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*BY THE SAME AUTHOR*

THE CONQUEST OF THE SOUTH POLE  
ANTARCTICA, A TREATISE  
ROBERT EDWIN PEARY





*By courtesy of R. C. WAKFIELD.*

DESCENDING MIDDLE PTARMIGAN GLACIER TO NORDENSKIÖLD  
GLACIER, EAST GREENLAND

# THE CONQUEST OF THE NORTH POLE

RECENT ARCTIC EXPLORATION

BY

J. GORDON HAYES, M.A.

" Let us probe the silent places, let us see what luck betide us ;  
Let us journey to a lonely land I know.  
There's a whisper on the night-wind, there' a star a gleam to guide us,  
And the wild is calling, calling . . . let us go."

*Robert Service*

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MADE AND PRINTED IN GREAT BRITAIN

*To*  
GINO WATKINS



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## PREFACE

**F**OR the benefit of a prospective reader who may wish to see in a sentence the purpose of this book, it may be said that it is attempt to give an accurate and proportionate narrative of Arctic exploration and research during the last 25 years, approximately—a period closely crammed with incident and adventure. The first account in English of several expeditions will be found here, and as a large proportion of the whole story is very little known it may thus possess the charm of novelty. Public interest in the polar regions is rapidly increasing, which shows a healthy mental appetite for stories of noble deeds in the open air, as well as intelligent concern with geographical exploration and other branches of science. Administering to this demand is a public duty as well as a great pleasure.

The same general principles, with minor variations, are followed in this book as in the sister volume: repetition is avoided, and reference to some parts of the subject are not as full as in the last book; very little quotation will be found here; footnotes are distracting, so the number of references has been reduced to a minimum and given in the text. Most of the data will be found in Appendix III. The "Shorter Oxford English Dictionary" has been followed throughout, except for the useful adjective "inartic," akin to "inartistic" and "inarticulate."

Every ship that has sailed north of the Arctic Circle could not be mentioned; many that go for trade purposes or for hunting carry one or two students. It is difficult to separate exploring expeditions from all other voyages. The Canadian and Russian Governments now send out annual Arctic patrols, all of which cannot be scheduled. Scientific work is carried out in connection with Norwegian fisheries, and research work often accompanies commerce. Apologies are tendered to any explorers who may feel unjustly overlooked, but the balance of the book as a whole claimed the first consideration; the list in Appendix I is as complete as possible.

Acknowledgments of assistance will be found on another page.

I have also received much help in preparing this book from a friend familiar with the Arctic Regions, and I greatly regret that his insistence on anonymity leaves me only this impersonal way of acknowledging his assistance and recording my thanks. His labours on my behalf have been heroic. I should like to thank my wife who has again undertaken some of the secretarial work.

J. G. H.

STORRIDGE VICARAGE,

MALVERN.

*April, 1934.*

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Reference to the data will be found in Appendix III.

## GLOSSARY OF TECHNICAL TERMS

- Ablation* . . . . The erosional effects of wind, drift-snow and other forces.
- Arctic, The* . . . . (Gr. *Arctos*, bear = *Ursa major* and *minor*.) A term in mathematical geography, meaning "within the Arctic Circle" in lat.  $66\frac{1}{4}^{\circ}$  N. or  $23\frac{1}{4}^{\circ}$  from the North Pole.
- Bergschrund*. . . . The uppermost crevasse on a glacier or between a glacier and a rock wall.
- Beset*. . . . . A ship is beset when surrounded by sea-ice and unable to move.
- Blizzard* . . . . . A strong wind accompanied by drifting snow.
- Cache* . . . . . A depot of, or to depot, stores.
- Calving* . . . . . The birth of an iceberg.
- Cartography* . . . . The making of maps by surveying.
- Close Pack* . . . . . Composed of floes mostly in contact. Almost or quite unnavigable.
- Col* . . . . . A mountain pass.
- Consolidated Pack* . . The heaviest form of pack. Entirely devoid of water spaces and usually composed of pressure ice.
- Continental Ice* . . . Inland ice which swamps all the irregularities of the land. See Ice Cap.
- Continental Shelf* . . That part of the land that extends from the shoreline under the sea, usually to an average depth of 100 fathoms.
- Crevasse* . . . . . A deep rift or fissure in land ice.
- Degree* . . . . . 60 minutes on a great circle, and the equivalent of 69 st. miles.
- Drift* . . . . . A convenient abbreviation for drifting or drift snow, as in a blizzard. Also used compendiously for the motion of sea-ice and ships, due to wind or currents.
- Drift Ice* . . . . . Loose, very open pack, where water preponderates over ice. Usually navigable at full speed.
- Fast Ice* . . . . . Sea-ice that remains fast where it formed.
- Field*. . . . . (See Ice Field.)
- Floa* . . . . . Any area of sea-ice, other than fast ice, whose limits are within sight from a ship's masthead; see also Ice Field.
- Frost Smoke* . . . . . Dark fog-like clouds that rise from newly-formed



water areas in the pack owing to the condensation of the vapour rising from the relatively warmer water.

- Glacial Erosion* . . . . The same as glaciation.
- Glaciation* . . . . The erosive action exercised by land-ice upon the land over which it moves. The term is now restricted to glacial erosion, as distinct from glacierisation, q.v.
- Glacier* . . . . A field or stream of ice, formed from compacted snow, which moves slowly downward over slopes or through valleys and depressions. Some glaciers, however, now appear to be inert.
- Glacierisation* . . . . The inundation of land by ice. The term *Glaciation* was formerly used also in this sense.
- Glaciology* . . . . The science of ice-forms and phenomena.
- Hummock* . . . . A mound or hillock in sea-ice usually formed by pressure.
- Ice Blink* . . . . The white or yellowish-white glare on the sky produced by the reflection of large areas of ice.
- Ice Cap* . . . . A continuous covering of ice, névé or snow, such as occurs in polar lands; it specifically denotes a continental ice sheet. An astronomical term, used of the white polar areas of Mars.
- Ice-divide* . . . . The equivalent, on land-ice, of a water-parting (commonly known as "watershed").
- Icefall* . . . . A steep or precipitous slope of land-ice usually connected with glaciers.
- Ice Field* . . . . When applied to sea-ice, is an area of pack ice, or of a single floe, of such extent that its limits cannot be seen from a ship's masthead.
- Icefoot* . . . . A sheath of ice adhering along the shores of polar lands.
- Ice Pack* . . . . (See Pack Ice.)
- Igloo* . . . . An Eskimo term for a snow dwelling, used for any shelter built of snow or ice.
- Inland Ice* . . . . The usual term for the Continental Ice or Ice Cap of Greenland.
- Island Ice* . . . . The ice cap of a small island.
- Latitude* . . . . Angular distance on its meridian (q.v.), N. or S. of the equator.
- Lead* . . . . A navigable passage through pack ice.
- Longitude* . . . . The longitude of any point is the arc of the equator intersected between the meridian of Greenwich and that of the point, measured E. or W. from the Greenwich meridian.
- Meridians* . . . . Great Circles round the earth, intersecting at the Poles.
- Moraine* . . . . Rock débris associated with a glacier, usually forming a continuous mound either on a glacier or on its previous site.

- Névé* . . . . . Compacted snow; a stage in the transition from soft snow to glacier ice.
- Nunatak* . . . . . A bare rock projecting through land-ice.
- Open Pack* . . . . . The floes for the most part do not touch, so navigation is possible, though slow.
- Pack Ice* . . . . . Sea-ice that has drifted from its original position; see pp. 29-30.
- Piedmont* . . . . . Abbreviation for Piedmont Glacier or Piedmont Ice, an ice-formation of glacier type extending along the shore.
- Pole, Geographical* . . . . . The imaginary point at which the meridians meet.
- Pole, Magnetic* . . . . . The Magnetic Pole is a variable area in which the vertical needle points downwards at an angle of 90° with the horizon.
- Pressure Ice* . . . . . Ice that is disturbed by pressure and forced above or below its normal level, usually into long mounds of debris.
- Sastrugi* . . . . . Ridges in the snow, covering land-ice, formed by wind.
- Scree or talus* . . . . . A sloping mass of detritus at the foot of a cliff or elsewhere.
- Seracs* . . . . . Ice-pinnacles on a glacier.
- Tide-cracks* . . . . . Fissures produced in sea-ice by the movement of the ice under the influence of the tides.
- Valley Glaciers* . . . . . Glacier streams flowing down clearly defined valleys.
- Water Sky* . . . . . A dark appearance of the sky due to open water beyond the pack.



## INTRODUCTION

**T**HE CONQUEST OF THE SOUTH POLE " was introduced to its readers by my good friend Dr. Hugh Robert Mill, with the weight of his erudition and experience. This volume is deprived of such help, and my standpoint is far removed from that of Dr. Mill in its detachment from most of the expeditions with which we are concerned. Human life largely consists in balancing *pros* against *cons*, and detachment has at least the advantage of making impartiality easier. The gain from an external standpoint is that of the spectator who sees the whole game in better proportion than the players or even, perhaps, the referee.

This book is a companion volume to my last, which met with a warm welcome in the British Isles and the United States, and it deals with a period of similar length. A retired General recently asked Dr. Mill and myself why we chose military titles for un-military books. The reply was that Sir John Keltie suggested "The Siege of the South Pole" as Dr. Mill's title for his history of Antarctic exploration, and Lady Shackleton pointed out that the obvious appellation for the continuation of the story was "The Conquest." The publishers share the responsibility for the present title.

*“ . . . Peace hath her victories  
No less renowned than war ”*

and less costly, though even geographical discovery has not been possible without considerable loss of life.

Several "popular" books on the subject have appeared during the last 25 years, but all that I have seen are incomplete. No Arctic history in book form has appeared since Markham's "Lands of Silence," which carried the narrative to about 1910-12. The most accurate record at the date of its publication, however, was Dr. H. R. Mill's article, "Polar Regions," in the 11th edition of the "Encyclopædia Britannica." To gather up the thread of the story, the following chapters will go back to the early years of the present century and will be introduced by a short survey covering approxi-

mately the last quarter of the nineteenth century. In 1928 General Greely published his "Polar Regions in the Twentieth Century," but this was a species of intellectual pemmican in which 80,000 pages were summarized in 200 pages for business men to learn the economic aspect of both Arctic and Antarctic; readers interested in this subject should consult it. Other works of a more popular nature may have done as much harm as good because they fail to separate truth from error and may lead their readers astray. Thus a chapter-heading, "Nearest the Pole," in one of them, is an example of pure credulity; while the next two chapters, "First at the Goal, Frederick A. Cook," and "Peary as Second Victor," appear to be both incorrect. The author of this book admits, in a private letter, that he simply took the travellers' stories at their face value.

Arctic history has suffered from prejudice as well as ignorance—the two greatest hindrances to all progress. Hence the time has come, not only to bring the narrative up to date but to do this with Lord Shaw of Dunfermline's "resolute dispassion." Impartiality and impersonality are, above all things, essential here. Truth is not so much concerned with reputations as with facts, and the one object throughout this book has been to reach and record them without fear or favour, knowing that they will be more and more firmly established by time and that the great truth must eventually prevail.

Uncritical writings are now intellectually obsolete, except among very simple readers, and they should be abolished because they are not merely unreliable but usually untrue. Truth cannot be distinguished from error without criticism, though readers need not be troubled with the process; it may be enough for them to reap the fruits of the author's labour. Historical and literary criticism are essential for separating history from legend; and geographical criticism is equally necessary to winnow away the chaff of mere travellers' tales from the good grain of discovery. Judgment there must be, sometimes even by fire, to separate the gold, silver and precious stones from the wood, hay and stubble.

The history of geographical exploration may be viewed from at least two very different standpoints: the standpoint of the general reader who may seek entertainment and the student seeking knowledge. It would be greatly to the advantage of the former if he could assume the student's standpoint to estimate the true worth of exploration, so as to correct for publicity. The reaction of the student to publicity is very different from that of the "layman," whose danger is that he may not react but imbibe; as "The Times

Literary Supplement" (16th March, 1933) said: "It is a curious reflection that there are people whom advertisements deceive." Research students react very strongly to publicity. They know that essentially it has nothing to do with the merits of an expedition, unless necessary to raise the means for carrying it out, and even then it may be deplorable. Some of the best work ever done by explorers has scarcely, if at all, been mentioned in the newspapers—the usual means of publicity. Hence the general public should beware of advertisement in connection with geographical exploration, and should seek true worth in its own quiet resting-places.

The largest unexplored areas of the earth's surface are in the polar regions where a new stage in exploration, that of consolidating our gains, has now been reached. The older explorers who pushed out into unknown lands and seas are followed, at the present time, by research students who increase our knowledge more than the pioneers because their work is more intensive. On many recent expeditions the two operations have been simultaneous, but this cannot continue much longer in the Arctic as there is little land there awaiting discovery. The ocean floor is the next great area to receive attention, and much oceanographical research has already been done. Expeditions tend to consist of scientists and surveyors who bring back accurate maps and natural history collections, data, observations, notes and reports.

The old British school of Arctic explorers has long died out or been diverted to the Antarctic. There was a gap of some years in which no Englishman entered the Arctic, and only one Scotsman, Dr. W. S. Bruce, went as far north as Spitsbergen. Then in 1921 came a renaissance, with the birth, at our old universities, Oxford and Cambridge, of a new school of explorers. An Oxford Movement arose that has promoted unity and true progress instead of discord and retrogression. In the same year two expeditions went north, one from each university. They were not unimportant in themselves, and their results were of value; but as evidence of new exploratory life, and as the pioneers of a splendid series of scientific expeditions, they were epoch-making. The Cambridge branch of this school of explorers traces its ancestry through Wordie to Shackleton; and the great explorer's son, Edward Shackleton, at the time of writing, is organizing the Oxford University Ellesmere Land Expedition. Although there have been more than 20 of these Oxford and Cambridge expeditions during the last 13 years, they are little known because their members are opposed to publicity and subscribe their

own expenses ; but the bushel will have to be removed that their light may shine forth. This British neglect of the Arctic until 1921 left the Danish school of explorers not merely predominant but supreme. It was a very fine school, founded in 1876 when the Greenland Committee was formed in Denmark, and it has produced an unbroken chain of great explorers, some of whom are still alive. They include Jensen, Holm, Amdrup, Ryder, Garde, Mylius-Erichsen, J. P. Koch, Mikkelsen, Rasmussen, Mathiassen, Freuchen and L. Koch. Their efforts naturally have been concentrated upon Greenland, Denmark's huge province.

The world is divided into Northern and Southern Hemispheres of which the polar regions form correlative as well as important parts ; but as the Arctic lies at the doors of the British and Scandinavian countries, relatively inexpensive visits can be paid to it compared with the cost of crossing the world to Antarctica. Thus the main cause of the difference between Arctic and Antarctic exploration is financial ; and the most characteristic feature of recent Arctic exploration is its multitude of cruises made in one summer. Nearly two years are occupied in doing one season's work in Antarctica ; the cost is great and has led to a smaller number of larger expeditions. The larger number of smaller Arctic expeditions has made no appeal to the public imagination, such as that exerted by the magnetic influence of a well-known explorer.

It should not be inferred from this that the results obtained have been less valuable, or that there has been less heroism in the Arctic than in the Antarctic. The loss of life in recent years has been very much greater in the north than in the south, and there have been many more desperate struggles for life with their attendant hunger and hardship. Only 17 explorers have died in Antarctica since 1899, whereas at least 75 men and one woman lost their lives on Arctic expeditions between 1907 and 1933.

The European War had less effect upon Arctic than Antarctic exploration ; in one sense it had no effect on the former, as there were expeditions in the far north throughout its whole duration. Vilkitski and Sverdrup did not return until the end of 1915 ; Stefansson was dead to the world for 5 years after 1913 and did not hear of the war until 1916 ; MacMillan was away from 1914 to 1917, the year of Rasmussen's 2nd Thule Expedition. A striking contrast is seen here : on the one hand, the polar scientists

*" Along the cool sequester'd vale of life  
They kept the noiseless tenour of their way,"*

calmly living their students' lives and carrying out their research work in the cold ; while, on the other hand, thousands of fellow-students were destroying one another in the heat of the war.

This period of Arctic exploration will be found to resemble one of Frith's famous pictures, with its crowded canvas, as may be seen by a glance at Appendix I. From this it follows that the period as a whole is not as distinguished as the contemporary Antarctic period ; and it does not lend itself to a concise summary. The reason for this is that Arctic exploration has reached an intensive scientific stage, closely connected with the application of natural science to technical appliances, of which flying and the wireless are the best examples.

The Arctic Basin may be destined to play an important part in the history of the human race because of its central position surrounded by Europe, Asia and America. The present routes between these continents could be shortened by several thousand miles by flying near the North Pole. The shortest distance from England to Canada is over Greenland, and a route to Japan over Iceland and Spitsbergen would be 2,000 miles less than by the Siberian Railway. Other routes would pass still farther north, where fuelling stations could be established on the islands as well as on the mainland.

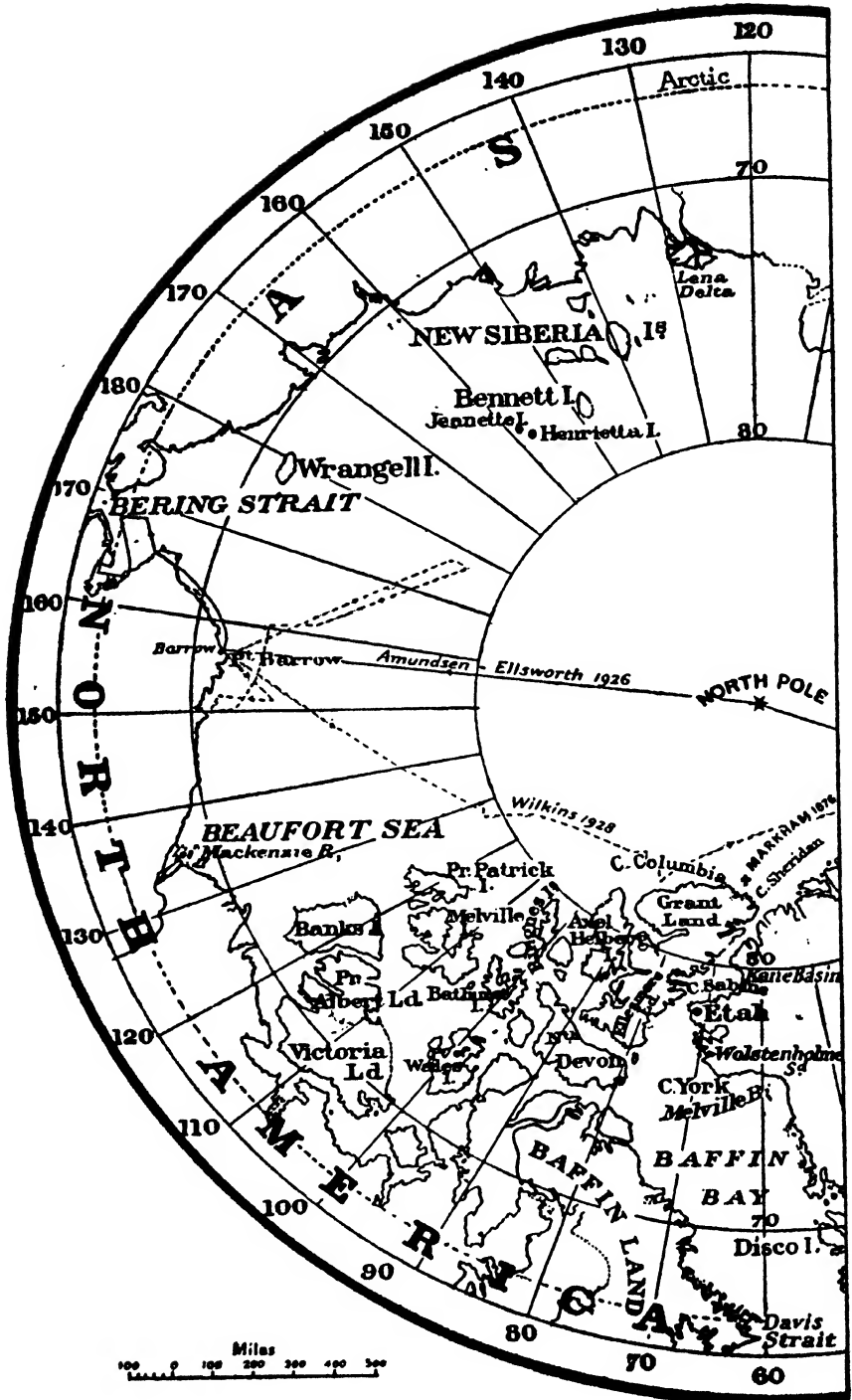
In addressing ourselves to the subject, it need only be added that the order of our going will be mainly chronological, but territorial centres will also be used.

#### POSTSCRIPT TO INTRODUCTION

Since the foregoing was written a copy has been received of the " Rules for the organization of expeditions " issued by the Oxford University Exploration Club. This club " is responsible to the Vice-Chancellor of the University for the conduct of its affairs," and imposes certain restrictions upon all expeditions equipped under its auspices. These restrictions set a high ethical and practical standard, and in some particulars, of which the limitation of publicity is one, drastic innovations are introduced. The system as a whole, seems excellent.

J. G. H.







## ABBREVIATIONS

cwt. . .	hundredweights	m.p.h. .	miles per hour
°C. . .	Degrees Centigrade	m.p.mar.	miles per march
E. . .	East	Mt., Mts.	Mount, Mountains
°F. . .	Degrees Fahrenheit	N. . .	North
f. . .	fathoms	No. . .	Number
ft. . .	feet	oz. . .	ounces
"G. J." .	"Geographical Journal"	p., pp. .	page, pages
Gr. . .	Greek	R.G.S. .	Royal Geographical So-
geog.. .	geographical		ciety
km. . .	kilometres	S. . .	South
lat. . .	latitude	sq. . .	square
lb., lbs. .	pound, pounds	st. . .	statute
long. . .	longitude	W. . .	West
m.p.d. .	miles per day	yd., yds..	yard, yards

## CHAPTER I

### THE GENERAL CHARACTER OF THE ARCTIC

1. Character and Divisions.—2. The Arctic Sea and its Pack Ice.—3. The Eurasiatic Sector : Its Islands and Vegetation.—4. Greenland.—5. Arctic America ; Land Animals.—6. Forms of Life in and near the Arctic Basin.—7. Climatic Conditions.

#### I. CHARACTER AND DIVISIONS

**T**HE history of recent Arctic exploration cannot be followed intelligently without some knowledge of the natural conditions that prevail in the theatre of operations. A sketch of them will therefore be given in this chapter, with the main geographical and oceanographical features of the Arctic, its ice-formations, natural history and climatic conditions. It would be well to consult Chart No. 1 before proceeding further. (A few details, slightly more technical, will be found in parentheses ; e.g. miles, unless otherwise stated, are st. miles of 1,760 yds. ; but minutes of lat. will also occur, and these are geog. miles of 2,029 yds. 1 geog. mile = 1.15 st. miles ; hence 7 geog. = 8 st. miles.)

For the meaning of terms, the Glossary should be consulted. The word "Arctic," in addition to its use given there, is also used adjectivally with different mental conceptions of its connotation, and this has led to some confusion ; arctic conditions do not mean the same to every explorer. The Arctic Circle is not a line of demarcation between temperate and frigid conditions. It may be imagined, indeed, as a symbol of wedlock between the two zones, for they have an intimate if not intricate relationship. The warm Gulf Stream or North Atlantic Drift sweeps 1,000 miles within the Circle, and Greenland with its cold current extends 500 miles outside it. The northern boundary of timber may be the best land frontier, with the southern limit of sea ice to complete it over the water. As the most characteristic feature of the Torrid Zone is heat, so the most characteristic feature of the Arctic is its cold ; and it is one of the two Frigid Zones in spite of the fact that colder areas exist outside the Arctic Circle than within it.

(Dr. H. R. Mill, in a personal letter, has explained this, as follows :

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The climate of the Arctic Region varies from the mildness of N.W. Norway to the terrible extremes of cold and heat in N.E. Siberia. Meteorologically, continentality and altitude rather than mere latitude constitute frigid conditions. We cannot rightly use the phrase "Frigid Zone," but rather "Frigid areas in winter" . . . The low sun in the Arctic zone means feeble insolation except on surfaces so sloped as to be nearly perpendicular to the rays. In that case, in summer when daylight is continuous, land near the sea and at sea-level, even at the Pole, would be snow-free and rich in dwarf vegetation. Of this there can be no doubt. Open water has always a small range of temperature, and water under ice exercises a certain effect in ameliorating climate, so that the Arctic ice-floes even at the Pole are less cold than the land in Northern Canada, Alaska and Siberia, each of which has a centre of maximum cold in winter far from the Pole and from the sea. The coldest of these areas, and the largest, is in Siberia with its centre nearly on the Circle but extending far to the south. In Greenland there is a fourth centre of cold which, on account of the altitude of the ice-cap, savours of Antarctic rather than Arctic conditions of climate.)

The following description will proceed in general from the centre to the circumference of the region, for the Arctic consists firstly in its frozen central sea and secondly in the lands that nearly surround it, with a large number of islands, most of which are in groups or archipelagoes. The whole region may be divided by drawing a straight line from Bering Strait across the North Pole, and passing to the W. of Spitsbergen; on one side of this line is the Eurasiatic Sector and on the other side Greenland and Arctic America. The principal divisions of the Arctic are therefore as follows:

THE ARCTIC SEA

THE EURASIATIC SECTOR AND ITS ISLANDS

GREENLAND

ARCTIC AMERICA.

### 2. THE ARCTIC SEA AND ITS PACK ICE

The area of the Arctic Sea is approximately  $5\frac{1}{2}$  million sq. miles; Antarctica is about 5 millions; and Europe, from the west to the Ural Mts. and Caspian Sea, is  $3\frac{1}{2}$  millions. Hence the Arctic Sea is the most extensive in the world, nearly 5 times the size of the Mediterranean, and more centrally situated in relation to large land-masses. The Arctic Sea is classified by scientific geographers as a portion of the Atlantic Basin. The surface of the earth is covered with large elevations, known as continents, and the larger depressions of the ocean basins. The most northerly of these basins, though not strictly oceanic, contains the Arctic Sea. Its greatest depth is over 2,000 fathoms.

The rim of the Arctic Basin, in common with all oceans, is formed

by a Continental Shelf that extends a varying distance from the shoreline. From the oceanographical standpoint, continents do not terminate at sea level but under water, on the Continental Edge which is often the 100-f. contour. The submerged land that extends out to this edge is known as the Continental Shelf on which stand all islands unless they are volcanic. The Arctic Continental Shelf varies in width from approximately 40 miles off Point Barrow in Alaska to more than 350 miles N. of Siberia. The gap in the rim of the Arctic Basin between Greenland and Spitsbergen is crossed at a depth of 800 f. by a submarine ridge. Thus the Arctic Sea is the central and principal feature of the whole region, with its islands and continents to the south, very much as Antarctica is the great polar feature in the Southern Hemisphere. Nearly the whole surface of this sea is covered normally with floating ice known as "pack ice" which plays such an important part in Arctic exploration that it must receive our careful consideration.

The first feature of the polar pack is movement; most of it is in almost continual motion. The direction of its drift is usually that of minor variability combined with a major resultant direction. Wind is the predominant power and drives the pack on one course after another, but almost invariably only one tendency prevails. Thus though the *Fram* entered the pack near the New Siberian Islands, and left it 3 years later to the north of Spitsbergen, its actual course was complicated in detail by motion towards every point of the compass. Tides and currents also move the pack. (Peary reported the maximum and minimum rates of drift—70 miles on 6th to 12th April, 1906, and none for 40 days on his last journey; see "Robert Edwin Peary," 135, 158.)

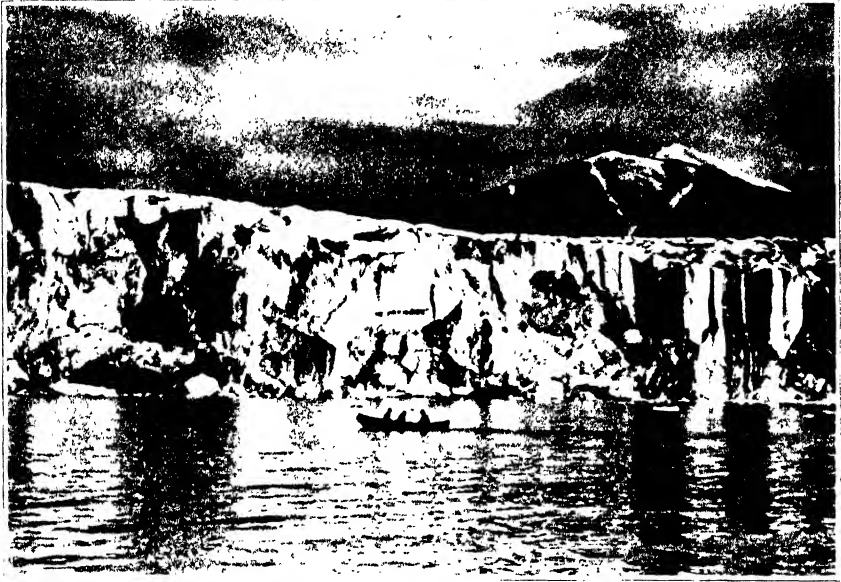
The motion of the ice has two principal effects: it crumples the edges of the floes, and often whole floes, when they come in contact into pressure ridges; it also forms spaces of open water between the floes. Before considering these effects more particularly, however, we must notice that the more common forms of sea ice are two, of which one has a tendency to merge into the other: FAST ICE; and PACK ICE, usually abbreviated to "PACK." FAST ICE is young ice formed in winter to a thickness of 6-8 ft. on coastal waters; this ice remains *in situ* for the greater part of the year. Most of it is only a year old because usually it ceases to be fast ice when it breaks out during the short summer, and becomes pack ice. PACK ICE may be regarded as floating beyond the coastal fast ice throughout the year, though its boundaries are very indefinite. It may be of any age, and its floes drift about, with water spaces between them.

In the coastal belt of Arctic Eurasia the water spaces in summer may equal the ice area ; but most of the pack consists of very heavy floes of great thickness and solidity, having small water spaces and a steady motion. The average height of the pressure ridges varies from 10 to 12 ft., with a draught of 50–60 ft. This brings us to hummocking—the first effect of the pack's motion.

The terms "hummock" and "hummocking" are generally reserved for old and weathered pressure ridges. As the ice-fields and floes drift about they collide, for their movement is far from uniform, and thus their edges are fractured, and ridges of broken ice are formed. A typical young floe consists of a level area surrounded by long mounds of this detritus, in the position of the fencing round a meadow ; but a typical view over the polar pack shows much more hummocking than level ice because the edges of the floes are by no means all that are broken by the pressure. The momentum of the ice is so great that whole floes and even fields are disintegrated and their flat surfaces serrated like a huge concertina. Sir Hubert Wilkins writes that "perhaps 90% of the pack ice surface is too rough for safe landings" of aeroplanes ("Problems of Polar Research," 404) a fact that should be remembered before accepting claims to excessive sledging speeds over the pack. As every hummocky floe continues to drift about for years, the proportion of level ice to hummocks in any locality tends to decrease, though there is one compensating factor.

We saw that the second effect and necessary accompaniment of the ice's motion was the formation of water spaces. Most of these spaces begin as long irregular cracks which widen into channels and are named "leads." Leads are of all widths up to several miles ; they merge occasionally into large lakes, and even small open seas whose limits are out of sight when standing on the floe, or about  $3\frac{1}{2}$  miles away in clear air. The formation of water spaces in one part of the pack usually implies the closing of open water in other places. During most of the year the surface of a lead will begin to freeze as soon as the water appears, unless there is too much wind, and it is covered with a few inches of ice in a few hours ; thus new areas of flat ice are formed.

Sea ice contains less salt than sea water because the process of freezing excludes a large part of it. Spots of brine may be seen on the surface of new ice as the nuclei of beautiful ice-flowers. Still further exclusion of salt takes place after hummocking, which is fortunate for travellers over the pack as the ice, especially from old hummocks, can safely be melted down for drinking water. As the



*By courtesy of HERBERT G. POSTING.*

GLACIER FRONT, BELL SOUND, SPITSBERGEN



*By courtesy of HERBERT G. POSTING.*

A LEAD IN PACK ICE





salt continues to drain out of the ice, the older hummocks are the fresher.

The Arctic Sea, being nearly enclosed, would become completely congested with ice if it accumulated indefinitely ; but equilibrium is maintained by the great ice-overflow known as the East Greenland Current. Smith, Jones and Lancaster Sounds, whence the Labrador Current flows, are smaller outlets, but their capacity is relatively trifling ; and Bering Strait, only 30 f. deep, is not an overflow. The Greenland Current is unique ; it varies from 20 to 300 miles in width, for the whole space between Greenland and Iceland is sometimes blocked with the ice, which travels at as much as 6 m.p.h., though more usually, for upwards of 500 miles, at an average of 10 m.p.d. with a maximum of 20 m.p.d. This high velocity enables the current to carry away the enormous surplus of ice that accumulates over an area that is nearly 2 million sq. miles larger than Europe. The overflowing ice drifts southwards until, rounding Cape Farewell, it turns northwards up the W. coast ; the current swerves west in lat. 64° N. and is rarely traced more than 40 miles from the coast. By midsummer the ice begins to disintegrate, and from August to January the coastal waters of South-west Greenland are free from obstruction.

More than 8,000,000 sq. miles of land drain into the Arctic Sea through the rivers, and thus fresh water, bearing Siberian timber, is liberally poured into the central basin. Some of these logs are carried completely across the sea, in about 5 years, to the shores of Greenland and other countries. The fresh-water ice soon becomes lost in the larger ice-masses of the pack. There are relatively few icebergs in the Arctic, and they are small compared with the huge tabular bergs of the Antarctic ; but the glaciers of North Greenland discharge enough bergs to become a menace to navigation. There are no icebergs in the central Arctic Basin, from which it follows that there is probably no undiscovered high land there.

### 3. THE EURASLATIC SECTOR : ITS ISLANDS AND VEGETATION

Proceeding outwards from the central sea we come next to the Continental Shelf on which stand numerous islands, mostly grouped into archipelagoes, followed by the Eurasiatic mainland and Arctic America. The following countries, named from west to east, have land on the rim of the Arctic Basin, Norway, Finland, Russia, U.S.A., Canada and Denmark. It will be convenient to glance at the vegetation in connection with the following description.

Arctic islands fall naturally into two large divisions : 1. The

compact Canadian Archipelago, to which we shall return ; 2. The long string of islands and groups on the Eurasiatic Continental Shelf, consisting of the Spitsbergen and Franz Josef Archipelagoes with Novaya Zemlya to the south of the latter and the more recently discovered Severnaya Zemlya to the east ; the New Siberian, Vilkitski, Wrangel and many other islands. Jan Mayen Island, being volcanic, stands alone. All these islands, more fully described in their places, are locked in the chilly embrace of their frozen seas during most of the year, with only 2-3 months in summer when open water, sometimes in large areas, may be expected in their vicinity. Nearly all are covered, partly or entirely, with land-ice formed from consolidated snow, though some favoured lands have no permanent snow covering.

Arctic Asia or Siberia is by far the largest sector of land on the rim of the Arctic Basin, extending for 3,000 miles from Bering Strait to the Russian boundary with Europe. Siberia is the coldest place in the Northern Hemisphere, with its soil frozen in places to a depth of 245 ft. (" Problems of Polar Research," 148). The surface becomes thawed in summer, but the subsoil is permanently frozen. It is remarkable, therefore, that any life should obtain a foothold there ; but it does, though mainly in the forms of lichens and grasses on which reindeer feed. The greater part of Siberia as well as Arctic Europe consists of *tundras*, which are semi-desert plains with marshy tracts in summer and scanty vegetation. Arctic Siberia is so inhospitable that very large areas have only recently been explored. In 1926 Mr. Obruchev entered an unknown region as large as Germany, and discovered several new ranges of mountains, covering a greater area than the Caucasus (" Geographical Journal," Nov., 1927). Considerable tracts of land were found covered with permanent ice formed from water that had overflowed from rivers, the beds of which were solidly frozen. Most of the barren lands are necessarily unpopulated.

Northern Europe resembles Siberia in having a semi-Arctic, semi-desert character which is also like the most northerly Canadian prairies in this, that the conditions in all these areas are continental as well as arctic. Boundary questions cannot be discussed here, but parts of these areas are more continental than Arctic ; Northern Canada and Siberia are not polar lands in the same sense as Greenland. In the Arctic, as a whole, there is more vegetation than might be expected, including ferns, and in its relatively warmer parts, several hundred species of flowering plants. The most luxuriant districts are oases in the prevailing desert or semi-desert conditions,

though some of the moderately-fertile areas, especially on the sub-Arctic border, are extensive. Among the flowers that bloom here are buttercups, saxifrages, heather, bluebells, dandelions, cotton grasses and poppies; while militant mosquitoes, sandflies, gnats, butterflies and bees make their appearance in the summer. It has been shown by C. S. Elton that Hover-flies and the dreaded aphids have been carried 800 miles from Europe to Spitsbergen.

#### 4. GREENLAND

Greenland is the largest island in the world, the largest purely Arctic country and the great dependency of little Denmark. Our knowledge of Greenland is more extensive than that of any other Arctic land, due mainly to the formation, in 1877, of the Danish "Commission for the Geological and Geographical Investigation of Greenland," and to the Royal Greenland Trading Company, now the Greenland Section of the Danish Home Office. All the larger libraries in England and Denmark possess the magnificent series of over 100 volumes, entitled "Meddelelser om Grönland," in which a complete record of the subject will be found. In 1928 another great work was published, in English and Danish, by a joint committee of the two institutions named above. This book, in 3 beautiful volumes, is named "Greenland," and edited by Dr. Vahl, Admiral Amdrup, Dr. Bobé and Dr. Jensen. These two works are as fine a series of documents as any that exist on any similar subject in the world.

In size, Greenland is exceeded only by the 6 continents: it is 1,600 miles long, nearly 800 miles wide, and the latest estimate of its area is 2,176,000 sq. km.; this is more than  $1\frac{1}{4}$  million sq. miles, a little less than the area of India. Greenland is situated between the Arctic Basin to the north, the Greenland Sea to the east, Baffin Bay to the west and the Atlantic Basin to the south; it is attached to the continental mass of North America across a series of shallow channels. The length of coastline, due to the number and size of the fjords, is very great and amounts to over 26,000 miles. The predominant feature of the country is its ice-cap, usually known as the inland ice or plateau, and more fully described in Chapter V.

Antarctica is the only country in the world with which Greenland can be compared, though Antarctica is a continent about 5 times the area of Greenland. They differ also in this, that Greenland is less heavily glacierised; for its inland ice seldom reaches the sea, but leaves a strip of rock and soil along the greater part of the coast.

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Some of the fjords are from 100 to nearly 200 miles in length, and at their heads the inland ice descends to the water in the form of glaciers. Occasionally, as in the Humboldt Glacier, the land ice gravitates directly into the sea. The whole country may be divided as follows :

1. *The Inland Ice Plateau.*
2. *The N. Coast*, from Cape Alexander to Cape Bridgman.
3. *The N.E. Coast*—Cape Bridgman to the N.E. Foreland.
4. *The E. Coast*—N.E. Foreland to Cape Brewster, Scoresby Sound.
5. *The S.E. Coast*—Cape Brewster to Cape Farewell.
6. *The S.W. Coast*—Cape Farewell to Godhaven.
7. *The W. Coast*—Godhaven to Cape Alexander.

In addition to these divisions, as Greenland is approximately triangular in shape, it is convenient to refer to the whole of its northern, eastern or western coasts as single terms.

Danish sovereignty over the whole country was admitted by the Permanent Court of International Justice on 5th April, 1933 (" G. J.," Aug., 1933, 151-6), and the Danish administration of Greenland has been marked by generosity and intelligence. The welfare of the native Greenlander has been placed before every other consideration and has saved the race from extinction. The administration of Greenland is by a Department of the Ministry of the Interior, known as the Government for Greenland, and the country is divided into 3 administrative provinces: 1. SOUTH GREENLAND, from Cape Farewell to North Ström Fjord; 2. NORTH GREENLAND, from North Ström Fjord to the N.E. Foreland; 3. EAST GREENLAND, from the N.E. Foreland to Cape Farewell. The Greenland Government has proved that the only way to preserve natives is to keep them from physical and moral contamination by Western Civilization. The Danish Government has also assisted materially in the exploration of the country; and its fine school of explorers, similar to the British Antarctic School, still flourishes. The exploration of this great country is the most important part of our subject.

### 5. ARCTIC AMERICA: LAND ANIMALS

Arctic America consists of the Canadian Arctic and Alaska. Arctic Canada is sub-divided into part of the North-West Territory and the greater part of the Franklin District (see Chart No. 5, also the "Ninth Report of the Geographic Board of Canada"). We are not concerned with the southern part of Franklin, as the district

from the Arctic Circle to the North Pole is officially named ; but the greater part of it is within both the Circle and our present province. It comprises the Canadian Archipelago which includes the smaller group of islands known as the Parry Archipelago. It is separated by 1,000 miles of frozen sea from Wrangel Island, the nearest known land to the W. This archipelago extends 1,200 miles to the S.W. from Cape Sheridan on the N.E. of Ellesmere Land to Cape Kellett, the S.W. point of Banks Island. Ellesmere Land is separated from Greenland by a series of waterways usually filled with ice and known as Smith Sound in the south, followed northwards by Kane Basin, Kennedy Channel, Hall Basin and Robeson Channel, the last of which debouches into the Arctic Sea ; these waterways form the principal part of the Smith Sound Route to the farthest north. The Canadian Archipelago in the Franklin District to the S.W. of Ellesmere Land consists of the Sverdrup Islands, Parry Islands, Banks, Victoria and many other islands, separated by narrow channels from the Canadian mainland.

Along the edge of the sea in summer there is often, but not always, life to be found, and inland there is sometimes grazing. One of the land-mammals most characteristic of the region is the Musk-ox (*Ovibos moschatus*), a ruminant more closely allied to sheep and goats than to oxen. Its flesh is quite free from the flavour of musk ; it is not found in Eurasia. When attacked by wolves, dogs or men, musk-oxen form a hollow circle with their calves, if any, inside and the bulls, facing outwards, charge singly and return to their places after each assault. A full-grown bull weighs 700 lbs. ; about 100 lbs. of this is fat, and there is said to be much waste in the butchering, but from 2 to 3 cwt. of edible meat remains. The meat is neither beef nor mutton, though commonly referred to as beef.

The caribou of Canada is the same type of animal as the reindeer of Eurasia, and there are said to be about 9 species or sub-species of this useful beast, which is nearly as ubiquitous as the polar bear and fox. Wolves are seldom seen in packs because of the shortage of food ; and they rarely attack man, but prey upon foxes, hares and lemmings—also, when opportunity offers, on musk-oxen. The polar bear (*Ursus maritimus*) is Nature's monarch of the icy north and has nothing to fear except starvation. He lives mainly on seals, but also eats fish, fowl and vegetable. A strong swimmer, he is almost amphibious and his habits are nomadic. When Jackson was at Cape Flora he found that polar bears do not hibernate ; the holes in snowdrifts are dug by expectant mothers as doe rabbits dig in our soil at home.

## 6. FORMS OF LIFE IN AND NEAR THE ARCTIC BASIN

The special features of a polar environment that have the greatest effect on organisms are the incidence of continual light for several months, followed by continual darkness (also for months), the shortness of summer, the length of winter and the general severity of the climatic conditions. Hence the struggle for existence between organisms in the Arctic may be less keen than the struggle of most forms of life with the environment, which is here most rigorous. And yet, whatever may be true of the central area, parts of the periphery of the Arctic Basin are friendly to life in its marine invertebrate forms, and it is also found in open water within the pack, especially in shallows. Terrestrial organisms are a different problem; but one of the biological reasons for the fertility of marine organisms in the Arctic is the constancy of the sea temperature near zero Centigrade, which favours the lower forms of life more than the bacteria that destroy it.

Much more oceanographical research in the polar basin is needed in order to ascertain how fertile may be its waters. They are not absolutely sterile, as formerly supposed, though desert areas exist. Sir John Murray said that Arctic waters were less fertile than Antarctic waters. The crucial question is what proportion the desert areas in the Arctic Sea bear to the whole basin. Nansen's evidence from his drift in the *Fram* points to the central part of the basin having very few mammals even in summer—and no other explorer has dwelt nearly as long as he in such high latitudes. The data are at present insufficient to decide whether the Arctic Sea as a whole is full of invertebrate life (the basis of other forms), with barren areas, or a desert with fertile oases. From the present partial evidence it may be of a semi-desert character, with more life in summer; but conjecture is futile and examples must be cited.

Nansen found forests of seaweed among the northern islands of the Franz Josef Archipelago, also marine plants in the pack between lat.  $81^{\circ}$  and lat.  $82^{\circ}$  N. No algæ were found in the sea, and little animal life, in lat.  $84^{\circ} 30' N.$ ; but as far N. as lat.  $81^{\circ} 40' N.$  diatomaceous ice was seen; this is ice discoloured by diatoms or minute marine plants. North of lat.  $85^{\circ} N.$  a large amount of dark brown ice was sighted, but he could not examine it and was doubtful whether the discoloration was caused by mud or organisms. In other parts of the Arctic, especially on the sub-Arctic borders, fish are plentiful in the forms of cod, halibut and herrings, with salmon

in fresh water. Birds abound in summer to the south of the polar pack, though mainly near land, for the number of pelagic birds is very moderate in most parts of the Arctic, and some districts are devoid of bird life. On the north of Greenland and Ellesmere Land they are very rare; though farther S. they are occasionally found in vast multitudes during summer. Between lat.  $82^{\circ}$  and lat.  $83^{\circ}$  N. Nansen saw in the pack fulmars, black guillemots, various gulls and little auks. Skuas were seen as far north as lat.  $84^{\circ} 40'$  N., with Ross gulls, Eider ducks, geese, snow buntings and kittiwakes nearer land. Puffins, loons and terns are also numerous. Ptarmigan and snowy owls are among the few land birds that winter there, while other migrants are too many to mention. Nansen found crowds of amphipods or sand-hoppers in lat.  $78^{\circ} 50'$  N., and other small crustaceans in the same locality, near the Continental Edge, where soundings varied from 30 to 800 fathoms. After the early part of winter (1893-4), bears, foxes, walrus and seals, or evidence of their existence, were seen repeatedly from the *Fram* until March, 1894, though there were three periods of nearly a month each when the higher forms of life were not observed.

Of marine mammals, a school of narwhals has been seen in lat.  $83^{\circ} 30'$  N. in the pack; ringed seals in lat.  $82^{\circ} 30'$  N. with bearded seals not far away. Walrus and seal abound in many parts of the Arctic Sea, wherever they can reach air to breathe; for they have lungs and occasionally drown. Nansen saw one walrus in lat.  $79^{\circ} 40'$  N. at a distance of 180 miles from the nearest land, where the depth was 1,000 f., and he regarded its appearance as a mystery. Seals feed on fish and crustaceans, while they themselves are eaten by bears, sharks and the Killer whale which is actually a dolphin and known as the grampus. The average weight of the Common seal (*Phoca hispida*) is about 150 lbs., though it is sometimes double this weight. About 90 lbs. of edible meat and blubber is obtained from a seal of 150 lbs. The Bearded seal (*Erignathus barbarus*) is uncommon, and reaches a weight of 800 lbs. Walrus are intensely gregarious, and consequently seem in danger of extermination, particularly as they are normally inoffensive beasts. They are allied to seals; and their tusks, sometimes 2 ft. long, are prolonged upper canine teeth. These tusks are very strong and are used in digging the sea-floor for molluscs and other shell-fish—the favourite food of the walrus—also in fighting, and in raising their massive bodies out of the water. A full-grown adult is over 10 ft. long; the species is said to be monogamous. The whaling industry has now passed from the Northern to the Southern Hemisphere, leaving a few



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Greenland right whales, rorquals and bottlenose whales to continue their species in the north.

Polar bears and foxes, though land mammals, wander long distances from land over the pack: from 100 to 200 miles is not unusual, and on three or four occasions Nansen saw bears or their tracks as far as 300 miles from the nearest land. Apart from this prowling, the amount of every kind of life clearly decreases as the distance from land increases over the pack; and on approaching land from the north the traveller passes from a relatively lifeless region to one of fertility. Nansen saw fox tracks in lat.  $85^{\circ}$  N. when 200 miles from Cape Fligely; these little animals live on the crumbs that fall from the rich bear's table. The most northerly evidence of bears seen by Nansen was in lat.  $83^{\circ} 20'$  N., and by Cagni near lat.  $84^{\circ}$  N., though the latter explorer on 5 occasions saw no bears, only the tracks, and very little life on his long journey over the pack. Peary never saw any animals on the pack, but on his last journey he may have found the track of a fox as far N. as lat.  $87^{\circ}$  N. It is seldom that reindeer, wolves or musk-oxen roam over the sea-ice. Nansen's drift in the *Fram* showed that sufficient game to sustain life could not be obtained when far from land (see Appendix II), for there was one period of 14 months when no fresh meat could be secured, and 16 months elapsed without killing a bear. It cannot be said that the members of the expedition did not look for game, or that they had no good hunters; Sverdrup was an excellent shot and even set a bear-trap. On approaching Spitsbergen in 1896 birds first appeared, then whales, seals and lastly bears.

#### 7. CLIMATIC CONDITIONS

The importance of Arctic meteorology may be gathered from the large number of stations, more than 80, established during the 2nd International Polar Year, 1932-3. There is naturally a great variety of climatic experience to be gained over so large a region, as well as in any one locality from time to time. The Arctic is less cold and windy than the Antarctic, and has less precipitation, mainly due to the moderating influence of the central sea. One important feature, the summer thaw, is unknown in Antarctica, whereas in the greater part of the Arctic it is the dominating feature for several weeks, when rain falls, glacial streams and lakes appear, and nearly the whole country is flooded. There is said to be little difference between the temperature of the winters in the two polar regions, but data will not be available for this comparison until winter temperatures have been recorded on several parts of the

Antarctic Plateau at about 9,000–10,000 ft. above the sea. The amount of snow, and of land-ice formed from it, does not depend upon precipitation alone but on its excess or otherwise over ablation and thaw. Wind and rain are the two great agents of ablation. The velocity and frequency of Arctic winds as a whole, and with many local exceptions, are relatively low, so ablation is not rapid.

There are insufficient data for a general statement on the frequency of storms over the whole Arctic area. Gales often rage for several days off East Greenland, with great force from the north-north-east, but they cannot be compared with the exceptional blizzards discovered in Antarctica by Sir Douglas Mawson. Very much of the Arctic is relatively calm. Cold air, because of its dryness, has less effect on men than higher temperatures at lower latitudes; warm air is more humid. In some parts of the Arctic low-lying mists are common. Books on physical geography commonly state that lat.  $65^{\circ}$  N. is the northern limit of timber, and that from lat.  $65^{\circ}$  to lat.  $75^{\circ}$  N. is tundra, beyond which is no vegetation. But vegetation depends upon favoured localities, and sheltered nooks and crannies, more than latitude. It is found on the most northerly land in the world, on the N. coast of Greenland in lat.  $83^{\circ}$  N., while sterile land comes as far S. as lat.  $60^{\circ}$  N. The boundary lines between the belts should therefore be curved to follow the lines of vegetation and the southern limit of the pack ice. As an example of how temperate and even warmer conditions affect the Arctic, we should note that the lat. of the British Isles,  $50^{\circ}$ – $60^{\circ}$  N., is that of Labrador, British Columbia and the southern half of Hudson Bay; and that the Shetland Islands are the same latitude as the southern point of Greenland. A second great factor, commonly known as the Gulf Stream Drift, prevents the British climate from becoming sub-Arctic in character. Similarly the atmospheric circulation in the Arctic has a pronounced effect on climatic conditions in lower latitudes; hence the value of the meteorological work carried out by Arctic expeditions.

A little rain falls in summer as far N. as lat.  $84^{\circ}$  N. in the Arctic Basin, though most of the precipitation is in the form of snow; the total is said to be equivalent to 12 inches of rain per annum, over the whole region, but there are insufficient data for such a sweeping statement. The variation in temperature is sometimes as much as from  $40^{\circ}$  to  $60^{\circ}$  F. in 24 h. Temperature is affected by 3 main factors: latitude, height and the presence of land or water. Hence the temperature at the North Pole is not the coldest in the Arctic. Nansen found no difficulty in becoming overheated when the thermometer

was in the *minus* forties, and Hansen on the *Fram* said that a temperature of  $-30^{\circ}$  C. was not cold enough for wearing fur clothing and he did not believe in pampering himself. The air felt almost mild one day in lat.  $80^{\circ}$  N., when the temperature was  $-42^{\circ}$  F. ( $-41^{\circ}$  C.) because there was no wind; and even  $-54^{\circ}$  F. ( $-48^{\circ}$  C.) was not objectionable until a light breeze of only 4–5 m.p.h. altered this opinion. Nansen said the sun was too hot one April day in lat.  $86^{\circ}$  N., though this is exceptional. He rejoiced, however, in a month of fine and mostly sunny weather in March and April, 1895, when he and Johansen were between lat.  $85^{\circ}$  and lat.  $86^{\circ}$  N.

The Arctic sky is sometimes as blue as in Italy, and the atmospheric colouring in the pack ice is most beautiful. All shadows on snow are purple or violet, and the tints above the horizon, sometimes lasting for days without a break, are most satisfying to the æsthetic sense. One interesting sight in the Arctic is the Aurora Borealis or Northern Lights—a remarkable phenomenon not yet completely understood; but it appears to be due to solar emanations entering the earth's magnetic field. It consists of rose or violet rays and luminous bands of other colours; sometimes as celestial curtains hanging from the sky or waving to and fro with rose or violet light. Had the Psalmist seen it when he sang:

*Who coverest Thyself with light as with a garment :  
Who stretchest out the heavens like a curtain ?*

## CHAPTER II

### THE SLEDGE-RACE FOR THE NORTH POLE

**I**N every Age there have been men with a passion for plunging into the unknown ; some have extended our intellectual horizons, and others have adventured over the rim of their known world to make geographical discoveries. Many of the latter have gone northwards ; but it is not our present purpose to repeat the oft-told tale of the earlier pioneers, such as Hudson and Parry, who began the struggle for the North Pole. History resembles a continuous roll of cloth, and all divisions into periods are more or less arbitrary. Hence it is advisable to introduce the period with which we are concerned by a rapid sketch of the principal events that led up to it ; and it may be well to emphasize some of the more notable attempts to reach the North Pole on foot.

From 1870 to 1880 several explorers were feeling their way northwards beyond their predecessors' turning-points and, in their turn, strengthening the foundations for later discoveries. In the Eurasiatic Sector, Leigh Smith visited Spitsbergen in 1871, while Payer and Weyprecht turned from here to Novaya Zemlya and afterwards discovered Franz Josef Land (Chapter VI). In 1878-9 the North-East Passage was first made by Baron Nordenskiöld, the Swedish explorer, in the *Vega*, and he missed meeting De Long's *Jeanette* in Bering Strait by only a month. The latter ship drifted to the NW. until 1881 and was lost near the New Siberian Islands after the discovery of Bennett, Jeanette and Henrietta Islands. The party reached the delta of the Lena where most of them, including Commander de Long, perished.

In 1875 Nares had worked to the N. of Smith Sound and made three records : Albert Markham reached the farthest N. in lat.  $83^{\circ} 20'$  N. over the pack ice ; Aldrich passed a point that he named Cape Colombia, only 20 miles S. of the above latitude, and pressed on to the W. for 300 miles, charting the N. coast of Ellesmere Land ; and Beaumont followed the N. coast of Greenland as far as long.  $50^{\circ} 40'$  W. in lat.  $82^{\circ} 18'$  N., and named the farthest point in sight Cape Britannia. In 1882 Lieut. Lockwood, of Greely's expedition,

extended the N. coast of Greenland 125 miles beyond Beaumont's turning point by reaching long  $40^{\circ} 46'$  W. in lat.  $83^{\circ} 24'$  N., his farthest point being named Lockwood Island. Greely charted part of the interior of Ellesmere Land, but unfortunately 18 out of his 24 men died (see p. 135).

A remarkable man entered the field of Arctic exploration in the year 1888, though young Nansen had been in the far north before this. He now took command of his first expedition. With his whole life before us, it can be seen that few men are worthy to be compared with him. Nansen was no product of the proletariat rising like a rocket into the sky of fame, but came of a distinguished and affluent family. A true scholar, he possessed all the qualifications—mental, moral and physical—for a great explorer, as his brilliant accomplishments subsequently proved. He was "noble in character, incapable of jealousy, steadfast in purpose and loyal to his companions" (Capt. A. B. Armitage in a letter to the writer). His genius was seen in the conception of a drift across the Arctic Basin when, in September, 1893, he put the *Fram*, a completely original vessel for the purpose, into the pack ice to the NW. of the New Siberian Islands. In spite of being caught in what may perhaps be described as several large "eddies," progress was made in a general north-westerly direction as far as lat.  $85^{\circ} 57'$  N.—reached in 2 years—after which the ship was carried SW. and S. Capt. Sverdrup extricated the vessel from the pack near Spitsbergen, after his party had spent the winter of 1895-6 beyond lat.  $85^{\circ}$  N., or 200 miles farther north than any other party ever wintered before or since.

On the return of the Jackson-Harmsworth Expedition (see Chapter VI) which had no designs on the Pole, the *Windward* was presented to Peary who took her north on his expedition of 1898-1902. These years coincided with those of the *Fram's* second voyage under Sverdrup which must now receive our attention. Sverdrup and Peary met in the Smith Sound district where the *Fram* and *Windward* wintered, in 1898-9, within 50 miles of each other. Great are the uses of advertisement! Those who read little beyond their newspapers will probably know nothing of Sverdrup or his expedition. Yet he was a much more important man than Peary, and accomplished more valuable work on this expedition than Peary did in his whole life. These explorers were quite unlike each other: Peary set out frankly to make a name for himself and had his reward in immediate applause; Sverdrup put polar research in the forefront, and his work will live for ever. Peary was of the past; Sverdrup is of the future.

For some years there was a popular craze over two geographical points, the mere attainment of which was of slight importance ; the feat was almost entirely athletic, and the public interest in expeditions to reach the Poles was maintained by newspaper campaigns. When the reaching of a high latitude was subservient to serious research there was little objection to a form of activity that, in itself and from the scientific viewpoint, resembled a bad habit. Sverdrup, after the drift of the *Fram*, had no interest in the Pole ; he was concerned with the discovery, charting and exploration of new Arctic lands. His capacity for leadership had been severely tested on Nansen's Greenland expedition when, on a crucial occasion, his coolness in the face of danger saved the whole party. He then further proved his powers as master of the *Fram* during the 3-years' drift, and in 1898 set out once more, this time in command of a new Norwegian expedition. His staff included a cartographer, a zoologist, a geologist and a medical officer, in addition to several technicians.

Sverdrup's object was to complete the delineation of Greenland by driving his ship as far north as possible and then continuing by sledge. On reaching Smith Sound, however, he found Peary already there, having raced to stake the first claim, and the ice conditions in 1898 and 1899 effectually prevented any ship from going farther north. Sverdrup's first winter was spent in Rice Strait whence journeys were made over Ellesmere Land, and its western coast was discovered. He withdrew into Jones Sound in 1899 and carried out the greater part of his campaign from there, though little could be done until the summer of 1900. Three splendid journeys were then made : Sverdrup's party was in the field for 76 days, the scientific party for 78 days and Isachsen's party for 92 days. The discoveries made were extended and consolidated in 1901 ; they included Axel Heiberg Land, the two Ringnes and Prince Christian Islands, with the delineation of the indented west coast of Ellesmere Land, excepting Greely Fjord. The expedition discovered and charted 1,750 miles of coastline, and claimed to have mapped 100,000 sq. miles of new land, besides doing much detailed scientific work. The results are worthy of comparison with those of the great Antarctic expeditions.

About this time six explorers, apart from Nansen, made the attainment of the North Pole their sole or paramount purpose : Peary, Cook, the Duke of the Abruzzi, Anthony Fiala, Andrée and Welmann ; but Welmann's attempt was a complete fiasco, and Andrée will be mentioned in Chapter XVIII. Peary began his long series of expeditions with this ultimate object as early as 1892, having the intention

#### 44 THE SLEDGE-RACE FOR THE NORTH POLE

of blazing a trail across Greenland to his goal, though he did not discover and reach its most northerly point until 1900. He then set off northwards from it over the pack ice, but the mass of pressure ridges prevented more than 3 or 4 miles' progress a day, and on the fourth day from land he gave up the attempt on this route, by which the Pole was clearly unattainable.

While Peary was suffering this reverse, Commander Cagni was making a marvellous march over the polar pack from the Franz Josef Archipelago. H.R.H. the Duke of the Abruzzi had entered into the contest for the North Pole soon after Nansen's return and inspired by his example. The Duke was a great explorer and a national hero of Italy; he based his plans on his predecessor's experience and had the advantage of his personal assistance. In 1899 the *Stella Polaris* was sailed to lat.  $82^{\circ} 4'$  N. where, to the north of Cape Fligely, open water was found in the position of King Oscar and Petermann Lands, and a base was established in Teplitz Bay on Prince Rudolph Island in lat.  $81^{\circ} 40'$  N., 40 miles north of Nansen's hut. The Duke unfortunately was prevented by a frostbite from leading his polar party in person. On 11th March, 1900, Cagni set out with 9 other men and 12 sledges drawn by 98 dogs—the finest equipment that had ever essayed to reach the Pole. There was much more snow and wind than Nansen had experienced five years earlier in the same locality. Two supporting parties were sent back, one of them being lost on the return journey, and on 31st Cagni advanced with 3 companions, 5 sledges and 49 dogs. On reaching lat.  $85^{\circ} 44'$  N. rations were reduced for a final effort; and on 23rd April the record latitude of  $86^{\circ} 34'$  was attained. This point was 20 miles beyond Nansen's turning-point and about 200 miles from the Pole. Cagni's latitude has never been doubted, and his party consisted of 4 Europeans. On returning to the base after a hazardous return journey, a distance of 753 miles had been covered in 104 days; for 300 miles an average of 14 m.p.d. was maintained. The cartography of the Franz Josef Archipelago was further corrected by this expedition, and other scientific work was not neglected.

In 1901 the Baldwin-Zeigler expedition wintered in the archipelago and left a large depot of stores at Cape Auk on Prince Rudolph Island; another depot was placed at the Bass Rock on the NE. coast of Greenland. This enterprise was followed in 1903 by the Zeigler-Fiala expedition which possessed 30 ponies and 218 dogs, yet the total distance made over the pack was no more than 10 miles. More corrections, however, were made to the map and some new islands discovered.

In 1901 Peary tried a new route, swerving westwards from Robeson Channel and starting over the pack from Ellesmere Land. As he had only 12 dogs, and as the ice was nearly as rough as that off Greenland, there was no prospect of success, and he soon returned to his hunting. On 6th April, 1902, he made an attempt from Cape Hecla, but the difficulties were so great that he gave up the struggle in a fortnight, though he had only reached lat.  $84^{\circ} 17' N.$  which left him 137 miles behind Cagni's record of 2 years earlier. Some pioneer charting of coastlines was done, and thus ended Peary's 4-years' campaign, the failure of which was mainly due to the base being too far south. This mistake was not repeated.

He went north in 1905 much better equipped than before, with a new ship, the *Roosevelt*, specially built for his work. An examination of this expedition, and that of 1909, will be found in "Robert Edwin Peary, a Record of his Explorations" (1929). His account of the 1906 journey is unsatisfactory. There was no other white man in the advanced party but, as again in 1909 after leaving Bartlett, only Henson (a negro servant) and Eskimos. Peary claimed to have reached lat.  $87^{\circ} 6'$  north or 32 miles farther north than Cagni, on 21st April, 1906, but no distances are given on 28 out of the 34 outward marches from land. All Peary's miles, unless otherwise stated, are minutes of lat. or geog. miles, and much less than the distance actually travelled. Borup gave the allowance for deviations in 1909 at 30 per cent ("A Tenderfoot with Peary," 194). Two days were missed out of Peary's diary during the final dash in 1906, but he carried on as if they had not existed; and in the narrative of his return to the *Roosevelt* all dates are omitted, including the date of his return to the ship. He then wrote: "I quote from my journal of the next day," when he had not told us the date for a month! A story of this character could not deprive Cagni of whatever honour there may have been in attaining the farthest north. Peary then believed he had shot his last bolt which, at the advanced age of 50 for this strenuous work, is credible.

In 1907 J. R. Bradley and Dr. F. A. Cook sailed to Smith Sound, and the following year Cook made his attempt to reach the North Pole—an attempt that cannot be dismissed in a few words. The introduction of his name, however, confronts us with a difficulty left as a newspaper legacy from the year 1909, when the press clouded the issue and the loudest voice was heard last. The controversy will not be revived here; but unless Peary as well as Cook is to be ignored, the subject cannot be entirely avoided. A few of the more important facts will suffice, and it is clearly a question for reference to authorities.



The principal authority is "The Congressional Record" or United States' "Hansard." It is impossible to form a correct conclusion on this subject without reference to this official document which contains much important evidence; and it is the first authority because it shows how much reliance can be placed on Peary's assertions. The second authority is his book, "The North Pole" (Frederick A. Stokes Company, 1910)—a book that bears Peary's name as sole author, but was not written by him. He supplied Mr. A. E. Thomas with the subject-matter from which Mr. Thomas wrote the book, though his name does not appear and his authorship was a secret. Letters written to me by Mr. Thomas and Mr. Frederick A. Stokes the publisher state quite clearly that Peary alone was responsible for the accuracy of all statements in the book, and Peary read the proofs. The last authority to which we need refer here, for other data are relatively immaterial, is "My Attainment of the Pole" (The Polar Publishing Company, 1911) written by Dr. F. A. Cook. This book as a whole bears the stamp of reality; it presents no more difficulties than most other books of the same class and fewer difficulties than Peary's "The North Pole." Neither book contains any proof of reaching the Pole; but Peary's book contains positive evidence that he could not have reached it. There is no reason for anyone to lose his sanity because the North Pole was not attained on foot; the matter was of very little importance.

Dr. Frederick A. Cook had served as honorary medical officer on Peary's Greenland expedition of 1892, when the seeds of discord appear to have been sown; and in 1897, in the same capacity, had visited Antarctica in the *Belgica*. Amundsen in "The South Pole" says that Cook was "beloved and respected by all . . . The Belgian expedition owes a great debt to Cook . . . Upright, honourable, capable, and conscientious in the extreme . . ." and more to the same effect (op. cit., 24). When Cook sailed for the Arctic in 1907 there was nothing against him.

He chose a new route to the Pole, through Sverdrup's game lands; this avoided trespassing on the route that Peary claimed exclusively for himself. Though longer, it had the two advantages of ample fresh meat and smoother ice. On 19th February, 1908, he set out from Etah with a large party of Eskimos and 100 dogs, sending back supporting parties and laying depots from time to time. On 18th March he left the land with 2 men and 26 dogs, all well fed; this was the second or marine stage of the journey. New land was said to have been discovered near long. 85° W. on 27th March and named Bradley Land; Sir Hubert Wilkins, in 1928, could neither verify

nor disprove its existence (see p. 250). Cook said that he also discovered a glacial island; but the illustration he gives differs from his description of it. He believed that he reached the Pole on 20th April, 1908, and this does not appear impossible, though it may be improbable. His astronomical observations were fuller than Peary's; Cook took longitude as well as latitude observations, and they do not form a bad series, but his chronometer could not be checked and there is no certainty as to the position of his turning-point. Apart from this, he made no incredible claims, and his daily distances were not more, on the average, than 15 miles.

He became lost on his return journey and had the most extraordinary adventures in Jones Sound which delayed his return to civilization until 1909; thus his first telegram was only a week before Peary's. E. S. Balch, the well-known jurist of Philadelphia, pointed out that Cook's earlier description of the conditions found at his turning-point was verified in detail, or alternatively copied, by Peary. (See "The North Pole and Bradley Land.") Excluding Cook's claim to have reached the Pole, there are 3 separate lines of evidence on the validity of his record as a whole:

1. Presumptive evidence prior to 1907.
2. Evidence external to Cook's records.
3. The internal evidence of those records.

1. *The Antecedent Evidence* leaves nothing to be desired. Cook's character until 1907 stands the test of careful investigation. He had led an honest life, as testified by others; and to the age of 42, when he sailed for the Arctic, his word had never been doubted. He had a good record as a more or less scientific type of explorer. The evidence, therefore, antecedent to the time when he started on his last expedition is strongly in his favour.

2. *The External Evidence*, on which the burden of proof lies, falls into 3 sections which together cover nearly the whole of Cook's route. *Section 1* is the first 450 miles of the journey, over the whole of which MacMillan travelled 6 years after Cook, and was unable to mention one fact that could in any way invalidate his story. MacMillan, indeed, found two of Cook's depots, one of them being about 400 miles from the base, thus proving the truth of Cook's record for nearly half his outward journey. *Section 2*, Bradley Land, the most important discovery claimed by Cook, strange to say, never appears to have been doubted, and Peary placed it upon his maps! (See "The North Pole.") Should this land be found, it will be external evidence that Cook travelled at least 650 miles out of his whole distance of about 900 miles. *Section 3*, the polar area. The con-

ditions found at Cook's turning-point, and first made known to the world by him, were afterwards confirmed by other explorers, including Peary, Byrd and Amundsen. The main fact was that there was no land.

3. *The Internal Evidence* of Cook's journal amply supports what has already been proved by others. His story is reasonable and credible ; it bristles with natural history memoranda at every stage of the journey and gives valuable descriptions of regions and phenomena never before seen by man. Its truthfulness is shown by the human admissions of weakness and depression, as well as by the modest references to the interesting discoveries made. The internal evidence seemed so strong to E. S. Balch that he wrote " the genuine ring of Cook's narrative " convinced him of its truthfulness from the first (op. cit., 15-16). Cook is clear and consistent, simple, unaffected and matter of fact. His book is not free from defects, but they are no more than those usually found in works of this character.

The Mt. McKinley Controversy is irrelevant to the polar journey, and was introduced during the major controversy purely for the purpose of discrediting Cook. If his reply is given the same weight as the charges brought against him—the only judicial attitude—he not merely clears himself but makes a very effective counter-charge.

It is submitted therefore : 1. That, in the year 1908, Dr. F. A. Cook probably reached at least as high a latitude as that attained by Admiral Peary the following year ; 2. That Cook's statements, except in relation to his attainment of the North Pole and possibly his Glacial Island, may be accepted as substantially genuine, truthful and accurate ; 3. That, therefore, the newspaper and other charges of fraudulence were unjustified.

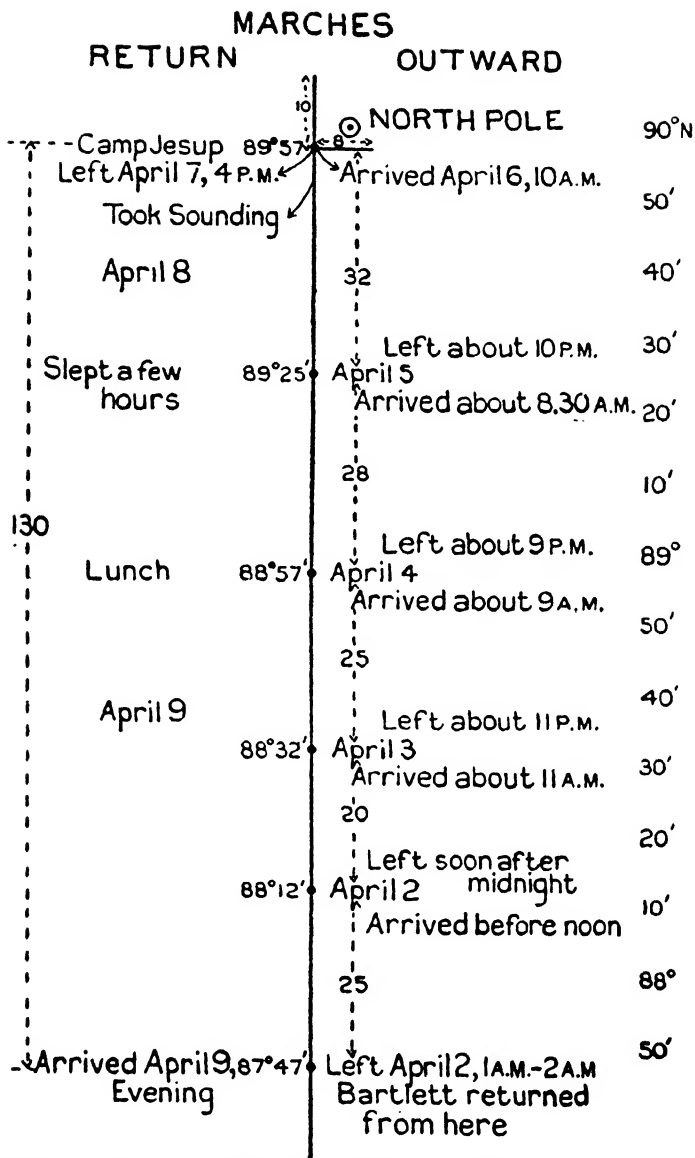
Perhaps it should be added, with reference to the well-known Copenhagen Verdict, that had the university made the same demands on Peary as on Cook, for the examination of records, the resulting verdict would have been the same. All that Peary submitted to the Royal Geographical Society were copies of some of his alleged observations.

In August, 1908, while Cook was struggling for life in Jones Sound and on North Devon, Peary opened his last Arctic campaign by pushing the *Roosevelt* again to Cape Sheridan, where the expedition of 1906 had wintered. In February, 1909, a long procession of 22 men, and 133 dogs pulling the sledges, set out for Cape Columbia in lat. 82° 7' N. the most northerly point of Ellesmere Land, and on 1st March they embarked upon the pack ice. No observations were taken until 23rd March in lat. 85° 48' N. when the sun was a few

degrees above the horizon. One supporting party after another was sent back until lat.  $87^{\circ} 47'$  N. was said to have been reached on 11th April. Here Bartlett is supposed to have turned back and Peary said he went forward with Henson and his Eskimos.

The diagram on the next page graphically shows the northernmost portion of the journey according to Peary's data, all of which have been carefully examined. The diagram does not show what he did, for no man could have done it, but what he must have done if he reached the North Pole. Where he turned back will probably never be known. He appears to have followed Bartlett by returning to Cape Columbia from the northwest of that point, so both had been many miles from their meridian. When Peary was examined by the Congressional Committee, in 1910, he stated that his longest day's march was "fifty geog. miles, estimated" or  $57\frac{1}{2}$  st. miles; yet on his official test he walked no more than *half* this distance over the excellent roads of Washington, D.C. From his own account in "The North Pole" he must have averaged 50 m.p.d. for a week over ice-floes and in heavy fur clothing; he did not use ski, and he said he did not ride (op. cit., 193-4, 250-1, also 199).

There have been many critics of Peary's claims, on both sides of the Atlantic, and all disinterested inquirers have come to the same conclusion—that he did not reach the Pole; by this it may be understood that he was never within 50 or more miles of its position. Many polar explorers agree with this verdict; but they have hitherto refused to make any more public admission of their opinion than an affirmation in their lectures, though this they do not hesitate to make. Peary said that he returned from his camp at the Pole to lat.  $87^{\circ} 47'$  N. in not more than 56 hours. This is a distance of 150 st. (130 geog.) miles, apart from deviations over the pack ice and the drifting of the floes. Hence a man 53 years old either walked considerably more than 75 m.p.d. for 2 days over a rough surface or he never came near the Pole. He had 401 miles to travel from where he left Bartlett, to the Pole and back to the same latitude, and he claimed to have covered this distance at an average rate of 50 m.p.d. He tried to conceal these excessive speeds and distances, but he gave the data for them. His total unwitnessed distance was 799 miles, covered in 23 marches that average 34 miles a march; yet Sir Hubert Wilkins affirms that 90 per cent of the surface of the pack ice is too rough for the landing of an aeroplane. In the 14th edition of the "Encyclopædia Britannica," article ("Arctic Regions," p. 302), we read that Peary was able to make one march of as much as 30 miles; the higher speed of the return is not mentioned.



PEARY'S RETURN FROM THE POLE TO LATITUDE 87° 47' N.









Peary admitted to a Congressional Committee that his original records were never submitted to a competent authority for examination ; and he was acclaimed as " Conqueror of the Pole " on the word of a publishing company. This and similar evidence was so remarkable that it seemed advisable to apply to the Librarian of Congress at Washington for verification of statements made even in the United States official " Congressional Record." The librarian was good enough to comply with my request and assured me that there was no error in the record, though it included a description of questionable actions. One example of these will be found in the Congressional Report, Private Calendar No. 733, 61st Congress, 3rd Session, House of Representatives Report No. 1961, pp. 21, 22 ; it can be seen in the library of the British Museum.

As some of these doubtful incidents were in connection with crucial facts and have been verified by an official of the United States Government, the subject may be regarded as closed. University students are now being taught the truth, and some of the learned societies that accepted Peary's claim, before his record was examined, have now revised their verdict in accordance with the facts brought to light, and it is high time that other societies found the moral courage to do the same. Thus the North Pole may be said to have been besieged for several years, but emerged from the infantry attack like a virgin fortress.

## EXCURSUS I

*from Chapter II*

### PEARY'S RECORD

- 1886. 1st Greenland journey. The point claimed to have been reached was doubted by Nansen.
- 1892-95. 2nd and 3rd Greenland journeys. Claim to the discovery of Navy Cliff, Academy Glacier, Independence Bay and Peary Channel. The cliff and glacier exist but the bay and channel do not.
- 1898-1902. *Windward* Expedition. Claimed to have completed the delineation of Greenland, but this was done by Mylius-Erichsen and J. P. Koch in 1907.
- 1906. 1st *Roosevelt* Expedition. Claimed to have reached lat. 87° 6' N. and to have discovered Crocker Land, but the latitude is very doubtful and Crocker Land does not exist.
- 1909. 2nd *Roosevelt* Expedition. Claimed to have reached the North Pole, but no man of 53 could have sledged 180 miles in 2 days over the polar pack.

## CHAPTER III

### MYLIUS-ERICHSEN IN GREENLAND

**G**REENLAND is remarkable, if not unique, in having a hiatus in its history when its existence was completely forgotten by the rest of the world. Its *western* coast was colonized by Norsemen in the tenth century ; but before the end of the fourteenth century all communication between Scandinavia and the settlements ceased. Not until 1576 was the SW. coast re-discovered by Fro-bisher, who made a landing in 1578, followed by John Davis in 1585, and by the Danes early in the next century. The medieval colonists appear to have died out in the sixteenth century, and the modern settlements date from 1721.

On the *east* coast, the outstanding explorers were Scoresby and Clavering. Scoresby, junior, was a whaling master who sighted it in 1817 and again in 1820. He was probably the first to cross the pack ice of the East Greenland Current and reach the coast, in 1822, when he landed at Cape Lister in lat.  $70^{\circ} 30'$  N. and entered the great and glorious Scoresby Sound ; he made the first survey of the coast between lat.  $69^{\circ} 15'$  and lat.  $75^{\circ}$  N. In 1823 he was followed by Douglas Clavering, who had served under Broke in the action between the *Shannon* and the *Chesapeake*. Capt. (afterwards Sir Edward) Sabine, R.E., was at this time investigating the actual form of the earth and wished to swing one of his gravity pendulums on the E. coast of Greenland. He was sent by the Admiralty in the *Griper* under Clavering. The pack was penetrated to an island, Great Pendulum Island, near Shannon Island, in lat.  $74^{\circ} 32'$  N. and  $18^{\circ} 50'$  W., and many geographical discoveries were made. The names of Shannon Island and its Cape Philip Broke are reminiscent of the naval duel, and the Haystack in lat.  $75^{\circ} 45'$  N. was sighted. A more surprising discovery was that of an Eskimo family on Clavering Island, cut off by hundreds of miles from their nearest neighbours. These successes provoked the Danes to emulation, and Lieut. W. A. Graah went out in 1828, when he landed and wintered on the *west* coast, and the following year worked past Cape Farewell and northwards along the SE. coast in boats on the shore-water. A second



MYLUS ERICHSEN IN 1906



winter was spent in lat.  $63^{\circ} 22' N.$ , and in 1830 he charted the SE. coast as far north as lat.  $65^{\circ} N.$

In September, 1869, the first German Arctic expedition under Capt. Koldewey sighted the E. coast of Greenland in lat.  $74^{\circ} N.$  One of his ships, the *Hansa*, was then caught in the ice of the East Greenland Current, carried away from her consort, the *Germania*, was crushed and sunk, though no lives were lost ; escape was not made from the ice till the following May, hundreds of miles farther south. Meanwhile the *Germania* was making more valuable if less exciting history. After wintering at Sabine Island, Koldewey and Payer made a sledge journey to lat.  $77^{\circ} 1' N.$ , on which there were many discoveries. Dove Bay and Cape Bismarck (lat.  $76^{\circ} 47' N.$ ), near the turning-point, were discovered and named. This district afterwards played a prominent part in the history of East Greenland exploration.

Turning back to the *west* coast we find the first serious attempt to reach the inland ice was made by Baron Nordenskiöld in 1870, when he penetrated 30 miles from the coast to a height of 2,200 ft. In 1878 Lieut. Jensen, of Denmark, made a longer journey and reached 4,700 ft.

The Greenland Commission sent out Lieut. G. Holm in 1883 on the first of a long and important series of expeditions dispatched by Denmark to Greenland. No advance had been made on the SE. coast since Graah's time till Holm worked northwards from near Cape Farewell and wintered in lat.  $65^{\circ} 32' N.$  The native name for the district was Angmagssalik, and this part of the coast is more accessible to ships than any other part of South-East Greenland. Here Lieut. Amdrup, R.D.N., wintered in 1884-5, when he charted the coast northwards to lat.  $67^{\circ} 32' N.$  He found Eskimo settlements at Angmagssalik ; and here in 1901 and 1905 two Danish scientists brought their wives. It was here also that, in 1883, Baron Nordenskiöld had taken the *Sophia* through the ice, afterwards sailing round to the west coast and making his second attack on the inland ice. He reached a height of 5,000 ft. at a distance of 73 miles from the coast, and his two Lapps are said to have gone 145 miles farther. Their turning-point, however, like that of Peary, who made a journey over the plateau in 1886, is uncertain ; Nansen drew attention to the unsatisfactory nature of Peary's observations (" The First Crossing of Greenland," I, 505-6).

The year 1888 is memorable for Nansen's crossing of Greenland—the first journey from coast to coast ; a short account of it will be found in Chapter V. Lieut. C. Ryder followed close on Nansen's heels to Greenland, where he wintered in Scoresby Sound, which he

explored, in 1891-2. Here he discovered an intricate system of beautiful fjords. A call was made at Angmagssalik—again accessible through the pack.

A well-known polar ship now comes on the scene, originally named the *Cap Nor*, and in 1893 re-named the *Antarctic*, when she was introduced by Kristensen to the southern ice. In 1899 she carried Prof. Nathorst's expedition to Scoresby Sound; Franz Josef Fjord was traced to its head and King Oscar Fjord discovered. The following year the *Antarctic* returned to Scoresby Sound under Lieut. G. Amdrup who had wintered at Angmagssalik in 1884. He had an excellent scientific staff in 1900, which included Lieut. J. P. Koch and Dr. Otto Nordenskjöld (nephew of Baron Nordenskiöld), who the following year took the *Antarctic* on her second trip to the Antarctic, where she was lost. Amdrup's expedition is noteworthy for several reasons: it was financed by the Carlsberg Fund, derived from a brewery; it mapped parts of the coastline between Cape Farewell and Cape Bismarck in lat.  $76^{\circ} 47' N.$ ; it brought back a mass of scientific data of great interest; it also introduced to Greenland Ejnar Mikkelsen as well as J. P. Koch, both of whom afterwards made no little Arctic history. Amdrup and Mikkelsen carried out a fine boat journey of 44 days, from lat.  $69^{\circ} 25' N.$  to Angmagssalik. Another Antarctic ship, the *Belgica*, sailed for North-East Greenland in 1905 under her old master, Lieut. de Gerlache. The leader of this expedition was H.R.H. Philippe, Duke of Orleans, and he made a new record off this coast in his ship by attaining lat.  $78^{\circ} 16' N.$  in long.  $16^{\circ} 21' N.$  French names, such as the Île de France, were dotted over the map as far north as Bourbon Island, approximately in lat.  $78^{\circ} 45' N.$

In 1906-8 the greatest of all Danish expeditions visited North-East Greenland, yet no proper account of it has previously been published in England. This was Mylius-Erichsen's expedition. Its official "Report on the *Danmark* Expedition" was produced in 1913, in English as well as Danish. (See "Meddelelser om Grönlund," Vol. 41; the mere list of diaries and other documents used in the preparation of this great report occupies  $2\frac{1}{2}$  pp.) Frequent reference to the work of this expedition will be made in succeeding chapters. The "Geographical Journal," in December, 1913, drew attention to "the extraordinary amount of work accomplished by Mylius-Erichsen's expedition" and deplored the fact that "in this country . . . the expedition attracted far too little notice." This inattention must now be rectified.

Ludvig Mylius-Erichsen was born in 1872, and after his student

days became a journalist and author. But his great ambition in life was to become a Greenland explorer, and in 1902-4 he was able to gratify his desire by leading the Danish Literary Expedition which traversed most of the west coast of that country, explored Melville Bay and wintered at Cape York. Rasmussen and Count Harald Moltke accompanied him, and the record will be found in "The People of the Polar North" (1908). Mylius-Erichsen was of dæmonic temperament and felt that a sacred fire burnt within him to advance into the unknown. He was destined to be offered up on his own altar.

In 1905 he laid a plan for a larger expedition before Messrs. Holm, Ryder, Garde and Amdrup, who approved of it and formed his committee for raising the cost. The King of Denmark became Protector of the Expedition, and the Danish Government granted altogether about £10,000 out of a total expenditure of nearly £15,000. It would be erroneous to assume that the expedition was less important than the well-known Antarctic expeditions which it closely resembled; it was better equipped than some of them, with 2 motor-boats and over 100 dogs. Like the *Discovery* Expedition that returned home 2 years before it sailed, the *Danmark* Expedition laid the foundation for many later voyages of exploration, and was no less successful because relatively inexpensive. The Danish expedition was very well equipped; and it resembled the *Discovery* Expedition in taking its name from the ship.

Mylius-Erichsen left Copenhagen at the head of his great enterprise on 24th June, 1906, with a strong scientific staff and ample transport facilities. Lieut. Trolle was Second-in-Command of the expedition, director of the marine surveying, and Master of the ship, a sealer of 450 tons gross, with auxiliary steam power, re-named the *Danmark*; she was provisioned for about 3 years. Lieut. J. P. Koch, who was the Chief Surveyor, after returning from Amdrup's expedition, had led (1902-4) 3 cartographical expeditions to Iceland; he was also a Master Mariner. Lieut. N. P. H. Hagen was another surveyor. Dr. Alfred Lothar Wegener, who was at that time an assistant at the Royal Aeronautical Observatory in Lindenberg, joined his first expedition, as physicist and meteorologist, to that country where, after other visits, he was destined like his leader eventually to make the supreme sacrifice. There were also a geologist, a zoologist, a botanist, and a medical officer. Lieut. H. A. O. Bistrup, who had lived in Greenland until he was 8 years of age and who in 1923 was to command the *Teddy* on her last voyage, was First Mate; 2 artists went as engineers, and 2 students (one of whom was

Peter Freuchen) as stokers. There were 3 Greenlander dog drivers, one of them being N. I. J. Bronlund who had formerly been a curate and had accompanied Mylius-Erichsen on his expedition of 1902-4. The total complement was 28 men, of whom 17 were scientists or technicians.

Mrs. Mylius-Erichsen parted from her husband at Iceland. The ice pack was entered on 30th July, and on 13th August a landing was made on Koldewey Island in lat.  $76^{\circ} 20' N.$  where a record was left. Later in the day Mylius-Erichsen went ashore at Cape Bismarck, as this seemed a favourable locality in which to winter. To the northwest of the cape was a little sheltered bay, afterwards named *Danmark* Harbour, and here a snug anchorage was found to which the ship returned for the winter; but first the northward voyage along the coast was continued to lat.  $77^{\circ} 30' N.$  Here on the 15th August the *Danmark* was stopped by impenetrable pack. A large depot was landed on Cape Marie Valdemar, and a party under Koch went out in one of the motor-boats to chart the coast from the Île de France to Cape Bismarck, also to kill as much game as possible for the dogs. Two bears were shot by this party.

On 17th August the *Danmark* returned to Cape Bismarck. The latitude of the cape was fixed at  $76^{\circ} 46' 17'' N.$  and the longitude at  $18^{\circ} 37' W.$ ,—the farthest north on the E. coast of Greenland that any ship had wintered. While the ship's party unloaded the vessel, Mylius-Erichsen took 8 men on a boat journey into Dove Bay to hunt for fresh meat and investigate the district. The erection of the station buildings was completed on 24th October, but only 4 of the scientists lived ashore. Mylius-Erichsen brought his party back to the station on 14th September after charting all the neighbouring fjords and islands; some old Eskimo tent rings were found. Two depots were left before returning to the ship. A dozen walrus and 7 musk-oxen were shot, as well as 1 wolf. Koch was placed in charge of the surveying and given a staff of assistants; hence the mapping was exceedingly well done. Two other boat journeys were made for surveying purposes, and on 1st October Mylius-Erichsen led out the first Autumn depot journey; dog transport was used, for which 112 dogs had been landed from the ship. Two bears were shot on the outward march that ended in lat.  $78^{\circ} 14' N.$  on North Depot Island in Jokel Bay; the ship was reached on the 11th, and more stores were sent north before the winter. The sledging equipment was thus well tested.

This expedition was characterized by the dynamic energy that consumed its leader, who fired every one with his own enthusiasm,



and a colossal amount of work was carried out at the station. Regular meteorological observations had been begun on 17th August, 1906; astronomical, magnetic and tidal observations soon followed, and the artists were busy working in oils and pastel colours. Several sledge journeys were made during the winter, the longest of which started on 8th November for the Pendulum Islands, to examine the depots of the Baldwin-Zeigler Expedition on Shannon Island and Bass Rock. Mylius-Erichsen took 6 men with 6 sledges and 50 dogs; after a severe journey, Bass Rock was reached on the 20th. A post-bag was left here and *Germania* Harbour entered 2 days later. On the return journey the temperature varied between  $-22^{\circ}$  C. and  $-32^{\circ}$  C. The trip ended at *Danmark* Harbour on 4th December, one party setting up a winter sledging record of  $37\frac{1}{2}$  miles a day for the 5 days occupied in driving the 189 miles from *Germania* Harbour; the best day's run was 49 miles.

The sun had disappeared on 2nd November, though some of the darkness was relieved by the moon and the Northern Lights. Lectures were much appreciated during the winter, and regular exercise was taken every day. Fox traps were set and many fine skins secured. Two days after the traditional celebration of Christmas a hunting party set out, soon followed by other journeys. There was no sign of slackness throughout the dark period, and all hands were well and cheerful. Preparations were early begun for the great northern journeys, which were the result of consummate consideration and care. The dogs were given extra food and no more exercise than necessary for several days before starting. The three Greenlanders went hunting to the edge of the pack on 21st January, 1907, and found themselves adrift on a floe at a considerable distance from the main shore pack. Fortunately they had pickaxes, and were able to cut a raft of ice on which, after 6 hours' paddling with picks, guns, hands and feet, they reached safety. One of these men was Bronlund, whose life was thus spared for a nobler end. Four spring depot journeys were made over the northern route, and a large quantity of stores had been cached by 22nd March when the last of these parties returned to the ship. Six depots were laid within approximately 100 miles of the Base, the most northerly depot being in lat.  $78^{\circ} 14' N.$

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.  $81^{\circ} 37' N.$  and long.  $34^{\circ} 5' W.$ , 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," 1.352 ; " 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. Peary also claimed the discovery of a large channel, named after himself the Peary Channel, that cut off Peary Land from the mainland. In the year 1900 he discovered and roughly surveyed 150 miles of the extreme NE. coast of his Peary Island ; and he left a record in lat.  $82^{\circ} 57' N.$  and long  $23^{\circ} .09' W.$  which he thought the most easterly point of Greenland. This point, Cape Clarence Wyckoff and Navy Cliff, were the two main objectives of the *Danmark* Expedition, though there were many other investigations that would be made.

Two northern parties with two supporting parties set out together on 28th March, 1907 ; each northern party had 1 surveyor with 1 Greenland hunter and dog-driver. The 1st party, Mylius-Erichsen's, included Lieut. Hagen and Bronlund ; the 2nd party was that of Lieut. J. P. Koch, with Bertelsen the artist and Gabrielsen, another Greenlander. Each supporting party consisted of 2 men, and thus the total personnel was 10 men with 10 sledges and 86 dogs. Cape Marie Valdemar, 42 miles from the station, was reached with light loads the first day ; on continuing the journey, more heavily laden, the speed decreased. On 30th March, however, when the temperature was as low as  $-32^{\circ} C.$ , 30 miles were covered with full loads. Koch was given a glass of cognac to assist him in taking a time determination of the sun. North Depot Island was reached on 1st April, and here, as the name implies, was the last of the depots already laid. Mylius-Erichsen returned 36 miles from this point, with empty sledges, to bring up more stores ; he ran mile after mile with his team. On 4th he continued northwards, reaching Lamberts Land on 10th, after crossing several miles of rough ice that damaged the sledges.

A depot that became of tragic interest was left on the eastern point of Lamberts Land ; sufficient supplies were cached here for the return of Mylius-Erichsen's and Koch's parties to the Base. As the dogs needed fresh meat a halt was made for hunting, and a bear was shot with her 2 cubs. This event led to the first occasion on a polar expedition when a pack of about 80 dogs broke loose and ran amuck. The dogs had been unharnessed and were in view of the bears while 4 men cut up the meat ; the other 6 men were kept busy

trying to restrain the dogs till the food was ready. But the animals became unruly and paid no attention to blows or lashes. At last the whole pack made a concerted attack on the carcasses. The men were forced to fly, and in less than 15 minutes all the meat was demolished.

Seventy-nine Fjord was reached next day, and Hovgaards Island on 14th April. Here another bear was shot, but the dogs were left harnessed to the sledges while the meat was cut up. The result was worse than when they were loose. One team dragged its sledge to the food, thus inciting all the others to frenzy; so the confusion of feeding and fighting among tangled harness and loaded sledges was indescribable. Heavy ice was encountered on 17th, and Malle muk Fjord in lat.  $80^{\circ} 09' N.$  was not reached until 18th when several days were lost in finding a way through the glaciers. The temperature varied from  $-20^{\circ}$  to  $-30^{\circ} C.$  and progress was difficult. Near this fjord (lat.  $80^{\circ} 09' N.$ ) the foundation rocks ended and a fossiliferous sandstone began. A depot was left here, and the 1st Supporting Party (Bistrup and Ring) turned back. To the north of Malle muk Fjord the remains of an old Eskimo settlement were found, with knives and fragments of sledges. On 26th April, when the northern parties continued their journey with 6 sledges, they left the 2nd Supporting Party of Wegener and Thostrup at a depot in lat.  $80^{\circ} 43' N.$  on the S. side of Antarctic Bay. On 29th the northern parties discovered and rounded the most easterly point of Greenland, Nordost-Rundingen or the North-East Foreland (lat.  $81^{\circ} 24' N.$ , long.  $11^{\circ} 48' W.$ ). A small depot was left in lat.  $81^{\circ} 30' N.$ ,  $10\frac{1}{2}$  miles beyond the foreland, where the coast bore NW.

Mylius-Erichsen and Koch were now faced with a serious difficulty largely due to their journey being planned on Peary's erroneous map and de Gerlache's sketch of the coast "up to  $79^{\circ}$ " ("Report on the *Danmark* Expedition," 121). The distance by this map from *Danmark* Harbour to Independence Bay was about 240 miles, whereas the actual trend of the uncharted coast had been NE. instead of NW., thereby making the total distance approximately double that provided for. The correct distance from Cape Bismarck to Navy Cliff by the coast is over 500 miles. An unexpected risk would now have to be taken in attempting to carry out the original programme of reaching both Navy Cliff and Cape Clarence Wyckoff. Good hunting alone could save the situation and the lives of the explorers.

Camp was pitched on 30th April at Nakkehoved whence, on 1st May, the coast was found to trend W. and later SW. without the slightest resemblance to Peary's map. Mylius-Erichsen's intention was to pass through Peary's channel to the NW.; but as no game

had been seen for several days, Koch repeated an offer he had previously made that his party should turn back after giving their leader most of their stores. Mylius-Erichsen again refused this self-sacrificing suggestion, though he agreed to separate at once, for two reasons: 1. Koch felt reasonably sure of reaching Cape Wyckoff and returning to the  $81^{\circ} 30'$  Depot. 2. The leader of the expedition would be taking the greater risk, as he was entering undiscovered country. Thus the parties separated with mutual good wishes on 1st May in lat.  $81^{\circ} 47' N$ .

Koch drove northwards over the sea-ice, and on 6th May camped about 9 miles from Peary Land of which he was the first to see the SE. coast. His party reached land next day and cached most of their stores in lat.  $82^{\circ} 30' N$ ., after travelling over 60 miles across the entrance to Independence Fjord. Twelve musk-oxen and 5 calves were shot within 24 hours of landing; then a blizzard came on, in which the dogs had 3 days to gain strength by eating and resting. On 11th Koch drove northwards over heavy going, and the following day found Peary's cairn in lat.  $82^{\circ} 57.7' N$ . (Koch's determination), from which he removed Peary's record and substituted his own.

On 13th May Koch continued NW., and next day drove 30 miles across Hyde Fjord; on 15th he reached Cape Bridgman, his most northerly point, and the NE. cape of Greenland. Here on 16th he built a cairn in which he deposited a long report. He then had 25 dogs and 3 sledges, with food for about 4 days or barely enough for reaching the last depot, and 24 miles were driven towards it. On 17th Koch and Bertelsen were ill, apparently suffering from want of fat and from eating the lean beef raw, the result of a shortage of oil. Gabrielsen went hunting but shot nothing, and next day 6 dogs disappeared. They were afterwards found to have pursued a musk-ox over a precipice 1,600 feet high, and the dead ox was seen at its foot on 19th. Marvellous to relate, one dog was also there, not merely alive but unhurt! The other 5 dogs were never seen again and probably "remained hanging on the cliff."

The journey was continued on 20th May, when a distance of 32 miles was covered, and the following day Peary's cairn was repassed. The invalids were then better, though still suffering from an abdominal complaint. On 21st the last of the oil was consumed, but they expected to reach the depot next day and would have done so had they not passed it in a blizzard. Fortunately a musk-ox was shot and they ate the raw marrow from its bones, with snow, but found the blood too nauseating to drink; as they were without fuel

to melt snow they could obtain no liquid. During the afternoon of 23rd the weather cleared and the stores were recovered from the depot. Independence Fjord was reached on 25th and a course set on Cape Rigsdagen. Here on 27th, by a happy coincidence, Mylius-Erichsen's party was met, travelling northwards, and a joint camp was made. The leader of the expedition had made some surprising geographical discoveries; the following account of them has been amplified by reference to Bronlund's diary.

When the parties separated on 1st May, Mylius-Erichsen proceeded westwards along the north coast of Crown Prince Christians Land which then bent southwest, though supposed at that time to be part of Independence Bay. By 4th, as the dogs were in need of fresh meat, a depot was left on Princess Dagmars Peninsula—a tongue that jutted out into the fjord. A westerly course was then taken across the fjord to the new country (now named Mylius-Erichsen Land) which looked more favourable for game. Here 3 hares and 2 ptarmigan were shot. Blizzards raged on 9th-11th, but the dogs were becoming hungry, and the 3 weakest had to be killed to feed the others. The party moved southwest along the new coast, and on 12th shot 7 musk-oxen. The last bread was eaten on 15th and they now had nothing but meat. As excellent hunting was found, they remained until 20th, having shot 14 more musk-oxen. On this day they drove 40 miles up the fjord and next day reached its head. Then they knew it was not Independence Bay but a new fjord, 120 miles long; it was appropriately named *Danmark* Fjord. A stone wall and trap were seen on 21st showing that Eskimos had at some time been there; a piece of driftwood was also found and used for cooking, to save the oil that was running short. The edge of the plateau appeared to be from 1,500 to 3,000 ft. high and inaccessible from the fjord. The return to Cape Rigsdagen was uneventful.

When Mylius-Erichsen met Koch he had on his sledges food for only 3 days and oil for a few meals, but he had left 4 days' supply 20 miles away. At first he thought of returning with Koch, but on 28th he climbed the neighbouring hills and could not resist the call the unexplored country to the west. He therefore resolved to spend a few more days in this direction before turning back. This proved to be one of the fatal decisions in the history of exploration. Koch gave him a box of dog pemmican and some oil, as he had enough to carry him past the depot in lat.  $81^{\circ} 30' N.$ , and he agreed to take no more than absolutely necessary from the Amdrups Land Depot in lat.  $80^{\circ} 43' N.$  Koch was also to leave the North Depot, if

possible, untouched, as his chief wished to remain for a few days in the vicinity on his return.

Mylius-Erichsen sent Capt. Trolle a letter that has since possessed a pathetic interest, for it was the last he ever wrote. In it he tells of the discovery of *Danmark* Fjord, and gives a glowing account of Koch's exploits. He expected to be back at the ship in about 6 weeks, after connecting with Peary's Navy Cliff. At 7 p.m. on 28th May, 1907, Mylius-Erichsen, Hagen and Bronlund

"Sailed into the west as the sun went down"

and were seen no more.

SCHEDULE No. 1

J. P. KOCH'S RETURN FROM DANMARK FJORD

1907:		Miles
May	28. 7 p.m. left Cape Rigsdagen, with sledgemeter.	—
"	29. Camped on Princess Thyra's Island after heavy going.	30
"	30. On Danmark Fjord.	21
"	31. Blizzard. No march.	0
June	1. Blizzard until 6 p.m. when set out.	0
"	2. Heavy going through soft snow. Fog.	24
"	3. Snow falling and drifting.	31
"	4. 81° 30' DEPOT & North-East Foreland passed. Depot not touched.	38
"	5. Four seals, one walrus and one bear shot.	29
"	6. Camped near 80° 43' DEPOT, Amdrups Land.	17½
"	7. Drove back to cache walrus.	(29)
"	8. Caching game at Eskimo Naze. Bertelsen snowblind.	18
"	9. Took on Wegener's fossils.	24
"	10. MALLEMUK DEPOT reached after a dangerous struggle.	?
"	11. Heavy sledging through loose snow.	18½
"	12. Heavy sledging through deep loose snow. Fog.	21
"	13. Camped at LAMBERTS LAND DEPOT after better going.	42½
"	14. Repaired sledges and rested dogs. Oil taken from depot.	0
"	15. Forced to the west by impassable ice.	29
"	16. Passed NORTH DEPOT, about 400 miles from Cape Rigsdagen	27
"	17. Loose snow, 3 feet deep, and brash ice	
"	18. Difficult going. Camped at HAGENS ISLAND DEPOT } ? 10-12	
"	19. Camped at Bjorneskaerene.	
"	20. Passed CAPE AMELIE DEPOT & camped 6 miles south of it } " 36 "	
"	21. Camped near CAPE MARIE VALDEMAR DEPOT.	" 16 "
"	22. 87th day since leaving ship.	" 24 "
"	23. Reached <i>Danmark</i> Harbour after sledging about 1,400 miles.	" 18 "

\* The last four marches have been deduced as they are not given in the official report.

On the same day Koch started his return journey to the ship, with no prospect of serious trouble except a compression of the bowels from which two of his party were never free during the last part of the trip. After driving 30 miles on 29th they camped on

Princess Thyras Island that seems poised like a dainty morsel in the mouth of *Danmark* Fjord. The eastern half of the fjord was crossed next day, and then two days were lost through a blizzard. The return was uneventful, though Schedule No. 1 shows that long distances were driven on most days as far as the North Depot. On 5th June, 4 seals, 1 walrus and 1 bear were shot, and some of the meat was carried on the sledge; Koch also took the fossils collected by Wegener at Eskimo Naze. One whole day, 10th June, was occupied in negotiating the difficult ice at Mallemuk Fjord; the sledge collapsed and the sledgemeter was broken. The depot here was not touched, and ample food appears to have been left on the route as a whole for Mylius-Erichsen. On 14th June the sledges had to be repaired and no march was made. Two days later the North Depot was found to have been scattered by bears; it was rebuilt and left in good order. On resuming the journey the going became very bad and the sledgemeter could not be used for the last hundred miles to *Danmark* Harbour—reached at 2 a.m. on 23rd June.

Koch's journey was one of the finest ever made in the Arctic; the total distance he sledged was at least 1,400 miles, in 88 days, and 570 miles of this distance were over undiscovered country. Mylius-Erichsen, Koch and the *Danmark* Expedition have the credit of discovering and charting all the land beyond Bourbon Island, 130 miles N. of Cape Bismarck. The 400 miles from Cape Rigsdagen to the North Depot were covered by Koch's party, on their return, in 15 marches at an average rate of nearly 27 miles a march, including the relaying of game and with 3 or 4 days on which no march was made. Cape Bridgman is over 200 miles farther north than Cape Rigsdagen. The scientific results of this journey were of great interest and value, chief of which was completing the main outline of Greenland and the final proof that it was an island.

Bistrup and Ring's party had started back from Mallemuk Fjord on 23rd April, 1907, and filled in the outline of the survey already begun by Koch. The southern point of the Île de France, Cape Philippe, was climbed on 10th May, and here the Duke of Orleans' cairn was found, also a depot laid from the *Danmark*. The party reached the base on 13th. Wegener and Thostrup's party turned back from lat. 80° 43' N. on 28th April after spending 2 or 3 days in the exploration of the district near the Amdrups Land Depot, and particularly in driving out over the sea ice to investigate the Henrik Kroyers Islets. Fossils were found on them as well as in the rocks of the mainland. Early in May, when the party was short of food,

2 musk-oxen and a calf were shot which enabled Wegener to continue his work instead of having to rush home. On 9th 4 bears were killed and the party drove between Hovgaards Island and the mainland into Seventy-nine Fjord and so on to Lamberts Land where the depot was reached on 21st. They arrived at the North Depot on 26th after much difficulty and in an exhausted condition. All the remaining depots had been well stocked from the ship—reached on 31st May after 65 days' absence.

While the northern parties were away, three parties went out from *Danmark* Harbour to lay depots for their return. Capt. Trolle was in command of the station and also sent out as many hunting parties as possible, to provide food for the dogs. Wegener's news from the front had not been too bright. The trend of the coast to the NE. instead of NW. had dislocated Mylius-Erichsen's well-considered plans and, when Wegener left him, he had only 3 weeks' food. There was anxiety at the station until Koch returned on 23rd June, men and dogs exhausted but in high spirits at their success, and bringing the favourable news that their leader's party was expected back in a few weeks, if not days.

But days became weeks and weeks passed into months without any sign from the north ; and the Arctic summer with its thaw made sledging impossible till the autumn frosts set in. Preparations for a relief party were begun in good time, and it started well loaded with supplies on 23rd September, 1907, consisting of 7 teams as far as Cape Marie Valdemar and 6 teams beyond here. The North Depot was reached on 27th when a blizzard completely buried the camp and made further progress with full loads almost impossible. A speed of 20 m.p.d. had been averaged for the first 100 miles ; now one-third of the weight was cached and only 13½ m.p.d. afterwards covered. The loads were then relayed until 4th October when full loads were resumed. On 7th the Schnauders Island Depot was reached ; it was in good order, but contained no news of Mylius-Erichsen.

At this point the party divided ; 3 teams, after caching more stores, returned to the ship and reached it on 18th October, exhausted by a struggle through deep snow. Thostrup, Lindhard and Gabrielsen, who were respectively navigator, doctor and hunter, continued northwards on 8th October. Their dogs were tired through the heavy going, and the animal's paws were cut by sharp ice. They struggled forward, day after day, though visibility was poor, for the darkness of winter was advancing ; but they limped as far as Seventy-nine Fjord on 12th and there cached part of their loads.



Next day they pushed on, to be stopped by open water in Mallemuk Fjord on 17th. Further progress was impossible, yet there was still no trace of the lost party. It was afterwards found that this same open water, only 2 days before (15th Oct.), had turned Mylius-Erichsen towards the inland-ice. The loads of the relief party were cached, a report was left for Mylius-Erichsen, and on 18th they turned back. At this time the doomed party was not many miles away. The return of the relief party was very painful and depressing: the dogs were breaking down, though the plucky animals pulled until they dropped. The ship was reached on 2nd November, after 42 days' absence.

There was now little hope for the missing party. The bare possibility, indeed, existed that they might still crawl from depot to depot down the coast, but, apart from the depots, there was no chance of their being alive. Over the whole distance of 320 miles from Cape Marie Valdemar to the North-East Foreland, however, there was a series of 11 well-stocked depots. The ceaseless activity that had distinguished the expedition during its leader's presence was no less conspicuous during his absence. A meteorological sub-station was set up in September, 1907, as near as possible to the inland-ice, for comparative readings with those at *Danmark* Harbour. The cartographical work alone was an enormous task, involving many journeys. On the whole expedition, nearly 200 journeys, long and short, by sledge and boat, were made; this number must be more than that on any other polar expedition, but each one is recorded in the report.

When the *Danmark* was frozen in for the second winter there was one great distraction from the absence of the leader's party: during the summer of 1907 the ice that held the ship did not break up, and it was a serious question whether she would escape in 1908. If not, a hazardous retreat would have to be made down the coast. Several parties, therefore, drove to the depots on Bass Rock and Shannon Island in November, to take stock of the stores. Capt. Trolle also planned a search-party to seek for information of Mylius-Erichsen. This party consisted only of Koch and Gabrielsen, who intended to pass through Peary's channel to Cape York, if nothing were previously seen of their leader. Food for 50 days, and 20 dogs, were taken when they set out on 10th March, 1908. Good progress was made and Schnauder Island reached on 17th. Two days later they arrived at the Lamberts Land depot, over 170 miles from the Base. Though everything was covered with snow, Koch soon saw that stores had been taken from the cache; it had not been disturbed by bears;

but cases of food, an oil jar and clothes had been removed. Then at a distance of 100 yds. from the depot a piece of tin was seen projecting from the snow under the slope of a little hill. This metal was the lid of a sledge-box, and it guided Koch to the entrance of a small cave, nearly covered in snow. On digging this out, a human form was found and proved to be the body of Bronlund. His face was covered by the hood of his coat and he was completely clad except for his left hand which was bare, and across him lay his gun with both barrels loaded. In a box at his feet was a bottle containing his own diary and Hagen's sketch-charts. The diary was written in Greenlandic and not translated until after the return of the expedition to Denmark, but a few lines in Danish indicated where the bodies of his companions should be sought.

Bronlund had lived for 5 or 6 days in the cave before the mid-winter frost had called him home, and he had made all preparations for the end. When his remains had been reverently buried, Koch said: "Farewell, Bronlund! You were a good comrade to us."

The bodies of Mylius-Erichsen and Hagen had not been found; but on mature consideration Koch came to the conclusion that the quest would then be hopeless, mainly on account of the heaviness of the snowfall since they had died in November, but also because Bronlund's description of the place where they lay was vague. Farther advance northward could not be made without considerable risk, and this was inadvisable, for if anything happened to Koch and Gabrielsen, Bronlund's diary and Hagen's charts would be lost. Hence on 19th March the return journey began and the ship was reached on 26th after a fast run on which the high average speed of about 30 m.p.d. was maintained.

Every man at the station heard the news of the disaster with heartfelt sorrow, but it relieved their suspense which was almost unbearable. They then knew the worst, and continued their tasks as they knew their lost leader would have wished. Queen Louise Land was discovered and partly mapped; here and elsewhere geological surveys were made, and specimens collected of the rocks, as also of the flora and fauna of the district. Peter Freuchen spent 6 months at the meteorological sub-station. Hydrographical and zoological investigations proceeded continually. Among the many other scientific sledge journeys one was made by Koch, Freuchen and Knudsen, from 24th April to 5th June, over the inland ice to the Ymer Nunatak near lat.  $77^{\circ} 25' N.$  and long  $23^{\circ} 43' W.$  On 10th July the masters of 3 Norwegian fishing vessels visited *Danmark*

Harbour, bringing letters for nearly every member of the expedition, as well as the welcome news that the ice was open ; their ships were not far away. A huge cairn surmounted by a cross was erected in memory of the lost explorers, and on 21st July the *Danmark* was steered out of the berth she had occupied since August, 1906. Some marine surveying was carried out, during which lat.  $78^{\circ}$  N. was reached, and Copenhagen was regained on 23rd August, 1908, two years and two months after setting out.

The *Danmark* Expedition, apart from the loss of its leader's party, was one of the most successful, because one of the most efficient, expeditions that ever sailed. It broke a great deal of entirely fresh ground, and discovered many hundreds of miles of new country, all of which was well charted and closely investigated. Its greatest geographical achievement was the completion of the delineation of Greenland with the final proof that it was the largest island in the world, which was the most important work in the whole of the Arctic at that time. A mass of scientific data was brought home for examination, including the results of a large number of soundings, trawlings and dredgings, as well as other oceanographical material. The hydrographical report alone is of nearly 200 pages ; and Koldey's charts were corrected and extended. The absolute latitude and longitude of *Danmark* Harbour was established ; large botanical, zoological, ethnographical and geological collections were made ; meteorology, magnetism, astronomy and glaciology were investigated ; 230 paintings and drawings were made and 1,500 photographs taken.

When Bronlund's diary had been translated, Mylius-Erichsen's last journey was reconstructed, not only from the information that the diary contained but also from communications made by Mylius-Erichsen to Koch, as to his leader's intentions, and from Hagen's sketch-charts. The journey is here taken up at the final separation of Mylius-Erichsen's and Koch's parties on 28th May, 1907, Bronlund's diary supplying most of the particulars.

On 29th May Mylius-Erichsen entered Hagens Fjord, thinking that at last he had found Peary's Independence Bay ; and his mistake was not discovered even when the glacier at the head of the fjord was seen. Soon after, however, on rounding Cape Peter Henrik his party began to realize the true position. The head of Independence Fjord was reached, apparently on 1st June, and several days were spent in surveying the district. Peary's Academy Glacier and Navy Cliff were charted, and thus, at last, the connection was made with the American survey. A cairn was erected in the

fjord on 4th June before turning back. The official report on the *Danmark* Expedition points out that

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 Danmark Fd. and Hagens Fd. 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. ("Report of the *Danmark* Expedition," 214.)

They were back in *Danmark* Fjord on 14th June, but then found the season too far advanced for crossing the fjord; and as the dogs were becoming emaciated they had no choice of action. Their lives depended upon game until the autumn frosts again made sledging possible. A summer camp was therefore set up; a musk-ox, a hare and a goose were shot on 15th June, and the following day Bronlund, who was a mighty hunter, killed 5 more musk-oxen. The weather was warm, windless and sunny, so life was then worth living, except for its monotony. When the oil was finished, fuel was the greatest difficulty and depended upon finding driftwood, which was scarce. Cairns were built on the hill-tops for Hagen's surveying; but during the first half of July this work was hindered by fog, snow and rain. By 16th of this month Bronlund had to go hunting again, as the larder needed replenishing, and one musk-ox was shot. The men's footgear was then worn out and their feet suffered badly, though the leather of the sextant-bag was used for boot soles. During the last week in July and the first week in August there was much rain and snow which, without good fires, made the conditions of the party very wretched; they were back in the conditions of prehistoric man.

On 6th August there was food for only 3 more days, so Hagen and Bronlund hunted all 7th when they shot nothing but 2 ptarmigan; hence, on 8th, camp was moved in the hope of finding better game land. Progress was painfully slow, and a goose and 3 more ptarmigan were all that fell to the guns that day. Mylius-Erichsen was suffering from severe abdominal pains, and there was no food for the dogs. On 12th the last of the goose was eaten and 1 ptarmigan shot; this bird was divided into 3 parts and eaten raw. Next day a dog had to be killed and eaten by the men. There were then only 14 dogs left, and they were needed to pull the sledges back to the ship. The men were tortured by hunger, cold and wet; from 14th to 21st August there was much rain and wind.

The frosts started on 23rd August, and the following day the loads were reduced by abandoning all non-essentials; only 8 dogs then remained. On 25th Bronlund shot a hare and was so famished

that he immediately ate its heart, liver and kidneys, before taking the rest of the carcass into camp. On the way, he killed 3 more hares, and on rejoining his companions found that they had just killed another dog. Seven hares and 13 ptarmigan were shot soon after this, and the weather improved; but the party could not cross the fjord before the end of August. From then there is no entry in Bronlund's diary until 19th October. It is probable, however, that the men moved from depot to depot round the coast. They must have reached their first cache on Princess Dagnars Peninsula, where there was food and fuel for several days; these would enable them to drive the 66 miles to the  $81^{\circ} 30'$  Depot. This depot contained supplies that could have been made to last for 20 days, or presumably more than enough to take the party the 70 miles to the  $80^{\circ} 43'$  Depot which was a relatively large one. Of the little that is known of this devoted party's fate, Bronlund's entry in his diary for 19th October is clear that they were forced by open water in Mallemuk Fjord, to ascend the inland-ice, apparently on 15th.

The last stage of this journey must have been terrible. At the beginning of November the sun disappeared and the winter darkness deepened day by day, while the cold on the plateau, several thousand feet above sea level, would be intense. The men's garments were ragged and their boots falling to pieces; they were frostbitten, worn out, weak and ill. Hagen died on 15th November; and Mylius-Erichsen could not drag himself as far as the well-stocked depot in Lamberts Land. Thostrup's relief party had not left here until the last week in October.

Bronlund, who was the strongest, then went on alone for supplies, and on his return two days later found that his leader also had entered into rest. This camp was off the beaten track, and Bronlund knew the importance of being at the depot where a record of their achievements could be found. He must have known by then that, with midwinter approaching, he had little chance of reaching the ship alone.

He therefore struggled back to the depot and crept into his cave, making all necessary arrangements for the end, that his body might be found by his comrades from the ship, who he knew would search for news of his party. He loaded his gun, for bears were prowling about, and he had 5 or 6 days to wait.

There in the darkness and cold of the Arctic night, in circumstances more dreadful than any others on record, alone amid the snows after losing his companions, Bronlund calmly faced death, and wrote his last words:

Perished 79-Fjord after attempt to return over inland ice in November. I arrived here in waning moonlight, and could not go further for frozen feet and darkness. Bodies of the others are in middle of fjord off glacier (about  $2\frac{1}{2}$  leagues). Hagen died 15th of November, Mylius about ten days later.

JORGEN BRONLUND.

Here was a new saga. Each of these men died a hero's death. Mylius-Erichsen was one of the greatest of all Arctic explorers and an enthusiast who realized his ideal. Lieut. Hoeg Hagen was also a fine explorer, soldier and surveyor. Jorgen Bronlund was a muscular Christian whose last acts were for the good of others. All three made the supreme sacrifice in the noble cause of human progress, and their names should live as long as mankind retains a true sense of values.

*Bring me my bow of burning gold!*  
*Bring me my arrows of desire!*  
*Bring me my spear! O clouds unfold!*  
*Bring me my chariot of fire!*

## EXCURSUS 2

### *from Chapter III*

#### MYLIUS-ERICHSEN'S DEPOTS

J. P. Koch and Thostrup left a letter at the Mallemuk Fjord Depot stating that depots were laid for Mylius-Erichsen all down the coast to *Danmark* Harbour. He did not use them, but Mikkelsen and Iversen, 2 years later, nearly died because several of them were empty. What became of the food?

Mikkelsen found the following depots:—

1. Mallemuk Fjord. 15 days' rations for 2 men. Cereals mildewed. Mylius-Erichsen may have been there.
2. Hovgaards Island. More mildewed food. (Mikkelsen says nothing about the Lamberts Land Depot at Bronlund's grave.)
3. Schnauders Island. Like Shackleton's Bluff Depot, in 1909, this saved the party. Mikkelsen spent a week here. Evidently not touched by Mylius.
4. Northern Depot, 100 miles from *Danmark* Harbour. 8 days' supply but cereals mouldy.
5. Hagens Island. 84 miles from *Danmark* Harbour. Empty.
6. Orleans Island. 80 " " " "
7. Cape Amelie. " " " "
8. Cape Marie Valdemar. 3 tins meat extract.
9. Depot 10 miles N. of *Danmark* Harbour. 3 tins cereals.

In the 2 years before Mikkelsen's visit some of these depots may have been robbed by bears and others drifted over by snow.

## CHAPTER IV

### CAPTAIN MIKKELSEN'S ADVENTURES

**T**HE sequel to the tragedy recorded in the last chapter is now to engage our attention.

There have been many so-called "worst journeys in the world," though only one could have the lowest temperatures. In the polar regions alone hard journeys are too numerous to mention; they may be divided, however, into two classes: 1. Those that ended fatally; 2. Those on which death hovered near but was finally evaded. Capt. Mikkelsen's extraordinary journey in North-East Greenland belongs to the latter class, and Dr. Rudmose Brown has well described it as "one of the most marvellous sledge journeys on record."

Einar Mikkelsen, on his return from Amdrup's expedition, joined the Baldwin-Ziegler Expedition in 1901 when he met Ernest Leffingwell, and their friendship culminated in the Anglo-American Polar Expedition of 1906-08 to the Beaufort Sea, of which they were the joint leaders. On the return of the *Danmark* in 1908 Mikkelsen, who had just returned from Alaska, undertook to search for the relics of Mylius-Erichsen and Hagen whose diaries were thought to have been deposited on the coast. The second object of Mikkelsen's Greenland expedition was to settle the question of the Peary Channel which, from Hagen's survey, appeared to be a fjord. The Danish Government paid half the expense; the remainder was privately subscribed, and the sloop *Alabama* of 50 tons was bought and fitted with a motor. She was provisioned for 18 months for the 7 men who sailed in her.

Mikkelsen left Denmark on 20th June, 1909, and at the Faroe Islands where he expected to find 50 good sledging dogs he met with the wreck of his transport. No more than half this number awaited him, and they were so diseased that they had to be shot. The ship, after calling at Iceland, proceeded to Angmagssalik where on 29th 47 dogs in good condition were bought. A return was made to Iceland which was again left on 7th August. After a struggle with the pack in which the *Alabama* was injured, Pendulum Island was

sighted on 19th at a distance of 60 miles. Then the ice pressed hard, bent the propeller shaft, broke the tiller, and preparations were made for abandoning ship. On 24th, however, the pack opened, and Cape Philip Broke was reached next day. In beautiful weather the ship proceeded northwards to the NE. of Shannon Island, where, on 27th, winter quarters were established.

Mikkelsen had intended to winter at *Danmark* Harbour, but it was a bad ice year on the coast. On 25th September he set out with 2 companions and 3 sledges to lay depots northwards, but *Danmark* Harbour was not reached until 11th October, for the going was bad and storms were frequent. Four days were spent here in packing and in resting the dogs; then a distance of 40 miles was covered on 15th and 16th, when another gale caused delay. The first depot, of 135 lbs., was laid near Orleans Island on 20th, after which Mikkelsen bore too far W. and ran into difficulties in Jokel Bay. The weather seemed to be breaking up and the wind "blew the sun down" towards the end of the month. Schnauders Island was passed in decreasing daylight and Lamberts Land reached on 30th October. Here Bronlund's body was found, covered with snow, on 4th November, and was again buried before the journey was continued to search for the remains of the other explorers. Three days were spent in the locality indicated by Bronlund's diary, and no search could have been more thorough; but nothing was found, apparently because Mylius-Erichsen had camped on sea-ice that had since drifted out. Mikkelsen went as far as the large glacier between Lamberts Land and Hovgaards Land, near Seventy-nine Fjord, and on 8th November turned back.

It was high time to return, for only 3 days' supply of oil remained and the distance to the *Alabama* was over 250 miles. Winter advanced with cruel strides; fog added to the difficulties of travel and a storm lasted for 2 days. The dogs were so ravenous that they killed and devoured the weakest animal in the team; but the victim was revenged after death, for three of his cannibal murderers also died, possibly from eating his liver. Provisions were short and always exhausted by the time each depot was reached. The sleeping-bags were instruments of torture; they had become masses of ice from frozen perspiration which had to be thawed by the heat of the body, and when this was done the men lay in the wet. Thus the last refuge from the inhospitable elements failed, and life consisted exclusively of hardships.

All this was changed when *Danmark* Harbour was reached on 25th November with bread and oil exhausted. Now men and dogs



indulged in a week's rest, supplied with all the necessities of life. A blizzard lasted for several days. It was important to husband the 10 dogs that remained, out of 20, for the great journey next summer. Yet when they set out on 3rd December 4 more dogs died of exhaustion from the struggle through a foot of soft snow. A depot was left to lighten the sledges and the men remained cheerful in spite of their privations. The ship was reached on 16th December and fresh meat at once enjoyed, for a bear had been shot. A trip had also been made to the depot at Cape Philip Broke. After the Christmas celebrations, all were busy preparing for the northern journey. On 5th February, 1910, the sun returned, and on 17th a party set out to cache 1,328 lbs. of stores at Bessels Fjord. The main journey of Mikkelsen and Iversen began on 4th March when Lieut. Laub led a supporting party. They were all given a cheery send-off in which a landsman tried to bear his part by fixing a flag at the masthead. But the rigging was frozen and slippery, so that he could not climb to the top ; and feeling that he had gone as far as could be expected, he fastened his flag at half-mast and came down.

In spite of this melancholy manner of speeding the parting guest, the 5 men set out in high spirits and at a good speed as far as the Bessels Fjord Depot. From here relaying was necessary, as the load was 3,600 lbs. for 20 dogs. Dove Bay was reached on 25th March, and here two bears were shot. The 2 days' rest that followed, with unlimited meat, worked wonders with the dogs ; each of them ate about 10 lbs. of meat a day. The ascent to the inland-ice was made up Storstrommen, a large glacier between Queen Louise Land and Germania Land. To haul 2,400 lbs. uphill, over the rugged ice, was a hard tussle, not to mention the danger from crevasses. A blizzard gave them another day's rest before setting out, on 28th, over the plateau. Relaying was still necessary, which meant 30 miles sledging in a day for 10 miles progress. On some days only 5 miles were gained and on others no march was possible on account of the blizzards. The surface was covered with elevations and depressions, river channels, and sastrugi carved by the wind.

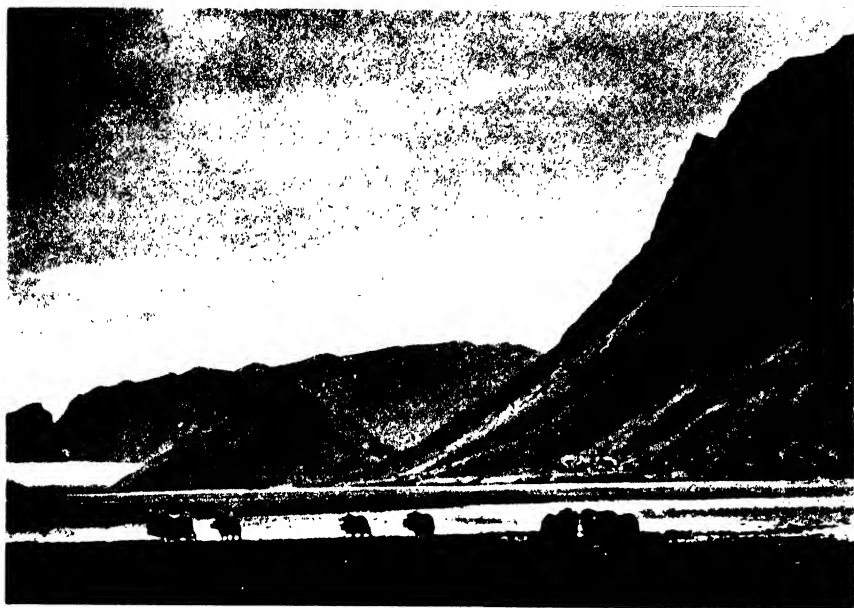
Progress was so slow that on 6th April 400 lbs. of stores were cached, though it was dangerous to leave food on the open plain. On 10th, in lat. 77° 20' N., the supporting party turned back. Mikkelsen and Iversen had then only 15 dogs and food for 100 days. There was little chance of their being able to reach the *Alabama* before she sailed in August, and word was sent to Denmark that a winter in Greenland might be necessary. Laub visited Queen Louise Land on his way back ; but his dogs broke into the provisions

and consumed 4 days' supply, and this precipitated his return. The country that he saw was mountainous and will be referred to again (see p. 91); he reached the ship on 22nd May.

Mikkelsen found that he was not on the main part of the plateau but on a huge lower ledge or step, 2,000 ft. high, between the plateau proper and the coast. First a range of hills gradually arose in the N.; then on 18th April the ascending gradient became steeper; and lastly, but coincident with the change of gradient, crevasses were encountered. Large undulations were crossed; and on 22nd the main mass of the inland-ice, at a height of 4,000 ft., was attained. The top step or ridge, over which the ice gravitated, had then been ascended and was found to be in line with a row of nunataks that extended from Gerlache Nunatak in the north to Ymers Nunatak, at the N. end of Queen Louise Land, in the south. The delays caused by blizzards were many and vexatious; the men were confined to their tent, and the lash of the storm outside continued day and night. Mikkelsen told his companion tales of the Southern Seas, which he had sailed as a lad; and their minds wandered away among the palm trees and lagoons until an extra blast outside seemed to mock them, as if it shrieked: "Whew! You and your Southern Seas! You're here—here on the inland-ice!"

The first dog was killed on 17th April to feed the others and all were on half-rations during the gales, one of which lasted 4 days. On 22nd 2 dogs died from fatigue, for there was a constant struggle against bitter head winds, often accompanied by driving snow that made the work killing. On 26th, dog food for 32 days remained, but progress was very slow and the outlook doubtful. Next day land was seen to the north, in the form of an imposing mountain landscape. Crevasses in which 1 dog was lost were a danger for several days. Iversen also had a narrow escape, as he fell half-way through a snow bridge; but he clung to the sledge and the dogs pulled him out. Blizzards prevented travelling on 14 days in April, and only 105 miles were made in the month. May came in with better weather, and longer marches were made. The land ahead rose higher day by day and bearings on it were taken. *Danmark Fjord* was sighted on 7th, and the following day a reconnaissance was made, the dogs being left in camp. The edge of the plateau was reached and the fjord seen below; after walking 5 miles vertical ice-cliffs, however, extending in both directions, forbade further advance.

On the return to camp after 18 hours' absence the dogs were found making merry in the tent. They had devoured 24 lbs. of pemmican, besides biscuits, dried vegetables, socks, walrus-hide



*Photo* P. I. White, 1926

HERD OF MUSK OXEN — HEAD OF GRANIA FJORD, EAST GREENLAND



*Photo* M. M. I. Parkinson, 1929

ATTESTUPAN — 5,000 FT. — FRANZ JOSEF FJORD, EAST GREENLAND



straps and, best of all, 13 ft. of whip-lash. Then they wished they had eaten the stock. A watercourse was followed nearly over the precipice ; but by cutting 350 large steps down a ravine, *Danmark Fjord* was reached after 47 days on the plateau. The land below seemed an Arctic paradise with its grass and dwarf plants, especially as fresh tracks of musk-oxen, hares, foxes and wolves were seen. Two musk-oxen were soon shot, and the men became exhilarated with the joy of life. A watercourse and a series of lakes were followed in leisurely fashion ; then another herd of 6 musk-oxen was seen, but left unmolested. On reaching the frozen waters of the fjord on 18th May the search for Mylius-Erichsen's diaries began. Mikkelsen drove along the W. coast, and the following day passed Cape Holbak, an impressive sight with perpendicular cliffs, 1,500 ft. high, that extended for many miles. Farther north the cliffs receded from the coast which became low and shelving. A range of hills bounded the view at a distance of 2 miles inland.

By 22nd May another dog had to be killed, for no musk-oxen were seen when needed ; and the following day a cairn was found containing a note written by Mylius-Erichsen on 12th September, 1907. The message stated that all his party were in good health, and there had been ample game, though 7 dogs had previously been killed ; and that the party was leaving with 300 lbs. of meat, or 16 days' supply for the men and 8 days' dog-food. They were returning to *Danmark Harbour* by the outer coast. The last statement was the only clue as to where the diaries could best be sought.

Mikkelsen continued northwards, his team now reduced to 7 dogs. Many other cairns were seen but were survey points and contained no messages. At length an old fireplace with some ashes and charred bones was found—the site of Mylius-Erichsen's summer camp—and not far away was another cairn that Mikkelsen eagerly examined. It yielded an empty thermometer case containing an important report, dated 8th August, 1907, which stated that Peary's channel did not exist, and that Navy Cliff had a land connection with Heilprin Land ; that all the party were well and going in search of game ; finally, they had hoped to reach the ship before the end of September, with or without dogs. This was an earlier message than the one previously found and came as a great shock to Mikkelsen as it completely altered his plans. His intention had been to drive through Peary's channel, which had not been explored, and to return by the Smith Sound Route. In a state of disconcerting indecision he proceeded to Cape Rigsdagen. The one bright spot that helped to relieve his gloom was that the disproof of Peary's channel had added another important

geographical discovery to those that Mylius-Erichsen's party had already purchased with their lives. The cape was reached on 28th May, and here the decision was made to return along the ocean coast, hoping to anticipate the summer thaw and to find Mylius-Erichsen's diaries.

Mikkelsen had 40 days' food for the men but only 12 days' supply for the dogs, and the team was already exhausted. The worst factor in the situation, however, was the state of his own health. The grim fact had to be faced that a distance of 600 miles had to be covered with insufficient food and one sick man. Moreover, unless Mikkelsen could travel fast the thaw might turn the scale against him ; his only hope then lay in game.

Thus began one of the most Homeric of Arctic journeys. The distance to the nearest *Danmark* Depot, near the North-East Foreland, was 100 miles and it was not reached until 10th June on account of the deep snow and increasing exhaustion of the dogs. Mikkelsen felt his own strength failing and found he had scurvy—a terrible start for a long and dangerous journey. Relaying was necessary, and Mikkelsen was so ill that Iversen had to do all the work ; while the going was good the invalid rode on the sledge. The depot contained only 10 lbs. forcemeat with cabbage, 2 lbs. pemmican and 1 lb. peas, though this was better than nothing ; but a gull was shot, and fresh meat was the only cure for Mikkelsen. His party had now been in the field 100 days and, including relaying, had sledged nearly 1,000 miles. On resuming the journey Mikkelsen went ahead, but became giddy and was forced to lie down until Iversen came up and lifted him on the sledge. The dogs were failing and another had to be killed.

Two wild geese were then shot, and eaten with some of the cabbage. The next depot, in Amdrups Land, was reached on 16th June and contained about 1 cwt. of provisions of which 100 lbs. were dog food. There was also a note from Koch saying that bear and walrus meat had been cached, but it could not be found. Mylius-Erichsen did not appear to have touched the Amdrups Land Depot, whereas he must have consumed most of the stores from the first depot ; this was difficult to explain, though it proved at least that he had travelled down this coast, and is evidence that he took to the inland-ice before reaching lat. 80° 43' N. (see p. 69). Mikkelsen's dogs would not eat much of the patent food from the depot, but Iversen shot another goose. Water was now on the ice, and the men's wet clothes made them cold. Mikkelsen was feverish and delirious but Iversen tended him, in addition to doing all the other

work. Eskimo Naze was reached on 19th June with Mikkelsen better and able to drive; the fresh food already showed its effect. Relics of former habitation were seen here and some of them collected. Several seals were seen, also one bear, but neither was shot.

After the hungry men had arrived at Mallemuk Fjord on 20th they had to be satisfied with a hare. The depot could not be found; as summer reigned over the beautiful fjord and the thaw water made travelling almost impossible, it was agreed to rest here. Mikkelsen would recover if game could be shot. Provisions for 20 days then remained, with 300-400 miles yet to cover. Iversen hunted every day, and always returned with one or two gulls which he gave to Mikkelsen. At last he found the depot with 15 days' rations for 2 men, if they could eat mouldy biscuits and green chocolate. They could and did, saying that, after all, mildew was a vegetable. There was also dog food and oil, coffee, tobacco, (melted) sugar and a tin of gooseberries; there were cigars and cigarettes, clean clothes, black puddings and (mouldy) oatmeal which went the same way as the biscuits. Lastly, there were letters to Mylius-Erichsen from Koch and Thostrup, stating that depots were laid all down the coast. The future for Mikkelsen and Iversen seemed assured.

An attempt was made to continue the journey on 29th June, but it had to be abandoned as Iversen was soon up to his waist in slush. On 5th July a more successful attempt was made, after 18 days at Mallemuk Fjord which had restored Mikkelsen's health. Only 3 dogs now remained to drive along the coast of Hovgaards Island where the sledge was sometimes rafted on pieces of ice over the all-pervading water. Once the whole load was nearly lost and everything was soaked; the biscuits reverted to dough, and salt water was squeezed out of the tea. This accident was serious, for the men had been living on 1 lb. food a day and were already weak. After the accident they dared not eat more than half this amount, and the pangs of hunger became most severe. The going was like sledging through a morass; and the dogs were useless, except as a portable food store, as the sledge could only be moved by the men in standing jerks. Nine days were occupied over the 30 miles to the Hovgaard Island Depot which contained more mildewed food.

Here they were obliged to stay until the water had drained off the ice. They hoped to find game, and one satisfying meal was indulged in. The delights of summer in Greenland were enjoyed on the warm rocks of Cape Anne Bistrup, with Seventy-nine Fjord to the south and the ground bright with grass and flowers. Fresh tracks of bears and

of hares were seen, though 2 days' hunting yielded no more than a brace of ptarmigan ; yet the dread alternative to securing game was death. Their last hope was in seals, and several were shot ; but they all sank and were lost. In 3 weeks a move had to be made, for only 7 lbs. of pemmican remained and Iversen now was poorly. There should be food in the depots, if they could be reached.

After all that these men had already endured, the real fight for life did not begin until they set out across Seventy-nine Fjord on 6th August. It was near here that Mylius-Erichsen, Hagen and Bronlund had perished. The progress of Mikkelsen and Iversen at first was encouraging, for 9 miles were covered before camping. As a boat would have been the most suitable means of transport they enclosed the sledge in a sailcloth and waded through the water towing their amphibious sledge-boat. On the third day an advance of 2 miles rewarded 10 hours' toil, and the men suffered from their continual immersion. The dogs were almost dead from the wet, but it was essential to keep them alive, for apart from them the only food left was 3 lbs. of pemmican. Lamberts Land was gained on 15th August with the men exhausted by their efforts. Here 12 ptarmigan were shot and the dogs devoured all the bones and feathers. By strict economy these small birds made 6 meals ; but now Iversen was ill, though able to struggle along. A little hare helped for a few hours and then a dog had to die. The starving men yielded to the temptation to eat its liver and found it delicious ; but they fell asleep soon after the meal and awoke with splitting headaches. Ill or well, however, they must press on, for it was now a race with death.

That they passed Bronlund's grave without any reference to him showed their condition ; and on 19th they left Lamberts Land hoping to find the depot on Schnauders Island, 15 miles away. The second dog was killed after being carried on the sledge, and the men were so famished that again they could not waste the liver, with the same results as before. When they set out on the third day from Lamberts Land they hoped to cover the 5 or 6 miles to Schnauders Island, but were stopped by open water and camped. The dog-meat was tough, and they enjoyed most the gravy and the marrow from the bones, swilling it down with " tea " made from leaves that had already seen service many times. With half a shoulder of dog and 3 ribs they hoped to reach the depot. On 25th the island was gained and the last ounce of food consumed on the strength of finding food. Even then they felt as hungry as they were before the meal. Then leaving camp they set off on their vital quest ; but mile after mile of the coast was searched without any sign of the depot—their only



hope of survival. After going 10 miles they thought they must have passed it. Then a ptarmigan was shot and saved them from starvation. At last a box was seen on the cliff, and a fire was made of the boards while coffee from the depot was brewed, and they fed on pea soup, cocoa, biscuits and butter; they also found oatmeal, apples, apricots and other delicacies.

A long rest was made at this depot; and when camp was regained the men had been awake for 32 hours. After a long rest they moved in a leisurely manner back to the depot and shot 5 ptarmigan. Here a week was spent, for Iversen was not well and both men still suffered a little from the effects of the dog-meat. On 4th September they started afresh with high hopes of reaching the ship, though they felt weak when pulling the sledge. The frost had now improved the going; there was no water to wade through. Their immediate objective was the North Depot where they would again be in need of supplies, as they had now only 8 oz. of food a day.

Provisions for 8 days were found at this depot. The cereals again were mouldy, but the tinned meat was good, and the next depot was 16 miles away so they made a hearty meal. As they approached the Hagen Island Depot they felt that at last their troubles were over. But there was *no food* here, and empty tins seemed to grin with sardonic scorn at their misfortune. They now had 8 lbs. of food on which to travel nearly 100 miles to *Danmark* Harbour, and a feverish race with hunger began while death stalked them from the rear. That day 20 miles were covered to the next depot; it was their last frail hope—soon dashed to the ground, for it also was empty. Mikkelsen had not ascertained the contents of these *Danmark* depots as his intention had been to return by Peary's mythical channel.

The last stage of this terrible journey then began. *Three pounds* of food were left on which to travel about 70 miles. The sledge, tent and sleeping bags were now abandoned and nothing carried but one rifle, the diaries and oil for 5 meals. In silence then they strode along, climbing the glaciers and cliffs when blocked at sea level. The Cape Amelie Depot contained nothing, and the night was spent in hunger and without cover on the frozen ground. Open water, next day, sent them miles off their course, and dangerous work had to be done; but they must reach *Danmark* Harbour or die.

*" Then welcome each rebuff  
That turns earth's smoothness rough,  
Each sting that bids nor sit nor stand but go!  
Be our joy three-parts pain!  
Strive, and hold cheap the strain!  
Learn, nor account the pang! Dare, never grudge the throe!"*

Mikkelsen says that this day was one of the worst he ever spent in the Arctic, with 7 hours' toil along a precipitous wall of rock, followed by a blizzard. The sea broke up the ice along which they were travelling and breakers dashed against the coast. A sheltered place was found for the night during which the gale increased, and next day it was impossible to proceed. They were extremely cold ; but fortunately they had shot 4 ptarmigan, though they dared not eat them all at once. As soon as the gale moderated they set off and for 5 hours progressed well. Then another storm arose and they were stopped again by open water. The gusts were so violent that the men were thrown to the ground, but managed to struggle as far as the shelter of some rocks in the middle of Skaerfjord. For 40 hours the gale kept them there, cut off from land, until only  $\frac{1}{2}$  lb. of pemmican was left. Then leaving everything except the gun, a dash was made.

It was now life or death, and they preferred drowning to dying of starvation. Loose pieces of pack ice had to be crossed to reach the south side of the fjord, and they jumped from one swaying piece to another, taking appalling risks, and moving over young ice so thin that it bent beneath their weight. On reaching safety they ate the last of their food, though still about 40 miles from *Danmark* Harbour ; but there should be food at Cape Marie Valdemar and they were forced to rely on it. Three small tins of meat extract were all that could be found at this depot, but the men made a great fire of the numerous boards that were lying about. Thus they had warmth, though too hungry to sleep, and on the 17th September set out once again. A slippery slope had to be crossed above deep icy water into which they were in great danger of falling. Then the sun rose and they had a short rest, repeating this every 2 hours, when they lay on their backs for a few minutes. Their hunger had now become extremely painful and was still increasing ; they were living on their reserves, and only the innate strength of their constitutions carried them through. Such an obsession did food become that, in their weakened state, they constantly thought they saw boxes of provisions, and went out of their way to pick them up—to find stones every time.

Mikkelsen and Iversen were very near desperation that evening, and half-delirious with exhaustion. Point after point along the coast came into view, was approached and passed, as they staggered on in a Dantesque kind of torture. They lost any idea of where they were ; all they could do was to keep on, "slogging along," and for a time they were half-mad with weakness. At 10 p.m. they sank

to the ground, completely played out ; but at midnight they went on again. The cold was intense and the night so dark that nothing could be seen 10 paces ahead, but the risk of advancing had to be taken. They knew that there had once been a few tins of food at a point 10 miles north of *Danmark* Harbour, and the thought of them buoyed up their spirits:

At 2 a.m. this place was reached and, for the time at least, they were saved, for 1 tin of peas and 2 tins of soup were found. A fire was made of broken boxes, and soon they were slowly tasting the wonderful food which seemed to them the finest they had ever eaten ; it gave them new life and almost appeased their wolfish hunger. But they dared not linger after sunrise, and painfully covered the last few miles to safety. Their legs ached continually, and Iversen was so weakened with pain that his companion occasionally had to support him. They staggered along for 5 hours, walking mechanically towards the end. At last Mylius-Erichsen's old hut came into view, but it took an hour and a half to cover the last thousand yards. The time was 11 a.m. on the 19th September, 1910, and they had marched for the last 40 hours with only a few short rests.

Outside the hut there was a bench on which Mikkelsen and Iversen sank and where they remained for some minutes in silent content. They then entered the hut and had 1 lb. of chocolate each, to take the edge off their appetite, though it seemed to make little difference, and this was followed by 2 lbs. of lobsouse, with porridge and butter. A veil must be drawn over the corollary to this breakfast. Naturally they wished to eat as much as they were able, and in a few days they were able to eat as much as they wished.

When they had sufficiently recovered from their journey, with its 3 months' starvation, they essayed to return as far as Skaerfjord to recover their diaries. They started northwards on the 15th October, but the equipment at the hut was too heavy and progress extremely slow. Only 18 miles were covered in a week, 2 days of which were lost through blizzards ; but as the food taken was insufficient for a long trip they turned back. When they fled from Skaerfjord without food they had reached *Danmark* Harbour in 3 days. A foot of snow fell during the return journey, so the sledge was left behind and the hut regained on the 25th October.

On the 5th November, when the sun had set for the winter, they started to march the last 100 miles to the ship, but Mikkelsen and Iversen soon found themselves badly out of condition. The going was difficult, and one blizzard held them up for 6 consecutive days. Enough food had not been taken for so long a delay, and on 22nd

November they left the tent and set out with only a spade, 1 lb. dog pemmican and the stove filled with oil for one meal. While stumbling through the darkness they fell into a deep hole, but as it was warmer down there out of the wind, they decided to stay. A small cave was dug in the snow and the pemmican cooked; as they could not sleep, however, they moved off again in the dark, guided by the stars. They were afraid to rest because a storm would have been the end. During the second night, however, when quite dark, they blundered into some very rough country, and once more made themselves as comfortable as possible in a hole; the risk of advancing in the darkness then was greater than that of a storm. They now had nothing but hot water, and when the moon rose they continued their way; they were not far from the *Alabama* and its mast was soon sighted—on dry land, high up on shore!

A hut was seen, but no ship and no companions. It was clear that the *Alabama* had been crushed by the ice, but where had their companions gone? The hut was empty except for snow, of which it was nearly full, for the roof had been blown off. This day, the 25th November, 1910, was the 270th since setting out. Mikkelsen appears to have made a record up to that time by sledging over 2,000 miles in 12 months. He claims to have travelled a distance of 1,400 miles on his great journey, but with the relaying, he must have sledged nearer 1,600 miles; and he had driven 500 miles in the late autumn of 1909 when he did not return until a week before Christmas.

His companions had built the hut with the ship's timbers, for on 13th March the *Alabama* began to leak so badly that she had to be unloaded. A temporary shelter was first erected in which to live ashore while the ship was broken up; she was far beyond repair and the mast had gone through the bottom. On 1st June messages were sent off to Cape Philip Broke and the Bass Rock; at the latter depot letters were found from the *Danmark* Expedition. The wooden house was inhabited on 14th July, but two of the men were always on the look out at Cape Philip Broke, and on 27th July the *7 de Juni* called. Her master agreed to take the men home, and from 2nd to 7th August the coast to the north was searched for signs of Mikkelsen and Iversen. When nothing was seen of them it was decided not to leave anyone to consume food that would be vital on Mikkelsen's return. They therefore set sail and reached Aalesund on 15th August, 1910.

Mikkelsen and Iversen found the hut well stocked; there was ample wood, though no coal, and the second winter passed unevent-

fully. Some Arctic foxes discovered that free meals were to be obtained here, and took lodging near the hut. Apart from the foxes, life was very dull and its monotony only relieved by the beauties of Nature. The light in the south grew stronger every day after mid-winter and there was a wealth of colour ranging from a golden red to the darkest blue. On 10th February, 1911, the sun appeared and was given a shout of welcome which disturbed a solitary raven as it flew southwards. This bird and the two men seemed to have North-East Greenland entirely to themselves.

On 25th April a message was left in the hut, and they started northwards again to recover their diaries, pulling a light sledge. *Danmark* Harbour was reached in 10 days, but they had a shock on approaching the rocky island in Skaerfjord where the depot had been built. First they saw a piece of the canvas in which the diaries had been packed; then a cartridge was found, bitten flat by a bear that had turned over the whole of the cache and swallowed—not the cartridge, though this might have advanced geographical research—but Mikkelsen's journal. Its loss was a terrible disappointment to its writer because all his sufferings on that hunger march seemed wasted; and geographers will be no less sorry at such a catastrophe; it was a loss to learning. There was, however, a silver lining to this dark cloud: the bear had not eaten Iversen's diary, and on 16th May the explorers turned their backs on Skaerfjord to march southwards once more.

This journey was uninteresting, and on reaching the *Alabama* hut after 40 days' absence the marooned men began to expect a ship; they therefore moved to Cape Philip Broke whence a good view of the sea was obtained. They naturally expected to be rescued, though no definite arrangements had been made. The beautiful Arctic spring came in, bringing Nature's annual resurrection from the dead: flowers, insects, birds and beasts—everything came except the ship that was longed for. Summer also came and went, with much open water, but still no ship; and after the month of August there seemed no hope of returning home that year. The subject was never mentioned, for the disappointment was easier to bear in silence.

Autumn approached with its frosts, and the migrant birds were watched with longing eyes by the men whom the busy world had forgotten. With pangs of homesickness Mikkelsen and Iversen saw the flocks winging their way from the advancing Arctic night, to follow the course of the sun, while they must remain to endure the hardships of a third winter. They were perfectly helpless and began to feel the loneliness of their position. Weaker men would have

succumbed, but these two explorers soon recovered their spirits, and in September were again quite cheerful. They decided to move to the Bass Rock where the largest depot of food was stored, and the work was beneficial as well as enjoyable. A few musk-oxen and hares were shot, and this also was a welcome distraction, besides providing a change of diet.

The removal to Bass Rock began on 16th October and was a big undertaking for two men ; the loads weighed 1,500 lbs., in addition to a boat of 425 lbs. Sledging went on for 10 days before the hut was finally evacuated, and the loads were worked forwards as well as could be managed. The sun was setting and the nights were becoming very cold as the stores were relayed over the snow. On 11th November, 1912, Cape Philip Broke was reached, and here the men stayed until the 20th. On the following day, when in sight of Bass Rock, they were surprised to see a large pole, with a cross at the top ; they had reached the climax of the whole expedition.

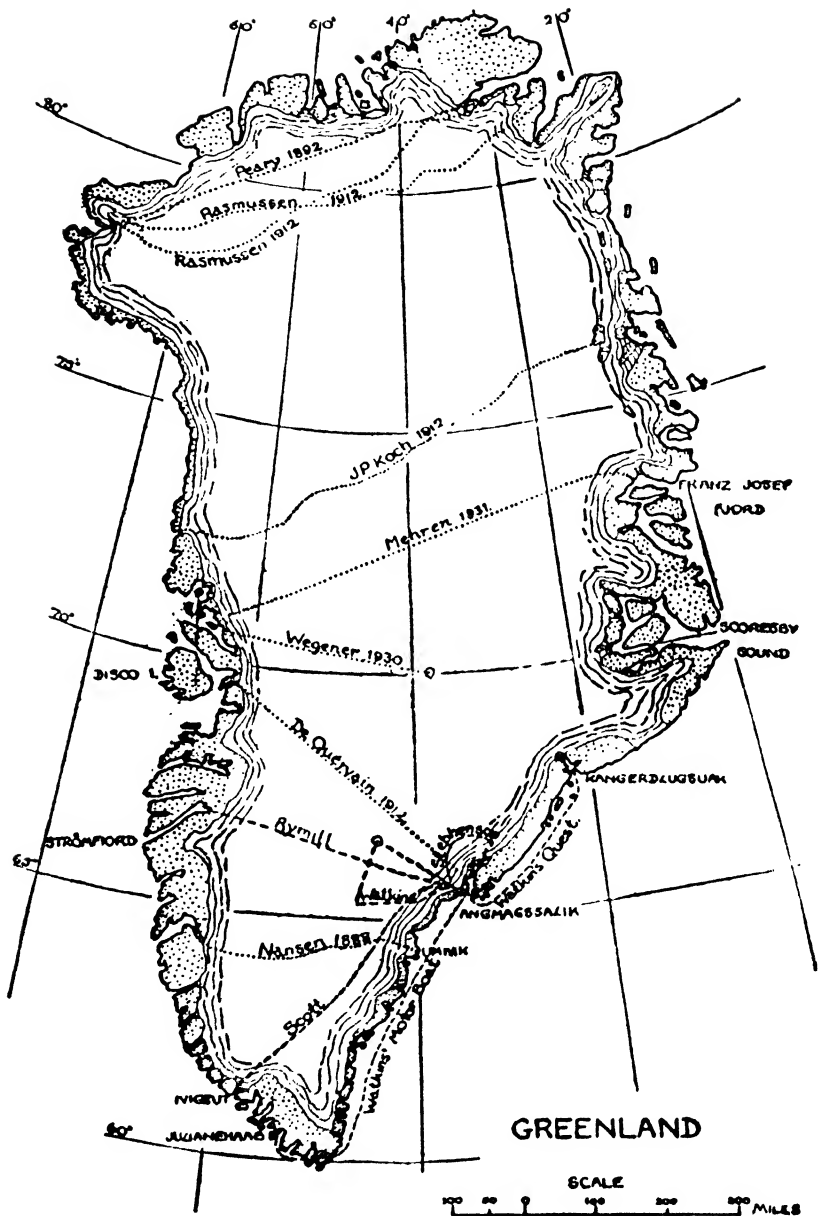
They left the sledge and dashed into the house. Here a message was read from the *Laura*, dated the 25th day of the previous July (1911), when they were waiting 15 miles away and never thought of leaving a message here themselves ! This was a terrible shock, not only because they would have been home before now, but chiefly because of the anxiety of their friends who might well have given them up for dead. They blamed themselves for their neglect, but the mischief now was done. There were also messages from Laub to the sealers and the sealers to Laub, showing that all was well with both parties. The other men had not forgotten to send messages to Cape Philip Broke and Bass Rock ; two of them lived at the cape to look out for ships, and thus on 2nd August, 1910, they were all taken off by the sealer.

The third Christmas in Greenland had nothing to offer, and on 25th January, 1912, Mikkelsen and Iversen set out to fetch some meat from Shannon Island, for a journey down the coast to Angmagsalik. The day after their arrival a bear attacked the door of the hut when the rifles were not only unloaded but frozen. Mikkelsen had to take an axe to close the breech of his gun, knowing full well, of course, the risk he ran, but, as he said, " it had got to go in." Iversen made a sporting effort by pressing his back against the door which the bear was banging, until it burst open and flung Iversen across the room. While the brute paused with astonishment at the strange things he saw, Iversen secured his gun. Then came the terrific roar of the rifle in the small apartment ; the bear's white chest quivered, and drops of blood appeared, yet he stood like a statue for a few

moments. Then suddenly he beat a retreat and almost crumpled in a heap.

Next day they started back to Bass Rock with a load of 600 lbs. and were soon busy with preparations for their journey down the coast. A trial trip was made to Walrus Island, 20 miles to the south, to test the equipment which was none of the best, but the excursion proved a severe test. They were out a week, relaying on the outward journey, and the trip made them both ill. They had to lie up for a fortnight and were obliged to abandon the proposed sledge journey, though they still hoped to go by boat. Their combined strength, however, was insufficient to move the boat ; and they were forced to remain inactive at the Bass Rock until 19th July, 1912, when a Norwegian steamer took them off.

Mikkelsen and Iversen had been alone for 28 months and in Greenland for 3 years. They had such a dreadful appearance after their primitive existence that their mothers would not have known them ; such temporary disfigurement is part of the cost of geographic exploration. The Marquis Curzon, as President of the Royal Geographical Society, stated that the Society had never listened to a more remarkable tale of human sacrifice and heroism than Mikkelsen's lecture on his experiences. Capt. Mikkelsen made one of the finest polar journeys, north or south, and had a historic race with death ; he discovered hundreds of miles of new country and made the first crossing of the inland ice between Dove Bay and *Danmark* Fjord. Though he failed to find the diaries of Mylius-Erichsen and Hagen, he was successful in bringing home two of the lost explorer's messages, and the " Report of the *Danmark* Expedition " states : " The honour of discovering that the Peary Channel does not exist belongs to Mylius-Erichsen and the honour of making this discovery known to the world falls to Ejnar Mikkelsen " (" Meddelelser om Grønland," Vol. XLI, Part V, " Mylius-Erichsen's Report on the Non-Existence of the Peary Channel," by G. C. Amdrup).





## CHAPTER V

### JOURNEYS ACROSS THE GREENLAND PLATEAU

**T**HE inland ice, or glacial plateau, of Greenland is one of the natural wonders of the world. It is a million sq. miles in area, or nearly 5 times the area of France, and rises to a height of 10,000 ft. above sea-level. This mighty mass of ice has buried nearly all the physical features of the land. Its thickness may vary considerably, but is probably about 8,000 ft. where Wegener sounded its depth (p. 270). The surface is a plateau that, in the S., forms a flattened arch from E. to W. ; but if all the recorded heights are trustworthy the greater part of the surface rises from the W., N. and NE., to summit-levels that lie W. of the eastern mountains, as seen by the contours on Map No. 3. C. R. Wager has recently shown (" Geological Magazine," April, 1933) that the coastal ranges appear to act as a huge barrage, impounding the inland ice in the manner of an upland reservoir, with the glaciers as its natural overflows. Dr. Lauge Koch observes that the inland-ice forms the great background to all existence in Greenland, and that a journey over it from north to south would be as far as from Copenhagen to the Sahara, without any change in the traveller's view. The latest glaciological term for this type of land ice formation is " Continental Ice," though the term " Inland Ice " was generally accepted until recently ; now the younger men refer to it as the " Ice Cap."

Nansen in the south and Peary in the extreme north were the pioneers of exploration over the Greenland Plateau ; and though their journeys were made between 20 and 30 years before our period begins, they form the natural introduction to the subject which would not be complete without a brief reference to them.

Dr. Nansen in 1888 boldly and wisely burnt his boats by making the journey from east to west, knowing that once started in this direction there could be no turning back and that the dread East Greenland Current must first be crossed. There was far more danger in passing this moving belt to reach the coast than in the subsequent land journey. On 17th July, Nansen's party left the *Jason* in two boats near Cape Dan, and began to thread their way between fairly

## SCHEDULE No. 2

## THE MOST IMPORTANT JOURNEYS OVER THE INLAND ICE

Year	Explorers and their Routes	Max. Height. ft.	Miles. approx.
1. 1888.	Nansen and Sverdrup—Umivik to Ameralik Fjord.	8,970	350
2. } 1892.	{ Peary and Astrup—McCormick Bay to Navy Cliff.	6,000	600
3. } 1892.	{ Peary and Astrup—Navy Cliff to McCormick Bay.	8,000	600
4. } 1895.	{ Peary, Lee and Henson—Whale Sound to Navy Cliff.	7,300	520
5. } 1895.	{ Peary, Lee and Henson—Navy Cliff to Whale Sound.	?	520
6. 1910.	Mikkelsen and Iversen—Dove Bay to <i>Danmark</i> Fjord.	4,000	300
7. } 1912.	{ Rasmussen and Freuchen—Inglefield Gulf to <i>Danmark</i> Fjord.	7,230	630
8. } 1912.	{ Rasmussen and Freuchen—Navy Cliff to Inglefield Gulf.	?	510
9. 1912.	De Quervain—Disco Bay to Angmagssalik.	8,200	420
10. 1913.	J. P. Koch, Wegener and others—Dove Bay to Proven.	9,500	700
11. 1916.	Rasmussen, Wulff and L. Koch—St. Georges Fjord to Inglefield Land.	4,000	240
12. 1921.	L. Koch—Vildt Land to Humboldt Glacier.	5,000	600
13. 1931.	Hoygaard and Mehren—Umanak to Franz Josef Fjord.	9,880	600
14. 1931.	Rymill and Hampton—Sermilik Fjord to Ivigtut.	7,600	360
15. 1931.	Scott, Lindsay and Stephenson—Sermilik Fjord to Holsteinsborg.	9,200	450

open floes towards the land that lay about 10 miles ahead. It was not until the 29th, after much toil and danger, that they reached the coast 300 miles to the south of where they had left the ship. They were able to return northwards for a distance of about 200 miles on the open shore water as far as Umivik in lat.  $64^{\circ} 20' N.$ , whence they ascended through a crevassed area to the plateau. The highest point reached was 8,970 ft. above sea-level, and the distance from coast to coast, 350 miles.

In 1892 Peary and Astrup ascended to the plateau from McCormick Bay with Dr. F. A. Cook leading a supporting party for 130 miles. A NE. course was set with the certainty of striking unknown country if a long enough journey were made, and the sea coast was almost in sight during four-fifths of the outward march. Petermann, St. George's and Sherard Osborne Fjords were successively seen in the distance, and a height of 6,000 ft. was reached. After driving

about 500 miles new land was seen, but exploration and surveying had to take second place to the need of food. A record was left on Navy Cliff in lat.  $81^{\circ} 37' 5''$  N. and long.  $34^{\circ} 5'$  W. Peary charted a wide open bay that he named Independence Bay, as well as a large channel that cut off Peary Land from the mainland. Several musk-oxen were killed, and the return journey was begun with 8 well-fed dogs. The maximum corrected height on the homeward march is given as 8,000 ft., and the distance was probably about 600 miles for the single journey, as a straight line along the route measures 500 miles. Peary's speed on the return was about 20 miles a day.

His second double crossing in 1895 accomplished nothing, and the risk taken was excessive. Blizzards deprived him of his stores before he set out, yet with Lee and Henson the journey over the plateau was made from Whale Sound to Navy Cliff again, though they were killing dogs for food several days before reaching the new land in the north. The danger of starvation was so extreme that nothing else could be considered, and their very lives were staked on the chance of finding musk-oxen. About half a dozen were shot, but no work was done and no purpose seems to have been served in making such a wasted journey.

The total supplies on starting for home were a fortnight's rations, some stimulants, 9 dogs and 9 cartridges. Peary considered that the prospect of the 3 men surviving the journey was good, provided only that the weather were reasonable. In a few days, however, Lee began to fail and was liberally doped with drugs and brandy; no more than one day's rest could be permitted him. The first dog was shot a week after starting, and 7 others followed in due course, but one was spared; and the men reached their hut with no other food and in a terrible state of exhaustion. It had been one of the greatest races for life in the history of exploration and had a very fortunate ending, for one blizzard of even a few days' duration would have wiped out the whole party. The exact distance was 517 miles and the average speed nearly 21 miles a day. Peary was then 39 years of age and apparently in his prime.

On reaching the period with which we are more particularly concerned, we first notice that Mikkelsen's plateau journey was given in the last chapter, and that a record of the journeys of Rasmussen and Lauge Koch, Scott's and Rymill's parties of Watkin's expedition, will be found in their appropriate chapters. There yet remain the great journeys of De Quervain, J. P. Koch and Hoygaard, and the subject is of sufficient importance to merit separate treatment.

In the year 1909 Dr. De Quervain, a Swiss scientist, visited

Greenland and made a journey from the W. coast towards the interior, but turned back at the edge of the inland ice. He then organized a larger expedition which sailed from Copenhagen on 12th April, 1912; but no extended account of it exists in English. There were 7 men in the party including Dr. Hössli and Prof. Mercanton, a glaciologist; some of the scientists remained on the W. coast throughout the winter. The expedition disembarked at Holsteinsborg, whence it proceeded to Disco Bay in the *Fox*, McClintock's old ship that was afterwards lost. Dog transport was utilized on and after 20th June, when the melancholy marginal zone of black rocks had been crossed, and the journey over the ice began at a height of nearly 2,000 ft.

As usual at this season of the year, the inland ice was free from snow for a distance of about 25 miles from its edge; rain and thaw water had formed many holes and channels in the ice. Crevasses also were encountered and caused no little concern. The course was SE., and as the party proceeded towards the interior snow was found on the surface. The plateau continually ascended until the 13th July when the highest point, 8,200 ft., was reached; and 4 days later an important geographical discovery was made. This was a new range of mountains that lay between De Quervain and the E. coast. He estimated the height of the highest peak, Mt. Forel, at 11,200 ft., making it the highest mountain in the Arctic. On 20th July his party reached the head of Sermilik Fjord, near Angmagssalik, where they shortly arrived by water after a most successful journey of 420 miles. The dogs enabled long marches to be made, but they had to be sacrificed at the end of the trip in accordance with the Danish Government's quarantine regulations.

After this crossing, a narrow strip in North Greenland had been crossed 6 times and was to be crossed yet again, while a wide belt in the south had only been crossed twice, and by far the greater part of the inland ice, north of De Quervain's route and covering the great central area, had never been explored. Capt. J. P. Koch, who will need no introduction to readers of Chapter III, proceeded to make good this deficiency by crossing the unknown area from E. to W., in one of its widest parts. The Danish Government, the Carlsberg Fund and private subscribers financed the undertaking.

Koch's expedition, well organized and equipped, disembarked on 21st July, 1912, at *Danmark* Harbour, less than 150 miles N. of where, only 2 days before, Mikkelsen and Iversen had been rescued. Koch was accompanied by Larsen and Vigfus, also by Dr. Alfred Wegener. Pony transport, introduced for Arctic service by F. G.

Jackson in 1896 and adopted by Shackleton and Scott in Antarctica, was also used by Koch, whose expedition was partly contemporary with Scott's. Although 16 ponies were landed, only 13 were eventually available because 13 stampeded on reaching the shore and 3 of these were lost. Koch intended to winter in Queen Louise Land. Two months were occupied in transporting the stores and equipment across the N. side of Dove Bay to the foot of the glacier. This work was very difficult and caused several accidents. The invaluable motor-boat sank during an attempt to push through young ice; and on 16th September Wegener had the misfortune to break a rib, though he recovered in a month. The next task, that of ascending the large glacier to Queen Louise Land, was the hardest of all. Apparently the Storstrommen Glacier was chosen for the ascent, thus approximately following Mikkelsen's route to the edge of the plateau and then Lieut. Laub's to the land. Instead of the light and nimble dogs of the 1910 expedition, however, Koch's heavy ponies had to negotiate crevasses. Pony transport has naturally been found unsuitable for such conditions as these, though none of Koch's animals seems to have been injured on the glacier.

Some of the stores left at the foot of the glacier were lost by the calving of an iceberg. For the second time Queen Louise Land resisted all efforts to reach it from the north, where it is well protected by vertical walls of ice, one of which Laub had estimated at 200 ft. high. He found that this land became lower towards the south and was mountainous country with peaks rising approximately to 5,500 ft., or 1,500 ft. above the inland ice. Koch had no alternative to establishing his winter quarters on the land ice near the edge of the plateau, thereby conducting an interesting experiment.

For some years the present writer has argued for inland stations in Antarctica, on the Beardmore Glacier and even on the plateau; but the professional scientists, with due regard, no doubt, for their reputations, opposed the suggestion; they said that a plateau station would be impossible, as the conditions in winter on the continental ice would be devastating. Capt. Koch proved that a station could be maintained in Greenland at a height of about 4,000 ft., and he has now been followed by other explorers who have wintered at 8,000 ft. on the plateau. The difference between the conditions in Antarctica and Greenland, in this connection, is so slight that it only remains for the station suggested in 1928 to be set up on the Antarctic Plateau. (See "Antarctica: A Treatise on the Southern Continent," pp. 352-5.)

Koch was laid up for 3 months with a broken leg, after a nasty fall

of 50 ft. down a crevasse ; but neither he nor his companions suffered from the cold, though the minimum temperature was  $-72^{\circ}$  F. or 104 degrees of frost. This temperature has been endured by other polar explorers under harder conditions than prevailed at Koch's station ; very much lower temperatures can be withstood at a station than on a sledge journey. Koch's hut was warm, and scientific work was continually carried out until the spring of 1913 when it was necessary to reconnoitre for a route towards the interior. A depot was laid to the west of Queen Louise Land at a height of 3,600 ft., and on 20th April the great journey began.

The weather at first was most unfavourable, with only 2 fine days during the first 6 weeks. Blizzards prevented all progress for 12 days, and punished the ponies as well as the men ; the latter suffered from many superficial frostbites, and 3 of the transport animals had to be killed. The surface at first was hard and deeply furrowed, then flat but soft, and the ponies sank several inches at every step. On 6th May, in long.  $27^{\circ}$  W., Queen Louise Land disappeared below the eastern horizon, and the expedition was out of sight of land for 2 whole months, until 2nd July. During this period the plateau gradually rose to a height of at least 9,500 ft., in long.  $43^{\circ}$  W. and lat.  $74^{\circ} 30'$  N., after which it gradually sank on the western side.

As the great ice-divide or crest of the watershed was approached the wind became less violent, but the low pressure troubled man and beast. The human skin became blistered and sore from the heat of the sun by day and by the cold, as low as  $-20^{\circ}$  F., at night. Pony cannot eat pony as dog eats dog, and so by the 11th June four more transport animals had been killed to keep pace with the diminishing quantity of fodder. Thaw-water pools and streams became an increasing difficulty towards the end of the journey. Sails were used on the sledges while descending the western slope ; and on 2nd July land, in the form of a lone nunatak, was sighted and found to be 37 miles from the edge of the inland-ice—reached in 2 more days. Here a depot that had been laid down for the purpose in 1911 was picked up and the last pony killed because of the difficulties of the way.

A raft was made of the sledge and sleeping-bags in order to cross the Lakse River and Fjord. Then for 5 days the men carried it over the mountains, where they met with rain and fog ; they had no shelter, and were without food for 35 hours. At last a sailing boat was seen on the fjord to the E. of Proven, near Upernivik, to which Koch's party was taken by the owner of the boat, Pastor Chemnitz.

The length of the journey had been 700 miles. Some of the information obtained from the interior is of great interest. Koch

found the ice-divide, on his route, to lie nearer the W. than the E. coast, whereas on the other routes it is the reverse. If all the maximum heights are correct, De Quervain found a slight dip in the gradient of the divide as it ascends from south to north. J. P. Koch brought back a mass of scientific data, physical, glaciological, botanical, zoological and meteorological, besides a survey of Queen Louise Land and a number of photographs. One of the most remarkable natural history discoveries was that foxes and snow buntings visit the most remote parts of the interior.

Eighteen years after Koch's fine journey the inland ice was crossed once again and on a course approximately parallel to, and 150 miles S. of, Koch's route. In 1931 two young Norwegians, Arne Hoygaard and Mark Mehren, started from the Western Base of Wegener's expedition and followed the German route up the Kama-rujuk Glacier to the plateau. The stores and equipment were carried to a height of 3,000 ft. by Eskimos, who then returned, leaving the Norwegians with 2 sledges and 16 dogs. On 10th July, at a distance of 42 miles from the western coast, a course was set for Franz Josef Fjord on the E. coast and an unexplored part of the interior was crossed. A height of over 9,700 ft. was attained on 4th August, when the surface began to decline towards the east, and afterwards a high speed was made by the use of sails. On 6th at a height of 8,000 ft. some new nunataks were sighted ahead and the E. coast mountains were shortly reached. From 14 to 24 miles a day had been covered in crossing the plateau. The mountains were the most difficult part of the journey and a detour to the north had to be made. Both sledges and much equipment were abandoned for the descent of the Hoel and Walterhausen Glaciers to a hut on the Strindberg Peninsula, reached on the 18th August. The *Polarbjorn* took the Norwegians home. They had named 10 mountains and nunataks as well as 5 new glaciers, and the length of their journey had been 600 miles. The E. coast mountains were found to extend farther west than was supposed. Meteorological and magnetic observations were taken daily during the journey, and interesting geological specimens were collected from the nunataks to the west of the mountains. A very useful and creditable piece of work had been performed.

Nansen had the honour of making the pioneer journey across the Greenland Plateau from coast to coast, and should be credited with its boldness of conception and execution, as well as for the value of the information he brought back; it was he who discovered the general form and character of the inland ice. Peary discovered its northern limits, and found that the fjords on the N. coast ended in

depressions which gradually merged, similarly to the Mertz and Ninnis Glaciers of Antarctica, into the frozen plateau; though Dr. L. Koch says that Peary was not sure which fjords he saw! ("Glaciology," 429). Nansen, De Quervain, J. P. Koch and Hoygaard made their crossings of the inland-ice the main purpose of their expeditions. L. Koch in 1921 used it, no doubt deliberately, for surveying purposes; but all the other explorers who have travelled over the plateau simply crossed it as a highway to or from their major field of operations.

Next to Nansen, Col. Koch deserves the greatest credit for his splendid journey. When he made it, the vastitude of the central area was totally unknown, his route being 300 miles south of Rasmussen's. His journey is still the longest and most important of all the crossings, having regard to the amount and value of scientific research carried out; but De Quervain and Hoygaard also planned their routes well, to explore the largest unknown area, and the result is that the inland ice of Greenland is now quite well known. De Quervain made, perhaps, the most interesting discoveries.

In concluding this chapter we notice that the risk in making these crossings has not been in proportion to their length, but to the scarcity of food. One of the greatest risks on any of these journeys was taken by Rasmussen's party in 1916 when they set out with inadequate supplies for even the shortest crossing, and it ended in the death of Dr. Wulff, whose life was the only one lost on these journeys. In contrast to this fatal journey of no more than 240 miles, the risk that J. P. Koch's party took on their journey of 700 miles, the longest of all the crossings of the inland ice, was one of the least because of the abundance of food until the western edge of the ice was reached; the subsequent difficulties encountered on land, when the inland ice was behind the party, were a separate problem. Between these two extremes, L. Koch's journey of 600 miles in 1921 was undertaken at considerable risk from the shortness of supplies, and might have proved fatal to older men; this party was saved by the youthful vigour of each member. Peary took what appear to have been unnecessary risks in 1895, and was extremely fortunate in escaping without loss of life. Rasmussen and Freuchen on their outward journey of 1912 made by far the most rapid of all these journeys, and showed the high speed that could be attained by experienced dog sledgers. The fact that only one life was lost on the 14 crossings reflects great credit on some of the leaders for their organization and foresight, though others took dangerous liberties with this realm of death.







## CHAPTER VI

### RUSSIA ENTERS THE FIELD: THE FRANZ JOSEF ARCHIPELAGO

**T**HE basic fact of the Franz Josef Archipelago and the other islands situated to the north of Europe and Asia may, by a little imagination, be easily visualized. A giant tall enough might stride northwards from the mainland by wading through the shallow water, a few hundred feet deep, that covers the Continental Shelf as far as the archipelago. Should he continue beyond the islands towards the North Pole, he would soon be out of his depth, even if he were 2,000 ft. high, and would be forced to swim, for the Arctic Sea is 10,000 ft. deep. All islands, unless volcanic, stand on the submarine plateau or shelf, and many of them on its edge; such are the main oceanographical conditions.

Franz Josef Land was discovered in 1873 by Payer and Weyprecht in the *Tegethoff* while endeavouring to round the N. of Novaya Zemlya, and next year a sledge journey was made as far north as Cape Fligely on Prince Rudolph Island; but two mistakes were made: 1. The assumption that there was one large land-mass; 2. The charting of Petermann and King Oscar Lands to the N. of Prince Rudolph Island. Leigh Smith moved on from Spitsbergen to Franz Josef Land in 1880, and the following year returned here in the *Eira*; he viewed Cape Lofly from a distance and then turned eastwards until the ship was lost near Cape Flora. He and his party survived the winter and were picked up in 1882 by Sir Allen Young in the *Hope*.

Nansen and Johansen took the greatest risk in 1895 by leaving the *Fram* in lat. 84° N., but everything seemed in their favour. They attained the record lat. of 86° 14' N. and then, turning south, spent the remainder of the unusually fine summer in travelling to the northern islands of this archipelago where they discovered the Whiteman Group of islands. After seeing Jackson's map, Nansen questioned Payer's charting of King Oscar and Petermann Lands; but he did not know where he was until he met Jackson, nor could he do any surveying because his chronometer had stopped.

While Nansen was wintering in the far north, Frederick G. Jackson, the well-known big game hunter, explorer and traveller, was spending his second winter in the south of the archipelago. The Jackson-Harmsworth Expedition had sailed in 1894 and established a scientific station at Cape Flora on Northbrook Island, near lat.  $80^{\circ}$  N., where an Arctic record was made by remaining for 1,000 consecutive days. Lieut. (now Capt.) A. B. Armitage, R.N.R., was Second-in-Command, magnetician and meteorologist ; he was afterwards Capt. Scott's Second-in-Command on his first Antarctic expedition, discovered the great Southern Plateau, and became Commodore of the Peninsula and Oriental Steam Navigation Company's fleet. Dr. Koettlitz, who was Jackson's geologist and surgeon, also accompanied Scott in the *Discovery*. There were 3 other scientists at Cape Flora, and Dr. W. S. Bruce joined the staff as biologist in 1896. Jackson has done more than any other explorer in this group of islands since Payer : he discovered and charted about 600 miles of new coastline, besides making a careful examination and collection of many forms of life. He reached lat.  $81^{\circ} 20'$  N. on his first sledge journey and subsequently made the circuit of Alexandra and Prince George Lands. Neither King Oscar nor Petermann Lands were seen. His principal discovery, of great geographical importance, was that the country was misnamed—it was not one large land-mass but an archipelago. The detailed scientific work of the expedition was good ; the report of the Geological Survey on the rocks collected occupies 50 pages in "A Thousand Days in the Arctic," and Jackson maintained his party in perfect health for over 3 years.

Nansen and Johansen, after wintering in their hut, were making their way south and west in 2 canvas canoes, in 1896, when a historic meeting of explorers took place, much more extraordinary than Stanley's finding of Livingstone at Ujiji. Jackson saved the lives of Nansen and his companion, who had very few cartridges left, for their canoes could not have carried them safely across the 200 miles of open sea that lay between them and Spitsbergen. Their good fortune, however, never forsook them, and Jackson sent them home in the *Windward*. In 1898 Wellman discovered Graham Bell Island and other islands of the archipelago.

There are approximately 100 islands in the whole group, which is spread out from Cape Mary Harmsworth, on the west, for a distance of 230 miles eastwards to Graham Bell Island, the most easterly land, and for 130 miles on the 59th meridian from Lamont Island in the south to Cape Fligely, the most northerly point on Prince Rudolf

Island. This cape is a few miles S. of the 82nd parallel ; and the most southerly islands of the archipelago are a little south of the 80th parallel which, about 200 miles W. of Cape Flora, crosses the northern part of North-East Land. The large British Channel discovered by Jackson divides the archipelago into 2 groups of unequal size, of which the islands to the west are known as the Alexandra Group. The greater part of the archipelago to the east of the channel is subdivided by the smaller Austria Sound, discovered by Payer, into the Zichy or Central and the Wilczek or Eastern Islands. The only other obvious sub-division would be by regarding Markham Sound as leaving a McClintock Group to the south. Victoria Island is only about 40 miles SW. of Cape Mary Harmsworth, but it is regarded as part of the Spitsbergen Archipelago. Most of the larger Franz Josef Islands have a monotonous uniformity in appearance, with horizontal strata of fossiliferous rocks about 500 ft. thick, overlaid by 500-700 ft. of basalt, and capped by island ice. Hence there are hundreds of miles of cliffs 1,000 ft. high extending along the coasts, flanked by several hundred feet of scree. There are many small valley glaciers, and Payer mentioned tabular mountains of 2,000-3,000 ft. in height. The raised beaches point to a recent elevation of the islands which are the remains of one or more larger land-masses.

It is said that, from 1865 to 1928, some 10 Norwegian and 28 other expeditions for hunting or scientific research have visited the archipelago (" Franz Josef Land," Gunnar Horn, Oslo, 1930) ; but as this number is known to be incomplete Dr. Horn estimates the Norwegian expeditions at about 150. Of the 138 vessels that have touched at these islands during our period, 55 have sailed on hunting trips and only 8 (more or less) on scientific expeditions ; there have also been 5 search expeditions. Some fishery investigations were made off the SW. coast of the archipelago by Thor Iversen in 1923. Consul Lars Christensen sent an expedition to the Group with 2 ships in 1929 when a winter station was to be erected ; but the pack prevented the vessels from coming within 20 miles of the land. Six other ships also failed to reach the islands that summer.

The number of Russian expeditions sent into the Siberian Sector of the Arctic during recent years is legion. Little is known about many of them, and apparently much of the information would not be of general interest. Much valuable work, however, has been done, and there have been some most remarkable experiences. One of the Russian explorers, Vilkitski, is of such eminence that his name must appear at the head of a chapter (Chapter VII). Great activity in

Arctic exploration marked the end of the Czar's regime, and this may have stirred the Soviet Government to even greater exertions. Between 1912 and 1914, five wireless and meteorological stations were established by the Russians in the Arctic. In 1912 Vilkitski's 2 ice-breakers started working from Vladivostock ; and the same year 3 other Russian expeditions set out for the Franz Josef and Novaya Zemlya district, but all 3 ended in disaster, and the ultimate fate of 2 of them is still shrouded in mystery. The 1st of these expeditions was led by Lieut. Sedow, the 2nd by Lieut. Brussilow and the 3rd by Capt. Russanow. It is believed that the following account of these expeditions is the first attempt to compile a complete record in an English book, but unfortunately much is still obscure.

Sedow sailed in the schooner *St. Foka* with the intention of wintering as far north as possible and then making an attempt to reach the North Pole. He went no farther, however, than the N. of Novaya Zemlya where he wintered at the Pankratyeff Islands. During the dark months spent here the health of the men suffered and scurvy broke out. On 11th August, 1913, Capt. Zacharow and 4 sick sailors were sent back to Russia on the *Olga* which, by a fortunate coincidence, was in the vicinity. A request made for a relief expedition was strongly supported by Nansen who happened to be in St. Petersburg at the time. From available information it appears that Sedow left his winter quarters about the end of August, 1913, and sailed to Hooker Island on the S. of the archipelago. The second winter (1913-14), during which scientific work was carried out, was passed in the ice off the NW. coast. Weise and Pinegin made a journey to Bell Island, Alger Island and Cape Flora ; geological, meteorological and tidal observations were made. Sedow was determined to attempt his polar journey in the spring of 1914, though he had suffered from scurvy and had not fully recovered his strength when, on 15th February, he set out with 2 sailors driving 3 sledges with 24 dogs. On reaching Cape Brorok, SW. of Prince Rudolf Island, they were overtaken by a blizzard that continued for 3 days. On 5th March Sedow died from fatigue, and the seamen returned to the ship.

Meanwhile Lieut. Brussilow, in 1912, had also set out, in Sir Allen Young's *Pandora*, rechristened the *St. Anna*, and provisioned for 2 years. On 29th October she was beset in the ice of the Kara Sea and drifted northwards to the E. of Novaya Zemlya all the winter. In 1913 and 1914 the ship was borne northwards in the firm grip of the pack, past the eastern side of the Franz Josef Archipelago to beyond its northern point. Brussilow's men, like Sedow's, were

attacked by scurvy, and they had to burn the wooden fittings of the ship to keep warm.

The *St. Anna* when N. of the islands first drifted W. as far as long.  $54^{\circ}$  E. and then approximately NE. to lat.  $83^{\circ}$  N. in  $60^{\circ}$  E. The prospect of the ship escaping from the ice or reaching land was then extremely remote ; and the first mate, Albanow, led a party that left the ship on 27th April, 1914. The vessel was then about 50 miles N. of Cape Fligely, but Albanow went SW. towards the non-existent King Oscar Land shown on Payer's map. His party originally numbered 14 men with 7 sledges and 7 canoes. Albanow alone seems to have been sanguine of success, and 3 of the weaker men returned to the *St. Anna* after 10 days. Nothing more has ever been heard of Brussilow, his ship or the men on board, numbering 13 all told. If the ship escaped disaster, she would probably have drifted across the Arctic Sea to some point on or between Spitsbergen and Greenland. M. Rabot in "La Geographie" (1916-17, No. 4) has compared the drift of the *St. Anna* as far as known with that of the *Tegethoff* abandoned by Payer in 1875.

Albanow's party made slow progress at first as the going was rough and the sledges had to be relayed. All suffered from snow-blindness and some from scurvy. In 47 days they covered 174 miles which was farther than Nansen's hut on Frederick Jackson Island. The compasses were now out of order, and Albanow had to depend mainly upon the sun. Circumstances then slightly improved : the pack began to drift in the general direction of their advance, so that in the next 10 days the party covered 117 miles ; and when, on 7th June, their supplies were almost exhausted, the first bear was killed. Had it not been for this kill, and other bears and seals that were shot, the whole party would have perished. Even so the position was critical, for the drift threatened to carry them into the open sea between the Franz Josef Archipelago and North-East Land.

On 22nd June they were surprised to see land about 30 miles to the east, and for 16 days they struggled towards it, their hopes rising and falling as wind and tide alternately favoured and opposed them. Two of the party, pretending to reconnoitre, decamped with equipment and stores ; but when they were afterwards encountered on the island their crime had to be overlooked. The other 8 men, on 8th July, reached the foot of a glacier wall, 100 ft. high and apparently unclimbable. Faced with the alternative of a dangerous voyage in their canoes through ice-strewn waters to a low cape 8 miles away, the men turned in desperation to the ice cliff and discovered in its face an old snow-filled crevasse up which they scrambled to safety.

Numerous sea-birds were seen, and hope returned. In 4 days Cape Mary Harmsworth was reached, as Albanow found by the following record :

The Jackson-Harmsworth Polar Expedition. This expedition landed upon this cape—Cape Mary Harmsworth—on August 7th, 1897, having left Cape Flora on the S. Y. *Windward*. We intend to proceed north-west in the ship to ascertain if any land exists near this cape in that direction, and then, if possible, to reach the Johansen Islands. All well on board. Frederick G. Jackson commanding the expedition.

In order to appreciate the position of Albanow's party, we should notice that Alexandra Land, to which they had escaped, is almost completely covered with ice that rises to a height of about 2,000 ft. in the interior, and that ends on the S. and W. coasts, in vertical ice cliffs, the height of which is given by Jackson as 50–80 ft. The long N. coast and Cape Mary Harmsworth are the only proper landing-places.

One of Albanow's men had died on the pack and another during the crossing of Alexandra Island. As 9 men, but only 2 canoes, now remained, the party was divided : 3 men accompanied Albanow in the kayaks, and the remaining 5 marched along the southern coast. The shore party, with the loss of 1 man, reached Cape Neale where Albanow's canoes were met and the party was reorganized on account of illness. Four men accompanied Albanow from here by canoe ; of these one died from exhaustion and two were drowned during a storm off Bell Island. Albanow reached Jackson's hut at Cape Flora with only one companion, after 101 days of desperate struggling for life. The leader had little expectation of surviving his hardships, and his diary vividly reflects the tortures endured in the course of an outstanding achievement. The fate of the shore party has never been ascertained ; but the southern coasts of the archipelago are dangerous enough for men who are strong and well equipped, as Jackson and Armitage found in April and May, 1897. Albanow and his comrade remained at Cape Flora till August 1914, when they were rescued by their countrymen of the returning Sedow expedition in the *St. Foka*. A fruitless search as far as Cape Grant was made for the shore party. Unfortunately the Russians were short of fuel and burnt Jackson's hut.

Great obscurity hangs over the third ill-fated Russian expedition of the year 1912. Its leader was Capt. Russanow who, with the Italian Candiotti, had made a crossing of Novaya Zemlya in 1908. He and his bride set out with the intention of prosecuting geological researches to the E. of Novaya Zemlya ; he had a 65-ton whaling



cutter, the *Herkules*, and her captain was Kutschin, who had been with Amundsen in the *Fram* on his South Pole expedition. Russanow is known to have reached Spitsbergen, whence he sailed to Novaya Zemlya and sent the following telegram on 31st August, 1912, from Matotschin Schar :

The southern portion of Spitsbergen and Hope Island are blocked by ice. We carried out hydrological work on the way. The storm brought us south of Matotschin Schar. From here the expedition goes to the north-west point of Novaya Zemlya and then to the east. Should the ship meet with an accident I propose to make for whichever is nearest of the Lonely, New Siberian or Wrangel Islands. Supplies for one year. All well. RUSSANOW.

*"And after that the dark."*

It is surmised that the vessel was lost with all hands and the bride, in stormy weather at the beginning of September in the Kara Sea. Was ever a honeymoon like this in the world before ?

The *Hertha* was sent out in the summer of 1914 to search for Sedow, but she appears to have accomplished nothing beyond the leaving of supplies at Cape Flora. After Vilkitski's return in 1915 (see Chapter VII), the Franz Josef Archipelago and the islands to the east remained for 5 years undisturbed by the presence of man, unless any of the missing Russians were dragging out a doomed existence among their snows. Then in 1920 the Soviet Government founded the "Institute for the Exploration of the North," and a series of cruises were made in the Barents Sea. The first was a reconnaissance in 1921 under the leadership of Profs. R. Samoilovitch and P. Wittenburg ; but it is said that 23 expeditions, mostly commercial, went north in that year. In 1923 scientific work was carried out in Novaya Zemlya, and the following year two parties went north. In 1925 when the Arctic Institute of the Russian Government was formed, and again in 1927, terrestrial and marine surveying were done, as well as other scientific work. (For further details see "Arktis," I, Jan., 1928.)

In 1923, 1924 and 1926 the Moscow Scientific Maritime Institute sent out the *Perseus* under Prof. Meschachew and Capt. Burkow to visit the archipelago and its waters. On 30th June, 1924, Novaya Zemlya and its adjacent islands had been placed under an Islands Administration of the Russian Government, which exhibited immense energy in the Arctic as will be seen by reference to Appendix I. A colony of 9 Russians and 51 Chukchis was established on Wrangel Island in 1926 (see p. 111), and there are permanent wireless and research stations in the New Siberian Islands, Severnaya Zemlya,

Hooker Island and many other places. As many as 40 cargo boats have followed the ice-breakers on one of their annual Arctic voyages, and the insurance rates have fallen considerably. No less than 76 stations carried out the work of the International Polar Year on Russian territory and 29 of these were newly established. The most northerly station in the world is on Prince Rudolf Island in lat.  $81^{\circ} 47' N.$  ; it has a personnel of 2 scientists and 2 technicians. In 1929 Vienna was officially notified of the annexation of the archipelago by Russia. Norway disputes this action ; and the British have at least as strong a claim to the islands as any other nation. The Soviet Government claimed Victoria Island in 1932. A record of the numerous hunting expeditions to this archipelago will be found in Gunnar Horn's "Franz Josef Land."

On 15th July, 1930, the ice-breaker *George Sedow* left Archangel with an expedition of 40 men under Prof. O. J. Schmidt and including Profs. Samoilovitch and Wiese among the 17 scientists. The first call was at the station on Hooker Island where a party of 9 relieved the 7 men who had occupied the station during the previous year. The leader of the new party, I. Ivanow, was accompanied by his wife who was the first woman to be included in a party of this kind. On 3rd August the *Sibiryakow* was met by appointment off the NW. coast of Novaya Zemlya, and the party of 7 transferred to this ship from which a supply of coal was received. A course was set on 12th August for the uncharted W. coast of Severnaya Zemlya and the following day a new island, named Wiese Island, was discovered in lat.  $70^{\circ} 27' N.$  and long.  $76^{\circ} 41' E.$  ; it is 19 miles long and 6 miles wide. Many smaller islands were afterwards discovered, on one of which, 15 miles from the W. coast of Severnaya Zemlya, a winter station was established. A party of 4 men was left with 40 dogs and provisions for 3 years under G. A. Uschakow who had already lived for 3 years on Wrangel Island. The wintering party completed the survey of the island group and the station was afterwards taken over by one of the Russian Polar Year Expeditions.

Severnaya Zemlya or North Land consists of 3 larger and numerous smaller islands, the whole group being approximately the size of northern Novaya Zemlya. The most northerly point is in lat.  $83^{\circ} 16' N.$  and long.  $95^{\circ} 37' E.$  ; the area of the largest island is 5,510 square miles. The Russian station is on the Serge Kamenev Islands, 15 miles W. of the large islands which are covered with ice and rise to a height of over 2,000 ft. About 70 per cent of them have been explored. A wind motor successfully generated electricity for the station. Russian expeditions have been in the Arctic annually

for several years, but there seems to be little information of general interest regarding them. One was a botanical expedition to the Siberian tundra.

In 1931 the ice-breaker *Malyguin* carried a mixed personnel of scientists and tourists to the archipelago under the command of Prof. W. J. Wiese, Assistant Director of the Arctic Institute at Leningrad. General Nobile joined the party, as a search was to be made for traces of Amundsen and the *Italia*. Calm Bay, Hooker Island, was reached on 25th July and the *Graf Zeppelin* met 2 days later (pp. 270-1). The *Malyguin* then went N. to Teplitz Bay and discovered three small islands in De Long Fjord. It was finally proved that Alfred Harmsworth Island to the N. of Arthur Island does not exist. The ship turned S. and called at the station at Matochkin Shar, Novaya Zemlya, on 15th August, where it was found that one of the scientists had perished in a snowstorm. Archangel was reached on 20th August.

Prof. N. N. Zubow in the *Knipovitch* of 100 tons had the distinction in 1932 of being the first to circumnavigate the Franz Josef Archipelago. After a landing had been made on Victoria Island, the 42nd meridian was followed northwards to lat. 82° N., and the sea being open to the east a course was set in this direction. A call was made at the Polar Year Wireless Station on Prince Rudolph Island and the most northerly islands of the group were rounded. The only ice encountered was in lat. 80° N. and long. 65° E. Novaya Zemlya was visited, and 3,000 miles were covered on the whole voyage which lasted 34 days. The following paragraphs were kindly sent by the Librarian of the Royal Geographical Society.

The Russian Programme for the second International Polar Year included an expedition by the ice-breaker *Russanow* to Severnaya Zemlya and the Taimyr Peninsula. An account of this voyage by the commander, R. Samoilovitch, appears in "Petermanns Mitteilungen," 3rd April, 1933. In addition to scientific work on the voyage, the purpose of the expedition was to establish a wireless and scientific station at Cape Chelyuskin, and to relieve a party on Severnaya Zemlya. With 93 persons on board, and building materials for the stations, the vessel was heavily loaded. Dickson Island was reached on 6th August, 1932; while waiting for a further coal supply a visit was paid to Sverdrup Island, named by Nansen, but not previously visited. It proved to be about 6½ miles in length from E. to W. and 3 miles wide, not rising more than 130 ft. above the sea, and composed of sands and clays of fluvio-glacial origin. Traces of bears and foxes were seen. Resuming the voyage, the expedition

unexpectedly encountered, on 13th August, an unknown group of islands in approximately  $75^{\circ} 4' \text{ N.}, 81^{\circ} 47' \text{ E.}$  The 3 islands of the group appeared similar to Sverdrup Island ; some hours later another island was seen, of a different character, having cliffs 230–260 ft. high. The *Russanow* afterwards passed near the position assigned to Einsamkeit Island without sighting it.

On 14th August the vessel reached Kamenev Island without experiencing any difficulties from ice. This was an exceptionally favourable ice year ; the strait E. of Kamenev Island was free on 15th May, while the previous year it had not been open until September. The party of 4 men, relieved after 2 years on Severnaya Zemlya, had carried out geological and topographical surveys in the archipelago, and made zoological and botanical collections. The relief party was under the command of Frau Demme-Riabzowa. The *Russanow* then sailed S. through Shokalsky Strait, carrying out hydrographical work, and reached Cape Chelyuskin on 22nd August. The expedition remained there 30 days, building huts and a wireless station. On 22nd August an aeroplane, with a crew of 5, arrived from Dickson Island and flew on the same day to Kamenev Island, returning the next day with fuel. The *Russanow* visited the station on Kamenev Island on the return journey to assist in repairing damage caused by a storm, leaving on 11th September for Novaya Zemlya where, at Russian Harbour, another scientific party was established for the winter.

CHAPTER VII  
THE NORTH-EAST PASSAGE: VILKITSKI AND  
AMUNDSEN

**I**N these days of the general diffusion of information it is remarkable that the name of a great explorer, and that of his principal discovery, should still be unknown; yet very few people have heard of Vilkitski or Severnaya Zemlya. This delay in the public recognition of a distinguished Russian is due to the European war, for Vilkitski returned from his last voyage in 1915; but it is high time that his discoveries were known. Had there been a dearth of news when they were made, the newspapers might have given them the widest publicity.

In the year 1910 two Russian icebreakers, the *Taimyr* and *Waigach*, began a long career of useful work in the Arctic, with hydrographical surveys in the Bering Strait district and the waters north of East Siberia. Each winter, until 1914, the ships returned to Vladivostock. In 1911 they sailed under Admiral Trajan to the mouth of the Kolyma, and in 1912 as far as the Taimyr Peninsula. In 1913 Capt. Vilkitski, who was then in command, attempted to make the NE. Passage from east to west. He first visited Bennett Island and retrieved the natural history collections left there some years earlier by Baron Toll. Then he discovered some more islands of the New Siberian Group; and lastly, on this memorable voyage, he made a surprising and important geographical discovery.

The *Fram* in 1894 had found deep water of over 1,500 ft. at a distance of less than 300 miles to the N. of Cape Chelyuskin, the most northerly point of Asia. Vilkitski in 1913, after vainly attempting to round this cape, pushed boldly northwards and discovered a new country of considerable extent, no more than 35 miles from the cape. This new land, named Severnaya Zemlya or North Land, was followed for 200 miles northwards, as far as lat.  $81^{\circ}$  N. in long.  $96^{\circ}$  E. which showed that the *Fram* had drifted past it at a distance of less than 100 miles. In 1914 Vilkitski made a landing in lat.  $80^{\circ}$  N. and hoisted the Russian flag. No one suspected land here, though it

stands on the Continental Edge, and Vilkitski's discovery was of great importance.

In 1914 Capt. Otto Sverdrup, the veteran explorer, also went north, in the *Eclipse*, with a Norwegian crew, to look for Brussilow and Russanow. This expedition, equipped by Breitfuss, sailed from Oslo on 13th July. On 28th August the ship went aground on a reef near Dickson Island off the mouth of the Yenesei but was towed off by a passing steamship. Sverdrup proceeded in a north-easterly direction along the Siberian coast during the first week in September, and was able to establish wireless communication with Vilkitski whose ships were then beset near his newly-discovered Severnaya Zemlya. This was the first occasion on which wireless telephony was successful on an Arctic expedition.

Vilkitski in 1914 had once more taken the field with his two ice-breakers, the *Taimyr* and *Waigach*, on another attempt to complete the North-East Passage from the east, and with the hope of extending his discoveries of the previous year. His expedition was then provisioned for 18 months and is reported to have been furnished with a seaplane, though no confirmation of this assertion is forthcoming. When at Nome in Alaska news of the outbreak of war was received ; but Vilkitski was ordered to proceed with his expedition precisely as Shackleton, at the same time, was told by the British Admiralty to sail in the *Endurance*. On 3rd August the *Waigach* was beset by the ice when 15 miles E. of Wrangel Island, and the *Taimyr* went to her support. As both ships were damaged by the ice it was impossible for them to rescue the survivors from the *Karluk* who were then marooned on this island and who were saved a month later by another ship (see p. 179).

The Russians licked their wounds in Koliuchin Bay, N.E. Siberia, on 6th August and then made a second unsuccessful attempt to reach Wrangel Island. Vilkitski tried to force the ships to the W. of the island, but the ice was impregnable. Land had been reported in this locality by Andreyeff in 1764, and it is still possible that an undiscovered island is holding up the ice. Vilkitski Island, discovered in 1913, was reached by the *Taimyr*—afterwards joined here by her consort. Another new island with a circumference of 20 miles was discovered north of Vilkitski Island in lat.  $76^{\circ} 10' N.$  and long.  $153^{\circ} E.$

The *Waigach* then departed for the Taimyr Peninsula, and on her way extended the survey of the New Siberian Islands. She was afterwards able to reach Severnaya Zemlya again, while the *Taimyr*, after touching at Cape Chelyuskin, was held up by the pack. The *Waigach*

rounded the south-eastern point of the new land and proceeded along its southern coast in a channel of open water, with its depth varying from 27 to 83 f. Mountains were seen at a considerable distance from the coast, and the south-western point of the land was found to be in lat.  $77^{\circ} 50' N.$  and long.  $99^{\circ} E.$  Two large icebergs aground near this cape were assumed to have drifted from the Franz Josef Archipelago. From the south-western cape the ship returned, surveying all the new land, as well as discovering another island.

Meanwhile the *Taimyr* had been more or less closely beset, but eventually worked herself free and rejoined her consort. A party that went ashore on Severnaya Zemlya found the country to be sandy, with frozen tundra, and hills leading towards the interior. Both ships became beset in September and drifted about at the mercy of the pack. The first landings, however, were made on Axel Heiberg Island (not the large island of the Canadian Archipelago) and Fernley Island near which the ice carried the ships. The *Taimyr* was afterwards subjected to great ice-pressure and her hull crushed. Her consort also, in an endeavour to render assistance, had a very narrow escape; arrangements were made for abandoning the damaged ship.

A few hours later the Russians were much encouraged when Capt. Sverdrup established wireless communication with them, for they knew his great Arctic experience; and he was able to inform the Russian Government at Petrograd of the accident to the *Taimyr*. The *Eclipse* was then only 180 miles away, between Tillo and Markham Islands, and Sverdrup shortly after went into winter quarters at Cape Wilda. By 11th September both the Russian ships had also gone into winter quarters at a distance of 16 miles apart and 100 miles from Cape Chelyuskin. Their approximate position was lat.  $74^{\circ} 47' N.$  and long.  $100^{\circ} 52' E.$ , apparently at Axel Heiberg Island, and they were in wireless communication with Sverdrup. As the *Taimyr* was frozen in the ice only 2 miles from the island, huts were erected ashore and driftwood was collected; but the pack afterwards carried the ship farther from the land and it was 7 miles off on 6th October. All the usual branches of scientific work were carried out continually. Early in 1915 the Russians received a wireless message from their Emperor and another from the Ministry of Marine. On 16th February Lieut. Shokhoff of the *Waigach* died and was followed in March by one of the firemen.

Sverdrup had laid 3 depots towards the Russian ships, and taking 3 dog teams in April, 1915, he paid the *Taimyr* a visit. His hosts say that he made a most favourable impression upon them, and they

admired his great strength at 63 years of age. When he took his departure in May, Vilkitski accompanied him for some distance in order to survey the mouth of the Taimyr River. On 22nd June 650 reindeer with sledges arrived at the *Eclipse* ; they had been ordered by wireless, and they took about 40 of the Russians to Golchika on the Yenesei. All the ships broke out of the ice in July, and the Russian ships were repaired ; but it was not until 14th August that Vilkitski's interrupted voyage was resumed. He then successfully completed his westerly voyage through the North-East Passage. The ships proceeded together through an ice-free Kara Sea and reached Archangel on 4th September, 1915. Valuable scientific data were brought back and the geographical discoveries were of the highest interest. Vilkitski was a great explorer, and his expeditions with his ice-breakers are worthy of comparison with the Antarctic voyages of Admiral Ross in his ships, the *Erebus* and *Terror*.

Vilkitski's ice-breakers are linked with Amundsen's *Maud* by the North-East Passage, first penetrated from west to east by Baron Nordenskiöld in 1878-9. Vilkitski was the second to make the passage but the first to make it from east to west. The fortunes of another great explorer must now be followed.

Amundsen was born in 1872, graduated at Oslo University in 1890 and afterwards went to sea. In 1903-6 he made the North-West Passage in the *Gjoa* of 47 tons. He probably holds the explorer's record for changing his plans. In 1908 he began to prepare for an exploration of the Arctic Basin ; but when Capt. Scott was on his way to Antarctica, Amundsen informed him that he too was going there instead of to the north, and he reached the South Pole in 1911. The Arctic project was resumed on his return from the south, and, though the war delayed its execution, a by-product of the hostilities was utilized to improve the equipment.

Amundsen says in " My Life as an Explorer " that he made £50,000 out of neutral shipping and spent it in building the *Maud* and equipping his expedition for drifting across the Arctic Basin. The new ship was a schooner of 900 tons register with the *Fram* type of hull. She was launched in 1917, and on 15th July of the following year Amundsen sailed from Tromsö. He proposed to start his trans-Arctic drift from the N. of Bering Strait, and decided to take the North-East Passage as the shortest route from Norway. This had been Nansen's route in 1893 as far as the New Siberian Islands. Cape Chelyuskin was passed by the *Maud* on 9th September, and its position as the most northerly point of Asia fixed at lat. 77° 43' N. and long. 104° 17' E. On 13th further progress through the pack was



impossible, and the ship was laid up for the winter in the lee of two small islands which were the only shelter available. Here Amundsen had the misfortune to fracture his right shoulder and was in bed for over a week. On 8th November he was knocked down by a bear and his life saved by one of his dogs which distracted the bear's attention. The injured arm took several months to recover, and it was not until 1921 that a surgeon could examine it. Amundsen had one more narrow escape during this winter, when he was nearly suffocated by the fumes from a stove, and his heart was affected for months.

The *Maud* was unable to leave her berth until 12th September, 1919, when two of the crew left the ship to return to Norway with letters. They were well equipped, and made light of their journey, but both of them perished. The body of one man was found near Dickson Island, 500 miles towards home, but the other was never heard of again. This was the only tragedy connected with any of Amundsen's expeditions, and shows that, like Shackleton, the foremost polar explorers lose few lives.

The *Maud* made poor progress eastward in 1919. Shortly after passing to the S. of the New Siberian Islands, she was forced to spend the second winter at Ayun Island, off Chaun Bay near Cape Shelasky, reached on 23rd September. This island was inhabited by a tribe of Chukches, and Dr. Sverdrup of the *Maud* made a tour through their country in Siberia until May, 1920. The voyage was continued in July, and Nome in Alaska reached the following month. From here four other men returned home, and Amundsen was left with only three assistants to work the ship when he sailed for the north on 8th August, 1920. All went well until the propeller broke, near East Cape, which made it necessary to winter at Cape Serole Kamen. In the spring of 1921, 5 natives helped to sail the *Maud* to Seattle. Amundsen had saved the life of the little daughter of one of these men, and he brought her with another little girl to Norway where he had them educated.

While the ship was refitting at Seattle, Amundsen found his coffers empty, and in January, 1922, returned to Norway in the hope of refilling them. The Norwegian Parliament made him a large grant, though by the time he actually received the money its value was reduced by half, or to about £15,000. Amundsen was now considering another change in his plans; for his main interest, in the spring of 1922, had been diverted to flying. He sailed in the *Maud* from Seattle on 1st June, with the ship provisioned for 7 years; but as the ice conditions were unfavourable for beginning the drift, on 28th July he left the expedition in charge of Capt. Wisting. The

story of Amundsen's Arctic flights will be told in a later chapter (Chap. XVII).

The long-delayed drift of the *Maud* at last began and Herald Island was sighted by Wisting on 7th August, 1922. On 22nd the ship became frozen in for the winter, and on 26th September the pressure of the pack was very severe; the *Maud* was lifted 2 ft. but remained undamaged. She drifted steadily towards the NW. and attained the lat. of  $74^{\circ}$  N. in long.  $170^{\circ}$  E. by 10th March, 1923. In June lat.  $75\frac{1}{2}^{\circ}$  N. was reached and for another 2 months the track nearly coincided with that of the *Jeanette* in 1879-80. Instead of linking up, however, with the *Fram's* course to the W. of the New Siberian Islands, a long series of gales in September and October drove the *Maud* to the south-west. In December, 1923, she was near the New Siberian Islands, and wintered to the S. of the De Long Islands. Instructions were received by wireless in February, 1924, to return to Nome, but this was impossible before the winter. The most northerly lat. attained was  $76^{\circ} 25'$  N. in long.  $143^{\circ} 20'$  E. and on 9th August, 1924, the ship was out of the pack and the drift abandoned.

The *Maud* became frozen in near the Bear Islands, and her long voyage was not ended until she arrived at Nome on 22nd August, 1925. Scientific work had been carried out by Dr. Sverdrup throughout the expedition. There was some surveying on the Taimyr Peninsula and a raised beach from 5 to 20 miles wide was discovered ("Naturen," Jan.-Feb., 1922). Valuable oceanographical, glaciological and meteorological researches were carried out and the results embodied in several scientific reports (see "G.J.," Jan., 1929, for review). One of the most important results was the proof that no permanent drift of the pack existed from north of Bering Strait to the NW. across the Arctic Basin.

The North-East Passage had now been made in each direction, by 3 explorers, over a period of 40 years, but not without wintering off the Siberian coast during the voyage; and the *Maud* had occupied 3 seasons in completing the passage. The well-known Russian explorer, Prof. O. V. Schmidt, Director of the Arctic Institute at Leningrad, set up a new record, in 1932, while making the passage. He left Archangel on 28th July in the ice-breaker *Sibiriakow* with a party of scientists, and first called at Dickson Island. The ship then proceeded to the station on the W. coast of Severnaya Zemlya where Uschakow's party had been in residence for 2 years. A course was next set for the New Siberian Islands and thence to the Lena Delta. The wintering party at Tiksi Bay was visited, and the ship after-

wards touched the Kolyma River ; but on 18th September a propeller was smashed in heavy pack, and though repaired it was broken again. With only an improvised sail the ice-breaker did well to pass through Bering Strait and reach Yokohama, towed by a trawler, on 5th November. The 3,000 miles between the White Sea and Bering Strait had been negotiated in 9 weeks, and a full scientific programme was also carried out. Schmidt was the fourth to make the North-East Passage, but the first to complete it in one season. At the time of writing, March, 1934, he is struggling to save nearly 100 people on the pack ice ; to understand this we must go back to 1921.

In that year the nucleus of a British colony was landed on Wrangel Island, but most of the colonists perished, and in 1924 the Russians removed its survivors and substituted a colony of their own. Since then the island has been permanently occupied. In July, 1933, Prof. Schmidt left Leningrad in the *Chelyuskin* of 4,000 tons, apparently with a large number of colonists. The ship was caught by the pack in October, and after wintering in the ice, was crushed and sunk, early in 1934, about 80 miles from the Siberian coast. Ten women and 2 children were rescued by aeroplane ; the 89 men at present left seem to have ample food, though the temperature has been down to  $-40^{\circ}$ . Probably all will now be rescued.

## CHAPTER VIII

### RASMUSSEN'S THULE EXPEDITIONS

**K**NUD JOHAN VICTOR RASMUSSEN was one of the greatest Arctic explorers and the highest authority on the Eskimo people. Of Danish parents, he was born in Greenland, where his father was a missionary, in 1879, with the blood of the Greenlander also in his veins. The Eskimo language was his native tongue. When a child of 8 years he drove his own little dog team, and at 10 he had a rifle. At the age of 14 he entered Copenhagen University, and at 23, his father having then retired from the mission field, he left the country vicarage in Denmark at the call of his mother's ancestors, and

*" This is the song of the Parson's son, as he squats in his shack alone,  
On the wild weird nights when the Northern Lights shoot up from the frozen  
zone  
And it's sixty below, and couched in the snow the hungry huskies moan."*

Knud Rasmussen's first voluntary visit to Greenland was in 1903 with Mylius-Erichsen's Literary Expedition, and he spent about 35 years in that country. In 1910 he founded the most northerly settlement in the world and named it Thule ; it is in North Star Bay, Wolstenholm Sound, North-West Greenland, and in lat. 77° N. He planned an expedition to the north coast, in 1911, to explore Peary's channel, when the news came that Mikkelsen had not returned from his search for Mylius-Erichsen, and plans were altered so that relief of the missing explorer, if needed, could be given.

Rasmussen was very thorough in his preparations and made two preliminary journeys : the 1st to Melville Bay, in the event of having to descend here from the plateau after crossing from the east ; and the 2nd journey to Upernivik for equipment. On the former of these trips a blizzard broke up the sea-ice and drove him inland where he was isolated by torrential rain and lived on bears. The longer journey involved 1,000 miles of sledging before he set out on the northern expedition. Thule was not reached until the end of March, 1912, with the dogs exhausted ; they were generously fed and rested until 9th April when the great journey began.



*By courtesy of Professor DEGENHARDT*

KNUD RASMUSSEN



There was unlimited food at the outset, but the weather was unpropitious ; a hurricane broke up the sea-ice and drove the party inland. It was therefore decided to make the crossing of the plateau at once and to return round the north coast. Thus the immediate objective became *Danmark* Fjord where some record of Mikkelsen was expected ; Rasmussen would afterwards act according to its purport. Should no record be found, it would be assumed that Mikkelsen had returned to his Base. Living on the country was no novelty to Rasmussen who took 2 years' supply of ammunition but only one month's dog meat. The work of the expedition would not begin until the east coast was reached, and the crossing of the plateau was of no interest except as the means of reaching it. Hence the outward journey was as rapid as possible, and all previous sledging records for comparable journeys appear to have been pulverized by the speed.

Rasmussen's only civilized companion, Peter Freuchen, was well equipped for the work by nature and by his service on the *Danmark*. There were also 2 hardy and cheerful Eskimo hunters and drivers, with 53 dogs and 4 sledges. The dogs were fed on walrus hide which, coated with ice, also formed the under sledge-runners for the plateau crossing. The equipment was more Eskimo than European, and each team consisted of 1 canine family, trained to work together ; they were young picked dogs and worked with all their little hearts, without the use of whips. Their food was 4-5 lbs. of meat every 2 days.

A blizzard delayed the start until 14th April, 1912, when the ascent to the plateau was made from Robertson Bay by the Clements Markham Glacier with its easy gradient and no crevasses. A prodigious amount of extra power was available for transporting the loads to the summit—35 sledges with 350 dogs, another record for exploratory journeys, and they made light of the labour, driving nearly 40 miles over an ascent of 3,600 ft. in the day. Only 9 of the auxiliary sledges went beyond the 1st camp, and these were sent down to Peabody Bay on 19th April to assist Mikkelsen, should he have passed through Peary's channel, as he intended, to Fort Conger. Rasmussen's course was approximately NE. (true), and his party travelled for nearly 20 hours every fine day, when they slept very little, as there was ample time for rest during blizzards. No better road could be desired than the inland ice on this route.

Undulations similar to those on the Antarctic Plateau were found on the surface to the W. of the ice-divide. Snow igloos were built at first ; but afterwards a tent was pitched in a hole, excavated in

the snow, with the debris heaped round to form a windscreen. Frozen meat was eaten alike by men and dogs, though the men had in addition a little hot food; and they washed down meat and blubber with huge draughts of hot tea to thaw the lumps, apparently after being swallowed. In fine weather, supper was the only meal in the day, coffee alone being taken for breakfast. The highest part of the plateau, near long.  $42^{\circ}$  W., was 7,230 ft. above the sea; and valley systems 160 ft. deep extended N. and S. From here the route fell rapidly to a height of 6,890 ft. and was then level for some distance before falling gradually to the east. The sastrugi here indicated steadier winds than on the western side. The average length of the last 6 plateau marches was 46 miles—a record for the distance, 278 miles.

On 9th May, at a height of 5,490 ft., land was clearly seen ahead extending in a long arc from N. to S., and the course was altered to due east. The gradient then increased, and a high speed was maintained down the declivity till a large basin was entered and followed to the edge of the inland-ice. The length of this journey was 629 miles, and the average speed, 35 m.p.mar., was nearly double Peary's speed over the plateau, in his prime.

## SCHEDULE No. 3

## RASMUSSEN'S CROSSING OF GREENLAND IN 1912

April	5.	Iterdlagssuaq } C. Parry }	Three sledges drove the 83 m. in one run.	{	9 hours	29 miles
"	6.	Kiatak }		{	16 "	25 "
"	8.	Nege.			9 "	37 "
"	9-13.	Preparing for crossing of plateau.			0 "	0 "
"	14.	INLAND-ICE			12 "	40 "
"	16.	13 sledges, 153 dogs.			14 "	32 "
"	18.	" " " "			7 "	32 "
"	19.	4 " 54 "			11 "	31 "
"	20.	Recovering lost equipment.			6 "	21 "
"	23.				7½ "	33 "
"	24.	Halt for observations.			6 "	25 "
"	25.	Blizzard.			4½ "	17 "
"	27.				11 "	45 "
"	29.				10 "	32 "
"	29.				12 "	38 "
May	2.				12½ "	54 "
"	4.				10 "	41 "
"	5.				11 "	43 "
"	7.	53 dogs.			11 "	40 "
"	8.	52 "			11½ "	47 "
"	9.	51 "			8½ "	53 "

Total distance, 628.8 m. in 26 days or 165.5 hours. 18 marches. Speed 24 m.p.d. and 3.8 m.p.h. On 8 days no march because of blizzards.



On reaching the E. side of the plateau, the whole expedition was lowered over a vertical ice-cliff by sealskin harpoon lines, an operation that occupied 12 hours. A gale blew with such force during the descent that one team of dogs was lifted into the air and 3 of the animals were lost. The maps of the *Danmark* Expedition had not been published when Rasmussen set out, and he entered new country near the head of *Danmark* Fjord. A ravine at the foot of the cliffs was named *Zig Zag Valley*; it was of a chaotic character for sledging purposes, with a series of lakes strung on a watercourse. The descent of this ravine presented great difficulties, especially from a frozen waterfall, 585 ft. high and broken into 4 separate falls. The highest lake was 1,657 ft. above the sea, and the second was bordered by cliffs nearly 2,000 ft. high. *Zig Zag Valley* finally emerged eastwards into undulating lowlands, sparsely clothed with vegetation, on the western side of *Danmark* Fjord.

It is interesting to notice, before proceeding with the narrative, that the life of nearly every traveller who reached this fjord country in North-East Greenland depended on the musk-oxen that Peary first found near here in 1892. Mylius-Erichsen killed enough beasts in the district to enable the 1st charts of these fjords to be made, but his whole party perished for want of more meat. And now, 20 years after Peary's first visit, Rasmussen arrived, having crossed the plateau on a course approximately parallel to Peary's; with the lives of their dogs also depending upon the results of the chase.

Men and dogs were at first overcome by the enervating air of the valley after the bracing breezes above, and Freuchen remained in camp with snowblindness. The other men were out for 40 hours, but shot only a few hares, though traces of musk-oxen were seen. On 10th May they took 44 dogs and 2 sledges for a determined attempt to find game, leaving 2 teams in camp. The whole day was spent in reaching game country, and 6 dogs were killed to save the remainder. Next day 9 musk-oxen were shot and the pack was saved; but the difficulty of escaping from *Zig Zag Valley* was not over until 31st, and long before then one whole team had to be killed to feed the others. Three sledges instead of four were no disadvantage, and skis were made out of the disused sledge. This deplorable valley that cost so much in time, labour and dogs, was 90 miles in length and took nearly as long to traverse as the plateau. The *Zig Zag River* ended in a delta, and an old sea beach was found 130 ft. above the present water level of the fjord.

On reaching the shore more musk-oxen as well as seals were shot, and the search for Mikkelsen's record was pursued along the

north-western side of the fjord. The remains of Mylius-Erichsen's summer camp were found on 4th June, but no record of Mikkelsen. From this it was assumed that he had not been here, for explorers seldom fail to leave messages in these remote pillar boxes. The next purpose was to explore Peary's channel. Peary Land was reached on 6th June and found remarkably fertile: not only were musk-oxen and seals seen on its shores, but also hares, lemmings, wild geese, ducks, gulls, terns and ptarmigan. Old Eskimo tent-rings were evidence of former occupation; but streams flowing full spate became a hindrance to travel. Rasmussen remained in this favoured locality from 8th to 10th June. One raised beach 32 ft. high was found, and another terrace 100 ft. higher.

Since 1st June the weather had been beautiful, though the summer thaw made travelling on sea ice almost impossible. Rasmussen intended to look for Mylius-Erichsen's record at Cape Glacier, Independence Fjord, but the water on the sea ice prevented this. Bronlunds Fjord, however, was crossed in 13th June, and during the succeeding days it became evident that Peary's open bay was the long and narrow Independence Fjord. On 17th the head of this fjord was reached, and afterwards the hills were ascended. There was no Peary Channel. Peary had charted only one waterway, from which he showed a northern branch nearly 100 miles to the north-west of Navy Cliff. (See Inset on Chart, No. 2.) Bronlunds Fjord joins Independence Fjord 50 miles north-east of the same point and terminates to the W. in a glacier. Rasmussen said they "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" ("Report of the First Thule Expedition," pp. 321-2; see also pp. 85, 185 of the present work.)

Two tasks then remained: to make a proper survey of as much new country as possible, and afterwards (as there was no channel) to return over the plateau. Peary undoubtedly reached a point some miles south of the south-western head of Independence Fjord, where Rasmussen then was, and had seen some of the country near Academy Glacier; but with equal certainty his map had been incorrect, for it was officially withdrawn in the United States ("Congressional Record," 13th Jan., 1916, p. 1,096). Rasmussen's immediate difficulty was to cross 20 miles of morainic land from the fjord below to the plateau above. A bold promontory 2,600 ft. high was first ascended, and from here a way was found over a glacier. The going was extremely rough and dangerous, along narrow ridges and among yawning chasms. A glacier lake, 6 miles long, was discovered

at a height of 877 ft., with many stranded icebergs, up to 65 ft. high, near its shores. An interesting feature of this lake was a distinct mark in clay of a previous high-water level, 146 ft. above its present surface. By the end of June, Adam Biering Land was reached and found to be a little Arctic paradise with ample game. The 28 dogs were rested, and fed on 17 musk-oxen. A cairn was built and a record enclosed when the land was left on 12th July for Navy Cliff.

This cliff, in lat.  $81^{\circ} 37'$  N. and long.  $34^{\circ}$  W., reached on 22nd July after crossing many glacial streams, was extremely redolent of Peary's memory. His little cairn was found and his record, in a bottle, of 5th July, 1892, withdrawn. A much more remarkable relic was the discovery of his footprints, distinctly seen in the gravel and appearing no more than a fortnight old. Skeletons of musk-oxen and their calves that he must have shot were also found. As Rasmussen had a pain in his leg, Freuchen alone visited Navy Cliff. In Peary's record the large waterway was named "Independence Fjord," not a "bay" as subsequently printed on his charts; and the record made no reference to the channel.

When Freuchen rejoined Rasmussen on 24th July, their conclusion was that Peary thought Independence Fjord continued to the west as a large channel. This is clearly seen on Peary's charts attached to his "Nearest the Pole" and "The North Pole," and would partly be accounted for by the fact that the head of the fjord cannot be seen from Navy Cliff; but the fjord is seen to extend westwards and to pass out of sight towards the interior. Freuchen said that an observer from the summit of this cliff, nearly 2,000 ft. high, would readily imagine that the fjord extended westward ("Report of the Thule Expedition," p. 369). Rasmussen points out that Mylius-Erichsen, in 1907, discovered the non-existence of the "Peary Channel," but could not complete his survey of the district; and that this work was left for Freuchen and himself, furnishing proof, as do their charts, that Mylius-Erichsen was correct.

August brought a week of bad weather, but by 8th the survey was thought to be complete, and a record was left in a cairn. About 60 musk-oxen were seen in this district and 30 killed. On 9th the expedition set out for home with its leader riding on a sledge, as his leg was still painful. There were then 27 dogs and 3 sledges. Again no crevasses were seen in ascending to the plateau, though the dry beds of streams were a hindrance. A distance of 29 miles was driven on 11th and 31 miles on 14th; but the weather was breaking up and the conditions were adverse to a swift advance. On 19th 30 miles were sledged and 33 miles next day. There was sufficient food, tea

and tobacco for the men, but little dog food remained. On 23rd August the distance was 31 miles and on 25th 24 miles, when Rasmussen's leg was well enough for him to drive. The thaw made the going very heavy and there were constant gales. One sledge was broken up to repair the others; the walrus hide under-runners had been eaten. On 27th a run of 30 miles was made downhill, followed by 31 miles each on the 29th and 30th. Ninety miles were driven in the next 3 days, and the weaker dogs were fed to the stronger. Land was sighted to the south on 4th September, and 31 miles made towards it; but the party was off its course, on the north side of Inglefield Gulf. They had averaged  $25\frac{1}{2}$  m.p.mar. for the 510 miles from Navy Cliff, but there was no more food for the dogs, and the long detour round the head of the gulf proved a tedious struggle with adverse conditions. Only 15 dogs remained on 9th September, and Freuchen was now suffering from pains in his legs.

Drastic measures were necessary to cover the 120 miles that separated the party from Thule. One sledge was left behind, with all but essential equipment, and on 11th September the surviving 13 dogs pulled the other sledge 24 miles. Freuchen refused to ride, developed a fever and, after his march, became unconscious. A snowstorm next day delayed progress; Freuchen was conscious and in great pain. On 13th, in fine weather, 30 miles were covered, for the load, like their meals, was now very light. Freuchen walked, on 14th, for 24 miles, and Thule was reached next day after a difficult journey. The total distance sledged was approximately 1,500 miles, making it one of the longer polar journeys. The expedition was the first of an interesting series; its transport was highly efficient, and valuable scientific results were obtained. The Eskimos worked well with their leaders. Freuchen collected 45 species of plants, of which 28 species had not previously been found in North Greenland. Some rock specimens collected cannot be classified as they are not fossiliferous. Insects also were collected, and zoological notes taken of the larger forms of life. A meteorological log with from 1 to 4 entries a day was kept.

#### THE EXPEDITION OF 1917

The account of this expedition in "Greenland by the Polar Sea" is appropriately introduced by Admiral Sir Lewis Beaumont who in his youth made the record for the Nares expedition on the same coast. Much work remained undone between Adam Biering Land and Sherard Osborne Fjord after the first Thule expedition, and an attempt to do it was made in 1914; but Freuchen, who again accom-

panied Rasmussen, fell into a crevasse and broke his theodolite which made it necessary to abandon the enterprise. In 1916 preparations were begun on a more generous scale than in 1912, for an expedition that became of considerable importance. No geologist had ever examined the rocks N. of Sherard Osborne Fjord, where the map also was incomplete. Rasmussen himself was interested in ethnological problems, and he took a botanist.

His choice of scientific associates was excellent. Dr. Thorild Wulff, who was to make the first botanical survey of the district, was a professional botanist of distinction. Of Swedish nationality, he had visited Spitsbergen in 1899 and travelled extensively over Europe. In 1902 he made a botanical exploration in India, and from 1906-12 was a lecturer on botany in Stockholm. During these years he visited Lapland and Iceland, and in 1912-14 made a botanical collection in China. In 1914 he spent some months in Japan, calling at Sumatra and Java before returning home. Early in 1916, at the age of 39, he joined Rasmussen's expedition.

Lauge Koch had spent the summer of 1913 in studying Greenland methods in Disco Bay. His profession was geology, and he had planned to make a geological survey of the N. coast as soon as an opportunity occurred. Hence he enthusiastically accepted the invitation to join this expedition; but he did more, for he took a course of instruction in cartographical surveying, knowing that the maps of North Greenland were very deficient. A Greenlander named Olsen, who was Rasmussen's personal attendant at Thule and who had accompanied the *Danmark* Expedition, with 3 Eskimos, completed the personnel.

On 5th April, 1917, the first contingent left Thule for the north amid a great gathering of Eskimo clans, like some high festival, and a magnificent Arctic transport of 27 sledges with 354 dogs started off. When Rasmussen followed next day he drove a distance of 56 miles in 10 hours. Only 15 sledges went as far as the Humboldt Glacier, 13 to Cape Constitution, 8 to Thank God Harbour and 6 on the main journey. There was greater dependence on game than in 1912; ample ammunition was carried, but supplies for only 2 months.

Rasmussen's party was entertained from 10th to 13th April by MacMillan at Etah (see pp. 143-4); and on 14th an Eskimo presented the expedition with 35 dead seals which demanded a day for their consumption. There were then 185 dogs, each with a capacious appetite, but some of the meat was carried on the sledges. Peabody Bay was reached on 18th after driving 34 miles, and a good view was obtained of Humboldt (piedmont) Glacier. Although the largest

glacier in Greenland, its length of 60 miles tends to dwarf its height, which seldom exceeds 160 ft. A distance of 41 miles was driven on 20th, and this brought the party to the SW. corner of Washington Land where the first 3 bears were shot. Koch's geological interest must have been aroused by the fossiliferous rocks on the E. coast of Kennedy Channel, for he seems to have made a mental note of them for future reference. The last opportunity to send letters home was on 25th when 5 sledges turned back; arrangements had been made for dispatching the mail to Denmark.

The main party drove 40 miles on 26th April, and 2 days later found one of Nares' depots. A bear had eaten the sugar, but 400 lbs. of mutton remained and tasted perfectly sweet after 40 years. The dogs were regaled on a mass of tallow. Two tins of coffee were discovered on 1st May at Thank God Harbour, and their contents also were excellent. The last Eskimos to return were then sent back and took with them the geological specimens. As no food could be spared, they were crossing the channel to the game lands near Fort Conger. On 2nd, as the 7 men of the advance party rounded a rocky headland, the frozen polar sea burst into sight, with its pressure ridges forced up on the shallows to a height of 50 ft.

On 4th May the one crucial factor of this expedition emerged, though as yet in its mildest form: Rasmussen believed that his party could live on the country, and he took the Eskimos to hunt; but no game had been seen since 20th April. Seals were not expected so early in the season, and musk-oxen were the main hope of subsistence. The stores on the sledges provided full rations at present. Hunting in Greenland, however, is a gamble—sometimes with death. Peary's record of 8th June, 1900, was found near Repulse Harbour; he had left it on his return from one of the finest journeys he ever made, in exchange for a record of Beaumont's, nearly 20 years older. Rasmussen's men were longing for fresh meat when, on 5th May, the hunting yielded only 3 thin ptarmigan, one of which was caught by hand; they imparted an agreeable flavour to the oatmeal porridge. St. George's Fjord was crossed on 7th to Dragon Point where Beaumont's record of 25th May, 1876, was found. From here the real work of the Thule Expedition began, with the exploration of the fjords. This work had never been done, and it proved of great interest. There were then 6 sledges with 70 dogs, though only 1 meal for them remained. One month's food for the men was cached at Dragon Point in readiness for the proposed return over the plateau, and this left provisions for *three days*. Thus the situation on the threshold of the arena was most unpromising.

As no surveying could be started until the larder was stocked, they all went hunting along the coast. Cape May was rounded on 9th when the Eskimos shot 3 musk-oxen on the hills, and men and dogs, it is admitted, gorged far into the night. Next day they divided into 2 parties, to cover twice as much country. Rasmussen entered Victoria Fjord on 11th and found it 48 miles long, but it yielded only 2 hares. On rejoining the other party, however, there was great rejoicing over 16 dead musk-oxen, and Koch immediately started surveying. The dogs could now have a week's rest and recover their form by a steady diet of meat. On 15th the mangled body of a young musk-ox was found with its legs trapped between two large stones; its throat and chest had been ripped open in a masterly manner by a wolf. Only the tongue, heart and a few other delicacies had been eaten. Koch returned from surveying Victoria Fjord on 16th; his Eskimos had shot 6 more musk-oxen, making a total, we are told, of 26 head killed, besides 30 hares. The men usually ate the hares and reserved the beef for the dogs.

On 20th May Rasmussen, Koch and an Eskimo returned to survey Sherard Osborne Fjord, while Wulff and the others followed the coast to the NE. The first 2 seals of the season were seen, but not secured, as they were intensely alert: the greatest skill is needed to secure an Arctic seal, as many are lost by slipping into the sea, where they usually sink. Koch with his theodolite ascended the high land, which proved to be an island, between Sherard Osborne and St. George's Fjords; from the summit he sighted a glacier that promised a gradual ascent to the inland-ice, and this was remembered for the return journey. A pair of white wolves appeared, silhouetted against the sky on the crest of a ridge, and invited themselves to the party. On a closer inspection of the men and dogs, however, they changed their minds, and, keeping at a little distance, contented themselves with throwing up their heads and howling. Rasmussen called this duet a song of lamentation, and it sounded very melancholy.

Koch was unwell on 22nd May, but next day was able to discover some new mountains and glaciers. Several of the weakest dogs had already been killed and now 4 more were shot. Later in the day Koch was again ill, and became feverish after reaching the camp near Dragon Point; he could not travel for 3 days. Three more dogs had to be killed, but they were so thin that to make one square meal for the rest of the pack 2 others had to follow them. On 27th Koch was well enough to walk slowly, and set off before the main party; they returned to the NE. and reached Depot Island in 2 days. The meat

diet seemed to upset Koch, who suffered from dizziness, but he continued his work with great courage. Dr. Wulff's party, met on 30th, was found to have shot 6 more musk-oxen; thus Rasmussen's dogs had a good feed before the parties again separated. Wulff was to follow the coast as far as Cape Morris Jesup, while the other party crossed the plateau from the head of Nordenskiöld Fjord and proceeded down Independence Fjord to complete a circuit of Peary Land.

The two parties separated on 31st May when Rasmussen and Koch drove into Nordenskiöld Fjord; but, as a thick fog soon put an end to their activities, they camped. There was no food for the dogs and little for the men; on 2nd June 4 more dogs had to be killed. Nordenskiöld Fjord was of a totally different character from that shown on the American maps; Peary had charted it as the NW. reach of his mythical channel. Mylius-Erichsen, and Rasmussen on his first expedition, had found that the middle reach did not exist. It was now found that Nordenskiöld Fjord was only 12 miles long; and instead of the green game lands Rasmussen depended upon, the whole country was so heavily glacierised that the overland trip to Independence Fjord was impossible. By 4th June a precipitate retreat was necessary to avoid starvation, but an important discovery was then made.

Near the mouth of the fjord some water was seen in great agitation; and then a whirlpool appeared, with 2 seals on the edge of the ice. But all this merely led to a new fjord extending 30 miles to the east; it was named J. P. Koch Fjord in honour of Lauge Koch's uncle. Unfortunately men and dogs cannot live on geographical discoveries, and 2 dogs had to be killed. Nor was this the only difficulty, for a snowstorm raged from 5th to 7th June when nothing could be done except await its end. Rasmussen had only 10 dogs, and their paws were wounded; the loose snow froze into balls under their pads, and the dogs tore their paws with their teeth in attempting to clear the accumulations. A lemming was found dead from the same cause; all its paws were skinned and frozen together with blood. The little animal appeared to be annoyed with his unruly members which prevented him seeking his food.

Koch and the Eskimo went out in different directions as soon as the blizzard abated, on 7-8th, leaving Rasmussen with the dogs; they were raging with hunger and some of them attacked the tent. Koch returned after 25 hours; he had seen the new fjord and discovered 16 new glaciers, but the country was destitute of game. The Eskimo returned on 9th, after 30 hours' absence, with 3 hares, and reported



2 seals shot by the whirlpool. Camp was then moved, to be near the pantry door, for this whirlpool held out hopes of further supplies. Koch became dizzy after his long walk ; but he kept quiet for a few days and was better on 11th. The dogs then caused much concern, for a kind of paralysis seized some of them, and 2 had to be killed. The others gradually recovered.

A depot of Peary's was found on 15th June at Cape Salor, and his pemmican was mixed with the porridge. Next day they turned NE. and approached Cape Neumeyer where Peary's party, fighting for their lives in 1906, had landed from the pack. Here Wulff's party was met, with all the fight gone out of them after a fortnight on dog-flesh. No game had been seen, and they were escaping from the coast of death ; 13 dogs had been eaten and 14 remained. Want of game had prevented them from going farther than Cape Wykander. Rasmussen now made a final effort to reach De Long Fjord, 60 miles away, while Wulff's party recuperated. A seal was shot on 17th, and next day Rasmussen passed numerous evidences of Wulff's hunger march, one of which was a dog's carcass. Three barnacle geese, another seal, 4 hares and 6 ptarmigan were secured.

Near Cape Mohn a cairn was found containing a report of Lockwood's. Rasmussen reached De Long Fjord on 21st June and found that Peary's map of the locality bore little resemblance to the reality. Several new islands and 3 new fjords were discovered, one of the latter being 18 miles long. The " Peary Channel " myth was finally laid to rest. The charting of Nordenskiöld Fjord had left De Long Fjord as the sole remaining possibility for the channel ; and now both the new fjords were seen to end, as usual, in glaciers. On 22nd the terminal cairn was built, and the party turned back. Cape Neumeyer was regained on 26th, after finding at Cape Bennett another note of Lockwood's. When 3 seals had been secured, life seemed very pleasant, and the sun was so hot, within 500 miles of the North Pole, that the tent was not pitched ; the sleeping-bags were used as ground sheets and the men slept in the open air. After 2 days' rest, Dr. Wulff was met at Cape Salor. The Eskimos shot 6 seals, but the temptation to remain in this land of promise had to be resisted because waterlogged snow lay between them and St. George's Fjord, and the plateau had then to be crossed.

The reunited party set out on 2nd July with 20 dogs, and a seal was shot. Rasmussen was in contemplative mood at this time, and his diary contains some fine passages on North Greenland. He calls it a land without a heart—as if he knew the future—and he marvels at the miracle of vegetation that supports all the animal life on no

more than one month's annual growth. From 3rd to 14th July men and dogs spent every day in icy water up to the men's knees ; and the sledges had to be forced through the wet snow that floated on the surface. On 6th, when the last of the meat had been eaten, 6 musk-oxen were photographed and then shot, near Cape May. The dogs, now reduced from 70 to 18, were given 4 days in which to feed up, and during this interlude 5 more musk-oxen were secured. On 15th the party moved on again towards the beautiful Sherard Osborne Fjord with its glacier tongues in glittering contrast to the red and brown rocks. Dragon Point was reached on 19th after 6 seals had been shot, all of which sank to the bottom and were lost ; this was serious because there was now insufficient food for the return journey. The distance overland to Cape Agassiz, the objective, near the southern end of the Humboldt Glacier, is approximately 240 miles, and food for 20 days was necessary. At the depot in St. George's Fjord there were biscuits, oats, tea and coffee on full rations for this period, but only 7 lbs. of pemmican per man—obviously a small ration. For the dogs there was only 12 days' supply of meat, and the men realized that this journey would tax their strength to its limit.

They again divided forces, Wulff and Koch taking Olsen and 1 Eskimo inland, while Rasmussen took the others by the coast. Olsen then demurred at going with Wulff's party. This was remarkable in view of Olsen's fate ; but the future was unknown and the arrangements had been well considered. Hence Rasmussen felt they must be adhered to, and he was surprised that this man, who had an excellent record, should hesitate to obey orders. Olsen gave no reason for his objection, but appeared to have a premonition of something sinister, if indefinite. He gave way on hearing Rasmussen's reasons, and they all set off on 21st July. When the parties met next day Olsen was missing. He had been hunting alone with the Eskimo who said that Olsen became tired and lay down to sleep. The others felt little concern at the time, though one would have thought that they might have connected it with the missing man's forewarning ; but with continual daylight, lying down to rest was not uncommon ; and as only hares had been shot, the food problem was a strong counter-irritant. The Eskimo who had left Olsen alone was sent to seek him, but returned to say he could not be found.

A serious situation now faced the party. There was no snow to retain any tracks, and the summit rations were being eaten without progress towards home. Olsen could not have lost his bearings, for he knew his way about the district. On 24th July all joined in a

methodical search, and walked for 12 hours at a distance of  $1\frac{1}{2}$ –2 miles apart without seeing any sign of the missing man. It was unanimously decided that little more could be done for him; but 3 beacons, with letters and a little food were built in conspicuous positions. The lives of the 6 men were now in jeopardy, for their supplies had been insufficient before this delay, yet one last search was made. Altogether 72 hours were spent in looking for Olsen, whose fears had been justified, for no doubt he was dead. He might have been caught by wolves while asleep, or swept off his feet while crossing a river; but it was considered most probable that he had stumbled and accidentally shot himself.

Next day the saddened party approached the Daniel Bruun Glacier for the ascent to the plateau. Two seals were secured by 26th, yet on 28th they were short of food and had to kill a dog; this left 16. To save the summit rations, nothing but a little tallow was eaten for 48 hours. Rain held them up for 3 days, making them weaker when increased strength was needed, and at last forced them to kill 3 more dogs for food. On 1st August another seal saved the situation; nearly half of it was eaten at one sitting by the 6 men and 13 dogs. Not until 4th August was the ascent of the glacier begun, and then Wulff and Koch were tired after walking 4 miles. None of the party was fit for the journey of over 200 miles that lay before him, and only half-rations for 20 days then remained. On 6th their glacier was found to be isolated from the inland-ice, and a rocky gorge, 1,500 ft. deep, had to be crossed; it was named the Devil's Cleft, as it made several journeys necessary. On 9th another valley was seen snaking across the route, and when this also had been negotiated the position of the party was desperate.

The distance from here to Cape Agassiz was about 215 miles, for which *two meals* remained for the dogs, while the men became hungry soon after they had eaten. The following schedule shows at a glance the main facts relating to the next week of the journey:

SCHEDULE No. 4

Date	Height.	Notes	Distance.
1917:	ft.		miles.
Aug. 10.	1,800.	Left edge of Inland Ice. 6 men, 13 dogs.	2½
„ 11–12.	4,000.	One dog collapsed. Food for 6 days left.	25
„ 12–13.	4,000.	Held up by rain. 2 dogs killed.	21
„ 14.	2,500.	No food during march. All very hungry.	27
„ 15.	3,250.	Rough head wind. Ellesmere Land seen.	25
„ 16.	3,500.	Lat 75° 45' obs. 4th dog killed.	22
„ 17.	2,500.	Held up by storm and exhaustion.	0
			122½

Rasmussen could not sleep on the night of 17th August and lighted his pipe to consider the situation, while he made notes in his diary. The sleeping-bags had been cast away and the men's clothes were so wet that they all woke up shivering at irregular intervals. There were still 120 miles to cover, and 9 dogs remained; apart from them, the food would last only 2-3 days. As there was ample oil, however, life could be prolonged for another week on boiled dog, and by then the party should be safe. The worst feature was that the men were failing, and in 2 days they would have to pull their own sledges. None of them was fit for this labour; they were all half-starved. Wulff and Koch had boils, and one of the Eskimos had a swollen hand in a sling. Rasmussen, confirmed in his determination to aim for Cape Agassiz, closed his diary.

## SCHEDULE No. 5

Date 1917 :	Height. ft.	Notes	Distance. miles
Aug. 18-19.	4,000.	Stopped by head blizzard that rose to gale.	13
„ 19.	4,000.	Blizzard. On 1/6th rations. 2 dogs killed. left.	7 0
„ 19-20.	2,500.	Crevasses. Finished the coffee. 6 dogs left.	22
„ 20.	1,900.	Camp in sight of Peabody B. 5 dogs left.	19
„ 21.	1,900.	Rain. Cereals finished. 4 dogs left.	7
„ 22.	2,000.	Fog. Land ahead. Wulff failing. 3 dogs left	13
„ 22-23.	1,800.	Stopped by glacial river. 1 dog left.	10
„ 23.	1,400.	Fog prevents progress.	6
„ 24.	1,400.	Inglefield Ld. reached. Wulff can go no farther.	?

The party dared not attempt to travel during the gale of 19th August because they were near the edge of the Humboldt Glacier. The fog that came on in a few days was a similar danger, as the route for a distance of 60 miles converged towards the top of the ice-cliff. One-sixth of a ration (see 19th) was 1 mouthful of pemmican each, with 1 small biscuit—a “cracker,” not a ship's biscuit; and the coffee grounds were used a second time to make a hot drink. Dr. Wulff fell into one of the crevasses and hung by his arms until rescued; the men afterwards roped. After walking 13 miles Wulff, who had been ill all day, said he could go no farther, and the party camped. The others felt weak and dizzy, but they faced the facts fearlessly, knowing they were fighting for their lives. The rain that began on 21st was disastrous, for the plateau was soon covered with rivers and lakes. On 22nd, Rasmussen said, the foothold was insecure while fording the torrents, and one step might lead to perdition, or in other words, the ocean.

To lighten the loads further, even ground skins and ski were left

behind, though the men must then sleep either on damp snow or *on* their tent instead of *in* it. When fog came on again, the crossing of the glacier streams became more dangerous than before. Once they lost all sense of direction. Their legs were perpetually wet. One frothing river, 60 yds. wide and 3 ft. deep, took 2 hours to cross. On 22–23rd they had walked 13 hours when stopped by a stream that they were too weak to negotiate. Next morning they crossed easily, but fog again made their course doubtful. Then snow began to fall, and another stream taxed their failing strength. Their clothes had become large wet compresses, yet the men were so worn out that they slept soundly.

Rasmussen woke up repeatedly to see if the weather were fit for travelling. He was anxious about Wulff, whose exhaustion was rapidly increasing; after walking for 3 hours on 24th he lay down and said he could go no farther. A cup of strong tea enabled him to resume the march in good spirits, but his body was emaciated and his weakness appeared in his eyes. The dog-meat seemed to be one cause of his trouble. All the other men felt able to continue for a few more days and were encouraged by the hope of securing game, as they had reached the edge of the inland ice. Before land could be attained, fog again called a halt, but the men were so hungry that they killed the last dog and took the risk of finding food. There then remained only a spoonful of tea and a tube of glycerine. When the fog lifted, a steep but possible place of descent was found into a rocky valley, and the Eskimos who scouted for game saw a hare almost at once. As Wulff and Koch were in need of rest, 2 Eskimos were left to hunt for them while Rasmussen, who was by far the strongest man of the party, went on to Etah, distant 125 miles, for relief. Five hares were killed before he set off on 25th August, leaving Wulff on a mossy couch where he was not only happy but jocular—yet this was their final parting.

Rasmussen and 1 Eskimo made rapid progress through a country of idyllic beauty near Cape Scott. After walking for 13 hours they ate a hare and then had 4 hours' sleep. The 2nd march (26th–27th August) was very hard and over barren land; as no game was seen they became faint for want of food, and slept badly that night. On the 3rd day another hare was shot, and on the 4th day they secured 3 more. At a distance of about 60 miles from Etah they met an Eskimo friend, commandeered his dogs, and took a short cut across the inland ice to Etah—reached at 9 p.m. on 30th after a very fine effort. In 24 hours the relief sledge with 6 men and 5 dogs started back.

After Rasmussen had left his companions on 25th August they had a great feast on the hares, as there was one for each man, and Koch became satiated ; but Wulff could not eat his portion and spoke of dying. Next day the hunters returned empty-handed and the only hope lay in moving to better game land. It was now a flight for life. The theodolite, cameras and nearly all spare clothes were thrown away, and only the guns, some rugs and the scientific results were carried. Wulff wanted to stop on 26th, after going 20 minutes, but he was brought along for half an hour when a hare was shot and eaten raw. Wulff again could not eat his share and seemed to be losing the will to live. Two more hares were shot, and camp was made at midnight. Wulff ate half his ration and gave the rest away. On 27th he seemed weaker and there was great difficulty in bringing him on ; he complained of anæmia as well as his heart. In 3 hours the party travelled  $2\frac{1}{2}$  miles. Several more hares were killed during the day, but Wulff could not eat the meat and said it sickened him. His mind seemed fresh, for he kept up his botanical observations, in which his interest never flagged ; but as he could not take his food naturally he became thinner.

The following day yielded only 1 hare and a march of 5 miles in 12 hours. Wulff chewed tobacco incessantly, and Koch vainly tried to persuade him to renounce the habit. After 12 hours' rest they set out again, Wulff struggling on for 3 hours when he said he could go no farther ; he spoke of walking to his own funeral and asked them to leave him. When a suitable place could be found, he was made as comfortable as possible and warmed himself by drinking hot water. His last act was to dictate some letters, his will and a botanical report, to Koch. He told him that if some reindeer meat could be brought in a few days he would be glad, but he could eat no more hare ; that he expected to live for at least a couple of days and he hoped his comrades would reach safety. His last words were an injunction to save the scientific results of the expedition. There was little chance of doing this unless the others pressed on, for Koch was then becoming weak and his only hope was to reach Cape Scott, where his work might be found even if he succumbed. Everyone appears to have acted for the best.

Koch and the Eskimos set off on 29th August, leaving Wulff alone, lying in a valley by a large stone. The Eskimos hunted ; Koch was still weak, and they had nothing to eat except fungi until the evening when 6 ducklings were shot. They reached Cape Scott at midnight and secured enough hares for the next 3 days. On 2nd September 2 reindeer were shot. They thought of Wulff, but it

would have been 10 days after his last meal before they could have reached him with the meat, and he could not possibly have lived so long. On 4th, as Koch's party rested, they heard shots fired by the relief party from Etah and it was reached on 10th. Rasmussen says that, as he approached the returning party, Koch sat on a stone and silently wept.

Thorild Wulff was a great botanist, but his wandering life prevented him from committing his immense stores of knowledge to paper ; he left no books, and most of his learning has perished with him. Had he lived a few years longer it is possible that he would have written a monumental work from the material in his diaries. This loss to science enhances the tragedy of his early death at the age of 39. His diary ended : " Aug. 29th. I am half-dead, but found *Woodsia ilv.* Lay down at 7 p.m. for I will not hamper the movements of my comrades on which hang their salvation." And so another gallant gentleman laid down his life for his friends.

Two tasks now remained : the burying of Wulff and the rescue of the scientific collections. The first attempt to achieve these objects failed through a week's blizzard, during which the food was exhausted. Koch made the second attempt and reached Cape Scott at the end of October ; but the ground was then thickly covered with snow, and he failed to find where he had left Wulff, though he secured the collections. Rasmussen had an adventurous journey back to Thule ; he took the risk of tobogganing down a large hole in the land-ice, worn by a glacial stream, but his rush through the darkness ended safely over a snow-covered moraine. Home was reached on 22nd October after 6½ months in the field.

Apart from the regrettable loss of 2 lives, the expedition had been successful. The geographical discoveries have been mentioned ; the botanical, geological and ethnological researches were also valuable. A report on the flora and fauna of the N. coast of Greenland, based on Dr. Wulff's notes, appears in " Greenland by the Polar Sea " ; it was written by the late Prof. Ostenfeld of the Copenhagen Botanical Museum, one of the foremost Danish botanists. This is followed by Koch's geological report and by an essay of Rasmussen's on the Eskimos. Dr. Wulff's mind was constantly occupied with the great Arctic problem of how life is maintained on the frozen frontiers of the world. He did not live to solve it completely, but he made a definite contribution towards its solution. All the fauna in the world are based upon the flora ; the animals are consumers and the plants alone producers. Greenland has about 390 species of plants ; the number of species diminishes towards the north, though Wulff collected 60

flowering plants among the most northerly vegetation in the world. Dr. Koch was the first geologist to visit this coast and has the credit of discovering there fossiliferous strata of the Silurian and Devonian Eras. He said that the most important geological discovery of the expedition was the finding of the Greenlandic section of the Caledonian Folding to the west of the Atlantic Ocean.

#### THE ETHNOGRAPHICAL EXPEDITION OF 1921-4

Little geographical work remained to be done near the route taken on this expedition, and its purpose was mainly ethnographical, but Rasmussen tells us in his book, "Across Arctic America," that other researches were also carried out. During the first 2 years, Peter Freuchen, Thakel Mathiassen and others did useful work in archaeology, geology, botany and surveying. The expedition left Copenhagen on 17th June, 1921, and a call was made at Thule to embark equipment and Eskimo drivers. The ship then proceeded along Fox Channel to the N. of Southampton Island where a house was built for the winter. Its position was fixed at lat.  $65^{\circ} 54'$  N. and long.  $85^{\circ} 50'$  W. Scientific sledge journeys were made from this Base in all directions by the wintering party of 7 Europeans, who split into smaller units and were joined by Eskimos. On 21st February, 1922, Mathiassen returned after 8 months' absence and the expedition was soon divided into 5 separate parties, afterwards to remain apart.

On 10th March Rasmussen set out on his long pilgrimage towards the setting sun, on which he completed his comprehensive study of the Eskimo people. On leaving Hudson Bay he travelled through the Franklin country, passing Coronation Gulf and the Mackenzie Delta to Alaska. He spoke of these strange folk as our "contemporary ancestors!" They are historical survivals from the Stone Age when, during the Glacial Period, our progenitors lived under similar Arctic conditions to those that the Eskimos experience to-day. In September, 1922, the skeletons of some of Franklin's men were discovered in King William's Land. A native was met whose parents had come into contact with the fatal expedition of 1845; and a little later Rasmussen received the following information from some old Eskimos. They were indifferent to the tragic element in the disaster, but deeply concerned over the abysmal ignorance of their fathers with regard to white men and their property. The Eskimo report was substantially as follows.

Two brothers on the NW. of King William's Land saw a black mass that was found to be a ship, and the whole tribe came to investigate the portent. As the vessel was deserted it was decided to



take all they wanted from it, but none of these Eskimos had ever seen a white man and they did not know the use of many articles. The ropes supporting a boat, as it hung from the davits, were cut and the boat smashed. Guns were broken up for their metal parts, to be used in spears and harpoons—an interesting retrocession. Percussion caps were thought to be little thimbles, and the white men assumed to be dwarfs, until they entered the cabins. This they did with great fear and there found many dead men in their sleeping-places. The Eskimos were surprised to find the hold quite dark, and proceeded to rectify the white man's omission of a window by cutting a hole in the ship's side, below water-level, so they soon lost all their treasures.

Later in the same year 3 Eskimos found a boat in which were the bodies of 6 men with guns, knives and much food. Other bodies of white men were said by the natives to have been found in several places, and Rasmussen was taken to one of them on the E. Coast of the Adelaide Peninsula. Here he saw many human bones with remains of clothing and boots ; he had no doubt that they had been some of Franklin's men. A cairn was therefore built above their mortal remains and the British and Danish flags were hoisted at half-mast to pay the last honours to the illustrious dead.

Rasmussen did not believe that the so-called "Blonde Eskimos" were descended from the Norse colonists of Greenland, as they are found among several tribes. In May, 1924, Alaska was reached and the coast followed round Kotzebue Sound and the Seward Peninsula, but a boat was used after 30th July as there was no ice for sledging. On 21st August the mail-boat was taken to Nome, and from here Bering Strait was crossed to East Cape in Siberia where the most westerly Eskimos live. The Soviet agents, however, only allowed him 24 hours ashore, apparently suspicious after the Wrangel Island incident (see p. 111). It happened that the Danish Government obtained permission for Rasmussen to remain, but it arrived 6 weeks too late. Thus in October, 1924, the expedition ended. Rasmussen had made the longest scientific sledge journey on record. In 3½ years he had travelled, he said, about 20,000 miles from E. to W. and, if his previous work in Greenland be included, he must have visited nearly every Eskimo tribe. On his great journey of 1921-4, which he called his 5th Thule Expedition, he filled 30 notebooks with the data collected.

The 3rd expedition was relatively unimportant ; the 6th and 7th, for archæological and ethnological research, have recently been made to South-East Greenland. The last expedition was in 1932, when

Rasmussen led 62 men, with 7 motor boats and an aeroplane ; the Greenlanders of the party numbered 25. Flights of 6,275 miles were made, including one across the inland ice and another to assist the Hutchinson family.

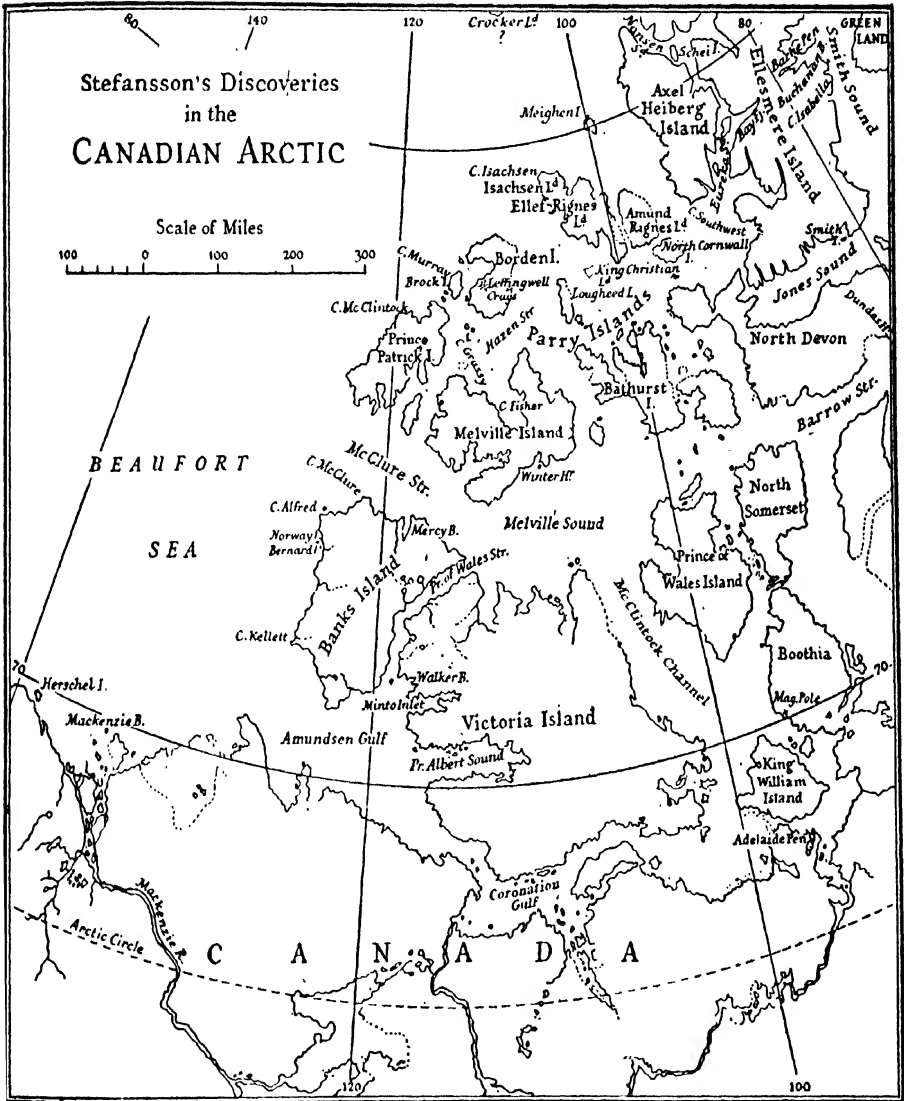
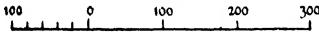
Rasmussen was one of the greatest Arctic explorers in our period. In 1923 he was awarded the Founders' medal of the Royal Geographical Society. He showed great kindness to H. G. Watkins and his associates before he died in December, 1933. Knud Rasmussen was a beautiful character ; and Greenland, to which he devoted his life, is the poorer by his loss at the age of 54.

#### RASMUSSEN'S THULE EXPEDITIONS

1. 1903. A member of Mylius-Erichsen's Literary Expedition.
2. 1912. With Freuchen to North-East Greenland.
3. 1914. (Abandoned.)
4. ? Depot-laying to Cape Columbia for Amundsen.
5. 1917. With Koch and Wulff to North Greenland.
6. 1921-4. Across Arctic America.
7. 1931. A reconnaissance to South-East Greenland.
8. 1932. The anthropological expedition.

# Stefansson's Discoveries in the CANADIAN ARCTIC

Scale of Miles



## CHAPTER IX

### BERNIER, MACMILLAN AND THE POLICE PATROLS

THE word " Dominion " was chosen as the official designation of Canadian territory because it seemed to comply with the conditions of the Psalm : " His dominion shall be from sea to sea and from the river to the ends of the earth." Canada extends from the Atlantic to the Pacific and from the St. Lawrence to the North Pole, excepting only that political blunder, Alaska. Arctic Canada is the northern part of this extensive territory, and stretches eastwards from the 141st meridian W. of Greenwich to the waters of the Smith Sound route and Baffin Bay.

When the British Government transferred to Canada all the islands situated to the north of the American Continent, an expedition was sent by the Dominion Government to take formal possession. Capt. J. E. Bernier, an efficient commander, was appointed to lead the expedition ; he had recently returned from Barrow Strait in the *Arctic*, after being in the north from 1906 to 1907. The *Arctic* was the new name of the *Gauss*, a splendid ice-ship built in 1899 specially for Drygalski's Antarctic expedition. In July, 1908, Bernier sailed from Quebec in the same ship with 43 men to Etah on Smith Sound, and then passed through Lancaster Sound, Barrow Strait, Melville Sound and McClure Strait to the depot at Dealy Island. The winter of 1908-9 was spent in Parry's Winter Harbour and 2 parties were sent out, the one to annex Banks Island and the other Victoria Island. On 12th August, 1909, the *Arctic* left her winter quarters and took soundings in Byam Martin and Austin Channels, afterwards sailing down Barrow Strait and so home. In 1910 Bernier took the *Arctic* north for the third time, with the object of making the North-West Passage by way of Melville Island and of completing the assertion of Canadian sovereignty over the Arctic islands. He had to turn back, however, near Banks Island, but his survey of Baffin Land between Fury and Hecla Strait and Cape Kater was good.

Three years later Donald B. MacMillan, who had been one of Peary's assistants in 1909, led an expedition to Smith Sound under the auspices of the American Museum, the American Geographical

Society and the University of Illinois. There were 7 men, of whom 5 were university graduates: W. Elmer Ekblaw, geologist and botanist; M. C. Tanquary, zoologist; H. H. Hunt, M.D., the medical officer, and Ensign Fitzhugh Green, U.S.N., physicist. There were also an electrician, and a mechanic who acted as cook.

On 2nd July, 1913, the expedition sailed from St. John's, Newfoundland, in the *Diana*, but she ran aground on the coast of Labrador and had to return to St. John's where everything was transferred to the *Erik*, thus causing a month's delay. MacMillan had to abandon a proposed station on Ellesmere Land, and built a house at Etah on Foulke Fjord; this added a distance of 80 miles to most of the single journeys. On 30th August the unloading was completed, and the house, named Borup Lodge, fitted with electric light and inhabited in a fortnight; its lat. is given as  $78^{\circ} 20' N$ . Meteorological observations were begun as soon as the party landed and continued for 4 years with only 10 days' interruption. The autumn hunting was successful and the meat-room well stocked when darkness fell in October. During the winter the usual branches of scientific work were carried out.

In December a depot was laid at Cape Rutherford in Buchanan Bay, for a journey in search of Peary's Crocker Land. On setting out in 1914, the 10 dogs of MacMillan's team were given no more than 625 lb. to pull. The rations for the men were 1 lb. pemmican and 1 lb. biscuit per day, with much tea, taken in 2 meals; no other food was carried, but Sverdrup's game lands were well known before starting. Green and an Eskimo started off on 7th February to take supplies across Ellesmere Land as far as Eureka Sound. Next day Tanquary set out, followed by Ekblaw on 9th and Dr. Hunt on 10th. When MacMillan brought up the rear on 13th there were 19 men, 15 sledges and 165 dogs ahead; he reached Cape Sabine, a distance of about 40 miles, in 6 hours.

This cape became notorious for all time when Greely made his camp of death there. His party had little food and was nearly worn out when they arrived on 12th October, 1883. On 1st November rations were reduced to 14 oz. per man per day, and in January, 1884, the first man died. Lieut. Lockwood, who had made the most northerly record on the coast of Greenland, died on 9th April after accurately keeping the meteorological log up to 7th. The food was all finished on 24th May, and deaths from starvation then became frequent. On 6th June one man had to be shot for stealing; seaweed and shrimps were all that the survivors had to eat until their rescue on 22nd June, when they were all near the end. Only 7 men,

including Greely, were found alive out of 24 American soldiers and 2 Eskimos ; most of the victims had died of starvation and frost-bites. Lieut. Greely was not to blame for the disaster ; he conducted his expedition with ability and firmness.

MacMillan's sledges were loaded to their limit at the Cape Rutherford Depot on 14th February, and 2 days later he overtook all his advanced parties in the middle of Hayes Fjord, named after Dr. I. I. Hayes who explored the coast of Ellesmere Land in 1860. Most of the Eskimos wanted to return ; some had influenza and others mumps, so MacMillan was forced to turn back and eliminate his worst assistants. The 90 miles to Etah were covered in 2 marches with light sledges, and 7 of the youngest natives were picked for the main journey. Ekblaw and Green were the strongest Americans and the only others taken. Nearly a month was lost before Etah was left for the 2nd time. On 11th March, Smith Sound was again crossed in 6 hours, and Beitstad Fjord reached on 14th. Next day the ascent of the glacier at the head of the fjord began, but further trouble arose during the crossing of the land : two more Eskimos deserted, and Ekblaw's feet were frostbitten. This was not surprising, as the highest camp was at an altitude of 4,750 ft. and the temperature here was  $-50^{\circ}$  F. Ekblaw returned to Etah where Dr. Hunt could attend to him, and MacMillan advanced with Green and 5 Eskimos. The amount of food that could be carried on the reduced number of sledges was insufficient for the long journey, and its success depended on securing game.

When the smaller party set off on 20th March good progress was made and MacMillan felt that the worst of his troubles were over. Bay Fjord was reached after a march of 16 hours down a glacier, into the crevasses of which the dogs frequently fell. The fjord was followed next day, and on 22nd 7 musk-oxen were killed ; the game country now lay before the party, and the prospect proved encouraging. On 23rd Green and 2 Eskimos were sent back to the depot in Hayes Fjord, according to plan, for the purpose of transporting more stores to the N. of Axel Heiberg Land. A large white wolf, larger than any of the dogs, was shot on 26th as a museum specimen. Five more musk-oxen were killed, and 27th was spent in eating them. A distance of 69 miles was then made northwards along Eureka Sound in 2 days. On 30th March, near Schei Island, the Eskimos wiped out a whole herd of 35 musk-oxen ; MacMillan disapproved of this unnecessary slaughter as all the meat could not be eaten. A rest of 4 days was then enjoyed in capacious igloos built of snow blocks in an hour ; they are warmer than tents, and sunlight filters through, filling

the interior with a delicate blue tint. On the 1st march from Schei Island an old depot was found containing Sverdrup's condensed milk and Dr. Cook's pemmican. On 11th April the N. of Axel Heiberg Land was reached, and next day Green's party appeared, running up to schedule; good progress had been made, and there were sufficient stores for 25 days on the polar pack.

MacMillan took Green and 2 Eskimos on the last stage of the search for Crocker Land. The surface of the pack was remarkably smooth for the first part of the journey from land, and then channels of open water had to be crossed. A sounding was attempted when 17 miles from the shore, but the 5-lb. pick used as a sinker (and lost on winding in) was too light, and nearly 2,000 f. of wire ran out. MacMillan thought that a strong current was flowing towards Nansen Sound; probably the pack also was moving. On 19th April a march of 18 miles was made, the going still being good, with no pressure ridges in sight. The following day 30 miles were covered and the party camped at a distance of 78 miles from land, then nearly out of sight. On 21st, MacMillan and Green thought they saw Crocker Land with snow-covered hills and valleys, but the Eskimos said it was mist; the features of the distant landscape then gradually changed and finally vanished away. Could Peary have been mistaken in thinking he saw this land? He had been mistaken in other parts of the Arctic.

The new country was shown on the maps at a distance of 120 miles from Axel Heiberg Land, and should now be in sight of MacMillan's party. On 22nd April their position by observations was in lat.  $81^{\circ} 52' N.$  and long.  $103^{\circ} 32' W.$  which agreed with the dead reckoning. A more northerly course was set on 23rd and 24th until they reached a point 150 miles NW. of Axel Heiberg Land and should have been 30 miles inland from the coast of Crocker Land, yet no land was in sight. The lat. here was  $82^{\circ} 30' N.$  and the long.  $108^{\circ} 22' W.$  On p. 202 of his "Nearest the Pole," Peary said he was thrilled to see from the NW. of Ellesmere Land the faint white summits of a distant land; and on p. 207 we are told that from Axel Heiberg Land he saw this new country again. MacMillan says that his party proved there was no land within 200 miles of Axel Heiberg Land, in the direction of Crocker Land; and at this distance, to be visible from Peary's standpoints, it would have to be 30,000 ft. high. MacMillan's supplies would have enabled him to advance for 2 more days, but the character of the pack had completely changed towards the end of the outward journey and had become a mass of pressure ridges. Another 6 miles were made over a frozen representation of

chaos, and then they turned back. Curiously enough, the position of Dr. Cook's Bradley Land is only a little more than 100 miles to the N. of MacMillan's turning-point, and if it exists may extend farther S. than where charted; it would be amusing if a mirage of Cook's Land mocked both Peary and MacMillan.

During the return to land, reached early in May, the dogs' ration was 2 lb. of pemmican per day. Green was then sent with an Eskimo to survey 25 uncharted miles on the W. coast of Axel Heiberg Land. While he was away there was a week's blizzard, but a rest had been earned by sledging 725 miles in the previous 50 days. Green returned without the Eskimo, Pee-a-wah-to, and said he had shot him; this is all we are told; but the man had served Peary faithfully, and was a member of the party that made the hunger march from the pack to Cape Neumeyer in 1906. The sleeping-bags left at Schei Island were recovered during the return; the men had wisely slept in their furs when on the pack ice. The head of Bay Fjord was reached on 12th May and 3 days later the Ellesmere Land divide was crossed at a height of 4,700 ft. On 16th the glacier was descended to its foot. Cape Sabine was reached on 19th, and a fine ending was made to the journey by driving 30 miles across Smith Sound in the usual 6 hours. On the return to Etah a distance of 1,400 miles had been covered. The average rate of travel was 20 m.p.d.

Ekblaw had recovered from his frostbites sufficiently to make a survey of the inner recesses of Princess Marie Bay on the E. coast of Ellesmere Land. Summer then came, bringing the migrant birds, myriads of which were to be seen on the islands and coasts of Smith Sound. The burgomaster or glaucus gull, the gyrfalcon, guillemot and brant appeared. An incredible number of eider ducks took up their abode on the islands, and the annual pilgrimage of laughing Eskimos was made to collect their  $3\frac{1}{2}$ -oz. eggs. This year the Americans assisted in acquiring 4,000 fresh eggs in a few hours on one small island; when kept in the shade, Nature's cold storage, they last throughout the winter. The Eskimo mother takes her children, and a net on a 12-foot pole, to catch the little auks, which are so numerous that 10 or 12 are often netted with one sweep of the arms. Many of the birds are eaten raw during the hunt, and one Eskimo will consume a dozen at a sitting.

The wireless installation never functioned and during the summer of 1915 was removed to an island 2 miles SW. of Borup Lodge, where a meteorological sub-station was established. A motor-boat was part of the equipment, and on 30th August justified itself by bringing



the mail to Etah ; the latter brought, not only news, but also severe colds for every recipient. On 24th October the sun set for the second winter—the Eskimo season for social festivities. Owing to the want of proper ocean transport, MacMillan had to sledge 1,000 miles to Upernivik and back, to dispatch his report and ask for a relief ship ; surely no other recent expedition has been similarly left out in the cold. On 26th December MacMillan and Tanquary slept on the ice under the lee of their sledges in preference to sharing the fertile accommodation of the Eskimos indoors ; and the following day they drove a distance of 50 miles in 12 hours. MacMillan afterwards set up a sledging record by driving 100 miles in 1 march of 18 hours across perfect sea-ice in Melville Bay. The temperature was  $-50^{\circ}$  F. ; there was moonlight and a dead calm. The dogs completed this very fine performance with their curly little tails in the air. They had been well fed and rested before starting, but they then went 5 days without any more to eat.

Only one long journey could be made during the summer of 1915 because of rabies among the dogs, as well as the shortage of meat. This journey was made by Ekblaw to explore Greely Fjord and the Lake Hazen district. As the outward route was to be through Eureka Sound and the return by Kennedy Channel, Ekblaw could not lay depots for his own return. MacMillan therefore undertook that 6 depots should be laid on the Greenland coast, and Tanquary was to meet Ekblaw at Lake Hazen. He started on 26th March and spent 2 days at Cape Sabine, feeding the dogs to repletion on a large cache of meat previously stored there. Except that Ellesmere Land was crossed by Flagler Fjord instead of Beitstad Fjord, MacMillan's route of 1914 was followed as far as the N. end of Eureka Sound. From here, where MacMillan had gone W. into Nansen Sound, Ekblaw turned E. into Greely Fjord, his first objective.

Before reaching here, on 8th and 9th April, 25 musk-oxen had been killed, and another entire herd of 21 head was wiped out on 19th ; but 21 of the beasts were eaten in a week. The 30 dogs and 3 men devoured 3 of these animals a day, and carried a little meat with them when they moved into Greely Fjord on 26th. The amount of game in the Sverdrup country is remarkable, for Ekblaw counted over 200 musk-oxen in sight from the top of the Fosheim Peninsula, besides hares, foxes, wolves, lemming, ptarmigan and a few bears. In 11 days 46 musk-oxen were eaten. Ekblaw had already started collecting geological and botanical specimens when he turned into Cañon Fjord, at the head of which, where a record was left, he found the ruins of 2 stone houses. Another kill of musk-oxen was made,

but the number of beasts is not mentioned. A more interesting incident of wild life was provided by a pair of wolves, disturbed while consuming the carcass of a full-grown bull they had killed.

The party now entered unexplored country and found it of an impressive character. In a new fjord, named after George Borup, there was more butchering. Borup Fjord was seen to be 16 miles long, with 2 branches on the E. side, flanked by high mountains of Alpine type, with blue glaciers in the valleys. On continuing along Greely Fjord, progress was much hindered by deep snow that balled under the dogs' paws. The sides of the fjord were precipitous mountain walls of grey and blue limestone; they were so high that little except the sky could be seen above them. Two other new fjords were also discovered: a small one on the S. side of Greely Fjord, and a large fjord, where 2 musk-oxen were slain, on the N. side. The limestone cliffs at the entrance to the large fjord, named after Tanquary, were highly fossiliferous. As new features of the unfolding landscape came into view, Ekblaw named them after his American friends. He was now doing pioneer work and says that the exploration of Tanquary Fjord was the most important part of his journey. The fjord extended nearly 30 miles in a north-westerly direction and was flanked by high mountains, one range of which was named the Osborn Mts. in honour of the President of the American Museum. Many glaciers in Tanquary Fjord descended to sea-level, and the scenery at its head was very grand. A large valley extends from here towards Lake Hazen. More Eskimo ruins of stone houses were found and 6 more musk-oxen killed.

Ekblaw climbed a mountain from which to view his promised land, and found it of a majestic appearance. He was tempted to travel through the valley from the head of Tanquary Fjord to Lake Hazen, and this would have been breaking more new ground; but he preferred to follow Lockwood and Brainard's route of 1883. On 16th May, Ekblaw's party had returned to Greely Fjord, and they reached its head on the same day of the year that their predecessors, 32 years earlier, had started from this point for Fort Conger. As Lockwood's route was followed, little need be said of it except that it is forbidding country, with precipices 1,500 ft. high, enclosing dreary lakes and deep cañons of Cimmerian gloom. The plateau was reached with great difficulty after the dogs had begun to fail for want of food; they were saved, however, by a herd of 8 musk-oxen. On reaching Lake Hazen Ekblaw had an alarming experience. He was suddenly seized with severe internal cramp, and remembered that an Eskimo had once died from drinking ice-water after eating a large quantity

of caribou tallow. As this was precisely what he had done, he hastened to write his last messages and to give the Eskimos final instructions. Fortunately he did not die, having a more powerful digestion than the Eskimo ; he slept soundly until, with the dawn, hope revived, the pain was gone, and he hit the trail in high spirits at his reprieve.

He found the Ruggles River a splendid frozen highway, a quarter of a mile wide, down which rapid progress was made to Fort Conger. Ekblaw's natural surprise that no one met him at Lake Hazen, as arranged, was deepened on finding Fort Conger also tenantless. His party was now in no need of food, and the last musk-oxen killed on the trip, a herd of 11 head, were shot near Conger. On 4th June Kennedy Channel was crossed to the Greenland coast, and the following day Green and 2 Eskimos were met at Cape Constitution, where they had been stopped by open water. Etah was reached on 16th June, 1915, without further incident. The journey had been most successful, as well as free from casualties. Ekblaw brought back good geological and botanical collections ; he supplemented the work of Greely and Sverdrup on the W. of Ellesmere Land ; and he travelled about 1,200 miles at an average rate of 16 miles a day, or probably more than 20 m.p.mar. The last 280 miles from Fort Conger were covered in 9 marches, at 31 m.p.mar., which was a high average for this distance.

In addition to the birds seen in Smith Sound during the summer of 1914, brants, long-tailed ducks, snow-buntings and wheatears were busy laying their eggs by the end of June, 1915. The American explorers were busy packing their great collections in readiness for a ship that might possibly arrive to take them home ; but as they were harassed with doubts as to whether they would be going or staying, thousands of pounds' weight of meat had to be killed and stored for the winter. On 1st September all hope of returning home that year was abandoned and the party again began to settle down. Tanquary had delayed the amputation of 2 frostbitten toes, as he thought the operation might be performed in the United States ; now Dr. Hunt successfully removed the afflicted members.

On 15th September a motor-boat arrived with Dr. Hovey, the official representative of the American Museum. He had come out to Greenland on a schooner sent to take the expedition home, but was unable to proceed farther than North Star Bay, 150 miles to the south and he invited the party to return in the motor-boat. MacMillan definitely refused as he felt he must stay with the collections that could not be carried. Dr. Hunt was away hunting ; but Ekblaw,

Tanquary, Green and the electrician at once went aboard and left for the south. The cook stayed with MacMillan, and the two inhabitants of Borup Lodge were soon immersed in the annual news of the world that had arrived in their letters and papers. In due course Dr. Hunt returned and preparations were made for the winter. Then on 5th November Green came back, accompanied by Freuchen, with the news that the relief ship was frozen in, 90 miles to the south, and in need of MacMillan's help. This was given at once, and in the course of the journey he complained of taking 16 hours for a run of 48 miles that he had repeatedly driven in 9 hours. MacMillan's second long journey was made in the summer of 1916.

Up to this year Sverdrup's King Christian Land was assumed to be the eastern side of Sherard Osborn's Finlay Land; but the country had only been seen from a distance. Part of MacMillan's programme was to survey and explore it, as well as any other land in its vicinity. On 21st March his party set out in a blizzard, and reached Ellesmere Land on the 24th. The next day 12 seals were shot and the meat cached before leaving Flagler Fjord for the pass; this route, used by the Eskimos for centuries, was now chosen and the divide reached in 9 hours. The Eskimos who formed the rest of the party showed MacMillan where Dr. Cook left a depot near the Flagler Pass. On 29th March another Eskimo arrived in camp from Etah after driving the 150 miles in 3 marches. Nine musk-oxen were shot in Bay Fjord on 31st and 3 more next day. Fresh meat at this time was secured daily. After driving 50 miles on 4th April, to the entrance of Eureka Sound, the first supporting party was sent back loaded with meat and skins. MacMillan's course was then westward along the S. coast of Axel Heiberg Land until Cape South-West was reached on 10th April. From Etah to this point the distance was 345 miles and the average speed had been 17 p.m.d. The last supporting party now turned back and MacMillan went on with 3 young Eskimos.

He carefully worked out their speed on the 13th and found it to be  $3\frac{1}{4}$  m.p.h.; they covered 50 miles in the day, about half of which the men walked. A new islet was discovered a mile to the south of Amund Ringnes Island. Ellef Ringnes Island was reached on 17th April, and next day King Christian Land rose above the horizon. On the 19th its coast was attained for the 1st time, and peaks 2,000 ft. high were seen in the interior. It had been charted by Isachsen of Sverdrup's Expedition. But now that MacMillan had reached his objective a blizzard came on and raged for 3 days without intermission. On the 3rd day, 22nd April, he started for home, apparently short of food for the dogs, though he had not started killing

them. Thus little was done here, though some more work was carried out on North Cornwall on the way home and Etah reached on 16th May after a journey of 1,200 miles at an average speed of about 21 m.p.d.

The first blossom of the season, a purple saxifrage, appeared on the 5th June, followed in a fortnight by the Arctic poppy, arnica, dandelion, daisy, and in favoured localities by ferns, bluebells, rhododendrons, heather and even mushrooms. There was the same uncertainty as to whether the expedition would be going home or not as in 1915, so everything was again packed and another store of meat secured for the winter. The Eskimos killed 75 walrus in the months of July and August; 1 of these beasts had 3 tusks. On 17th August Dr. Hovey and others called in the motor-boat, but MacMillan again refused to abandon his collections without positive instructions from the American Museum and remained alone at Borup Lodge. By 18th he had 160 boxes packed, and by 1st September he had given up hope of relief for the 2nd time and began to rush preparations for the winter. On 7th four of the other men returned to Borup Lodge, and this time they remained.

On 11th January, 1917, a letter was received from Stefansson who had found MacMillan's record on Ellef Ringnes Island. The explorers were at one time only 800 miles apart, but the letter had travelled 10,000 miles. The most important work that MacMillan could now carry out was the exploration of Peary's channel across the N. of Greenland; hence he was disappointed when Rasmussen informed him that the channel was on the Danish programme. There yet remained, however, the exploration and survey of the Ellesmere Land coast from Cape Sabine southwards to Clarence Head; this coast had never been explored on foot and had only been charted from ships. MacMillan set out on 25th March, 1917, with 4 sledges and 42 dogs, crossed Smith Sound, and in Rice Strait found a cairn and a cable, both relics of Sverdrup's expedition. Near Cape Herschel, on the site of Greely's first camp, one of his boats was seen. Records of the Nares expedition were discovered at Cape Isabella, and the reports were quite legible though written on 24th August, 1876. The large amount of open water along the coast decided MacMillan to return from this point, especially as he still hoped for an opportunity of exploring Peary's channel, should Rasmussen be unable to do so.

Etah was reached on the 9th April, and the following day Rasmussen arrived; he astonished MacMillan by admitting that he had no pemmican and very little biscuit or oil. He was given 290 lbs.

of pemmican, 100 lbs. of biscuit and 30 gallons of oil. (See p. 119.)

On 3rd May MacMillan again set out for Cape Isabella to continue his survey, and arrived on the 9th. To the south of the cape the country was virtually unexplored, and the first survey was made of Cadogan Inlet. The temperature on the W. side of Smith Sound was 10° colder than on the E. side; and the coast as a whole, especially between Paget Point and Clarence Head, was much more heavily glacierised than the W. coast of Greenland. A new island was discovered 2 miles S. of Paget Point and named Orme Island; and a new glacier, the American Museum Glacier, 20 miles long, was discovered near Cape Faraday. Only 9 glaciers had been charted on the coast before MacMillan's exploration; he mapped and photographed 42 of them between Cape Sabine and Clarence Head. A long piedmont at Boger Point was named in honour of the American Geographical Society. The latitude of nearly every point on the coast was said to be inaccurate. Saunders Island is a nunatak completely surrounded by ice, but it may have been an island before the advance of the glacier. The return journey from Clarence Head was begun on the 16th May when Talbot Inlet was found to be a beautiful fjord, 8 miles long, with hills 1,000 ft. high on its flanks, intersected by numerous glaciers. On 24th May Etah was reached after the 10th crossing of Smith Sound.

In 1915 and 1916 unsuitable ships had been sent to Etah and neither had arrived. In 1917, 200 boxes were packed by 28th July and everything was ready for the return to civilization. On the following day Capt. R. Bartlett arrived in the *Neptune*; Sydney Harbour, Cape Breton, was reached on 24th August, 1917, after "four years in the white north," as MacMillan's book is named, and an interesting expedition came to an end.

The Dominion Government since 1919 has devoted much attention to its Arctic possessions, and in 1922 the first annual patrol was sent by the Department of the Interior to "the islands of the Canadian Arctic Archipelago: to reprovision the Government posts; to establish new posts when necessary; and to convey the officers of the various departments who are detailed for duty in that area" ("Canada's Arctic Islands"). On the 1st patrol, under Dr. J. D. Craig, a post was established at Craig Harbour, near Smith Island,

on the N. coast of Jones Sound, and 6 constables of the Royal Canadian Mounted Police were left under Inspector Wilcox with 2 years' stores. The following year they were taken on board the *Arctic* and a call was made at Etah, where MacMillan was found with the *Bowdoin*, and visits were exchanged. MacMillan returned to his old haunts from 1923 to 1924 for the purpose of making an Arctic film; and he placed on Cape Sabine a tablet to the memory of Greely's men. The ice prevented a new Canadian post from being established on this cape as intended, and the *Arctic* returned to Craig Harbour. In February, 1924, the main building was burnt down, and the 3 constables nearly lost their lives. The temperature was  $-55^{\circ}$  F., and they lived in the blubber house. They made a journey of 100 miles to the west, along the N. coast of Jones Sound, and had found in a cairn one of Sverdrup's records of the year 1899.

A hut well stored with provisions and fuel was left in Rice Strait in 1924, but again it was necessary to winter at Craig Harbour, though a new post was established at Dundas Harbour in Lancaster Sound, and more southerly posts than those in Ellesmere Land had been established from the first. In 1925 the depot in Rice Strait and the station at Craig Harbour were visited by the *Arctic*, but the stores and material, amounting to 100 tons, carried for a more northerly post, were left for the season at Dundas. The following year another ship, the *Beothic*, a steel vessel of 2,700 tons, was chartered and 42 men went N.; 1,500 tons of coal and 300 tons of general cargo were carried. At Dundas the new northern station was taken on board and Craig Harbour reached on 30th July. Here an S.O.S. was received from Capt. R. Bartlett that the *Morrissey* was aground 50 miles S. of Etah. The *Beothic* went to his assistance, but on the way received a further message that all was well. This year a new post was established on the S. side of the Bache Peninsula, near the entrance to Flagler Fjord, in lat.  $79^{\circ} 04' N.$ , one of the most northerly outposts of civilization in the world. Staff-Sergeant Joy was left in charge with 2 constables.

Thus the Canadian Arctic Patrol visits the islands of the Franklin District year after year and advances their exploration, scientific investigation and administration. In 1928, 1929, and 1930 the ice prevented the post on the Bache Peninsula from being reached, but supplies were landed 25 miles away. The *Beothic* was able to enter Flagler Fjord in 1931 and made arrangements for a further search for Dr. Kruger's missing party. The police made a splendid journey in carrying out this search, but in order to understand it we must go back to the year 1930.

In that year Dr. H. K. E. Kruger, R. A. Bjare and the Eskimo Akoioa left the post on the Bache Peninsula to make the reconnaissance for a larger scientific expedition in the north of the Sverdrup country. They were trusting, though to what extent is not on record, to living on the country ; and Kruger, before setting out, had been suffering from meat poisoning. It is also said that he had insufficient ammunition for a long journey. His party failed to return to Bache and the police made a search in 1931. As no trace of the missing party was found, Corporal Stallworthy and Constable Hamilton led other search parties in 1932. They left Bache together on 20th March with 7 Eskimos, of whom Etookashoo of Dr. Cook's and Koch's journeys was one, and 124 dogs. From Bay Fjord Stallworthy went north and Hamilton west. The reports of each state that the dogs suffered from want of fresh meat when fed only on pemmican. Hamilton saw no sign of Kruger at Cape South-West on 3rd April and crossed to North Cornwall, returning to Cape South-West on 12th. Next day his party covered 50 miles in the 24 hours. One of his Eskimos was severely injured in the hip by a wounded bear which the Eskimo afterwards killed. Baumann Fjord was reached on 22nd and the land crossed to Smith Bay ; the E. coast was then followed northwards and Bache regained on 7th May. Blizzards and deep snow had impeded progress ; 17 dogs had succumbed. A distance of 25 miles was not considered a good day's march. The total distance sledged was 943 miles, and Hamilton's opinion was that Kruger had been north of the country visited on this patrol. The Eskimos were confident that the missing party had perished before 1931.

Kruger had intended to travel over the pack to the north of Axel Heiberg Land ; but as he had only one heavily-loaded sledge, Corporal Stallworthy believed the journey impracticable. The latter officer parted from Hamilton on 24th March and drove northwards along Eureka Sound where much game was seen ; when the dogs became hungry and weak from their diet of canned meat, 6 bull musk-oxen were shot on 4th April after which the dogs pulled better. Musk-oxen are now strictly preserved in Canadian territory. Schei Island was found to be a peninsula. All the shores were carefully searched for signs of Kruger, but nothing was found until the north of Axel Heiberg Land was attained. Here a report, written in German, was discovered ; it was dated 24th April, 1930, and said that the party had visited Lands Lokk and were then on their way to Meighen Island. The record was signed by all the members of the party.



On proceeding to the south-west, Stallworthy became short of food, owing to the restrictions in killing musk-oxen and the roughness of the route. It was therefore necessary to aim for the depot at Cape South-West, and before reaching it some of the dogs were staggering from weakness, though the men's food had been given to the bitches. On 20th April 6 dogs had to be killed to feed the remainder. Next day the depot was reached by leaving the heaviest equipment behind, and a note was found from Hamilton. A few days' supply of tinned meat was in the depot, but the dogs did not recover condition until 7 caribou were shot on 26th; this meat also proved insufficient, because lean, and on 29th the dogs were again hungry and weak. On reaching Eureka Sound, 6 more dogs had to be killed and the party went hunting. A seal of about 300 lbs. was secured on 4th May, the fat of which was equal to half a dozen caribou. Other seals and a bear were afterwards shot, and on 9th Etookashoo went back for the equipment. The return was by Bay and Flagler Fjords and Bache regained on 23rd May after 65 days in the field. The distance sledged was at least 1,400 miles, and the map had received some corrections. Stallworthy says that no severe hardships were experienced by the men, though 29 dogs were lost; and he believes that Kruger's party perished on or beyond Meighen Island during the winter of 1930-1 from want of food. Etookashoo and Nookapinguaq are specially mentioned as excellent guides. Corporal Stallworthy is to be congratulated on a very fine journey.

The Bureau of Information at Canada House, Trafalgar Square, has been good enough to supply copies of all their bulletins, and this chapter may fitly conclude with the following.

SPECIAL PRESS BULLETIN. *Issued 15th March, 1933.*

CANADA AND THE EASTERN ARCTIC  
RETURN OF THE 1933 EXPEDITION

"The Department of the Interior at Ottawa reports the return home of the members of the 1933 Expedition to the Canadian Eastern Arctic after a most successful patrol. The expedition utilized this year the Hudson Bay Company's Steamship *Nascopie*, which sailed from Montreal on July 8th and returned to St. John's, Newfoundland, on September 27th.

During the outward voyage the *Nascopie* called at Cartwright, Labrador, and made stops at posts on both sides of Hudson Strait, afterwards entering Hudson's Bay and proceeding southwards to Charlton Island, opposite to the new port of Monsonee, the recently opened terminal of the Timiskaming and Northern Ontario Railway. Subsequently the *Nascopie* proceeded to Churchill and called at Southampton Island, thence sailing to posts on the southern shore of Baffin Island—the latter being the northernmost point of the patrol.

A call was made at Robertson Bay, Greenland, for the purpose of returning Eskimos employed by the police in the search for Dr. H. K. E. Kruger. Robertson Bay is approximately 725 nautical miles from the North Pole.

On the return trip southward, Pond Inlet and the remaining posts on Baffin Island were visited, including Pangnirtung, the return homeward being by way of Port Burwell and Cartwright.

Members of the expedition made visits to Eskimo villages, missions and police posts, and a number of operations were performed by the medical officer. Fingerprints were taken by the police of these persons treated by the medical officer in order that later reports might be identified. Generally speaking, the health of the population was found to be good.

The Department of the Interior distributed 10,500 pounds of dried buffalo meat, obtained from the slaughter of surplus animals at the Buffalo National Park, Wainwright, Alberta, and 500 green buffalo hides were distributed to those concerned with Eskimo relief. . . . Reports were received from detachments of the Royal Canadian Mounted Police on islands and mainland posts in the eastern Arctic. The chief interest in the thousands of miles of patrol reported upon being the three-year search for the missing Kruger and his Danish assistant, Mr. A. R. Bjare, and the safe arrival at Craig Harbour on the south coast of Ellesmere Island of the Bache Peninsula detachment, which had performed the greatest part of this work.

As the Bache Peninsula post was not reached by the 1932 expedition, the members were instructed by radio-telegraphy to move south to Craig Harbour, where supplies were left for them by the 1933 expedition. The members of this expedition were taken on board and a new detachment left at the re-opened Craig Harbour post. It is not intended to reoccupy the Bache post for the time being, though the buildings were left in good order. With the relief of the Bache Peninsula officers the unsuccessful search for the Kruger party was closed, after 3,000 miles of journeying by the patrols in various directions.

Scientific features of the expedition were more prominent this year than ever before, including geological examinations in areas on the south shore of Hudson Strait and near Cape Smith on the east side of Hudson Bay. Sulphide deposits were mapped and studied in some detail, whilst at Lake Harbour on Baffin Island the old mica mine and graphite deposits were examined and new data on the structural geology of the district was obtained. The coal deposits near Pond islet, at the northern end of Baffin Island, from which that settlement secures its fuel supply, were studied and samples collected. At this point, as well as elsewhere, on Baffin Island and also on Devon and Ellesmere Islands, important information concerning glacial history was obtained.

Inspection was made of the meteorological stations at Port Burwell, Lake Harbour, Port Harrison, Churchill, Dundas Harbour, Pond Inlet and Pangnirtung and new stations were installed at Coral Harbour, on Southampton Island, and at Clyde River, Baffin Island. The station at Craig Harbour was re-established and refitted. Much valuable information was obtained regarding the topography of the areas about the stations with relation to its effect on temperatures, winds and precipitation. A number of special observations were made during the voyage particularly regarding optical phenomena.

A pioneer effort was made in connection with the inauguration of a

parasitological survey, and a number of specimens were collected and arrangements made for others to be collected at all posts along the route and to be forwarded to Ottawa by next year's patrol. Botanical research was unfortunately terminated at Charlton Island by the lamented illness and subsequent death of Dr. M. O. Malte, but the collection of over a thousand plant specimens made by him up to that point, which was shipped to the National Museum by rail from Churchill, will undoubtedly prove of great value in the prosecution of the work in the future. . . ."

## CHAPTER X

### STEFANSSON THE REVOLUTIONARY

**R**EVOLTS against established order are probably as old as human history and have been of many kinds—some have been beneficial ; but there have been few such uprisings in the realm of exploration more striking than Stefansson's revolt against the traditions of polar research. Detonations are inevitable on the contact of originality with entrenched conventionality, and Stefansson has been deliberately provocative ; hence he cannot justly complain if others also use plainness of speech.

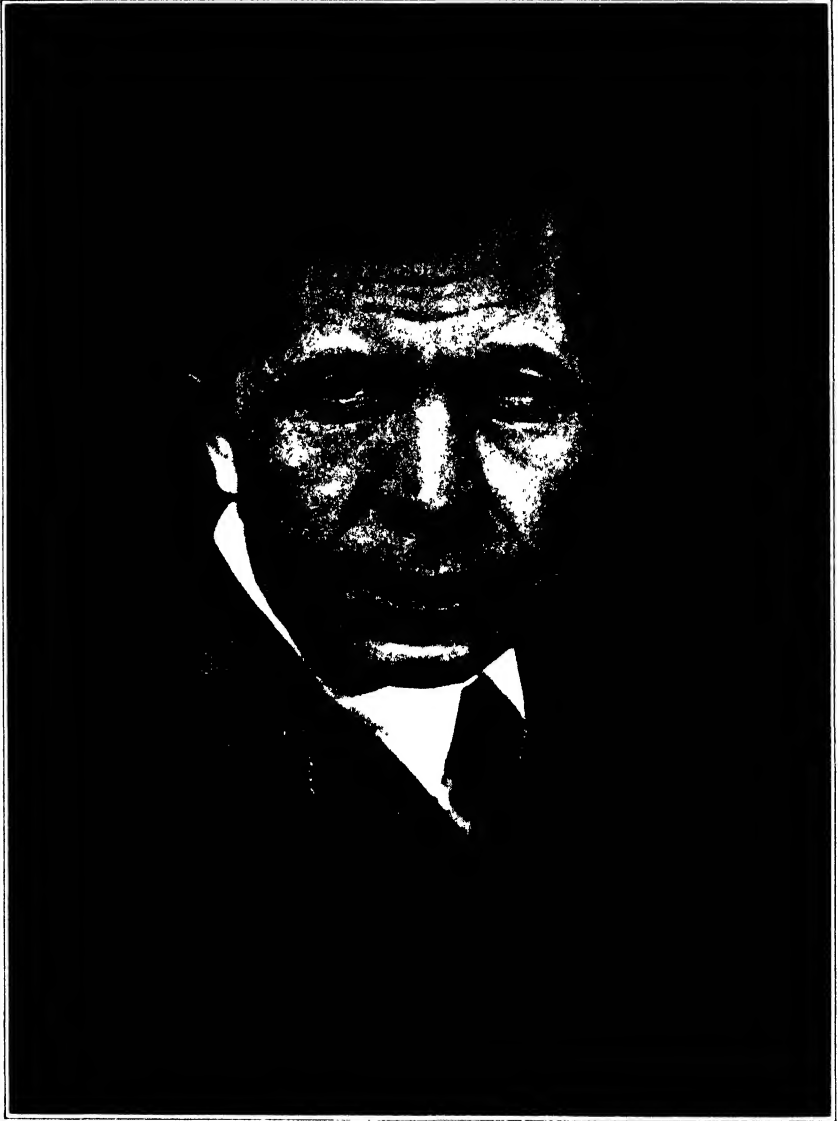
The members of his one great expedition imbibed his spirit too well for his own comfort and convenience, and remind us of Macaulay's " Radical War Song " :

*" Awake, arise, the hour is come  
For rows and revolutions."*

No other expedition of its initial magnitude ever suffered such disintegration, and few leaders so much insubordination, yet much good work was done by each of its two surviving parts. The leader's reputation, indeed, was made by these achievements, based on his novel conceptions of life in Arctic Canada.

In his " Hunters of the Great North " he paints a vivid picture of the pioneering life into which he was born of Icelandic parents in 1879, in Manitoba, and in which he grew up on the wilds of Dakota, where his family migrated before he was 2 years old. His parents wrought at the mighty task of transforming primeval prairies into agricultural land. In the natural order of things he became a cowboy, and life appeared one long sweet song. Before reaching the age of 10 he was proficient, like Rasmussen, in the use of firearms, as well as inured to winters as cold, and blizzards as fierce, as any he was afterwards to experience in the Canadian Arctic. At the age of 18 he had a perfect physique, and was brimming over with energy and ambition that would have assured success in almost any career.

He then entered the State University of North Dakota, and passed on to the State University of Iowa, where he graduated as a



*By courtesy of the ROYAL GEOGRAPHICAL SOCIETY and L. H. MCKINLEY*

STEFFANSSON



Bachelor of Arts, and afterwards took a 3-years' post-graduate course in anthropology at Harvard and became a Teaching Fellow. In 1904 and 1905 he visited Iceland. He then decided to become a field investigator in his subjects, ethnology and anthropology, and in 1906 was appointed to Leffingwell and Mikkelsen's expedition, on which soundings were taken over the Continental Edge from the Beaufort Sea pack ice. Stefansson appeared to hold a roving commission, the expenses of which were paid by the universities of Harvard and Toronto. His first northern journey was through 2,000 miles of Indian country to the delta of the great Mackenzie River on the Arctic coast, where he found that his preconceived ideas of the Arctic had been incorrect. He was to write and lecture widely in later years on what he delighted to call "The North that never was," which he made a chapter-heading in two of his books, and he became a rank revolutionary against his own conception of accepted ideas on the Arctic. With the impulsiveness of youth, he jumped to conclusions that he is now old enough to revise. He did not at first realize how "inartic" were the conditions in the localities he visited.

When Stefansson arrived at Herschel Island, W. of the Mackenzie Delta, on 9th August, 1906, he met Capt. Amundsen, who was completing his North-West Passage in the *Gjoa*. Leffingwell and Mikkelsen were delayed, and this gave Stefansson a free hand for studying the Eskimos. His imagination as a young ethnologist was stirred by reports of some so-called "blonde" natives on Victoria Island; he thought they might be descended from the lost Norse colonies of Greenland or from survivors of Franklin's expedition, and he yearned to pay them a visit. For the present, however, he had to be content with studying the Eskimos of the mainland; he lived with them, and affirms that he enjoyed the life. In the spring of 1907 he met Leffingwell at Flaxman Island, and was back in the United States in September.

In April, 1908, he and Dr. Anderson set off for a 4-years' sojourn in the Mackenzie Delta district, though Stefansson visited Point Barrow in Alaska. No geographical work was done, as the expedition was ethnological; but Dr. Anderson made natural history observations. In "My Life with the Eskimos" Stefansson propounded one of his favourite theories, that adventures are signs of incompetence. At Point Barrow he wrote a vocabulary of over 9,000 local Eskimo words and several hundred thousand words of their folk-lore; he became fluent in some of the native dialects (*ibid.*, 85).

During the 4 years of this expedition he found the country fruitful in game and friendly to man. Hence he thought that much of the Arctic would be similar, and that explorers, if good hunters, could live on the country. As he has given such prominence to this theory, it is well to remember that our prehistoric ancestors were the first to live by the chase; and other Arctic explorers, notably Rae and Rasmussen, had practised it before him. Its data need to be carefully considered (see Appendix II). It will be convenient to refer to the method, on land but not on the pack ice, as "Rae's System." Nature seldom produces a hunter who is also interested in science; so Stefansson appears to be *sui generis* and perhaps an inevitable revolutionary. He is a born and trained hunter who loves the chase, as all good hunters should, above all else in life; and the years he spent in the north were mainly on hunting expeditions, in order to live, though his other results were valuable—but undoubtedly they were jolly hunting trips.

The Canadian Arctic Expedition, 1913-18, was decided upon during the years with the Eskimos, when Stefansson believed that there was game farther north than he had been. In February, 1913, the Canadian Government undertook to finance the expedition with Stefansson as Leader, Dr. Anderson as Second-in-Command and Capt. R. Bartlett as Master of the *Karluuk* (250 tons). There were also the *Alaska* and *Mary Sachs*, each of 30 tons, and other boats bought later. The expedition was intended to be the most comprehensive of its kind that ever sailed, but it met with almost complete disaster at an early stage and never functioned as a whole. Geographical exploration was the main object of the Northern Party, under Stefansson. The Southern Party, led by Anderson, was to carry on detailed scientific research, and ultimately did so in the Coronation Gulf district, between long. 107° and 124° W. and lat. 67° and 70° N.; cartographical, geological and other surveys were made. The Northern Party, based on the *Karluuk*, was less fortunate.

Stefansson's record of the Northern Party, "The Friendly Arctic," is very long and full of information. The first two chapters are introductory; and the purpose of Chapter II is to show that the current conception of the Arctic before the writer's time, as a region of eternal ice and sterility, was incorrect, for the region is actually friendly. Is it unkind to ask if the personnel of the *Karluuk* found the Arctic friendly? In the remainder of the chapter Stefansson rides his hobby-horse with evident delight, showing that the Arctic is not arctic or frigid. By going back to the days of ignorance he conjures up monsters from the vasty deep in the literary north barren, dismal



and desolate. Then, saying in effect : " Look here upon this picture, and on this," we are shown a country of insufferable heat in summer, with flowers and mosquitoes—this is Stefansson's Arctic. We now come to the sailing of the expedition from Nome in Alaska, in July, 1913 ; but, as its subsequent history is very complicated, no attempt will be made here to follow all its ramifications ; many of them, indeed, appear of slight importance. The work of Stefansson's Northern Party and the fortunes of the *Karluuk* will amply suffice.

This expedition was almost unique from the financial standpoint, for no expense had been spared and it was sumptuously equipped. Stefansson and Bartlett, however, were at first the only men in the ship with previous Arctic experience, and the loss of the *Karluuk* was due to the difference between Stefansson's Arctic and Bartlett's. The former knew that the only safe place for a ship N. of Alaska was the shore water. Bartlett could not understand the local conditions and was anxious until he had persuaded Stefansson to let him take the *Karluuk* away from the land, as may be done in Baffin's Bay. The anxiety then passed from Bartlett to Stefansson who takes full responsibility for all that followed, though persuaded against his better judgment. On 13th August the ship was tied to a floe, over 15 miles from land ; she was afterwards beset and remained entirely at the mercy of the pack.

The two smaller boats were safely navigated through the shore water with the equipment of the Southern Party, which proceeded according to schedule. Stefansson in the *Karluuk* soon came to the conclusion that a long drift would be made, and Bartlett agreed that the ship was unlikely to regain her liberty before the following summer. Hence it was also agreed that a hunting party should go ashore, and Stefansson was its obvious leader ; he took with him Wilkins and McConnell. George Hubert (now Sir Hubert) Wilkins first comes before us as photographer to this expedition. When the hunting party left the *Karluuk* on 20th September, 1913, they expected to be away for a week or a fortnight, and Stefansson must be exonerated from blame in leaving the ship. Bartlett thought she would not move much for some weeks ; and all Stefansson's equipment was on board. Bartlett offered to accompany him, and he helped to equip the party. Its members camped on the Jones Islands, about 4 miles from the mainland, on 21st, and while there a gale arose that broke up the ice and marooned them. In 3 days the gale had subsided, and the *Karluuk* had passed out of sight. The ice soon enabled the hunting party to reach the mainland and they went along the coast to the west.

There was no authentic news of the ship, but Stefansson informed his government that, whatever happened to her, the work of the expedition would be carried on. He wintered in Alaska, collected supplies for his first journey and, in January, 1914, made a trip inland from Herschel Island. Storker Storkersen was engaged and left to prepare equipment for the summer, when Stefansson intended to explore an unknown area of the Beaufort Sea and to live on the game.

On 22nd March his party set out over the pack from Martin Point, W. of the Mackenzie Delta, in about lat.  $70^{\circ}$  N. There were 8 men and 4 sledges, each drawn by 6 large dogs with loads of 145–160 lbs. per dog. At 6 miles from land, when Wilkins and Castel had returned for more oil, a westerly gale sprang up which drove the main party 40 miles SE. After the gale, miles of open water lay to the south of the party, then 20 miles from land. Some of the best dogs and equipment were thus lost for the northern journey, resumed possibly on 3rd April. We are not told with how much food they started, but they threw some of it away to save overloading the dogs. The pack was in motion but was covered with seals, and 6 were secured for food, much of which was sent back with the supporting party on 7th from lat.  $70^{\circ} 13'$  N. and long.  $140^{\circ} 30'$  W. This position was 50 miles from land—reached by the returning party on 16th. Stefansson continued north with Storkersen and Andreasen, 6 dogs pulling the colossal loads of 240 lbs. each, including full rations for 1 month; this food should be noticed. There were 2 rifles and 330 cartridges. The tent was kept as warm as desired with blubber stoves. As seals were plentiful, the rations were held in reserve. Everyone was happy, though in danger from the grinding floes during blizzards.

Progress hitherto had been slow, but on 11th April the ice improved and 13 miles were covered in the day, followed by daily distances of 20–25 miles for the next 3 weeks. About 1,700 f. of sounding wire had been taken, but the sea-floor was covered with mud into which the lead sank and frequently could not be withdrawn. By 15th April 4 sinkers had been lost and only 2 others, with 700 f. of wire, remained. The soundings therefore, except for ascertaining the position of the Continental Edge, were of little value, as they all showed 700 f. and no bottom. Igloos were built where the snow was suitable; they took 45 minutes to erect and were more comfortable than the tent as long as there was ample blubber for fuel. The consumption of game, when plentiful, was never stinted; but it is important to notice that as the party pro-

ceeded farther from land less game was seen, and finally a "desert" area was entered. We are then regaled with long dissertations upon snow igloos and sledging, but our attention is not diverted from the fact that no kill was made more than 50 miles from the Canadian coast until Banks Island was approached. Old bear tracks were seen farther from land; no seals, however, appeared in the channels. These facts support the old belief that most game is found near land; and they tend to discredit dependence upon hunting on the Arctic pack.

In lat.  $72^{\circ} 15' N.$  (not  $75^{\circ} 15' N.$ , as on p. 185 of "The Friendly Arctic"), reached on 23rd April, a great change in the ice was seen. It was evident that there had been no lateral movement of the pack throughout the previous winter; the channels had simply opened and closed, so that either there was no drift or a very large area was moving at a uniform rate. The distance from the mainland was about 160 geog. miles, with Banks Island 300 miles to the E. On 25th a distance of 24 miles was covered, for it was necessary to travel as rapidly as possible across the desert. Full rations were still eaten, but probably these were the original supply. The wind then blew from the E. and this decided Stefansson, in lat.  $73^{\circ} N.$ , to alter the course. Had his party been a fortnight earlier they could have continued on the northerly course for another 150 miles; but to avoid undue risks of adventure that might have proved fatal, a great circle course was then set for Cape Alfred on the NW. of Banks Island. It may have been unfortunate that the northerly course could not be continued longer because the theory of living on the country was thereby left, for the time, unproven.

Full rations for 15 days remained, and the party had not been living by the guns for the previous fortnight. Signs of game were vanishing; but an unknown area was being explored. The daily marches until the first week in May varied from 15-25 miles in length. Stefansson admits that the first 10 days of this month were a period of anxiety, for the food was nearly exhausted and there had been no game for weeks. On 5th May the party went on half-rations—no great hardship after consistently eating to repletion during most of the journey. Even Stefansson began to harbour unworthy doubts as to the possibility of living on the country, and on p. 191 of his "Friendly Arctic" says that he hastened to be near Banks Island in the (orthodox) belief that more game would be found near land than out at sea. Whatever he says cannot alter the fact that no game was seen at a greater distance than about 200 miles from land. Most of his writing on the subject, perhaps naturally, is special pleading to justify the theory of living by a gun.

Then on 7th May a seal was seen a mile away, though no attempt was made to shoot it, and the desert of 300 miles in width had been crossed. Half-rations for 2-3 days then remained. A long march was made over rotten ice, but the risk had to be taken because summer was approaching and the annual break-up of the pack had already begun. On 10th lateral motion at the channels was again observed. By 13th old boots and bed-skins were being fed to the dogs, and the men were down to  $\frac{3}{4}$  lb. of food a day, with only 2-3 days' supply, at this rate, now left. Two seals were shot, but both sank and were lost. A feeling of depression came over the party in camp that night, for the dogs were very thin.

The party struggled to make easting across numerous open channels, and found on 15th that the ice was drifting W., which was alarming. Two more seals were then seen and shot, but both sank. At last the tide of trouble turned and the 3rd seal floated. Three days of rest and feeding followed, for it mattered not where the party drifted if they had food. On resuming the journey on 18th May seals were numerous and meals gargantuan, but the party was then only 120 miles from Cape Alfred. The remainder of this journey was much enjoyed, for anxiety was over when food was plentiful. There was now so much open water that a sledgeboat was constructed by enclosing the sledge in a sheet of tarpaulin brought for the purpose; this boat carried a load of 1,000 lbs., and the equipment and supplies were ferried across each channel in 2 trips. On 24th May a channel about  $\frac{1}{4}$  mile wide was reached, but the water was too rough for crossing, and in a few hours it was 5 miles wide. The following day an open sea confronted the party; they were marooned on an island of ice. This was no cause for alarm, as the floe was 50 feet thick and there was ample food and fuel. A large store of meat was accumulated because it might be necessary to winter on the floe. In living on the Arctic the winter must be spent near the store of food that has occupied most of the summer in collecting—a primitive existence, healthy and carefree but not progressive.

There were plenty of seals, and the seal alone provides nearly all that is needed in the Arctic: the blubber to some extent takes the place of cereals in the diet and makes oil for heat and light. Five bears were shot, and thus the store of meat increased. Spring had arrived; gulls and terns were numerous, while the sea teemed with life, ranging from shrimps to whales. The lat. was  $74^{\circ}$  N., but the floating island drifted in all directions and even brought the party within 50 miles of Banks Island. The short sounding line then came again into play: on 25th May a depth of 397 f. was found, which

showed the improbability of discovering new land ; on 28th, after drifting W., 620 f. were found, and next day it was again 700 f. and no bottom. When June arrived the men were quite content with life, as it was simply idyllic in the summer sun ; but on 5th they had their first opportunity to leave and took it. During the 11 days spent on this floe it had drifted 90 miles west.

The opportunity was not a good one, for the channel started widening, and 4 loads had to be ferried across. The last load was 1,000 lbs. of meat, and even then over a ton of food was abandoned. The channel was a mile wide when the last trip was made, and half a gale was blowing, which tested the seaworthiness of the sledge-boat. The crossing was safely made, but on the resumption of sledging there was danger from the thin ice that lay between the old floes. A NE. course was pursued at 10 m.p.d. ; as the ice, however, was drifting S., the actual course was SE. On 11th June a sounding gave the depth at 400 f. ; frequent depths were taken after this and the positions fixed astronomically. Progress then became very difficult on account of open water and deep snow.

Stefansson's approach to Banks Island resembled Nansen's approach to Cape Fligely from the north, in 1895, in the progressive increase of life. On 15th June the first land birds were seen, and the depth was 170 f. ; this became 27 f. on 22nd, and the following day land was sighted. But the going was bad and the party did not reach Norway Island, where they went ashore, until 25th June, 1914. They had been 96 days on the pack ice. The length of the route, apart from deviations, was about 500 geog. miles, though they had actually travelled 700 miles. The Admiralty chart of Banks Island, based on McClure's survey, was found to need revision, and during the next 3 years the map was much improved. On reaching the coast, Stefansson at once went off caribou hunting, and shot 6 with 8 cartridges at 250 yds. ; he brought their tongues for breakfast after being out all night. When camp was moved to the meat, the party found themselves on an uncharted island about 8 miles long that was named Bernard Island ; it is separated from the larger island by a frozen channel. Most of Banks Island is typical prairie country which was like home to Stefansson, and he spent many months here.

Banks Island is over 200 miles long and nearly as wide ; it was sighted by Parry from a great distance, and in 1851 McClure nearly circumnavigated it in the *Investigator* ; the latter wintered in Mercy Bay on the N. coast, where the ship may still lie on the bottom. Stefansson enjoyed his hunting and shooting here throughout July and August, when 40 caribou were killed ; one herd of 200 was

seen, and 2,000-3,000 head were estimated to be on the island. After caching the meat, on 1st September, the party started southwards along the W. coast where several small islands and large bays were discovered; one bay, 15 miles wide, was named Storkersen Bay. Cape Kellett was reached on 11th September and the *Mary Sachs* found there unloading her cargo to form a small station. Wilkins was in command and brought news that the *Karluĸ* was lost and all hands had escaped to Wrangel Island; it was afterwards found that this was not quite correct.

Stefansson then returned to his master passion and soon bagged 23 caribou with 27 shots. A house had been built at Cape Kellett in which the 2nd winter was spent, and where preparations were made for next year's work. In December, 1914, and January, 1915, Stefansson crossed the Prince of Wales Strait to Victoria Island, and went as far as Minto Inlet; he covered 45 miles in 1 day during his return. Midwinter travel had no terrors for him, and he shot a couple of bears before reaching Cape Kellett. On 12th January there was enough light for 2 hours to see the sights of his rifle. Wilkins carried out tidal observations and prepared zoological specimens until 9th February, when he led a party northwards along the W. coast of Banks Island, thus early opening the sledging season of 1915. Stefansson started with the main party a few days later, intending to strike out NW. from Prince Patrick Island to search for new land, on a 2nd journey over the pack ice. He was the first explorer to revisit the N. and W. of the Canadian Archipelago since the return of the Franklin Search expeditions, 60 years earlier. Stefansson had 3 teams, but the temperature was down to  $-42^{\circ}$  F. and the dogs' paws were cut by needle ice. Various other hindrances were met with, and on reaching Cape Alfred no further advance could be made before 5th April, so he set out on the pack from here. Wilkins was now acting as Second-in-Command of the Northern Party, and went S. for a ship to establish a more northerly base than Cape Kellett, while Stefansson and 3 companions turned their backs on the land.

More risks were run on this journey over the pack than the leader usually considered justifiable, but there had been delay in setting out. On 11th April a risk was taken that might have been disastrous. The party started over an apparently limitless plain of ice only 6 inches thick. It would bear the weight of loaded sledges but was liable to be broken up by wind. As it was hoped to cross in about an hour, the risk did not seem excessive; but the party went on for many hours with the ice bending beneath them. They dared not stop, and the horizon ahead remained an inflexible straight

line. The nervous strain became intense until, after 20 miles had been covered, some thick ice was reached and they were safe. In less than an hour the thin ice began to break up.

The pack was drifting at right angles to their course, and many open channels were crossed in the sledge-boat. On 25th April the rear of the 2nd sledge broke through thin ice. The SW. drift neutralized so much of their progress that they were only 100 miles from Prince Patrick Island by the middle of May. They then travelled NE., but lost as much at night as they gained by day, and turned back 240 miles from the nearest land, to Land's End, the SW. cape of Prince Patrick Island. It was reached on 6th June after an unsatisfactory journey. Not a word was said about food on this trip, and from this we may gather that little game was shot. The W. coast of the island was then followed to the NE. ; but in a few days food had to be sought 10 miles out to sea, where seals were shot at the edge of the fast ice. The journey was continued along this line on which a few islets and reefs were discovered.

The NW. coast of Prince Patrick Island is of a complicated character, and 3 days were spent in surveying. On 15th June, 1915, as Stefansson drove north from Cape McClure, he found a record of McClintock, dated the same day of the year, 62 years earlier. Two days later, as Stefansson was walking NE., 15 miles from Cape McClintock, he had a session with his binoculars. Five miles to the N. he saw Storkersen also sweeping his unknown horizon with glasses ; he appeared to shout and his companions ran to him. As this could mean nothing but new land, Stefansson soon rejoined Storkersen. In due course he saw the uncharted land, afterwards named Brock Island, and next day went to explore it. A record was deposited in which it was annexed by the Canadian Government—the practice on every new land ; but visibility was low and little could be seen until 20th when a bay 16 miles wide was discovered. This land was not Brock Island, and about 2 miles inland rose to a height of 800 ft., partly rolling prairie and partly rock. A mountain showed dimly through the mist on 21st when Stefansson set out alone to reach it. The walk was rough, but after covering 20 miles the summit was attained. The height of these Leffingwell Crags, as they were named, is not given, though from them mountains were seen extending 50 miles N. and E. This new land, Borden Island, was therefore of considerable size. Stefansson walked the 20 miles back to camp in  $7\frac{1}{2}$  hours, and made light of his 40-mile tramp and 20-hour fast. To arrange for a more northerly base for the next year he started back to the south on 22nd June.

The W. coast of Melville Island was followed to Cape Russell and McClure Strait crossed to Mercy Bay. On 3rd July a wolf was caught in the act of eating a seal—possibly the only example on record of a wolf being able to kill a seal. He had attacked his victim's throat, and when disturbed had eaten 6–8 lbs. of fat, but no lean. Ten days later Mercy Bay was reached where little was seen of McClure's winter quarters except some decayed boots. From here the 1st crossing of Banks Island was made, using the dogs as pack-animals. They covered 10 m.p.d. with loads of 20–40 lbs. each, and for shorter distances 50–60 lbs. could be carried. There were 13 large dogs, and the men carried part of the bulky bedding. The journey was delightful, caribou were plentiful and the weather was fine. Cape Kellett was reached on 9th August after a cross-country journey of about 200 miles. The mixed diet at the base caused some indisposition after the unmixed meat consumed throughout the summer.

Two days after arriving, the *Polar Bear* sailed in with the first news of the European War, a year after its outbreak. Harold Noice, 20 years of age, arrived in the ship from Seattle and subsequently accompanied Stefansson. After a summer visit to Herschel Island the establishment of a base N. of Cape Kellett was undertaken. An attempt was made in the *Bear* to penetrate the Prince of Wales Straits to Melville Island, but closely-packed ice was encountered, and a new house was erected no farther north than Walker Bay, Victoria Island. Stefansson at once went hunting. The house was inhabited by 21st September when Storkersen set out to lay a depot at Peel Point on the NW. of Victoria Island. Stefansson started on an ethnological journey towards Minto Inlet, and met with the Copper Eskimos. Walker Bay was regained at the end of October.

On 16th November a move was made by sledge to Cape Kellett, whence Wilkins had taken the *Star* and was wintering 20 miles N. of Norway Island. Enough game was shot for the winter. On 2nd March, 1916, Stefansson left the *Star* for the north in the wake of a party under Castel. The N. coast of Banks Island was followed to Mercy Bay, and McClure Strait crossed to Cape Ross. Caribou were plentiful, and the explorers fared sumptuously every day. A bear was shot at Cape Ross. Storkersen, travelling from Victoria Island, was now ahead of Stefansson's party, and Wilkins turned back to take his part in the war. Stefansson followed Storkersen to the NW. from Liddon Gulf and crossed the isthmus to Hecla Bay. Here he was on the classic ground of the Franklin Search expeditions, and a monument left by McClintock was seen on Cape Fisher. About



this time (for no date is given) Stefansson sprained his ankle ; this was the only serious accident he ever had, and he did not allow it to interfere with his work.

On 3rd May he overtook Storkersen at Cape Murray, Brock Island, and the dogs after covering as much as 30 m.p.d. had 3 days' rest. The supporting party carried 2 rifles and 200 rounds of ammunition ; Stefansson had 3 rifles and 500 rounds. On 7th Storkersen started back S. and Stefansson, riding on a sledge, advanced N. with Castel, Noice and 2 Eskimos. Fogs made surveying difficult ; but Brock Island and the N. of Borden Island were charted. As a month's food for 2 men and 9 dogs remained by 21st May, most of it was given to Castel and Noice who went on ahead, while the other 3 men with 2 teams depended entirely on game. Two days later, while Stefansson was hobbling about, he fell 14 ft. down a tide-crack ; he escaped without help, but then had a slip that again wrenched his ankle.

A N.E. course was taken from Borden Island and a line of soundings made to Cape Isachsen on Ellef Ringnes Island, reached on 31st May ; the greatest depth was 243 f. Castel's party was overtaken here ; having provisions to carry, his speed had been no more than half that of Stefansson, though the latter had to ride. As Castel had what Stefansson terms " the common ideas about food," he was sent back from this cape on 4th June with nearly all the groceries. Noice and Charley were taken on as they had no objection to a meat diet. Attention is called to the fact that Stefansson took this party of 3 men, already 500 miles from their nearest base, another 100 miles farther with only a week's rations. Yet there was actually little risk when near land or open water. While civilians at home, during the war at this time, were deprived of sufficient food and warmth, Stefansson on the Arctic pack was living in the lap of luxury with almost unlimited food and fuel. Cape Isachsen was said to be incorrectly charted, and the following year was found to be an island. Raised beaches were seen here, and then a NE. course was set over the pack.

On 5th June Stefansson was well enough to walk 6 miles, after 37 days' incapacity. The height of one pressure ridge was measured ; it was 78 ft. and well aground, as the depth was 26-30 f. Morainic matter was seen on ice 2 years old. On 13th new land was seen to the NE. Next day it was reached and found to be snow-covered, with hills about 200 ft. high. Hutchins geese, eider ducks and gulls were flying about, and a prodigious number of eggs were eaten. Observations were taken, and several days spent exploring, Stefans-

son limping slowly along. Rain fell on 15th; there was no great depth of snow. Meighen Island, as the land was named, is about 30 miles long and 20 miles wide; it is bare except for a little grass, some lichens and mosses. There are raised beaches, and sea-shells are scattered over the island; the *ejecta* of owls were also seen.

On 23rd June the return journey was begun, and the snow mountains of Axel Heiberg Land were sighted to the east. The season was now too advanced for pushing farther north and there were surveys to be completed in the south, as well as preparations for next year's work. Meighen Island was nearly circumambulated, and on 28th a S. course was set for Amund Ringnes Island which came in sight 2 days later. Hassell Strait, crossed on 14th July, was found to be 15 miles instead of 3 miles wide, and tidal observations were taken near its southern end. Near here MacMillan's record of 22nd April, or less than 3 months earlier, was found. As it stated that MacMillan had been to Finlay Land or King Christian Island (see p. 142) Stefansson assumed that Isachsen's map was correct and was surprised to find the island smaller than charted. A controversy afterwards arose over Stefansson's discoveries of the next few weeks, but it will suffice to give an outline of his experiences.

He was greatly perplexed because so little that he saw agreed with Isachsen's chart; and finally he was forced to the conclusion that he was discovering new islands. He was certainly the first explorer to cross many miles of this district. The largest of the new islands, which he named Lougheed Island, is 40 miles long by about 12 miles wide, with 3 smaller islands. Sledging on the pack became almost impossible, for the dogs were swimming in, and the men wading through, deep water on the surface. On 22nd July a bear was seen stalking the camp; as he sprang, Stefansson and Noice both fired and brought him down. On 9th August Lougheed Island was reached and proved a delightful summer residence with grass and flowers, butterflies and beetles, while eider ducks swam in the shore water; there were also caribou and many birds. Bearings and tidal observations were taken. The autumn frosts made it possible to start the crossing to Borden Island on 9th September, but the journey was difficult and land was not reached until 15th; the distance between the islands was 50 miles. The coast of Borden Island was followed to the S. and W., Stefansson hoping that Storkersen had established winter quarters on or near Cape Murray. In this he was disappointed; none of his parties was seen, nor any depots.

Not even a message was found at Cape Murray, and Stefansson's party, after sledging the great distance of 1,500 miles, was in need of

clothes and other equipment ; now they had to face the worst part of their long journey. It was over 100 miles to Cape Grassy in Hecla Bay and they might have to go farther than this. They started on 26th September with very little food, but on reaching Melville Island on 2nd October some musk-oxen were shot and camp was made here for 3 days. On 7th the first of their people were met at Cape Grassy. Liddon Gulf, where Storkersen had set up winter quarters, was reached on 16th October after over 7 months in the field, during which Stefansson's party had lived by hunting and had travelled about 1,700 miles. This was a splendid journey and very creditable to Stefansson. No less than 120 carcasses, mostly of musk-oxen, had been stored by Storkersen, who had been unable to push the base farther north.

About 1½ tons of meat were cached on the S. of Melville Island, and 4½ tons of other foodstuffs were found in Bernier's hut at Winter Harbour not far away (see p. 134). Some of these stores were now used, and everyone but Stefansson was glad of a little coffee and of other luxuries, as a change from the continual meat. Stefansson would not admit that he desired any other drink than the broth in which the meat was boiled. When game was plentiful he ate absolutely nothing but unseasoned meat, not even salt, on his journeys. The Bernier groceries appeared to have a bad effect on some of the men during the following season. In the winter of 1916-17 meat was sledged northwards to Cape Grassy. The temperature fell as low as -60° F., and oil could not be poured out of a vessel with an aperture of over an inch in diameter ; the oil gave little light, and so clogged the primus that it would not burn.

The 4th and last sledging campaign of the expedition opened on 3rd March, 1917, when Storkersen set out with 4 teams for Cape Grassy, followed 2 days later by Stefansson's party. They encountered blizzards with a temperature of -50° F., which is a terrible combination of the elements. An advanced party under Castel was sent ahead from Cape Grassy to continue the survey of Borden Island and pick up a depot. On 30th Stefansson drove 28 miles to this island, and registered -54° F. with a breeze of 15 m.p.h.—the coldest spell he ever recorded. One party with 29 dogs was sent back on 5th April from the N. coast of the island, and 2 days later Castel's party was overtaken at the edge of the fast ice. The crucial part of the work now lay ahead, for both Peary and Cook had reported land to the N. of Borden Island.

It was 12th April before the journey over the pack ice began, and then progress was slow. The most striking feature of the pack here

was its stability. Frequent soundings were taken, the 1st at 20 miles from land, and they all gave a depth of approximately 250 f. The conditions were those of an enclosed sea, and new land was expected to the north. At 100 miles from Borden Island the depth was 280 f. and 40 miles farther N., 268 f. Stupendous pressure ridges were then met with and were evidence of shoal water or possibly land. The first evidence, however, was the undulating nature of the sea floor that became more shallow towards the north. The second evidence was the absence of open water ; the movement of the pack was retarded. Its great stability was the third evidence, and the colossal height of the pressure ridges proved them to be aground ; the height of one was over 50 ft. On the threshold of important discoveries, when Stefansson expected to spend many weeks in an unexplored district and perhaps in new land, his hopes were dashed to the ground, possibly by the result of yet another example of the continual insubordination from which this expedition suffered.

Noice and Knight are said to have had scurvy from eating the Bernier groceries instead of fresh meat ; but the former is quite clear in his book, " With Stefansson in the Arctic " (p. 228), that the disease was not discovered until the 3rd day of the return. Stefansson agrees that they had turned back before the complaint was diagnosed, but implies that illness was the principal reason for returning. There was another reason, in itself sufficient, the shortage of food. Noice says that when only 15 days' rations remained it was decided to continue N. for 10 more days, and that on the 7th day they were stopped by a channel in which no seals were seen. The men, perhaps excluding Stefansson, were becoming weak for want of food when, on 26th April, they turned back approximately in lat.  $80^{\circ} 40' N.$  and near long.  $110^{\circ} W.$  The position does not appear in the text of either Stefansson's or Noice's book, but it was 125 miles from Cape Isachsen, the nearest land. This was the 2nd occasion on which no game was seen at a distance of over 100 miles from land, in spite of the fact that water channels, if not numerous, were met with occasionally, but were devoid of life. Stefansson admits that this was another " desert," and doubtless there are many deserts in the Arctic Sea. His journey over the pack in 1915 was inconclusive. In 1916 he was hugging capes and coastlines ; but on the journeys of 1914 and 1917, each of which was a fair test, his farthest points from land were in desert areas. This fact does not support his system ; it supports the old belief that life is rarely found far from land ; and even the revolutionary Stefansson cannot alter the character of the cosmos or the laws of thought.

When Stefansson turned back on 26th April, 1917, he was behind his schedule, as he was every year ; this alone may have left the geographical world with the problem unsolved whether land lay to the N. of his turning-point. Had he not been late he might have reached as far in 1916 as he did the following year, and he would surely have gone another 200 miles in 1917. The want of food, apart from illness, made any further advance impossible ; and, after turning back, the 1st seal was not seen until 4th May, when 60 miles from land. There had been more channels than seals on the northern part of this journey. The crucial problem now was to obtain fresh meat to cure Noice and Knight, who were out of action when Cape Isachsen was reached on 11th. There were then 3 days' groceries for the party of 4, and the dogs were eating old fur clothing ; but Stefansson shot 23 caribou next day, and in a fortnight the invalids were able to travel. Their complaint may not have been true scurvy, but a disease that results from eating preserved food. The return journey was over well-trodden ground, and presented only one feature of outstanding interest.

In the hope of catching one of his ships at Cape Kellett, Stefansson went on ahead of his party on 16th August, when making his 2nd crossing of Banks Island, and performed probably the finest explorer's walk on record, a distance of over 80 miles in 28 hours across country at an average of nearly 3 m.p.h. It was a splendid performance, especially as Stefansson was then 39 years old. Bruce and Rudmose Brown walked about 70 miles in Spitsbergen, but they took more than 40 hours for the journey. Stefansson ended his 1,200-mile journey by walking straight into a series of " Treasure Island " incidents.

The story cannot be told here, for our record of his work is ended and we have only to conclude the chapter ; but its most important points were that the *Mary Sachs* had been deliberately wrecked in order to maroon Stefansson on Banks Island. The plot failed, though Stefansson thought of remaining voluntarily for a 5th summer, and was forced by illness to stay in Alaska for a 5th winter. He appears to have sledged about 1,200 miles in 1914, 1,400 miles in 1915, 1,700 miles in 1916 and 1,200 miles in 1917. He wished to undertake a year's drift on the pack ice of the Beaufort Sea, but his illness during the winter of 1917-18 prevented him, and Storkersen led the party. Perhaps Stefansson saw that the evidence for Rae's system as applied to the pack needed strengthening, and this drift proved its value—up to a point. Explorers should remember that such evidence goes very little farther than the place and year on

which the test was made. Stefansson paid off the crew of the *Polar Bear* at Victoria, B.C., in 1918, nearly 5½ years after they had signed on, and reached Toronto for the armistice, leaving Storkersen to make his drift.

This drift was of considerable interest, and Storkersen made an excellent leader for the party. He was born at Tromsø in 1884, and had made several previous journeys over the pack. On 15th March, 1918, he started N. from Cross Island, Alaska, with a well-equipped party of 12 men and 8 sledges drawn by 56 dogs. The weight of provisions and equipment was 8,000 lbs., and progress was slow. By 3rd April they had covered 105 miles and were in lat. 72° N. and long. 147° W. The first supporting party of 2 men and 19 dogs returned next day, and 10 men with 36 dogs continued northwards. On 8th one floe 8 miles in width was crossed, and, as open water lay to the north, snow houses were built here for the camp. Seals were numerous and 3 were shot at once. On 14th April Castel with 4 other men and 20 dogs went back; the lat. was 73° 3' N. and the long. 148° 32' W., or about 190 miles N. of the Colville Delta. Five men with 16 dogs and full rations for 101 days remained. Storkersen had 1,000 cartridges. The principal occupation of the drifting party was hunting, and on 16th April camp was moved to a better sealing centre. Storkersen kept a diary and took regular observations for position as well as meteorological notes. There were no seals without open water, and the party often came to their last meal of fresh meat, but no meal was missed; they had, of course, their original supplies to fall back upon. About 3 tons of boneless meat was accumulated by the middle of June when the shooting stopped for 2 months. There were still plenty of seals; but fresh water from 10 to 20 ft. deep lay on the surface of the salt water, and when a seal was shot it sank to sea-water level and was lost. By the middle of August the waters were mixed and the seals fatter, so another 4 tons of meat was secured. The total bag was 96 seals and 6 bears.

Storkersen's floe was over 50 ft. thick, 7 miles wide and of unknown length; he walked 15 miles without coming to its end, and it could be regarded as equivalent to land. Birds were innumerable during the summer between lat. 73° and 74° N., and the sea teemed with life—fish, amphipods, jelly-fish and other organisms. In 184 days the floe drifted 440 miles in various directions, though mainly NW.; but this was largely neutralized by easterly drifting. The farthest N. was lat. 74° N. on 3rd September, and the farthest W. was long. 151° W. A long line of soundings was made; at a distance of 40 miles from land the depth was 850 f., and at 90 miles it was 2,500 f.

Towards the end of August Storkersen began to suffer from asthma, and in September he was worse. He had no deputy, and if he died the whole party might perish. They therefore started back to land on 9th October, after proving the possibility of living where they did, if not altogether on the "country." On breaking camp, 55 days' full rations remained of the original supply; hence the party had lived by the guns for 2 days out of every 3, which is probably good enough; but as half the original rations were, in fact, eaten, the experiment failed to prove completely the truth of the theory. The distance to land was 200 miles, and the return journey, with darkness and storm, would have been a terrible ordeal to inexperienced ice-craftsmen. Storkersen merely says it was accomplished without accident or hardship, and that land was reached on 8th November after 238 days on the pack. The results of this drift may prove valuable; during its course there was no apparent current, but only movement by the wind, and no land will be found in the vicinity.

Storkersen's drift brought to a conclusion an expedition that was remarkable, not so much for the wealth of its geographical and other scientific discoveries in high latitudes, for these have been exceeded by many other expeditions, as for the new light thrown by Stefansson on Arctic exploration. No other expedition with which this can be compared has ever undergone such a complete process of disintegration: in one way or another everything and everybody except 2 men of the original personnel broke away from their leader, leaving him with only Wilkins and McConnell. If this expedition be judged by accepted standards, it is seen that the 5 seasons' work of Stefansson and the 3 years' work of Anderson's Southern Party produced valuable results, now embodied in many volumes of scientific reports; but accepted standards may be incompetent to do full justice to Stefansson and his achievements, and in view of this fact they may need reconsideration. The smug conventionality that settles down over polar affairs, as it does over so many branches of life, is now confronted by new methods of exploration, very much as Louis XVI, when he asked if there was a revolt, was informed that it was not a revolt but a revolution.

After Shackleton had crossed South Georgia in 1916, though he had lost no lives, he had nothing left of all the material and equipment of his great *Endurance* Expedition except the clothes he stood up in. This was at the end of an expedition; Stefansson found himself denuded to the same extent at the beginning of one, and its first outstanding feature is the extraordinary amount of intellectual

salvage that he secured in spite of the wreck of the *Karluk*. Very few explorers could have carried out his 5 seasons' work, because very few could have lived, as he lived, on the country. One man, whoever he may be, cannot do the work of a whole staff; and this loss, of the Northern Party's scientists and their apparatus, much reduced the results. Yet they are surprisingly large in the novel and unfortunate circumstances in which Stefansson found himself. To estimate these results adequately it is necessary to observe that an exploring hunter, maintaining himself and a small party by his gun, continued year after year to make geographical and other discoveries, and progressively to consolidate his gains by careful surveying and collecting. There is no reason to suppose that this could not have been kept up for many more years, had Stefansson been supplied with fresh equipment. His methods are not spectacular, but they mark one of the greatest advances in the progress of polar research.

The greatness of this advance is seen in relation to the Franklin and the Search Expeditions, the work of which Stefansson so well continued and extended. His proof is startling that Franklin need not have lost a life for want of fresh meat, had living in the Arctic been as well understood in 1845 as in 1913. If polar research had not developed rapidly, 68 years would seem a short period in which to afford so striking a contrast as this between Franklin's and Stefansson's expeditions. The difference seems mainly due to the return to Nature and the advance of Natural Science, particularly the application of scientific methods to polar exploration, in which Nansen played such a prominent part, and to the system of living by the guns. When Franklin sailed, Nature was neglected except by a few devotees, but confidence in mechanical inventions had arisen. The age of cheap travel into which we were born began in the decade before Franklin set out; though in 1834 Peel travelled from Rome to London, on first becoming Prime Minister, precisely as Constantine travelled from England to Rome on becoming Emperor 1,500 years earlier.

During Stefansson's last year in the north he admitted ("The Friendly Arctic," p. 518) that he had never seen an Arctic glacier. He would have seen many Arctic glaciers had he visited the more truly Arctic lands. The Canadian Arctic, with which alone he is familiar, is the mildest district of its area within the Arctic Circle, where vegetation takes the place usually occupied by glaciers. Thus his "friendly" Arctic is simply Arctic Canada. The term is much less applicable to other parts of the region, and altogether inapplicable to the greater part of it. Stefansson never reached very



high latitudes, and he found little difficulty in avoiding what he terms "hardships." Hence his attempt to alter the character of the Arctic cannot be entirely successful because he has claimed too much. Even he would have difficulty in living on the game in many areas within the Circle; he would suffer real hardship, as other explorers have done, and it is quite conceivable that, in this contest, Nature might have won a final and decisive victory.

If human life could be supported on the game of the N. and NE. coasts of Greenland the Eskimos might be there now; they have lived there in the past, when there must have been more game; and the fact that any Arctic land is now uninhabited may be taken as an indication that, at the present time, it is probably uninhabitable. Rasmussen's "Across Arctic America" is one long story of the Eskimo struggle against the hardest conditions on record; and the book and its author are the complete antidote to Stefansson and his theories. The name bestowed on the Eskimos by Rasmussen, "*a stone age people*," shows plainly the severity of their existence; and he says:

Beyond the tree line, beyond the crop line, far into the area of eternal ice and snow, are buried a score of Eskimo tribes. These tribes eke out an existence by hunting and fishing. They have no business, no work, no real interests in life save the preservation thereof. Their struggles and sacrifices, while tragic, make one of the greatest stories of the human race.

History will probably regard Stefansson not so much as an explorer as an original thinker. His geographical discoveries, important as they were, had been surpassed by Sverdrup in the Canadian Arctic and, among his contemporaries, were eclipsed by those of Sir Douglas Mawson in Antarctica. It is as an initiator of radical views and experiments that Stefansson's name will be known, for here he stands almost alone. It may be that he is so far ahead of his time that he is not yet fully understood, and many years may elapse before his work is seen in proper perspective. His greatest achievement was not the discovery of new land or his living by the chase, but his creation of a new mental attitude towards the Arctic. He has shown that our conceptions of the Polar Regions resemble those of all regions in depending mainly upon our own state of mind; that a month's darkness need not be more depressing than the few hours each day to which we are accustomed; that the risks of living in the Arctic are less than those incurred in crossing the street; and that snowscapes are as beautiful as green landscapes to all who do not criticize them for the absence of trees. Stefansson is revolutionary in the best sense of the word, for he revolts from much that is false and rings in

that which is truer. The concluding words of his greatest work, "The Friendly Arctic," are profoundly true: "It is chiefly our unwillingness to change our minds which prevents the North from changing into a country to be used and lived in just like the rest of the world." To his lasting credit he inaugurated a new era in polar exploration by his original philosophy of Arctic life.

## CHAPTER XI

### THE KARLUK DISASTER

CAPT. ROBERT A. BARTLETT, Master Mariner, and more familiarly known as "Captain Bob," is one of the best known Arctic skippers in the New World because of his ancestry and his association with Peary. He has told us in his autobiography, "The Log of Bob Bartlett," that his family came from Devon and Dorset with a mixture of Spanish blood from the days of the Armada. The Bartletts have always been seafaring people, and early in the eighteenth century some of them migrated to Brigus in Newfoundland, where Robert was born in 1875. His great-uncle, Isaac, in the *Tigress*, rescued the survivors of Hall's *Polaris* after they had drifted on an ice floe for 200 days; and his uncle John took Dr. Hayes north in 1869. Another uncle, Capt. Harry, began the long association of the Bartlett family with Peary, by taking him to Greenland in the *Falcon* in 1893; and Peary made his summer trips of 1896 and 1897 in the *Hope* with Capt. John Bartlett as master. Robert was mate in the *Windward* with Peary in 1898 and 1899, and master of the *Roosevelt* in 1906 and 1909. On the former of these voyages a second cousin of his, Moses Bartlett, was mate. Capt. Bob commanded a troop transport during the war under the United States Naval Reserve.

He has published two records of his experiences on Stefansson's expedition: a short account in his autobiography and full details in "The Last Voyage of the *Karluks*" (Boston, 1916); to these Stefansson has added Hadley's story in "The Friendly Arctic." There were 12 scientists in the *Karluks*, including J. Murray and Dr. Mackay, both of whom had been on Shackleton's *Nimrod* Expedition; G. Malloch, the geologist, and B. Mamen, his Norwegian assistant; Dr. Beuchat, a French anthropologist, and W. L. McKinley, a Scots magnetician. A. Anderson was 1st and C. Barker 2nd mate; J. Munro chief and R. J. Williams 2nd engineer. J. Hadley, who had lived in Alaska for 20 years, and some Eskimos, joined the *Karluks* before Stefansson left, and were valuable assets.

On 22nd September, 1913, 2 days after Stefansson's departure, the storm arose that drove the ship hard to the W. and nearer to

land ; the velocity of the wind exceeded 70 m.p.h. Before the end of the month the gale ceased, and anyone could have gone ashore, for the land was then from 3 to 5 miles away. On 3rd October a southeasterly gale sent the *Karluĳ* to the NW. at great speed, and on 9th Point Barrow was passed when 35 miles distant. Here the depth of water was nearly 100 f., and 2 days later it was 1,000 fathoms. The direction of the drift varied from W. to N. and even E., but NW. predominated. Malloch took observations for position daily with a theodolite, and all the scientists were at work. Murray fished out some new species of marine life from the deep, but all were lost with the ship. Hadley made sledges and the Eskimos fur clothing. Preparations were early begun for abandoning the *Karluĳ* : the boats were loaded with stores, and supplies for several months were stacked on the ice.

Nautical routine ended on 14th October ; thereafter every man took his turn as day and night watchman. On 27th the engines were disconnected for the winter, and from 28th two principal meals were served daily ; the food was almost sumptuous. During the months of October and November the Eskimos killed about 50 seals, the meat of which was agreeable, though of a fishy flavour. The large stores of soap and underwear carried on the ship promoted cleanliness ; even the Eskimos bathed at least once a week. Eventually everyone had a fur suit. When it was evident that the winter would be spent in the pack, a strong floe,  $\frac{1}{2}$  acre in area and 30 ft. thick, was chosen for the storage of supplies, and they were built into a house that was a storehouse in a double sense, with its walls of food-boxes. There was timber for the floor and roof, with a sailcloth covering, and the whole was banked with snow. The sun set for 71 days on 11th November ; on 15th-17th the ship was near lat. 73° N., the most northerly point of the drift. For the next month the direction was S. and SE., then it became westerly until very near the end. Gales with velocities of 60 m.p.h. were almost continuous, yet they did not affect the health of all hands which was good throughout the drift.

Christmas was celebrated in traditional fashion and sports were organized. About 1,600 lbs. of frozen seal-meat was then in store. Following previous ice-pressure at a distance, on Boxing Day the pack ice cracked against the *Karluĳ*, and on 27th December all were ready to abandon ship quickly, should this be necessary. Soundings gave 25 f. on 29th when Herald Island came into view ; but it was doubtful if Wrangel Island could be seen. The year 1914 was to be as fateful for the *Karluĳ* and her company, cut off from the world, as

it was to Western Civilization. On New Year's Day there was tremendous pressure at a great distance, and the ominous noise resounded throughout the interior of the ship. On 4th January the westerly movement again began before an easterly gale, and the position on 7th was lat.  $72^{\circ} 11' N.$  and long.  $174^{\circ} 36' W.$  At 5 a.m. on 10th everyone was awakened by a loud report, like a gunshot, and the ship was shaken. The ice at her stern had cracked, and she trembled. Bartlett ordered the storehouse to be prepared for habitation. At 7.30 p.m. a splitting crash came from the hold and the water rushed in; the ice had pierced the ship's side for a length of 10 ft., and Bartlett gave the order: "All hands abandon ship." Fires were drawn, except in the galley, and storm lamps used in the darkness. An additional 10,000 lbs. of pemmican and other food was deposited on the ice, where more stores were dumped than could be consumed. The fire in the storehouse was lighted and hot food prepared in the galley. A large snow igloo was also built.

By 10.45 p.m. there were 11 ft. of water in the engine-room, but the ice was holding the ship up. At 2.30 a.m. all hands turned in except Bartlett, the Chief Engineer and Hadley, who sat in the galley with a roaring fire and played tunes on the Victrola that they had carried there. As long as the ship was afloat Bartlett remained in the galley, and for the last few hours alone, the other men having turned in. He played 150 records and afterwards threw each on the fire. At 3.15 a.m. the ice opened and the *Kaluk* began to sink. In a quarter of an hour the decks were awash and the Captain, the last to leave, started Chopin's Funeral March. He stepped on the rail and from there to the pack, raising his hat in farewell to his ship, as she disappeared to her appropriate musical accompaniment. Bob Bartlett is a dramatic artist.

He was also a leader who had no fears for the future; his company had comfortable quarters, warm clothing, ample food, fuel and ammunition. The *Karluk* had sunk near the position, N. of Wrangel and Herald Islands, in which the *Jeanette* had been beset. The routine on the floe was similar to that on the ship, and everyone at this time was contented. On 17th January Bartlett arranged for a party of 4 men to sledge over the pack to Wrangel Island; they were to report on the conditions found on the pack and the land, also to look out for game and driftwood. All the men needed more exercise, but everyone could not start yet. The drift of the ice was so slow that there was no danger of the camp moving much farther from land; moreover, several tons of stores had to be transported, and this would take a long time. Bartlett wanted a hut erected on the island

by the pioneer party, which was to remain ashore ; and snow igloos were to be built on the route.

Wrangel Island had been named after Admiral Wrangel, the Russian explorer ; it was discovered by Capt. Kellett of H.M.S. *Herald* in 1849. De Long saw it from the *Jeanette*, and Lieut. Hooper landed on it in 1881. Others afterwards visited the island which is 80 miles long and 25-30 miles wide, excluding a number of immense sandspits that extend as far as 12 miles out to sea. The interior is hilly and rises to a height of 2,500 ft.

The first party consisted of Anderson the 1st mate, Barker the 2nd mate and 2 sailors, with 3 sledges and 18 dogs. Mamen and the 2 Eskimo men were to travel with them and return with the sledges. A start could not be made until the weather became fine on 21st January. All Bartlett's rations were 1 lb. pemmican, 1 lb. biscuit per man per day, and tea. On 25th sunrise was celebrated with a feast and concert ; there were oysters at this banquet. Preparations were made for the journey to land, and Herald Island was seen ; it is only 4 miles long and considered inaccessible. This island, like Wrangel Island, was discovered in 1849 by Capt. Kellett, and from its summit Wrangel Island was first sighted.

Hadley was sent with a party of 4 men on 29th January to see if the track was intact ; 12 miles out it was found to be broken and was knitted together. Other parties then worked the stores forward and cached them at their turning-points, besides improving the track. On 31st Murray asked for a sledge and supplies for 4 men for 50 days, as he with Dr. Mackay, Beuchat and a sailor named Morris wished to go to Siberia. Bartlett was against this proposal, but finally gave his consent on receiving a letter, signed by each member of the party, absolving him from all responsibility.

Mamen's party returned from Herald, not Wrangel, Island on 3rd February ; open water, 3 miles from land, prevented them from reaching the shore, and they left Anderson's party waiting for the channel to close. Bartlett was worried about this for Herald Island was a most unsuitable place of refuge, and Anderson's party was inexperienced in travelling over ice ; he hoped they would carry out instructions and continue their journey to Wrangel Island. What happened to them may never be known, for they were not seen again. On 5th Murray and Mackay's party started for Siberia, pulling their sledge ; the distance was about 120 miles. Two other parties set out on 7th : Chafe and Williams, to transport stores ; and Mamen with 2 Eskimos, also to carry stores but mainly to look for Anderson's party. Mamen soon returned with a dislocated knee,

and Williams because he had broken through young ice and soaked his clothes. Chafe and the Eskimos had continued the journey.

Parties were frequently sent forward with stores, and on 8th February there were nearly 5,000 lbs. of pemmican along the track. Herald Island was then about 60 miles away. Chafe returned on 11th having seen nothing of Anderson's party; and again they were unable to reach Herald Island because of open water 3 miles from the coast. No sign of Anderson's missing party was seen on the shore through the binoculars, and it was hoped that they had gone on to Wrangel Island. When about 20 miles from Herald Island, on their return, Chafe's party met Murray's party, struggling towards land. Beuchat was a mile behind the others, who were relaying the load, with his hands and feet frozen solid; he was partly delirious and had not long to live. Morris had a severe cut on one hand and was suffering from blood poisoning. Mackay seemed exhausted, though Murray was cheerful. All their pemmican had been soaked with sea water, but they declined assistance and said they were bound for Wrangel Island. Whether they reached it was not known until 1924, when the remains of a camp and 4 skeletons were found on Herald Island and there is evidence that they had been Murray's party.

On 19th February the main migration to Wrangel Island began, with 2 parties forming the advance guard, Malloch having 2 and Munro 3 men. As each of these parties had only 4 dogs, the men had to help in pulling the heavy loads. There were stores in abundance and 2,000 rounds of ammunition. Everyone started well fed and with new underwear. A little Eskimo girl had charge of the ship's cat. Bartlett's start with the main party was delayed by an injury to Kerdrillo the Eskimo's back; but this delay did no harm as a blizzard raged for several days, and it was well for surplus stores to be consumed. On 24th February the storm ceased and Kerdrillo was well enough to travel, so he was sent off early in the day with his wife and 2 children; the cook and 5 dogs completed this party. Bartlett brought up the rear with 7 dogs and 2 sledges; 1 sledge was left behind for want of dogs. Kataktoveck drove 1 sledge and Bartlett the other, accompanied by McKinley and Mamen, though Mamen's knee prevented him from rendering much help. It was noon before the party could start from camp, where a record was deposited over which the British ensign was left flying.

The first clear view of Wrangel Island to the SW. was obtained on 25th February. Unfortunately the storm had wrecked the track and a new one had to be made. Bartlett picked up some of the depot-camps, and found a note from Munro at one of them; but the

storm had destroyed a large quantity of stores. By sledging 18 miles on 26th Bartlett caught up Kerdrillo's party at 4.30 p.m. Before midnight the ice began to move, and a crack more than 2 ft. wide opened under the Eskimos' igloo. Bartlett then acted very nobly, though he says nothing about it. He gave his own igloo, which was safe, to the Eskimo mother and children; he himself paced up and down the floe all night in a temperature of  $-40^{\circ}$  F. The ice was in motion till the morning, when McKinley and Kataktovick were sent with an empty sledge and all the dogs to fetch 30 gallons of oil from Shipwreck Camp. A new track had to be made for several miles on 27th, as well as another igloo for the Eskimo family, and the party remained at the camp of 26th until McKinley returned at 3 p.m. He brought oil and other supplies, after making a good run of 60 miles in less than 2 full days.

On 28th February the advance party was overtaken at a gigantic mass of pressure ice, 3 miles wide and over 25 ft. high, extending across the track. It was estimated that a week's work would be needed to cut through the obstruction; but the delay was utilized to send fast sledges to bring up more stores from Shipwreck Camp. The pressure ridges were actually crossed in 4 days, and on 5th and 6th March Bartlett pioneered a new track beyond the pressure, while further supplies of stores were brought from the rear. Wrangel Island then seemed near and stood up very clearly. Three bears had been shot by one of the rear parties and the meat was brought to the front. As the going towards land was very rough, progress was slow and it was not until 12th March that the island was reached. Camp was made on Icy Spit near the NE. of the island, and a good fire of driftwood soon cheered the party; the Eskimo woman had tea ready to welcome the men when their work was done.

Timber of all kinds littered the foreshore, with whole logs and even planks; but no game was found in the interior, and at the time of landing there was little on the coast. The first needs of the shipwrecked party were rest and the drying of their garments; these needs were fully met by the erection of a snow shelter and by blazing wood fires. Bartlett intended to sledge to Siberia and thence to Bering Strait with Kataktovick for help. The other members of his party, with 80 days' full rations, could safely be left. None but the most hardy and experienced sledgers could undertake such a journey with any prospect of success; and great were the risks for the best of sledge travellers, though these would be reduced by an early start, to anticipate the summer disintegration of the pack.

Preparations were therefore begun on 14th March and continued



next day when a gale was raging. Three igloos had now been erected on Icy Spit and the camp properly arranged. Bartlett left Munro in charge; he was to make another journey to Shipwreck Camp for more stores. As 16 dogs were given to Munro, only 7 remained for Bartlett, who afterwards suffered for his unselfishness. Written instructions were left that a search be made at Herald Island for Anderson's party, and that all survivors should assemble at Rodgers Harbour, on the SE. coast of Wrangel Island, by the middle of July, when Bartlett hoped to rescue them with a ship.

On 18th March, 1914, Bartlett and Kataktovick set out on their dangerous mission. They carried on 1 sledge 48 days' stores for themselves and a month's dog-food. The shortest distance from Wrangel Island to Siberia is 109 miles, but they went round the E. coast of the island and along the whole of the S. coast, to search for the missing men, before striking southwards. The weather was bad for the 1st 4 days, and only the hardiest men could have travelled through the blizzards. Bartlett camped on 20th at Rodgers Harbour and searched for traces of human occupation; but neither here nor elsewhere could any be found. A line of pressure-ice then turned them miles off their course, before it could be crossed to the sea.

At last, on 23rd, they camped on the pack, and next day made better progress southwards, though a westerly gale kept the ice in continual motion. Open water was their greatest difficulty for 100 miles, and it involved much danger, labour and delay. It was often impossible to cross the channels, when many miles had to be covered at a right angle to the course. Risks were run in crossing young ice, and the disaster of losing the load was occasionally faced. On some days, after incredible toil, no more than 4 miles southing had been made. One encouragement that helped to keep up their spirits before they had gone far was the shooting of a seal. To make such a journey was a wild experience, as Bartlett said when the roof of the igloo was whisked off one night and they had to turn out in the darkness; the tent was sought on the moving ice, and protection from the blizzard found beneath it. The dogs were afraid of the water, and hours were spent in catching runaways.

A large bear was shot one night after camping and the meat eaten raw by men and dogs; there was no time to cook it, and a hind-quarter was all that could be carried next day. Soon afterwards a fox appeared, following the bear's trail. The dogs were so tired that they took no notice of fox or bear. A few days later another bear was shot, and again all except one hind-quarter was abandoned. Shortly before sighting land on 30th March another seal was killed,

so there was plenty of fresh meat to save the pemmican. Channel after channel was crossed on this day and the air being clear at sunset, Bartlett sighted land to the SW. Kataktovick was depressed, a common complaint with Eskimos, and refused to believe the good news ; but next day the land was clearly seen about 40 miles away. By the evening of 2nd April they were less than 20 miles from the coast. That night at 1 a.m. the ice cracked through the camp and opened out about 2 ft., needing fast work in the dark to save dogs and stores. When the sledge had been loaded and lashed they stood by until the morning and then started off in the dusk, hoping to reach land that day. The ice was so active, however, and the light so dim through a mist, that camp was made at 3 p.m. on the pack. At 5 p.m. the following day, 4th April, 1914, they reached the Siberian coast, after sledging at least 200 miles.

A new phase of the journey then began for which Bartlett had insufficient dogs and money, but the former were the more important for making a rapid journey. He found the natives uniformly hospitable and helpful, otherwise he and his companion must have perished after having survived the perils of the pack ; and the kindness of the Chukches enabled them to bring this part of the journey to a successful conclusion. We cannot follow in detail the last 300 miles of this trip. Bartlett had landed near Cape Jakan, 60 miles W. of Cape North, and immediately saw the trail of a sledge extending E. and W. along the coast. Kataktovick pointed E. and in this direction they set off with their 4 remaining dogs, 3 of which were useless. The going was good and the trail easily followed to a house, where they were warmly welcomed and waited upon hand and foot, though signs were the only medium of communication.

The travellers were treated in much the same manner all along the coast by these children of Nature, whom Bartlett speaks of as Siberian Eskimos or Chukches. Tea was the favourite drink, served in china cups and saucers, though truth to tell they spat on their crockery to clean it, for water was harder to come by, and Bartlett always had his own mug handy. Reindeer meat was given him to eat, but Kataktovick preferred some ancient walrus. In these huts men, women and children sleep together, as customary with many uncivilized people, in a stifling atmosphere rank with tobacco fumes. Thus were the travellers entertained as they made their way eastwards along the tundra, from settlement to settlement, obtaining some of their needs by barter. Farther east some English was spoken, and Russians were met with. At one outpost of civilization they were entertained with an old gramophone—half the songs in Russian

and half in English. Bartlett was aiming for the nearest wireless station.

The 2nd stage of this 700-mile journey came to a conclusion at the end of April, when Bartlett reached East Cape after covering as much as 50 miles in 1 day. He had been 37 days on the march, and his worst trials were now over. On 16th May he arrived at Emma Harbour, and caught a ship on 21st that reached St. Michael's, Alaska, on 27th. Here Hugh J. Lee, Peary's only companion on the Greenland Plateau in 1892, was United States Marshal, and he sent a message to Ottawa asking for funds. Bartlett had done his part well, and others had now to shoulder the responsibility of saving his people who still had food for 2 months. No attempt could be made to rescue them until about midsummer when the ice opened. The *Karluks* was thought by the world to be lost with all hands; hence great relief was felt at her captain's news. He became anxious to start when July came, but it was 13th of the month before the *Bear* sailed from Nome, bound for Wrangel Island, with Bartlett on board though not in command.

On 4th August, in Kotzebue Sound, news of the war came by wireless. A trading ship, the *King and Winge*, joined in the attempt to rescue the marooned party. On 21st August a call was made, for some inscrutable reason, at Point Barrow, and McConnell told Bartlett of Stefansson's doings since leaving the *Karluks*. A course was set for Rodgers Harbour on 23rd, and next day the ice was entered. Two days' fog then intervened, and on 27th the captain of the *Bear* turned back to Nome for coal. Bartlett could only hope that some other ship would have the credit of rescuing his people, and while at Nome arranged for the *Corwin* to make the attempt. The *Bear* sailed again on 4th September and loitered another 24 hours at Port Clarence. On 7th she was once more at the edge of the pack and 130 miles from Rodgers Harbour. Next day the distance had been reduced to 75 miles, when the *King and Winge* appeared from the north and finally came alongside with the survivors of the *Karluks* on board. Malloch, Mamen and Breddy had died; the others were transferred to the *Bear*, and told Bartlett their story.

Open water had prevented more stores from being brought from Shipwreck Camp. Williams had a frostbitten toe that was successfully amputated by Williamson, the 2nd engineer, with a pocket knife and a tin opener. One party lost a sledge, with guns and ammunition, by breaking through thin ice. Mamen, Malloch and Templeman, in accordance with instructions, proceeded to Rodgers Harbour and there erected a hut. Malloch became afflicted with

nephritis or protein poisoning, according to Stefansson's diagnosis, from eating exclusively lean meat ; and he died, to be followed in a few days by Mamen with the same complaint. Templeman was afterwards joined by Munro and Maurer, who lived on seals and birds' eggs. A bear was killed at Icy Spit, and then a general move was made to Waring Point where more birds were found. While here, Breddy shot himself, making the 11th life lost from the *Karluk*. After the ship's stores were exhausted, early in June, seals and ducks proved adequate, though not abundant, and a second winter was dreaded. Anxiety increased as the summer wore on without relief appearing, and it was feared that Bartlett had perished in crossing to Siberia. Their joy therefore was great when the sound of a hooter announced their rescue. Only 40 cartridges and 3 dogs remained. The Eskimo family had passed through all the hardships unscathed ; the mother had a baby, and her little girl triumphantly carried her cat on board the ship.

Nome was reached on 13th September, 1914, and here Bartlett kept his party on the *Bear* for a few days, remembering that their weakened condition would predispose them to the diseases of civilization. Their strength soon returned, and all were paid off on landing at Esquimalt on 25th October. From here, 15 months earlier, 20 white men had sailed in the *Karluk* ; now only 9 of them returned. Bartlett went to Ottawa and there handed in his report on the most tragic and ill-fated cruise, as he said, of his whole career. He had performed labours heroic in the classical sense, and nobly faced death in his determined endeavour to save the lives for which he was responsible. No other master of an Arctic ship could have surpassed him in the execution of his duty.

## CHAPTER XII

### LAUGE KOCH'S EXPERIENCES

**D**R. KOCH is one of the greatest living Arctic explorers and the principal surveyor of Greenland, both in geology and cartography. As a nephew of Col. J. P. Koch of the *Danmark* Expedition, scientific pioneering may be in his blood. At the time of writing he has taken part in 7 Greenland expeditions, including his summer trip in 1913, 5 of which he has led, and he is still a young man.

On his return from Rasmussen's expedition in 1918 (see Chap. VIII) he was qualified to lead his own party, and the following year planned a survey of Peary Land, to complete his previous work and connect it with that of the *Danmark* Expedition. He left Copenhagen on 15th July, 1920, and arrived at Upernivik on 4th September with the intention of living on the country in game districts and carrying provisions only for the barren areas. Tobacco was taken for the Eskimos who were his only companions. Robertson Bay was reached on 12th September and the unloading of the station completed by 15th. By 24th the house was inhabited. On 5th October Koch set out for Washington Land and reached Cape Calhoun on 22nd. His objects in making this trip were to test the equipment and to see for himself, in view of his main journey, the travelling conditions in Kane Basin during the autumn. Robertson Bay was regained on 5th November after sledging about 500 miles. Koch decided to winter in Upernivik, another 500-mile journey, where he arrived on 16th December, 1920, and remained until 22nd January, 1921. On 5th February he was back at his house in the north, and on 18th March started on his great journey round the north coast of Greenland. His experiences will be sketched in outline till he reaches the limit of his previous survey, after which we shall follow him more closely.

About 40 sledges opened the campaign, though some of them turned back in a few days. On 22nd March the temperature, — 40° C., was a little too chilly for comfort. The coast was followed into Kane Basin and at Cape Calhoun some fossils were collected.

Koch's custom was to drive for 3 hours and then halt for coffee, with sugar and biscuits *ad libitum*; this fare was so stimulating that his party would afterwards travel for 6 hours without a pause. Geological observations were made at Cape Constitution on 1st April, and on 3rd Kennedy Channel was crossed diagonally to Ellesmere Land: Fort Conger was reached on 5th and the hut found in fair order. A depot laid by Hanssen for Amundsen was also intact. The Eskimos went hunting towards Lake Hazen and killed about 20 musk-oxen, while Koch remained ill at the hut. Not until 19th April could the expedition leave here, and then 2 long marches were made to a point beyond Cape Brevoort on the coast of Greenland, whence another supporting party returned. After one more march on 22nd the last supporting party turned back.

Koch continued his journey on 23rd April accompanied by 3 Eskimos, 1 of whom, Etookashoo, was an experienced sledger who had been with Dr. Cook. One of the others, Inuiterk, was very young and on his first expedition. Each of these men had an excellent team of 12 picked dogs; but the 3rd driver, who rejoiced in the name of Nugapiinguak, had a poor team. From Cape Bryant the course was set on Beaumont Island—reached on 29th April. A lone wolf followed for 2 days and is said to have become reasonably companionable. The route touched the most northerly points of the coast and its islands, as far as the NW. cape of Peary Land where Koch arrived on 2nd May. Eleven hares were then shot and one of Dr. Wulff's old camping-sites was found. Many articles that he had discarded were seen, and a dog's skeleton was a grim reminder of the hardships endured 4 years earlier.

As far as J. P. Koch Fjord the land is of the plateau type and about 3,000 ft. high; N. of this fjord the country is of an alpine character with peaks rising to 5,000 ft. The mountain flanks descend directly to the shore with numerous valley glaciers. The interior of Peary Land has not been explored, but Koch has no reason to suppose that it is covered with highland-ice. The islands off its northern coast were perfectly free from snow, though some of them rose to 2,500 ft. On 5th May the principal work of the expedition began. While the Eskimos hunted, Koch took his observations, and hereafter carried on his field surveying every fine day and drew maps in his tent during blizzards. On 7th May he reached Lockwood's last cairn, found Peary's record and left his own, finally camping at Cape Washington. When the most northerly point of Greenland, Cape Morris Jesup, was attained on 13th the dogs were in need of meat. The following day Koch went northwards over the

pack ice for a few miles, to lat.  $83^{\circ} 46'$  N., and on returning to land found that the hunters had shot 32 hares but no musk-oxen. In consequence of this shortage of solid meat, 4 dogs had to be killed next day and the others were in a bad condition. A piece of wood with Peary's name cut on it was found in a small cairn. One sledge was left behind 2 days later, for the dogs were so exhausted that they had to be fed on the men's pemmican and porridge. On 19th May Inuiterk became depressed by the difficulties of the journey; Koch tried to cheer him up by opening tins of sardines and dried eggs.

To the E. of Cape Jesup the character of the coast again changed. The mountains were more rounded and stood back from the shoreline, with extensive gravel plains, a little above sea level, separating them from the coast. The mountain summits still rose to about 5,000 ft.; E. of Bliss Bay the peaks were sharper. The largest glacier on the coast, Moore Glacier, is near Cape Bridgman. There was little evidence of activity in the glaciers, which were few, and no moraines were seen; many of these glaciers do not reach the sea, but appear to lose themselves in the pressure ice on the shore.

On 20th May Koch was held up by a blizzard, and the outlook was far from bright as there was dog-food for only 2 more days and the animals were becoming emaciated. Cape Bridgman was passed in bad weather on 21st and J. P. Koch's record found. To celebrate the fact that the Danish flag then floated completely round Greenland, there was a feast of porridge, marmalade, sardines, coffee and cigars. Frederick Hyde Fjord was crossed in a fog on 22nd and a dying dog had to be killed. Next day the death of another dog caused a crisis; while a 3rd dog was dying and a 4th had to be killed. These losses broke the spirit of the Eskimos who said: "We can no more." There were only 18 exhausted dogs left, or about half the original pack, and everyone was weak for want of meat; in addition to this, the blizzard had scarcely ceased for a fortnight. Koch then produced 2 tins of sardines, the usual gruel, some dried eggs, sweet coffee and cigars. He opened the map and showed his despondent companions how near they were to the place where his uncle (J. P. Koch) had shot musk-oxen; and he told them that Bronlunds Fjord abounded in game. Thus were the Eskimos somewhat cheered by their leader's confidence.

On 24th May Peary's cairn on Cape Clarence Wyckoff was passed, but it had been interfered with, presumably by wild animals, and contained no record. Koch rebuilt it and left his report before continuing to the SE. through fog and deep snow. The following day he moved on to higher ground, away from the coast, and emerged

into sunshine. Inuiterk went hunting and shot a hare ; he also sighted musk-oxen. On 26th Etukussuk secured 9 head with 10 shots. The famished dogs dashed at the nearest carcase but could not break through the thick hide. When the men had skinned and quartered another beast the dogs were let loose and in half an hour were a dreadful sight, staggering away with distended bodies.

The acquisition of this meat saved the foundering expedition which camped near it until the end of the month. Unfortunately the food did not come soon enough to save 2 other dogs ; 16 had now gone, though the 16 strongest remained. Men and dogs regained strength through the food and rest. Some fossils were collected in the district. The party descended towards the coast on 1st June, setting the course for Cape Copenhagen, the south-easterly point of Peary Land, and reached it the following day. An immense morainic belt, 500 ft. high, extends north-westwards from the cape. There was great rejoicing over the sight of a seal near the cape, for the musk-oxen had been lean and the whole party was in need of fat.

The summer weather was very enjoyable with the temperature near zero C. On 3rd June the 1st seal was shot, and on the following days the party drove along the N. coast of Independence Fjord and secured ample game. The 4 men and 16 dogs consumed nearly the whole of a seal in 1 day. Hares and gulls varied the menu. Beyond Cape Lucie Marie the character of the coast changed from the low shelving shoreline and gravel plains that had been seen hitherto, and cliffs 1,300 ft. high extended for about 25 miles to the Falcon Mountain—so named because a pair of falcons were nesting on it. Koch ascended the mountain to take observations, and was the first to gaze upon the magnificent view seen from the N. side of Independence Fjord.

On resuming the journey westwards, Koch became very ill and fainted, but after taking coffee and quinine felt a little better. He was able to travel on 8th June when his Eskimos shot 2 seals and 5 hares. The cliffs had receded from the coast and the shoreline again became flat. Camp was pitched at the entrance to Bronlunds Fjord, where a moraine extended from the northern side nearly half-way to Heilprin Land. After a day's rest, Koch sent two of the Eskimos towards the head of Bronlunds Fjord and, taking Etookashoo, crossed the fjord to its southern side. They followed Independence Fjord to Mylius-Erichsen's cairn, found on 12th with the record in good condition, and next day drove north-eastwards to Astrups Fjord. A blizzard prevented surveying on 14th, and the following day Koch recrossed Independence Fjord to the camp at the mouth



of Bronlunds Fjord. The two other Eskimos had found that this little fjord ended in a long valley down which flowed a river.

The head of Bronlunds Fjord was reached on the 17th, and after making camp, 4 musk-oxen were shot on the mountain-side. Koch named the valley, which formed a continuation of the fjord, Wandel Valley; and on 18th June he ascended a mountain to the north. From the summit of this peak, 2,600 ft. high, a view was obtained in every direction. To the W. a lake was seen in Wandel Valley, and northwards rose the plateau (Koch's term) of Peary Land with a mountain range in the background. Astrups Fjord was sighted to the SE., and to the S. lay the icecap of Heilprin Land. The cold on the mountain-top was so intense, with the wind cutting through his clothing, that Koch could scarcely write for the numbness of his fingers.

He then retreated down the fjord, after plotting the Astrup Glacier that blocks the head of the Wandel Valley at a distance of 36 miles from his westernmost position. As he shows the glacier on his chart apparently discharging into the lake, no channel exists there, nor according to Peary's chart could it be a northerly branch-channel from Independence Fjord. (See inset to Chart No. 2.) Peary certainly charted such a branch, nearly 100 miles farther W.; but his "channel" is most clearly shown as the one and only great waterway of the whole district, which is Independence Fjord, prolonged westward into the Arctic Sea. A false impression is created by the claim to have rediscovered, in the Wandel Valley, the "Peary Channel." One glance at Peary's chart shows this to be impossible. Peary Land is not an island; and a channel is the bed of a stream. Mylius-Erichsen was therefore perfectly correct when he wrote: "The Peary Channel *does not exist* [his italics], Navy Cliff being connected by land with Heilprin Land." (See p. 116 herein.) Peary's channel was *south* of Heilprin Land; Koch claims to have rediscovered it *north* of this land in a high-level mountain valley. But Koch never went to Navy Cliff, as Freuchen did, and the explanation given by Freuchen of how the mistake was made is the only credible hypothesis (see p. 117). This subject has been given undue prominence because of Koch's gallant attempt to champion a lost cause.

On 20th June his party started from the head of Independence Fjord with the intention of ascending the Academy Glacier to the plateau and crossing it to Robertson Bay. While driving up the fjord Koch was again ill and had great difficulty in continuing his survey. Cape Glacier was reached on 22nd when a difficult ascent lay before the party. Next day huge pressure ridges were encoun-

tered at the side of the glacier, the surface of which was seamed with crevasses. The glacier and its surroundings were very impressive, though grotesque for sledging purposes, while above them towered cliffs 3,000 ft. high. Koch became worse and fainted several times. On 24th June a good camping-place was found, and here 2 days' much needed rest was obtained. A hare was killed, and an owl and two sea-swallows were seen. The ascent to the plateau was resumed on 26th when a belt of crevasses was crossed, and streams of thaw water impeded progress. The thaw here was a week later than down in the fjord. Camp was made at a height of 680 ft., and next day, after passing more crevasses, a wall of ice threw Koch off his course. The glacier consisted of at least 4 independent tributaries of ice from the plateau, all of which joined the main stream but moved at different rates. Camp was pitched on a moraine, and an Arctic gull was shot.

Peary's Navy Cliff was passed on the right, without mention, during the ascent. Koch still seemed unfit for his work and had 2 falls into crevasses. On each occasion he held on with his arms until the Eskimos lifted him out ; he does not appear to have been roped. On 28th June the skeleton of a musk-ox was found higher up the glacier, and the course bent round the Nansen Nunataks towards the W., at a height of 2,275 ft. A chill breeze blew off the plateau as Vildt Land was approached ; this land was discovered by Peary in 1892 and visited by Rasmussen in 1912. As no musk-oxen were seen, it was necessary to economize the seal meat brought up from the fjord. A dozen hares and two ducks were shot on 29th, and some split bones found here were probably relics of Peary's visit. The situation for Koch's party became serious because he had staked its existence on the expectation of finding musk-oxen in Vildt Land where Rasmussen had shot many. The crossing of the plateau on the homeward journey thus began to loom up as a shadow darkened by a struggle for life. There was only food, on short rations, for one-third of the total distance.

On 1st July a start was made and next day a height of 2,925 ft. was attained ; on 3rd Rasmussen's cairn on the W. coast of Vildt Land was sighted. The bicentenary of Hans Egede's arrival in Greenland was celebrated by a feast of sardines, chocolates, coffee and cigars which Koch seemed able to produce at will in the manner of rabbits from a conjurer's hat. It had been his ambition to complete the Danish circumambulation of Greenland before the bicentenary, and this he had accomplished. Some hares were killed and 1 musk-ox was shot on 5th. Koch did not visit Peary's cairn on Navy Cliff, but he established a cartographical station to the W., on

a peak 3,120 ft. high, and a cairn containing a record was left here on 6th. By the following day 40 hares had been shot ; and these, with the beef, brightened the prospect of crossing the plateau. Two fox cubs were caught alive.

On 12th July, 1921, the party set out and next day reached Adam Biering Land which was surveyed. The Eskimos hunted until 17th when another musk-ox was shot. On 18th the last land was left and camp pitched next day at a height of 4,340 ft. The next camp was at 4,970 ft. and on 21st an altitude of 5,100 ft. was reached. Instead of setting the shortest course, Koch was hugging the north-western coast of the plateau for his survey, in spite of the shortage of food ; and on 22nd he discovered that Victoria Fjord penetrated farther S. than was previously known. The route descended into the depression at the head of this fjord until camp was made at 2,275 ft., and next day the lowest point passed was 1,820 ft. A dog had to be killed, partly for human consumption, for the food problem was again acute and this time was very grave. On 25th all the men were ill as a result of eating the dog-flesh ; but they were not too ill for sledging. They camped that night near the Sherard Osborne Depression in which, next day, several glacial lakes and rivers were seen. On 27th all the men were ill and overwrought ; they were too weak to travel their usual distance of 20-25 miles, and next day they were worse. Although becoming exhausted, they were buoyed up by the hope of finding a depot that was to have been laid by some Eskimos on Warming Land. When the land was reached on 29th there was nothing for them ; the Eskimos had been ill.

Another polar struggle for life then began, and the only hope was in the youth and strength of the men. The nearest depot was at Cape Forbes, near the N. end of the Humboldt Glacier, 180 miles away. Three dogs were killed, and cooked with sledge wood, for the oil had long since gone. Everything possible was then abandoned, and on 31st July they set off again. If they could average 15 miles a day, and if no accidents happened, there was a bare chance of survival ; but in their enfeebled state 15 miles would be the very limit of their power. The dogs now left seemed too weak to pull the sledge, and one of the fox cubs had died ; but Koch found that the other cub was tame enough to run by his side on a lead, and when he led the way with his pet the dogs became so excited that they again pulled the sledge. On 2nd August they reached the Petermann Depression, and on the 3rd cooked 2 more dogs, which left 7, until the following day when another had to be killed. The remaining dogs had now only old sealskin, harness and footwear to eat. The weakening men

then entered a maze of crevasses with which they had a desperate struggle. One step might have been fatal ; but they were safe by the 5th when camp was made at a height of about 1,500 ft. The fox cub was ill, so it had to be killed and eaten with the dog meat ; there was now nothing else.

The last week of this eventful journey began on 6th August when they all felt too weak and weary to set out on the march, and another dog broke down, thus leaving four. As the conditions for surveying were good, Lauge Koch, true to his type, flogged his feeble and famished body into activity, and worked on inflexibly. Next day he found that Washington Land extended much farther into the inland-ice than was supposed. The Eskimos tried to hunt on 8th August but found themselves too weak, though they shot 2 gulls and devoured them raw. On the 9th one of the 4 surviving dogs broke down and was eaten ; the following day there were only 2 of the animals left. On 11th a strong following wind drove them 30 miles without exertion and possibly saved their lives ; Dr. Wulff may be said to have lost his life through an adverse gale in the same locality. The tent was used as a sail on the sledge. As the last 2 dogs were dying and could not be eaten, the men were reduced to devouring the sealskin dog traces, now useless, though they hoped to reach the depot next day. This they did after wading a river into which Inuiterk fell through weakness. The depot contained pemmican, marmalade, coffee and oil ; but they ate moderately at first. Koch's plateau crossing had been about 600 miles in length. The principal part of the work was now over, though some more fossils were collected, and Robertson Bay was reached on 2nd October after an absence of 200 days.

Koch had made one of the longest and best scientific sledge journeys on record, but he had not completed the work of this expedition. He made a tour of Inglefield Land in the autumn of 1922 and tested the motor sledge. The weather, however, was unfavourable and the tractor broke down. After packing all his treasures, Koch set out on a journey that might have proved his last. While crossing Melville Bay on the way to Upernivik in winter, a storm overtook the party on the pack and they lost their way in the darkness. The ice broke up and they were carried out to sea. Koch says there was ample food and they suffered no hardships. After several days the new ice that formed between the pack and the fixed coastal ice enabled them eventually to reach safety.

In the spring of 1923 Koch went north once more and spent some weeks surveying between Cape York and Robertson Bay. He



*By courtesy of the British Arctic Air Route Expedition*

TYPICAL EAST GREENLAND GLACIER NORTH OF SERMILIK FJORD



eventually reached Copenhagen in September, 1923, after an absence of 3 years, bringing to Europe the most complete collection of Palæozoic fossils, 4,000 in number, ever found in the Arctic.

In 1926 Koch was appointed leader of a Danish Government expedition to make a geological survey in East Greenland, and while he was building his hut in Scoresby Sound Wordie's expedition sailed into the bay, homeward bound, and the 2 leaders afterwards met. Koch started on a journey to *Danmark* Harbour in October when he expected the coastal waters to be frozen, but large areas of open water off the Liverpool Coast drove him inland. Although the latitude distance to his destination was 400 geog. miles, he set out with only a week's supplies, as he relied on finding game. None was seen as far as Davy Sound and after sledging about 100 miles the food was nearly gone. At last a musk-ox was shot and afterwards 2 bears; then there was no more anxiety. Koch turned back from Mackenzie Bay, Hold-with-Hope, and while geologizing was pursued by 4 wolves. He was unarmed, and beat a hasty retreat to the camp which was reached no sooner than his pursuers, but an Eskimo immediately shot one of them and the others fled. On returning to Scoresby Sound the ice was found to have gone out, which made it both difficult and dangerous to reach the winter hut through the darkness.

The difficulties that beset the second geological journey, begun on 22nd February, 1927, were immense. There was soft snow as much as a yard deep the whole of the distance to *Danmark* Harbour, and this curtailed the scientific investigations. The party was able to sledge for some miles over the sea-ice, and 2 bears were shot in their winter lairs on the coast of Traill Island. A short stay was made at the wireless station; and then the East Greenland Company's houses on the coast to the N. were visited. At the house on Hold-with-Hope one of the hunters had been killed by a bear. Hold-with-Hope, with its quaint name, is said to have been the first land discovered in East Greenland—by Hudson in 1607, though the Norsemen must have known the coast farther south. Clavering Island was left on 22nd March, and towards the evening of this day, when the old headquarters of the East Greenland Company could be seen on Sabine Island, open water barred the way. The coast consisted of a vertical mountain wall, and supplies were short because Koch expected to replenish at Sabine Island. Two Eskimos were therefore sent back to the last house for food and oil, while Koch and the other Eskimo returned to an unoccupied house in Tiroler Fjord. Here they remained for a few days, geologizing and hunting. The moun-

tains on the N. side of this fjord were over 6,000 ft. high and seemed inaccessible ; but a ravine was discovered up which they started on 1st April.

The highest point on this new route was 2,000–2,500 ft. above sea level, and the sea-ice was regained to the N. of Sabine Island. *Danmark* Harbour was reached without further incident on 8th April, but only a short stay was made here in order to devote as much time as possible to collecting fossils on Koldewey Island. The new route down the ravine to Tiroler Fjord was taken and an attempt made to penetrate to the W. of Clavering Island. Deep snow prevented this course from being followed, but a hitherto undiscovered valley was taken over Hold-with-Hope to the head of Loch Fyne. This district, as well as the head of Muskox Fjord, was surveyed during the first days of May, when another visit was paid to the wireless station in Mackenzie Bay. The geological survey was continued in Geologist Fjord and Antarctic Sound, after which a camp was fixed on the W. side of Geographical Society Island, whence excursions were made in all directions and Kongeborgen ascended to a height of 3,500 ft. Another mountain over 3,000 ft. high near Carlsberg Fjord was ascended, and no open water being visible from this height, the party drove home along the sea-ice off the Liverpool Coast. Some of the most beautiful scenery in Greenland is found in this district ; and the Liverpool Coast, so perilous to mariners when accessible to their ships, was very impressive. The peaks attained a height of over 6,000 ft., and the air was filled with the singing of little auks in myriads. Foxes also were so numerous that they could profitably be hunted. The length of this coast is about 60 miles—covered in 3 days at a distance of 3 miles from the cliffs.

Scoresby Sound was reached on 1st June after a journey of 1,500 miles on which only 1 dog was lost and he was killed by a musk-ox. A very fine journey had been made. On 20th August the expedition returned to Denmark. Koch brought back enough data for compiling a geological map of the district, and his investigations had led him to evolve certain theories that required further research for their elaboration. To this end he left Copenhagen on 16th June, 1929, with a personnel of 23 Europeans.

Including Koch, a staff of 8 scientists had been engaged, and 3 motor-boats were taken. Clavering Island was reached on 21st July and the expedition landed to the W. of Cape Mary. On 23rd the anchor was dropped in Tiroler Fjord near an unoccupied house whence the scientists spread out over the district. The geologists went out in a motor-boat and camped for a few days in various



localities. On 27th a move was made into Gael Hamkes Bay. In this manner, the ship moving slowly southwards, many fjords were surveyed and examined until 5th August when another ship was sighted; it contained Wordie's Cambridge expedition, and visits were exchanged. A great collection of fossils was packed by 7th September, and Koch's ship began her tussle with the ice and weather. It was then late for leaving Greenland, and 2 storms were encountered in the pack before 17th, when a terrible blizzard struck the ship.

The wind increased to hurricane force, and the driving snow was so thick that it was impossible to see a ship's length ahead. There was constant danger of being crushed by the raging floes. Then darkness fell. It was freezing hard and the decks became slippery. At 2 a.m. on 18th there was a terrific crash as the rudder was split from end to end. Koch says that at that moment, for the first time since his last escape from the inland ice, he knew that he and his companions were facing death. At daybreak the ship still lived, though pitilessly driven before the gale. The rudder was repaired and the ship brought under control; she was not leaking, but the planking of the hull was crushed. The sea was still very heavy, and an iceberg was missed by 4 ft. Then the air cleared and the ragged rocks of the Liverpool Coast were sighted at a distance of 35 miles. Shortly before midnight the ship passed out of the ice, and Copenhagen was reached on 27th September, 1929. An account of the geological work of the expedition will be found in "Meddelelser om Grønland," Vol. 74, 1930.

Koch returned to Greenland in 1930, and a new phase of activity began with the Danish 3-year expedition, 1931-4. This great enterprise had 3 ships, 12 motor-boats, 2 seaplanes, a total personnel of 68, which included 36 scientists and students; 4 wintering stations were maintained complete with wireless. Koch had the honour of leading the greatest scientific expedition that has ever wintered in either the Arctic or Antarctic. Sir Douglas Mawson had 18 scientists and 11 technicians at his 3 Antarctic stations in 1911-13. Koch's work was colossal, but most of it is of little general interest.

An air-survey of 24,000 sq. miles was made, much of it over new country; and Koch flew to Iceland on his way home. Three main stations were staffed during the winter of 1932-3, and the personnel in 1933 rose to 105; there were 7 geological parties working in different localities. The latest information is that 2 winter stations, at Clavering Island and Ella Island, are being maintained throughout the winter of 1933-4. A discovery that may prove to include one of

the missing links in the chain of vertebrate evolution was the finding of large numbers of fossils of primitive fishes and amphibia in Franz Josef Fjord. Several large-scale maps have already been published and the work is still proceeding.

The Arctic, even in the twentieth century, has not been tamed by civilization, and Greenland is as rough as ever, though also impressive and beautiful. Hence the experiences of its principal living explorer by no means resemble a Sunday School outing. Dr. Koch has all the qualifications for a successful explorer, with a fine physique fully adequate for the protection and support of his trained mind and dominating will.

#### DR. LAUGE KOCH'S GREENLAND EXPEDITIONS

1913. Summer trip to the W. coast.  
 1916-18. Geologist and cartographer to Rasmussen's 2nd Thule expedition.  
 1920-3. Leader of the Danish North Greenland Jubilee Expedition.  
 1926-7. " " " East Greenland Expedition.  
 1929. " " " " Geological Expedition.  
 1930. " " " " " "  
 1931-4. " " " " " "

## CHAPTER XIII

### THE EAST COAST OF GREENLAND AND LOSS OF THE *TEDDY*

**T**HE East coast of Greenland is one of the most formidable, yet beautiful, of its length in the world. Throughout its whole extent of  $24^{\circ}$  of latitude it is defended by pack ice, and hundreds of miles of its iron-bound cliffs are a terror to seamen. In other parts, for many miles, the inland ice descends to the sea, often at the head of the numerous fjords which are among the finest for natural beauty in the world.

This dangerous coast for many years has been the happy-hunting ground of roving Scandinavians, and in this chapter a typical example will be given of the vicissitudes and fate that have here befallen many small ships and their personnel. The Danish East Greenland Company arose from the *Danmark* Expedition, for 3 of its members had sailed on the company's 1st ship. H. L. Jensen, steward in the *Danmark*, first thought of fur-trapping on this coast ; but it was 1919 before the company was formed with Capt. Bistrup, 1st mate in the *Danmark*, on the administrative board. The 1st vessel sent out was the *Dagny* under Pilot Thostrup, the *Danmark*'s 2nd mate, and she sailed the same year. Equipment for 3 stations was carried : 1 station was established near *Germania* Harbour and the other 2 stations were regarded as one establishment under Jensen. They were both near *Danmark* Harbour and had a total complement of 7 men : 1 station was in Mylius-Erichsen's old hut and the other in a new hut erected 26 miles to the NW. The *Dagny* returned to Denmark in September, 1919, leaving all stations provisioned for 1 year.

In 1920 the same ship returned to Greenland under Capt. Hansen with relief men, stores and equipment, not only for the old stations but also for 2 new houses in lat.  $73^{\circ}$  N., one of which was afterwards moved farther N. The ice this year was difficult to negotiate and the *Dagny* was crushed near Shannon Island, though all hands reached the island and wintered there. Jensen's stations, however, had not been relieved and the neglected trappers suffered severely from want

of food, fuel and ammunition. Two of them died, and the surviving 5 set out, in the spring of 1921, on a journey of 600 miles to *Germania* Harbour. This they reached, after a terrible journey, more dead than alive from scurvy. A Norwegian schooner, the *Teddy*, was sent as early as possible in 1921 with Pilot Thostrup in command to search for the missing *Dagny*. R. Dahl, a journalist, was on board and has written a vivid account of the voyages of this ship in "The *Teddy* Expedition" (Appleton, 1925). When the *Dagny* had been salvaged and the marooned trappers saved, a new station was established on Clavering Island, in place of the Hold-with-Hope and *Danmark* Harbour stations which were closed owing to the uncertainty of reaching them every year. In 1922 the *Teddy* made her 2nd voyage; this also was successful and gave no promise of future disaster. It should be noticed in passing that other ships have borne the same name; see "The Cruise of the *Teddy*" (Jonathan Cape, 1933).

Capt. Bistrup, Vice-President of the company, took command of the *Teddy* on her last voyage in 1923 and sailed on 17th June with 19 men on board and a long programme before him. The old stations were first to be visited, and then an attempt would be made to reach *Danmark* Harbour. Lastly, 2 new stations were to be opened in Scoresby Sound with a view to future colonization. Dr. Richter, a German scientist, was taken to make zoological, botanical and geological collections. Eight trappers and Mr. Dahl were also on board.

The pack ice when first met, on 1st July in lat.  $72^{\circ} 33' N.$  and long.  $5^{\circ} 18' W.$ , was moderately open; and it was intended, after making Shannon Island, to work S. to *Germania* Harbour. By 10th the ice was more compact and progress ceased. The engine next broke down and a day was occupied in repairing it, but it gave repeated trouble afterwards. The ship reached the station at Borlase Warren where the 3 trappers were found in good health, though the catch at the 4 stations had been poor. On 17th July the motor-boat *Carl* arrived and Dahl made a trip in her to Clavering Island where he found the scenery magnificent. When the mail was delivered to the trappers at one station the men retired behind rocks to devour their news in privacy. After photographing a musk-ox at close quarters Dahl returned to Borlase Warren.

On 22nd July the *Teddy* steamed along the coast to the principal station, at *Germania* Harbour, where the *Germania* had wintered in 1869-70 and remains of the German observatory are still to be seen. On 28th the *Teddy* returned with a load to Borlase Warren, and a

large party hunted musk-oxen ; a young bull was captured and hauled on the ship which sailed to Clavering Island. The engine was so defective that the trip to Scoresby Sound had to be abandoned and an early start made for home. When they left, on 5th August, 21 men were on board, including 10 trappers. The ice kept the *Teddy* near the coast until 9th when, with open water before her, the engine again broke down, and as there was little wind the ship became almost stationary. By 11th the engine had again been patched up sufficiently to make 25 miles, when the pack prevented further progress ; but then the engineer dared not stop as the piston might become clogged and refuse to start again.

From then until 21st August the *Teddy* retained her freedom and puffed about in northerly and southerly directions, as the ice to the E. was impenetrable. On this date, in about lat.  $74^{\circ}$  N. and long.  $16^{\circ} 40'$  W., the ship was beset and for the first few days drifted eastward with the ice. The weather was fine but foggy till 27th when a northerly breeze sprang up. On 31st the *Teddy* was near Hold-with-Hope and the outlook, with autumn advancing, was serious. The light was beginning to fail at night and on 2nd September a blizzard started. The ship was now free, though this increased her danger when the ice began working, and the following day she received a squeeze that opened a leak. On 5th provisions for 10 months were stacked on a large floe. The pressure of the ice then increased, and a very unequal contest ensued between the ship and the grinding floes ; she was heaved upwards and turned round, with her stem at one time and her stern at another pointing to the sky.

The deck was crowded with skins, rifles and private luggage in readiness to leave at a moment's notice. A storm that raged for several days culminated on 7th September with great fury, and with a crash from the stern, water poured into the engine-room. Gallant efforts were made to stem the flood, but during the night the pressure increased and the ship was flung about with great violence. When daylight came on 8th the storm had ceased but the view from the deck was alarming, for the large floe had been broken up and tons of stores were lost. All hands started to salve as much as possible, and provisions were dug out of pressure ridges. Food had been thrown in all directions : flour was loose on the ice, and the men's legs became entangled in yards of tobacco.

As half the stores were lost, including 50 bags of coal, another 50 bags were stacked on the floe and a new cache was made in the safest available place. It was then seen that they were near the dreaded Liverpool Coast ; they had drifted nearly 100 miles in 9 days and

were caught in the East Greenland Current. The next observation gave the lat. at  $72^{\circ} 17' N.$  and long.  $21^{\circ} 15' W.$  whence the Liverpool Coast could be seen. There was then no pressure, though no water was in sight. In spite of the dangerous proximity of the coast, its grandeur was much admired, with snow peaks and rugged cliffs. Sledges were then constructed and rigid rationing began; the remaining supplies on this basis would last all hands for nearly a year. On 13th September the ice renewed its attack on the ship. Soon after noon the *Teddy* was bombarded on all sides, flung violently about and lifted up until she had a list of  $40^{\circ}$ , and 10 ft. of keel were in the air. Every man worked frantically to remove the necessities of life to the heaving ice, dangerous as this appeared; for the ship's timbers were cracking and it was feared she would turn turtle. The men watched her struggles as she climbed among the great ice cornices; then the pack opened and she slid back into the water.

The whole situation was extraordinary. At one minute the men's lives were in jeopardy amid a terrifying tumult of heavy ice-masses, and next minute they were laughing in the sunshine on deck, hugely amused at the dancing ice pack around them. Their great desire was to work the ship out of the pack to the E. and reach home, but there seemed little prospect of success in this direction, and their next hope was to reach a secure place on the coast where they could winter. Should the ship be lost, their best course was to camp near their food until the current carried them closer to land; they would naturally remain in or near the ship as long as possible. To be wrecked off the E. coast of Greenland is a terrible experience; but in one particular it is not as dreadful as it appears, because it is usually possible to remain near the food supply, and occasionally game is secured. The calf and 2 bear cubs were killed, and one night a full-grown bear was shot on the floe. There was a large stock of musk-ox and bear skins, and there were some sleeping bags; in fact, the party had most of the necessities of life except perfect safety. The large whale boat was too infirm for transport, but a dinghy that carried 5 was in good condition. After passing Davy Sound on 13th September the rate of drift was from 4 to 5 miles a day, though subsequently this speed was more than doubled. For the next 3 weeks life was uneventful. Rathbone Island came into view and began to cause anxiety lest it should set up pressure in the pack. There was no game at this time, and the hunters had target practice at old packing-cases.

Early in October the period of idleness ended and dangers again intruded. All hands were called out at midnight on the 1st-2nd to

drag their bedding and all movable property up on deck. Pressure had set in, though the *Teddy* lifted well, and is said to have actually climbed out of the water. There was no floe on which to dump supplies, as the ice was not thick enough. The ship then slipped back into the water, and next day when the pack opened she made a mile, it was fondly hoped, towards greater safety or in any event farther from Rathbone Island. Capes Hodgson and Brewster could then be seen, and on 3rd October the first iceberg appeared. At 2 a.m. next morning pressure began again from some heavy hummocks, and the ship was flung wildly about. Supplies were dumped in the safest place on the ice, in spite of the darkness. The deck was so crowded with stores that the best method of progression was on hands and knees. When the pressure ceased, the stem of the ship was high in air, and lowering it into the water was a difficult task.

Daylight on 4th October showed some open water, and the *Teddy* steamed opposite to the entrance of Scoresby Sound. The spirits of everyone rose and their dangers were forgotten like a nightmare. About 15 miles were made to the SE. before darkness fell, but on the 5th the ship was held up most of the day. On the 7th a storm opened the pack again and there was a race to reach the open sea before nightfall. At 5.30 p.m. darkness made the risk of forging ahead too great, so the ship was moored to a floe. That night is described as a night of terror.

At about 7 p.m. the storm increased and the *Teddy* could not be held to her floe, but fell off and began to bump. The whole ship trembled and was soon adrift, crashing broadside against the ice. When the engines, as usual, failed, Capt. Bistrup said *that* was the finish. He managed, however, to put the ship's head into the wind and to hold on somehow. The sailors were covered from head to foot with ice as the spray froze on them. There was no attempt at merriment that night, though perfect calmness prevailed, and every man would have gone down in the vessel without a whimper, for the Danes have still their ancient courage. The storm reached its height about midnight when the *Teddy* was flung about like a cork, with the ice crashing on every side. When daylight came, the gale had ceased and open water was seen for 20 miles towards land, but the ship was in the ice that stretched eastward. All hands were worn out; unfortunately, however, the stores had to be removed from the hold to the ice, and the work warmed the men's blood, tired and half-frozen as they were. Suddenly the ship was pressed between two heavy floes and seemed in danger of being crushed. All hands carried

equipment and supplies on to the pack as quickly as possible. The rudder was smashed and the ship abandoned.

That night there were  $10^{\circ}$  of frost, but the men were moderately comfortable, for they had plenty of skins. The floe on which they lay was over an acre in area and consequently firm and steady after the violent motion of the ship. Shelter was erected the following day, and the ship nearly emptied of stores, coal and loose timber. On 10th October the deck-house was removed to the floe and used as a hut. The latitude was then  $68^{\circ} 34'$  N. which showed that the drift had been 50 miles in the last 2 days. Spirits and cigars were then consumed, for they could not be carried on the sledges that were built at once. The stores were divided into 3 depots, 50 yds. apart. A new phase of life began when the men occupied the floe. An occasional seal or bear was shot, and the fresh meat kept the men from scurvy. The hut was quite warm and comfortable, though tightly packed with 21 men. On 11th October their position was in lat.  $68^{\circ} 18'$  N. and long.  $25^{\circ} 31'$  W. The following day it was found that they had drifted 20 miles in the 24 hours. On 14th there was rain, with the temperature at zero (probably C.), and next day they were midway between Greenland and Iceland, having drifted 70 miles in  $2\frac{1}{2}$  days. They did not fear the future, though a new danger was soon to threaten them.

On 15th October the ice began to rise and fall under the influence of an ocean swell. In a few hours it died down, and was succeeded on 16th by a NE. snowstorm that raged for 2 days, when they reached lat.  $67^{\circ}$  N. During the evening of 18th the swell started again, and the lamps in the hut swung to and fro as they do on a ship. The motion continued until the following night when the floe cracked right through the hut where the men were sleeping, and they all turned out at the double. All around them the ice was making a terrible din and the hut threatened to collapse from the violent motion of the floe. Everything was collected on the largest piece of ice, and the rest of the night was occupied in carrying provisions back to the *Teddy*—still afloat, though her hold was nearly full of water. She was secured to the floe on which most of the hut still stood, and all hands went on board. In the morning they first finished making some better sleeping-bags, so that every man was well provided for, and then they moved the hut away from the edge to a safer position on the floe.

On 21st October they were in lat.  $67^{\circ} 10'$  N. and long.  $30^{\circ} 47'$  W. or 60 miles E. of Cape Christiansen, which showed a drift of 112 miles in the last  $6\frac{1}{2}$  days. It was now necessary for the party to prepare



for the loss of both hut and ship ; and this led to a universal display of generosity, though few gifts could be accepted. The sledges were packed and stood in readiness for an immediate start ; the dinghy also was made ready for transport over the ice. On 23rd October a glimpse was caught of the coast, and 2 days later it was again sighted at a distance of about 40 miles. An observation on 26th gave the lat. at  $66^{\circ} 35' N.$  and the position of the shipwrecked men at 20–25 miles from Cape G. Holm. The coast with many fjords and glaciers was now clearly seen ; and on 28th, in lat.  $66^{\circ} 21' N.$ , it was only 10 miles away. During the last few days the *Teddy* had been moved by the ice some little distance from what the men called their home-floe, and finally she drifted away to the SW. with half the provisions on board. It was thought that enough food remained to enable the party to reach Angmagssalik.

The swell began again on 29th October when large lakes were formed in the pack, and during the night the home-floe appeared to be floating in an open sea. On the following morning the ice closed up and the masts of the *Teddy* could be seen. The marooned men were then about 80 miles from Cape Dan and it was vital for them to make an effort to reach land before passing that point or they might be swung out to sea again. Mail barrels had been brought for an emergency and messages were now consigned to them. By 30th October Cape Dan was only about 50 miles away, or  $2\frac{1}{2}$  days' drift at the rate they were then moving. Eric the Red's Island lay to the west. Capt. Bistrup gave the order to march, and hung up a report inside the hut. The *Teddy* was only a mile and a half to the west and after about 3 hours' sledging the party reached her for the first night. Several of the sledges had gone to pieces as a result of their rough treatment, but fortunately they could be repaired at the ship, which was half full of water.

Most of the stores left in the ship were cached on the ice, and the party set out about noon on a NW. course to counteract, as far as possible, the direction of the drift. The weather and the ice were good to start with, yet progress was extremely slow : nearly 3 hours were spent on the first mile, and soon after accomplishing this distance it was time to camp. Rations had been calculated to last 3 weeks at 2 meals a day. On the following day, 1st November, snow fell, and the *moral* of the men was severely tested. Capt. Bistrup resigned his command and Lieut. Rostock-Jensen, 24 years of age, who succeeded him, reorganized the march. Progress then improved and the men pulled their sledges in high spirits. The *Teddy's* masts were seen for the last time on this day.

Yet another danger then threatened in the form of an iceberg that was breaking up the pack and towards which the party was carried. As the berg was nearly half a mile long the men divided their one bottle of port wine and the last cigarettes, for death seemed inevitable. Great masses of ice were flung about in all directions as the party drifted nearer to the berg ; but their floe passed along its side and the pressure was soon reduced. As they moved into more open water, the men fell asleep. When morning broke on 2nd November they were lying a mile and a half from 3 rocky islets which they believed were the skerries at the mouth of Sermiligak Fjord, and Cape Dan was seen to the SW. Everyone felt happy at the thought of reaching land, and the 35 miles to Angmagssalik seemed nothing. A new record had been made in the rate of drift from Scoresby Sound, a distance of about 374 miles, in 22 days at an average of 17 miles a day. The whole drift was 710 miles in 71 days, and on 7th-9th October, after the storm, the speed was nearly 30 m.p.d. The last 5 days in this month averaged 15 m.p.d. There was a great deal of polar ice in the current, and the floe that brought the party to land was a piece of the polar pack.

Brash ice prevented the dinghy from being used, and nothing could be done till 3rd November when the fjord was full of drift ice. The men started sledging over this but only advanced 150 yds. in 2 hours. The luggage was then drastically cut down, even the photographic equipment being sacrificed. During 4th November better progress was made and the boat used from time to time as a ferry. One mile in 7-8 hours was the best that could be done, and an island was chosen as the objective. On 5th November the island was reached with 3 cheers, first for Greenland and then for Lieut. Rostock-Jensen. All were in good health and spirits, for they expected to call upon the East Greenlanders soon and their hospitality was proverbial. On 7th November the island was left behind as the ice then permitted an advance to Puisak Island. Capt. Bistrup, who was born in Greenland and knew the country, took 2 other men and went ahead of the main body to Nunakitit for assistance.

By noon 3-4 miles had been covered by the main party when the thin ice on which they were travelling began to rock. They were near another island, but the dinghy went through the ice before reaching it. A camp was made in a ravine on this island which all safely reached and where, for a time, they had to stay. The advance party returned from Nunakitit with the bad news that the settlement had been abandoned. Three of the younger trappers were then chosen to go to Cape Dan for help. They were given a light outfit,

with the pick of the equipment and food for 10 days. At noon on 8th November they set out, and it was now realized that there might be difficulty in saving all hands. The new ice that surrounded the island broke up, and the men were marooned where there could be no drifting towards a further food supply. Their strength declined and their spirits sank under the enforced inactivity. They were always cold and their sleeping bags wet. One man seemed unable to endure many more days of these hardships. There was food for only one meal a day, consisting mainly, after 11th November, of oatmeal porridge. Everything was therefore cached except the barest necessities, though tobacco was taken. On 12th 6 men were ferried a mile to another islet, and on 13th 3 more men had joined them, when a Greenlander arrived with a dog-team. He drove the invalid 8 miles to Utorkarmiut, and next morning returned with 4 other sledges on which the remainder of the party was taken.

Hospitality here is a sacred duty as well as a pleasure; and the interior of the Greenlanders' huts seemed like Paradise to the shipwrecked and exhausted men. They were soon devouring soup from a lordly dish, followed by boiled salmon and coffee. When the 3 trappers who had gone ahead joined the main party the happiness of all was complete. The trappers had reached Cape Dan after a difficult journey and had sent 14 sledges to carry their comrades. As there was insufficient food for such a large influx of visitors at the little settlement of Utorkarmiut, the Danes set out for Angmagssalik on 16th November and drove the 35 miles in 13 hours. They remained at Tasiusak the capital until 19th June, 1924, when Shackleton's old ship, the *Quest*, was the first vessel to enter the harbour after the winter. By this time all the Danes had either scurvy or preserved food sickness, for the food was obviously deficient in vitamins, and 2 of them were seriously ill. After calling at Iceland, Copenhagen was reached on 9th August and over 5,000 people gave them a warm welcome home.

In addition to the *Teddy*, 3 other ships were in difficulties off the E. coast of Greenland in 1923: the *Heimen*, with Wordie's Cambridge party (see p. 223); the *Conrad Holmboe*, beset on 2nd August in lat. 74° N.; and lastly the *Anni*. A Norwegian party reached Greenland in the *Anni* and wintered in Mackenzie Bay (1922-3). Nothing is known of their fate except that they attempted to cross the pack eastwards, and the ship is presumed to have been lost with all hands (p. 225).

## CHAPTER XIV

### THE OXFORD EXPEDITIONS: BINNEY

**T**HE three Oxford expeditions to Spitsbergen were important, not only on account of their results but also because, with the contemporary Cambridge ventures, they inaugurated a new school of British explorers.

Arctic expeditions of the Franklin and Nares type, dispatched by the Government of the day, were needlessly expensive. Other expeditions were sent out by learned societies and ship-owners. But in all these undertakings the leader was appointed by the governing body, from which he received his instructions. Most of the earlier Antarctic expeditions were of a similar character: Ross in the *Erebus* and *Terror*, like Scott in the *Discovery*, acted *under orders*. Then a new type of expedition was introduced by De Gerlache in the *Belgica*, Borchgrevink being only a year later, and soon followed by Bruce, Charcot, Shackleton, Mawson, Scott in the *Terra Nova* and others. These explorers appointed themselves as leaders, made their own plans and then carried them through. Some of the best results were obtained by this system, though it overworked the leader; and the great discoveries and Homeric deeds it produced gave its commanders the publicity that helped to finance their ventures. Both these methods, particularly the former, now seem relatively unsuitable for Arctic exploration, and a great change was made by Rasmussen and Stefansson's application of the Eskimo system. The British did nothing in the Arctic for many years until 1921, when another new type of expedition was introduced on the founding of the Oxford and Cambridge School of Explorers. While not unadventurous, this type is academic in character, benevolently monarchical in government and desirous of avoiding heroics. The Oxford University Expedition of 1921, indeed, appears to have been an oligarchy.

The "Spitsbergen Papers," in 2 volumes, affirm that the primary purpose of the 1921 expedition was ornithological, and Spitsbergen offered a most suitable field for the study of bird life. (A short description of Spitsbergen will be found on pp. 231-2.) The interrelation of organisms needed further study, and a group of relatively



BINNEY IN 1931



small Arctic islands formed a favourable field for gathering information on the subject. During its formative period the aims of the expedition rapidly expanded and finally embraced a wide range of interests : topographical and cartographical, glaciological and geological, botanical and zoological as well as exploratory. H.R.H. the Prince of Wales lent his patronage and Oxford University permitted the use of its name ; the Royal Society, the Scott Memorial Fund and private donors subscribed the cost, and the leader was the Rev. F. C. R. Jourdain.

George Binney, in his book " With Seaplane and Sledge in the Arctic," says it was the fate of the 3 Oxford expeditions, though his good fortune, that he should be organizer or leader of each one. He was organizer and secretary in 1921 : organizer and leader in 1923 and 1924. The three expeditions form a series of which the first became a reconnaissance for the others, and the aims of the principal promoter were not fully realized until the last. Many new topographical features were discovered and explored on these expeditions ; they carried out more accurate and intensive work than had been done before on comparatively old ground ; and they provided excellent training for their young and enthusiastic members, all of whom were tenderfeet in 1921. There were 13 professional scientists on " The Oxford University Expedition to Spitsbergen, 1921," including Profs. Julian Huxley and Carr-Saunders, Messrs. C. S. Elton, V. S. Summerhayes, R. A. Frazer and G. Slater. Two independent parties went north : an ornithological party under Jourdain and a scientific exploring party led by N. E. Odell. The first party sailed from Newcastle on 1st June, 1921, and visited numerous bird colonies.

The second party, led by Odell, comprised 2 units : a scientific unit under Carr-Saunders that worked near the Base in Klaas Billen Bay, Ice Fjord ; and a surveying unit, consisting of Odell, Longstaff and Frazer, which made an interesting sledge journey to the interior. Mt. Terrier, 3,963 ft., was climbed, and then the Nordenskiöld Glacier was ascended and a diminutive plateau, 10 miles wide, crossed to a new glacier, the Oxford Glacier, that lay NE. of the Base. A large glacial confluence was also discovered SE. of Mt. Chernishev, 4,570 ft., and the Base was regained in 17 days, many of which were useless on account of rain and mist. The earlier surveys of Conway and the Russians had been extended and a new area of the interior charted. The principal work of this expedition was scientific, and the results were published with commendable promptitude. The reports of many expeditions do not appear for years after the collec-

tion of the data ; but the scientific technique of all the Oxford expeditions was admirable, and the results soon appeared in the journals of the appropriate learned societies. They were also collected in the " Spitsbergen Papers," and Jourdain wrote a volume on the birds.

Binney was the only non-scientific member of this expedition ; he was a classical scholar of Eton and Merton College, Oxford, and he felt that a greater geographical harvest might have been gleaned. He therefore decided, at the age of 21, to organize and lead an expedition with the main purpose of geographical discovery ; to continue the work of the first expedition, but with the scientific work secondary to exploration ; and he chose North-East Land for the field of operations. Its interior was almost unknown, as the only serious explorer who had examined it was Baron Nordenskiöld ; he had crossed from N. to SW. in 1873. He did not make a direct traverse and had only one fine day during his journey ; hence he saw little of the country, which he found completely ice-covered. Its east coast was almost inaccessible because of the pack ice that drifted south from the Arctic Sea. North-East Land was ripe for exploration and, unlike Spitsbergen, was a truly Arctic country. Binney had two main objectives : to penetrate the interior and to conduct, from the ship, a photo-grammetric survey of the coastline.

The 1923 expedition was self-supporting, for an Arctic summer cruise when well organized is relatively inexpensive. The nucleus of the personnel came from the Merton College Eight : A. C. Irvine and G. Milling had rowed, indeed, for the university, and 7 members were not scientists. Another 7 formed the scientific staff, of which C. S. Elton of the 1921 expedition was leader. Dr. T. G. Longstaff was again medical officer, and 6 of Binney's men, including himself, Brown the naturalist, Frazer the surveyor and Odell, had served in 1921. N. E. Odell was geologist for the second time, but this was the first expedition on which he was associated with Irvine. A year later, on the Everest Expedition of 1924, Odell at a height of about 26,000 ft., was the last to see Irvine and Mallory alive.

The Merton College (Oxford) Expedition, 1923, was named with the consent of the Warden and Fellows, from the ancient house of learning whence it originated. It sailed from England on 14th July and left Tromsö on 22nd in the sailing sloop *Terningen*. A call was made at Green Harbour on the W. coast of Spitsbergen, and Liefde Bay on the N. coast was reached on 28th. The following day Hinlopen St. was entered, and the W. coast of North-East-Land was followed south in the search for a landing-place. The strait,



however, was choked with ice which prevented this objective from being attained. A landing was made, with some difficulty, on one of the Foster Islands; but it was impossible to put the sledging party ashore on North-East Land. On 30th it was decided to land the party on the E. coast of Spitsbergen, and on 31st July the sledgers under Odell disembarked to make a crossing of New Friesland. Binney led the ship's party in an attempt to circumnavigate North-East Land, but the propeller soon broke in the ice, and this reduced the speed to less than  $2\frac{1}{2}$  knots.

Odell, Frazer, Irvine and Milling made a journey of about 100 miles from Duym Point to Klass Billen Bay on the W. coast. Though the distance was not great, good work was done in continuation of the discoveries made in 1921. The little Loven Plateau was found to be 1,500 ft. high; and the topographical survey was carried from the coast to the junction with the work of the previous expedition. The Mt. Newton district also was explored. Mt. Hope, 5,079 ft., and Mt. Newton, 5,676 ft., were climbed. Five glaciers were found to debouch into the *Vallée blanche*, seen in 1921, over which Mt. Chernishev seems to preside. The Russo-Swedish Arc of Meridian Expedition had visited this mountain between 1899 and 1902, and had left 2 minimum thermometers on which Odell's party found the lowest reading to be  $-38.6^{\circ}$  C. The charting of the Merton Glacier, begun in 1921, was completed. Travelling and surveying conditions were adverse, but the journey was most successful. A wireless receiving set was carried and messages were received from the ship.

After landing the sledgers, the ship limped S. and then E. along the S. coast of North-East Land until turned back by impenetrable pack in Ulve Bay, where two landings were made. Several attempts to repair the propeller were unsuccessful, but in spite of this handicap Binney was determined to make another attempt to circumnavigate the island, this time by the northern route. Some reconnoitring was done in Wahlenberg Bay where a landing was made. North Cape was rounded in open water on 13th August. A most impressive coast with mighty cliffs and glaciers was found to the east, and a large tabular iceberg was seen. On 14th, Dove Bay was crossed through thin ice, and Cape Bruun reached. The risk of proceeding beyond here was too great, for the polar pack was approaching the coast. A landing was made on North Cape where a German tent bag was found—all that was left of the Schroeder-Stranz party (see p. 233). A spare propeller was fixed on 15th August in Wijde Bay, and the 21st to 25th were spent reconnoitring in Liefde Bay. On

30th Odell's party was picked up in Klass Billen Bay only 5 minutes late on schedule after a month's journey.

Although Binney was disappointed that the glacial defences of North-East Land had successfully resisted his attack, he shrewdly regarded this expedition as no more than the first round of the contest, and as a reconnaissance it had been successful. Good work was done by sea as well as land : panoramic photographs from ascertained positions were taken of the unrecorded N. coast of North-East Land and many corrections made to the charts, both of the coasts and of the sea-floor in the bays. The magnetic observations were particularly interesting, for the variation of the compass at 9 stations gave an *increase* of  $1^{\circ} 38'$  since the Admiralty chart of 1913, which foretold a *decrease* of  $1^{\circ} 50'$  for 1923.

The mixture of Oxford brain and brawn, tintured by a Cambridge contingent, had now proved its capacity for Arctic research, and Binney decided to make further use of the experience recently gained. He believed that North-East Land could be reached by competent men, and, with decided advantages, he set about the organization of another expedition. He realized the need of working on a larger scale, and he decided to experiment with a seaplane. Mittelholzer's flight (p. 244) had been made over Spitsbergen while the 1923 expedition was there ; but Binney has the credit of introducing flying for the specific purpose of geographical exploration.

One member of the 1923 expedition, by giving the generous amount of £3,000, made it possible to proceed at once with the formation of new plans. Oxford University and the Royal Geographical Society gave official support and small donations. H.R.H. the Prince of Wales became Patron of the expedition and presented a silver shield. The War Office lent the services of Lieut. Aldous as Chief Surveyor, and the Director of Civil Aviation lent Capt. F. Tymms, M.C., as seaplane navigator. Each member of the personnel, with the handsome exception just mentioned, contributed according to his means from £25 to £500, and thus the expedition was virtually self-supporting. No public appeal being made for funds, the venture attracted little attention, and it should be better known. C. S. Elton of 1921 and 1923 was Chief Scientist ; R. A. Frazer, also of 1921 and 1923, led one of the sledging parties ; H. M. Clutterbuck and E. Relf of the National Physical Laboratory, both of 1923, were Assistant Organizer and Assistant Wireless Operator. Unfortunately Odell and Irvine were on the Everest expedition whence the latter never returned. The total personnel was 25, including 4 Norwegian dog-drivers, of

whom one—Capt. Helmer Hanssen—had accompanied Amundsen to the South Pole; he was put in entire charge of the dogs.

Binney's record in book-form of the Oxford University Arctic Expedition, 1924—"With Seaplane and Sledge in the Arctic"—is introduced by Prof. Sollas, who draws attention to the youthfulness of the personnel. Most of the members, like those of Watkins' 1930 expedition, were under 24 years of age. Binney's book is written with ability and in a style that often sparkles. He adopted Shackleton's method of shouldering all the administration himself, with the assistance of Clutterbuck who, he says, reserved "a fund of patience and good spirits for the time when they were most needed—in moments of adversity." The *Polar Bjorn* (*Polar Bear*), a sealer of 164 tons, and a 27-ton sloop, the *Oiland*, were chartered at Tromsø. Sir John Thornycroft lent a motor launch, and other manufacturers were generous in their gifts of stores and equipment. The relative number of technicians (7-8) to scientists (8-9) is a measure of the expedition's modernity, for on earlier expeditions few of the former were taken, and Binney experimented largely with new inventions. It was characteristic of the new school of British explorers that the motor-boat mechanic, R. Thornycroft, was spare man of the Oxford boat. There were 4 Cambridge men, 7 from the services and 8 members of Oxford University. On 19th June, 1924, the *Polar Bjorn* left Newcastle, and after a rough but jolly crossing reached Tromsø on 27th where the Norwegians joined the ship.

As Hinlopen Strait frequently provides a passage south for polar ice, the safest route to North-East Land is north along the W. coast of Spitsbergen. In pursuance of this route Green Harbour was reached on 3rd July, and the difficult operation of landing the seaplane successfully undertaken. The *Polar Bjorn* sailed on 7th for Liefde Bay, on the N. coast, which had been chosen for the Main Base, and where the seaplane slipway was constructed. Binney remained at Green Harbour with Capt. J. C. Taylor (R.A.F. Reserve) to await the *Oiland* and to make the first flight to Liefde Bay. The *Polar Bjorn* was in command of Col. J. E. Tennant, D.S.O.; Lieut.-Col. Sir I. Colquhoun, D.S.O., was in charge of the working parties, and, together with Clutterbuck, these three acted as a triumvirate during Binney's absence.

On 9th July, when the *Oiland* arrived at Green Harbour, an explosion occurred on the Norwegian motor-boat as the last members of the expedition were coming ashore. They took to the water and escaped with singes. The engine was encased, and petrol fumes

were probably ignited by a spark. Next day the seaplane-engine underwent its first test, after which a flight was attempted. The machine climbed at 45 m.p.h. ; and during its short but epoch-making flight Binney felt the triumph of science over Nature. He was the first *explorer*, though not the first aviator, to fly in the Arctic or Antarctic (see p. 242). When other tests had been made Binney waited for a wireless message from Liefde Bay, 140 miles distant, to say that the conditions were favourable for landing. The message came on 13th July, and a start was made in spite of fog in the Foreland Sound. A month's supplies for two men, and sledging equipment, were carried. The route lay north along the coast to King's Bay and then over the mountains to the Base. A. G. B. Ellis, ex-R.A.F., was pilot, with Binney, who knew the coast well, as observer. At 4 p.m. they took to the air, but after flying 15 miles were forced to turn back by the fog. On the following day conditions were better, though far from satisfactory ; but it was decided to make an attempt to fly at least as far as King's Bay. The wireless gear was taken out of the seaplane to save a weight of 85 lbs.

The machine took off at 9.45 a.m., and notice of this fact was sent to the Base. Ellis had to fly at about 400 ft. to pick out landmarks through the mist, and cruised easily at 70 m.p.h. When a quarter of a mile N. of Michael Sars Point, with King's Bay in sight 15 miles ahead, the engine suddenly stopped without warning and into the sea they splashed. A piston head had broken and it was impossible to start again ; they had flown for 59 minutes. The seaplane was now at the mercy of the elements and was being blown north-westwards by the wind. Binney and Ellis spent the first hour after their descent in fashioning paddles from ice-axes and the lids of sledging-boxes ; they then sat astride the floats and hopefully struck out for the shore. They were near the middle of the Foreland Sound and wished to make Quade Hook ; but though they laboured for 3 hours, until soaked to the skin, they made no headway against the rising wind and sea. At 3 p.m. they climbed back into the cabin to avoid being swept off the floats. They extemporized a sea-anchor that may have reduced the rate of drift by half a knot. Further efforts were unavailing, and they had no choice but to hope for rescue by the expedition's ships which, however, might be too late.

The two crucial factors in the situation were the want of drinking water and the rising sea. Binney and Ellis were hungry and thirsty but dared not eat for fear of increasing their thirst. At 4 p.m. they were 2 miles from shore, though approaching the open sea, and the seaplane was groaning under the buffets of waves 7 ft.

high. The pilot cut the petrol pipes to relieve the seaplane of overhead weight, and this tranquillized the water to some extent. As the machine could not possibly last long the men donned their life-jackets ; Binney's, however, was punctured and useless. They drifted to within a mile of Quade Hook where the hut could be seen, and Binney fired a gun without attracting attention. Before they were driven from the land across the mouth of King's Bay, Ellis suggested trying to swim ashore. This would have been suicidal in the heavy sea with its low temperature ; and the night wore on with little change except for the sinking of their hopes. At 9 p.m. they were being driven towards Cape Mitre on which the surf could be seen breaking. There would be no chance of the seaplane surviving if the Cape was passed.

The situation was clearly faced : the machine would be pounded to pieces in 6 hours when they reached the open sea ; they were perfectly helpless and their thirst was becoming a matter of increasing concern. Fortunately Ellis was continually cheerful, having been through several similar experiences in the war. At 11.45 p.m., when the seaplane was apparently trying to stand on its head, he said : " Good night, mate. I'm going to turn in." Such behaviour seemed remarkable to Binney who had given up hope of rescue. At 1 a.m., however, a small motor-boat was seen approaching, and the two castaways finished the brandy and cigarettes, followed, we are told, " by a strange serenity." The seas broke over the rescuing craft as it disappeared in the trough of the waves, and the engines were more than once swamped by the water ; but at last the seaplane was reached and towed to Quade Hook. The rescuers were three Norwegians, two of them members of Oslo University, who were in charge of the meteorological station at Quade Hook, and had happened to sight the drifting seaplane. They treated Binney and Ellis like brothers. " More perfect rescuers exist," wrote the former, " only in fiction." We must now follow the main party.

Liefde Bay, reached on 9th July by the *Polar Bjorn*, delighted everyone with its beauty : the sun shone over the blue waters and glistened on the ice, while rocky peaks formed a purple background, and

*All the bugle breezes blew  
Réveillé to the waking morn.*

The Base of the expedition was established on the shore of the Reindeer Peninsula. Liefde Bay is the only completely landlocked

inlet on the N. coast of Spitsbergen, and it formed almost an ideal locality for the Base. It was 40 miles from North-East Land, but this was its only disadvantage. North-East Land resembles Antarctica on a diminutive scale, being so heavily glacierised that there are few good harbours. The seaplane cases had been specially designed for use as huts ; and a wireless station was installed. Uncharted and submerged rocks in the harbour were buoyed with empty petrol tins. When the seaplane failed to arrive with Binney on 14th July, great anxiety was felt because a forced landing was the least that could have happened, and measures were taken for relief.

The *Oiland* was instructed by wireless to search the coast northwards to King's Bay and there await the *Polar Bjorn* which left the Base at 4 p.m. The *Oiland* could not put to sea till 6 p.m. and was still 40 miles S., while the *Polar Bjorn* was 70 miles N., of the stranded machine at the time when Binney and Ellis were unexpectedly rescued by the Norwegians. The larger vessel would have been too late to rescue the aviators, and they were beyond the *Oiland's* area ; she reached Quade Hook at 7 a.m. on 15th and the *Polar Bjorn* at noon. The seaplane was lifted bodily into the larger ship and taken to the Base, where the repairs occupied a fortnight. Binney was the first explorer to transport a fully-rigged seaplane on a small ship ; it was afterwards done by Mawson, Wilkins and others in the Antarctic.

After Liefde Bay was regained on 17th July, and the seaplane landed, the 2 ships were headed for the N. coast of North-East Land in search of a Sledging Base. Both ships ran on reefs off Low Island, but floated off in about 12 hours without serious damage. Horatio Nelson, when a midshipman, had encountered his polar bear on the pack ice near this island in 1773. As no landing-place could be found on the N. coast, Binney turned back to Hinlopen Strait and soon saw that Murchison Bay would have been suitable had there been ice reaching the sea, but the glacier ended 5 or 6 miles from the coast, and the sledging equipment could not be carried across the rocks. A strong N. current usually keeps the Hinlopen Strait ice in motion, though the Foster and Waiigat Islands to the south temporarily arrest the flow. Hence there was little difficulty in reaching the entrance to Wahlenberg Bay, where an excellent base was found for the sledgers on a spit of bare land. The vital factor in its position was its accessibility for the ship, if possible at all times, to embark the parties after their journeys. The length of the bay was then unknown, but as far as could be seen it was full of ice.

Two sledging parties were landed here on 21st July, 1924, and then Binney's work was interrupted by illness. Law, the wireless operator, had pleurisy and Capt. Hanssen was suffering from blood-poisoning; they were taken to a hospital at King's Bay. The members of the Northern Sledging Party were Lieut. J. R. T. Aldous, R.E., leader and surveyor; W. B. Carslake, an expert mountaineer; F. A. Montague, the Oxford running blue; and Lindquist, a Norwegian dog-driver. A wireless transmitting and receiving set was carried by this party for the first time on any sledge journey, though Frazer had received messages on his journey in 1923. The experiment in 1924, however, was inconclusive for 2 reasons: Law's illness had deprived the party of a trained operator, and the weight of the apparatus, 40 lbs., was a serious addition to the loads. These totalled 1,400 lbs. and were carried on two sledges drawn by 7 dogs and the men. The main purpose of the journey was to explore the northern part of North-East Land.

The Northern Journey was successful, if mainly remarkable for the manner in which the difficulties of midsummer travel were overcome during the journey. Unfortunately the expedition was restricted to the summer for its field operations. Day after day there was water to contend with, and wet snow, slush, rain and mist. Relaying was the usual method of progress, and on the worst days a distance of 3-4 miles was the utmost possible gain by the united exertions of men and dogs. Some patches of bare ice were crossed on the higher part of the plateau, and here 10-13 m.p.d. were accomplished; but the crucial difficulty was the shortage of dog food. Had its quality been according to specification all would have been well, and ample food was provided. The direct distance was only 50 miles, or probably 150 miles for the round trip; yet 42 days' rations were taken for the men and 35 days' dog food. The dogs' strength, however, could not be maintained even by doubling their pemmican, and the only hope was that game would be found on the N. coast. A magnificent view, embracing the coast from the Seven Islands to Cape Platen, was obtained from a height named Mt. Toil on 5th August; and then in half a minute the visibility was reduced by a fog from 20 miles to 30 yards. Some purple sandpipers and snow buntings were the only forms of life seen when the coast was reached; and surveying was much hindered by gales. On 7th only 3 days' dog food remained, and next day the return journey was begun, when the difficulties of the outward journey were repeated. The dogs were fed on the men's biscuits until the base was regained on 15th. The route had been almost entirely

over the featureless plateau ; and there were fogs or blizzards on 18 out of the 25 days occupied by this journey.

On 21st July Binney had sent the *Oiland* to reconnoitre the S. coast of North-East Land, and then he set out with the invalids in the *Polar Bjorn* for King's Bay. The ship ran on a reef, but was kedgeed off. In passing Liefde Bay, on 25th, a call was made at the base, where everything was in good order and the repairs to the seaplane were proceeding satisfactorily. Law was left at the hospital the following day, with his pleurisy developing into pneumonia ; but Hanssen's blood-poisoning had so greatly improved that he could now remain in the ship. Binney dined at Liefde Bay on 27th and afterwards sailed for North-East Land, taking Relf as wireless operator and marooning Rankin and Stonborough in Wijde Bay to study bird life. On 28th Hinlopen Strait was solid with ice and the ship was taken back to Liefde Bay where the seaplane was nearly ready for the air. On 31st, after a test flight, Binney left in the *Polar Bjorn*, picked up the bird party, and next day found the strait navigable. On 2nd August the *Oiland* arrived at the *rendezvous* in Wahlenberg Bay with the most important information yet obtained on the expedition : that there was open water off the E. coast of North-East Land.

The 80 miles of this coast from Cape Mohn to Cape Leigh Smith were known to consist of a vertical ice-cliff against which the polar pack lay so heavily that it had seldom been approached, and, before Binney's expeditions, it had been assumed that a landing here was impossible. The *Oiland* found the cliffs, 3 miles N. of Cape Mohn, low enough to land upon, and from a height of 150 ft. a view was seen for the first time in history. Far to the N. some rock-cliffs appeared ; the sea was open, and to the SE. were the Wyches Islands. Thus the first landing was made on this coast on 30th July, 1924. The *Oiland* ran aground while seeking to bear the good news to Binney, and was afterwards detailed to act as seaplane escort. Binney sailed in the *Polar Bjorn* for Cape Mohn. East of Cape Torell the pack ice and mist held the ship up until 2 p.m. on 3rd August when Ulve Bay was passed in open water, and the position of the Krohn, Kervel and Klerk Islands sailed over ; they do not exist in their charted location. Cape Mohn was found to have three headlands, of which the central or SE. point was presumed to be the actual cape, and its position was fixed by the theodolite in lat.  $79^{\circ} 18'$  N. and long.  $25^{\circ} 10'$  E.

Binney now decided to lead the Eastern Sledging Party on a journey from the E. coast of North-East Land to Wahlenberg Bay.





very wet country that included a glacial stream 15 ft. wide. The following day was worse, with the sledge wallowing in a sticky morass and the dogs useless ; but the 7th, as the result of a frost, was more encouraging. Undulations were found on the surface of the featureless plateau. The snow was very wet and immersed the dogs to their bellies. The surface became flat, though not level, when the party had covered more than half the distance they had to travel. A series of parallel black lines then appeared ahead, extending north and south. They were reached next day and found to be Nordenskiöld's "ice-canal," or chasms from 30 to 100 ft. wide and about 40 ft. deep, with masses of congealed snow and open crevasses at the bottom. When these obstacles were surmounted, other difficulties faced the party. Their photographs show that ordinary crevasses were far too numerous for safety, and for several days the mist made sledging more dangerous than usual.

On 10th August a basin pitted with crevasses was crossed. Later in the day the sledge was passing along a narrow ridge between 2 crevasses when it skidded into one of them and dragged down the dogs. Had it not become wedged a few feet below the surface there would have been little hope for the party, for they were 30 miles from the nearest supplies and all their food and equipment were on the sledge. After this escape the dogs were uncoupled in the most dangerous places. For 24 hours on 11th-12th a blizzard made it impossible to move among crevasses that were within a few feet of the tent on each side ; and the going was most hazardous when the journey was continued over a large glacier, 9 miles wide, that was honoured with the name of Eton. The roar of an "underground" torrent was heard and the occasional rumble of splitting ice.

The descent of the glacier to the coast of Wahlenberg Bay, though infinitely dangerous, was delightful by reason of the magnificent panorama unfolded before the party. Below them lay the ice-flecked sea with unexplored land in the foreground ; while far to the west, softened by the haze of distance, stood the peaks of New Friesland. A terrible struggle with the glacier that then ensued is thus described by Binney :

We found ourselves in a great arena, wildly fantastic and unreal. On two sides of us an ice-cliff towered. We threaded our way by pale-blue grottos, past dark ice-caves, along the bank of a deep-blue frozen lake. We could hear the murmurings of a torrent in the bowels of the glacier. Around us, and above us on all sides, were ice-pinnacles—fashioned, as it were, by some frenzied architect, grotesque symbols of distortion. And the sun lent himself to this eerie landscape—a pale phantom in the mist, the mere

wraith of his own glorious being. ("With Seaplane and Sledge in the Arctic," pp. 203-4.)

Naturally the men were very tired after fording many glacier streams, and the dogs had finished all their food, when the *rendezvous* with the *Polar Bjorn* was reached. Binney pays a gracious tribute to his companions, saying that each of them did more than his fair share of the work. This journey must not be undervalued because it was short; for it was of great importance in settling the character of North-East Land, a cross-section of which could then be plotted. Binney found that the inequalities of the land were almost completely submerged by the island ice. Many geographical, glaciological and other discoveries were made, and the party successfully accomplished a very difficult journey.

After landing the party at Isis Point, the *Polar Bjorn* had sailed north, but when 20 miles S. of Cape Leigh Smith was forced to turn back by heavy ice. The ship then visited Liefde Bay before relieving Binney's party on 15th August. Next day the Northern and Central Parties were picked up, and great was the animation of every man at the reunion, duly celebrated that night by a "bump-supper" or rowing banquet, the ingredients having been provided by Binney with commendable forethought. Each party had done good work and avoided casualties, even among the dogs, under dangerous conditions. Binney then heard the story of the other sledgers, and that of the Central Party must now be recorded.

This party's original objective was Cape Mohn that lay to the SE., a journey which would have made, with the other routes, a comprehensive scheme of exploration. But the pack ice prevented a landing on the south side of Wahlenberg Bay, and the only possible route was along its north coast. The Central Party comprised Frazer, the leader and surveyor, Clutterbuck, Sandford and Schmidt, the Norwegian driver. As Frazer had accompanied both the previous Oxford expeditions, and as Clutterbuck was his Chief-of-Staff, this party was a model of efficiency. Clutterbuck extracted much comfort in the intolerable conditions of the journey from his inexhaustible reserves of cheerfulness; and "the other three rejoiced in the luxury of hearing some strange vituperation, which crystallized their own thoughts with admirable compactness." The party, after landing, set out through wet snow and glacier streams. At midnight on 21st-22nd July they camped at about 900 ft. above the sea. On the next march the first crevasse was encountered, but then the going improved, and after covering 6-7 miles some dry snow was found on which to camp. Crevasses proved the same formidable

obstacles to progress as on other parts of the coast ; on 25th, 15 were counted in  $\frac{1}{4}$  mile. The party was attempting an almost impossible task, for the ice is fearfully broken and contorted in its descent from the plateau, and they never left the disturbed area. Added to this were mists and the results of the thaw in pools, streams, slush and rain. At the head of the bay the Eton Glacier descended in the greatest confusion. On 2nd August it was impossible to force a passage eastwards through a snow-choked valley ; but on 5th the plateau was reached at a height of 2,000 ft. through great ice-disturbances, and the return journey was begun forthwith. Blizzards had much retarded progress and were to do so still more during the homeward march.

The Central Party had stormed the glacial defences of North-East Land and won through to the summit, but the return was like a nightmare. Torrential rain caused the cup of discomfort to overflow, and the men fell into crevasses, where they were held by their harness until rescued. The name of one camping-place—Hell Camp—is an indication, not of the temperature, but of the warmth of the men's feelings. Here a blizzard kept them prisoners in the tent for 60 hours. Soon after the storm ceased, the seaplane was sighted flying over Hinlopen Strait, and the view in this direction was most beautiful. On 15th August the depot was reached. The Central Party had made a dangerous journey, and its members are to be congratulated on returning without loss of life.

After supper on 16th the night was warm enough under the midnight sun to lounge on deck, and the men were enjoying their well-earned leisure when the *Oiland* like a fluttered bird steamed in with the news that the seaplane had crashed. Its efficiency had been reduced by the first crash, and a Base nearer than Liefde Bay to North-East Land was necessary. Treurenburg Bay was chosen, and the flight to the bay made without difficulty on 7th August ; but next day a gale arose and the seaplane dragged her anchor. When within a few yards of destruction on the rocks, a rope was made fast to the machine and it was towed by the *Oiland* to an assumed place of safety. An iceberg then bore down on ship and seaplane. The ship's engines had been stopped, and half an hour is required to start the semi-Diesel type of motor. It was seen that the berg would strike only the seaplane, and the mooring-rope was hauled in on the ship. Thus the collision was averted by less than a foot.

On 9th August a flight was made to Wahlenberg Bay, during which the surface of the plateau seemed impossible for sledging

because of its multitude of crevasses and streams. This was the only day on which all 7 sections of the expedition were simultaneously at work : the 3 sledging parties, 2 ships, the seaplane and the Base. The heat at noon was too great for comfort. No flight could be made until 13th when a leaking tank and other difficulties curtailed the length of the outing. On 15th the seaplane refused to rise more than a few feet and crashed on the coast of Treurenburg Bay, fortunately without injury to Ellis or Tymms ; she was again taken to Liefde Bay for repairs.

Various excursions were made by the other members of the expedition, of which the land and marine surveying were the most important. Binney took the *Polar Bjorn* to the head of Wahlenberg Bay. She was the first exploring ship to reach the locality, where there were many miles of interesting country hitherto unexplored. Here 5-6 days were spent, during which many geographical discoveries were made and many icebergs encountered, some of them 60 ft. high. Icebergs are rare in other coastal waters of the archipelago. Liefde Bay was visited for the last time, to embark the Base, on 30th August. The seaplane made its final flights on this day when it attained a height of 8,000 feet, after which it was abandoned because unfit to bring back. Aerial photographs had been taken of nearly 100 miles of the North-East Land coastline, and it had been shown that aircraft were a valuable aid to exploration. On 1st September the *Polar Bjorn* left the bay and on 18th the expedition was home.

The Oxford Expedition of 1924 was an excellent model of the new type of British expedition, and its results were admirable in spite of adverse weather ; the summer was said to have been the worst for 15 years. Binney's lecture on his expedition before the Royal Geographical Society was followed by 7 other papers on these subjects : the biology in relation to the geography ; geology and glaciology ; meteorology, and aerial navigation in the Arctic ; magnetic observations ; wireless ; and the aerial survey. The President of the Society truly affirmed that the achievements of the expedition were considerable and that much geographical work of real value was accomplished. North-East Land was little known until the concerted attack of Binney's parties ; to-day, as a result, it is quite well known. A direct traverse of the island had been made, and it had been nearly circumnavigated. In 1923, on the N. coast, Binney had been within 35 miles of Cape Leigh Smith ; in 1924 the *Polar Bjorn* turned back 25 miles S. of the cape after following the ice-cliff for 100 miles. Many miles of new land were discovered and charted ; the survey of Wahlenberg Bay, found to be 41 miles long, was completed. The new

maps of the expedition were drawn at the School of Military Engineering, Chatham. All the usual branches of natural science were studied by the staff under the supervision of Elton, whose personal researches were of great value. Binney believed that the secret of the most useful work in polar fields was comparative science; hence the results of this expedition are particularly interesting because of the vision, sympathy and imagination displayed. Youth showed its ability, and there was brilliant inventiveness. Binney again proved his capacity as a leader, and showed that he had in abundance the qualities essential to the successful leadership of a modern expedition.

This series of expeditions began a second Oxford Movement that is of no little importance because it forms a valuable part of the vanguard in the mental and material progress of man, and because it set the fashion for many later ventures of a similar kind. The Oxford, as also the Cambridge, expeditions were university expeditions in the best sense, for they were initiated and administered, not by the institutions, but by their members as individuals, though they received the moral support of their universities and vibrated with the young life that sustained them.

## CHAPTER XV

### THE CAMBRIDGE EXPEDITIONS: WORDIE

**J**. M. WORDIE, now Fellow of St. John's College, Cambridge, was educated at Glasgow University under Prof. J. W. Gregory before going on to Cambridge. He was always keenly interested in mountaineering and landscape, in natural scenery and geology, and his career is a good example of the varied interests which occupy the life of a modern geographer, and of the amount of exciting field-work that can be accomplished in distant places.

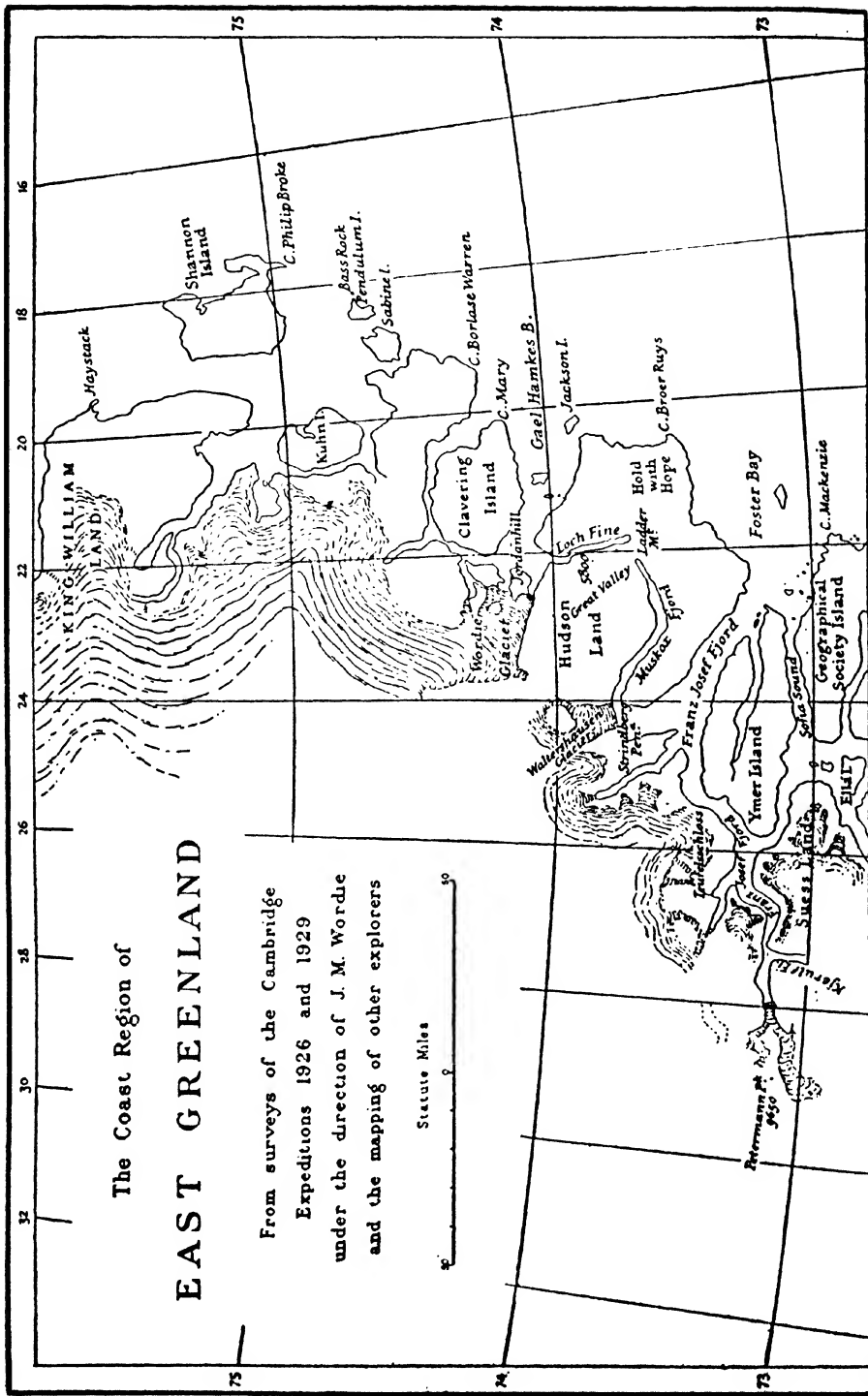
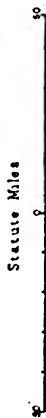
Fresh from Cambridge, Wordie went as geologist in Shackleton's *Endurance*, in 1914-16, when the ship was crushed by the ice in the Weddell Sea and the party lived on the pack for over a year. This was followed by the open-boat journey to Elephant Island and the appalling vigil there until rescued. These experiences would have satisfied the appetite of most men for polar exploration, but Wordie merely asked for more. From 1917-18 he served in the artillery during the European War, and was wounded. In 1919 he paid his first visit to the Arctic in the company of Dr. W. S. Bruce, who was leading a Scottish expedition to Spitsbergen. In 1920 he again spent the summer months in the north, this year in charge of a party which completed the exploration of Prince Charles' Foreland, the island off the W. coast of Spitsbergen on which Dr. Bruce had lavished his devotion. Wordie made geological researches and climbed Mt. Monaco, 3,543 ft. Later, in a ship in Stor Fjord, he corrected charts and took soundings; 75-91 f. of water were found on the site of a "low flat island" shown on the Admiralty charts. Glacier investigations were also carried out, and on his return the results of these Arctic expeditions were laid before the Royal Geographical Society which had only recently bestowed upon him the Back Award for his Antarctic work.

During the summer of 1921 Wordie joined an expedition, planned by J. L. Chaworth-Musters, to Jan Mayen Island. The expedition consisted predominantly of Cambridge men and, with the corresponding and contemporary Oxford Expedition to Spitsbergen, was the forerunner of a most important series of university expeditions.

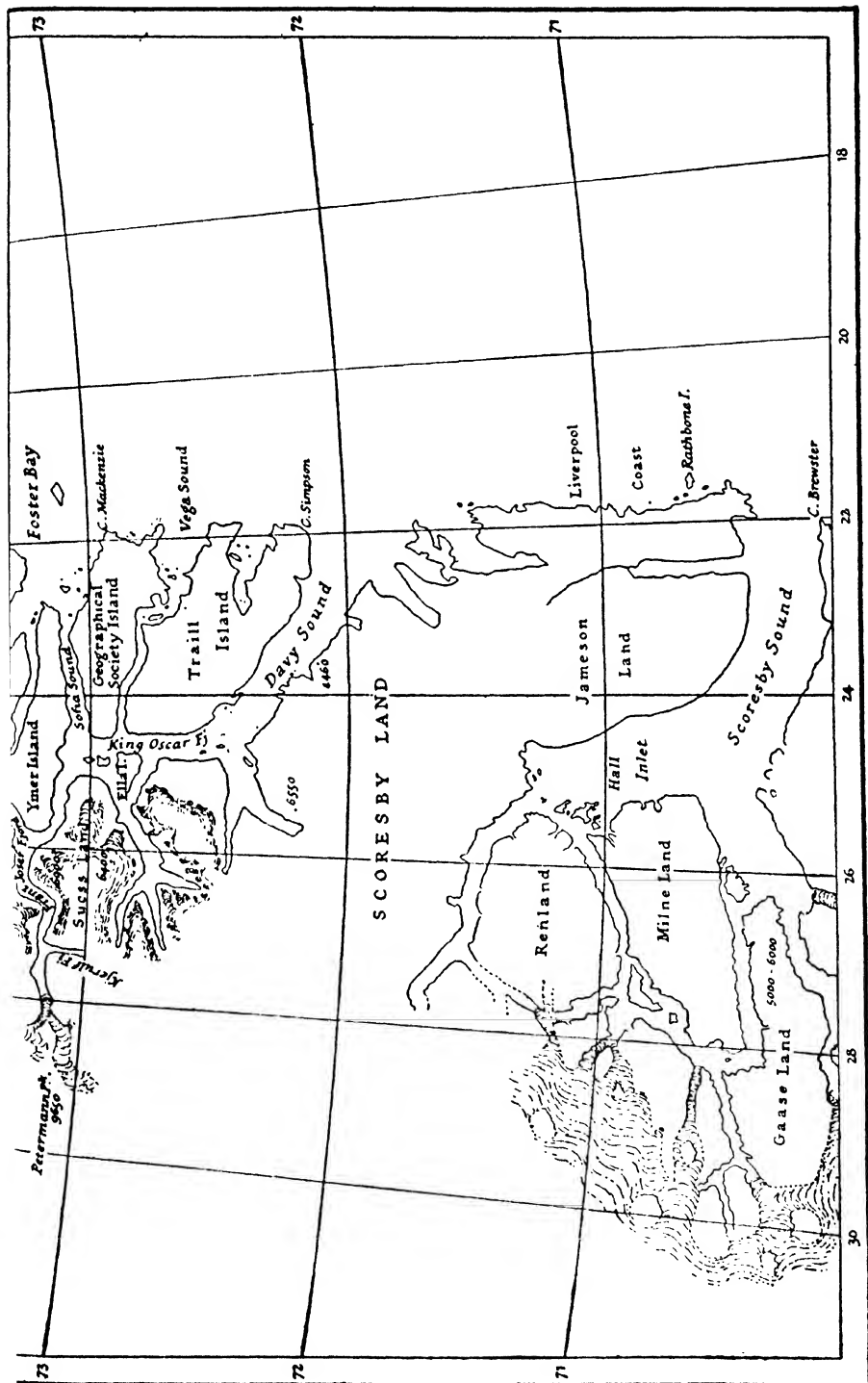
The Coast Region of

# EAST GREENLAND

From surveys of the Cambridge  
Expeditions 1926 and 1929  
under the direction of J. M. Wordie  
and the mapping of other explorers

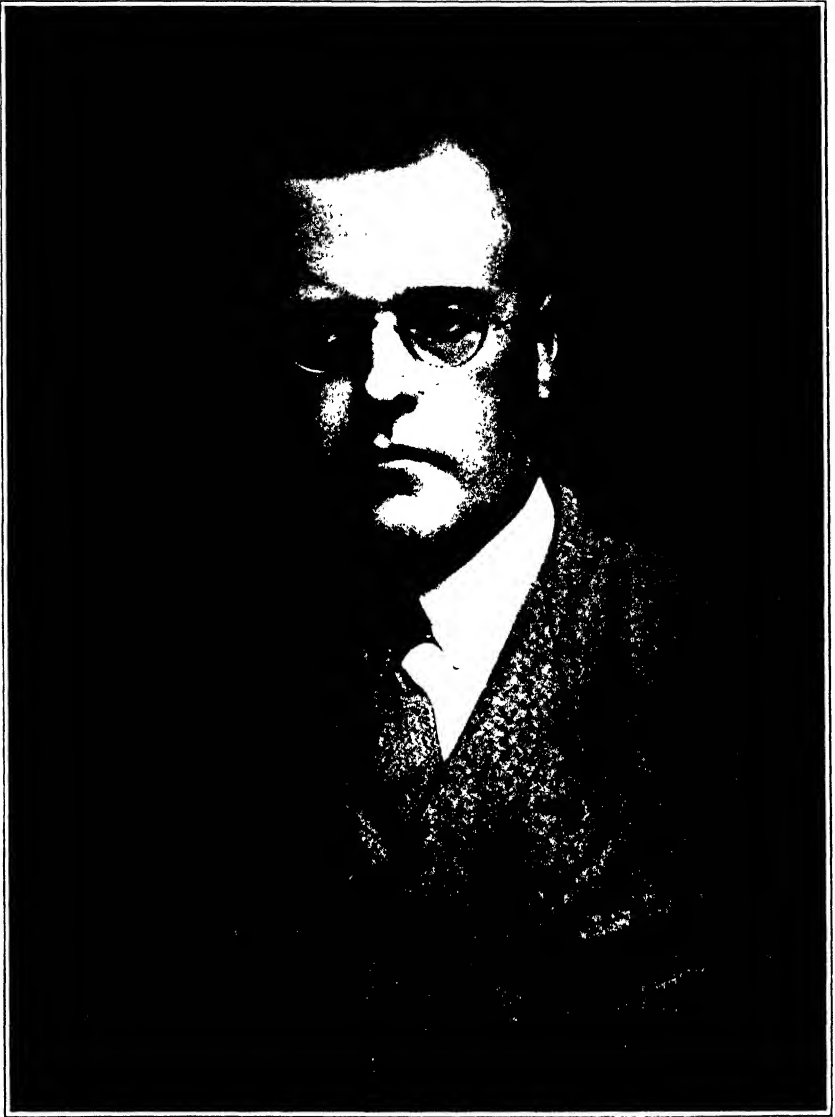






Wordie was geologist ; Musters, organizer and botanist ; W. S. Bristowe collected spiders and T. C. Lethbridge studied birds. Prof. Mercanton of Lausanne, who wished to take part in climbing Beerenberg, the volcano for which Jan Mayen is noted, also joined the party later as glaciologist. The passage from Norway was made in 2 small Norwegian sealers, and Jan Mayen was reached on 6th August. The island, 35 miles long and 2-10 miles broad, was explored throughout its length. The most interesting achievement of the party, however, was the first ascent of Beerenberg, the highest volcano in the Arctic. An Elizabethan sailor originally named it Mt. Hackluyt ; but it takes its present name from the bears seen there by Dutch whalers in the early seventeenth century. It is a striking landmark at sea, visible from a distance of 100 miles, and it occupies the greater part of the island. Wordie, Mercanton and Lethbridge formed the climbing party, and after a night at a high camp reached the rim of the great crater in 7 hours. Wordie made the height 8,090 ft. by aneroid, but later measurements have reduced it to 7,460 ft. The crater is about half a mile in diameter and 500-800 ft. deep. Beerenberg has not been active since the island was discovered, and its crater is now filled with ice which, through a break in the wall, descends crevassed and broken 7,000 ft. to sea-level. Ashes and steam have been emitted within the last 2 centuries from secondary craters, among them Egg Bluff, which is a fragment of an ash cone now being eaten into by the sea, a few miles S. of Beerenberg.

The naturalists made valuable collections : Musters, for example, found 5 flowering plants that had not previously been seen on Jan Mayen ; and Bristowe collected a still larger number of insects new to the island. Wordie's geological collection was far more extensive than any previously made. Numerous logs of driftwood and many glass fishing-floats were found along the foreshores ; the logs were mostly of Siberian conifers, and the Norwegian floats illustrated the rotary currents of the Greenland Sea. The vegetation of the island is particularly interesting because Jan Mayen has never been connected with any other land ; it is a submarine volcano rising from abyssal depths and as such is unique in the Arctic. Its plants must have been transported, as Musters pointed out, by wind or sea-currents or the agency of animals or birds. Some of the seeds were probably introduced on the feet of wading birds. The commonest plants were cerastiums and saxifrages. At least a dozen species of birds were seen. There were seals and many blue foxes, while bears may still visit the island in winter.



WORDIE IN 1931



Two years later, in 1923, Wordie organized and led his first trip to Greenland. The personnel included Lord Cawdor, Lieuts. R. H. Maclaren and C. C. Duchesne, also T. C. Lethbridge, H. E. David and C. S. Maynes. They sailed in the *Heimen* from Tromsø, and called at Jan Mayen on 20th July. A night only was spent here, and 2 days later the ice was entered in lat. 75° N. As already described in Chapter XIII, the pack this year was in a most dangerous mood. Progress was slow, but on 27th the land from Cape Broer Ruys to Sabine Island, discovered by Clavering 100 years before, was clearly seen at a distance of 30 miles across the closely-packed ice floes; but this was as near as the ship ever came to the land. She was fortunate, indeed, to escape destruction, as the captain boldly thrust in among floes that closed and lifted her bodily on top of the ice. At one time preparations were made to abandon the vessel, and it looked as if Wordie would repeat his *Endurance* experiences. Fortunately the pressure was released and the *Heimen* escaped, only to meet with a week of baffling fog. On 14th August a last attempt was made to reach the coast by following the edge of the pack southwards as far as Scoresby Sound, in order to see if a way through was possible in this direction. This was equally unsuccessful. East Greenland in 1923 was in fact unapproachable, and the expedition was forced to return without landing.

Wordie's time, however, had not been wasted, as his notes on the pack ice ("Geographical Journal," Sept. 1927) clearly show. His experience in 1923 was most disappointing, but it was also an unexpectedly favourable opportunity to continue his studies of sea-ice which had been begun in the Weddell Sea, and he was probably the first seriously to compare Arctic with Antarctic ice.

In 1926 Wordie led the 2nd of his East Greenland expeditions, with G. Manley and Lieut. P. F. White, R.E., in charge of surveys, assisted by Barnett, de Bunsen, and Augustine Courtauld, who will be heard of again. The party was completed by the doctor, Dr. McI. Johnson, and J. H. Bell. They sailed from Aberdeen on 30th June in the *Heimland*, a coal-burning sloop of 64 tons net, and called at Jan Mayen on 5th July. On 8th the pack was entered and presented little difficulty, apart from fog; and the weather was still foggy when open water beyond the pack was reached on 11th. A distance of 40 miles was made westwards through this water until landfast ice was found and its edge followed southwards to a secure anchorage. Next day the fog lifted and a pleasant hillside of brown lavas lay before the party, who found themselves off the S. coast of Little Pendulum Island. After failing to reach the land in 3

weeks, in 1923, they had now reached it without difficulty in 3 days.

One of the objects of the expedition was to repeat Sabine's gravity experiments made on Sabine Island in 1823, and to this end the Science Museum had lent the pendulum apparatus previously used in Antarctica on Capt. Scott's expedition, while the expenses were paid by the Royal Society. Longitude determinations was also to be taken on Sabine Island to test Wegener's theory of continental drift. A party therefore landed near *Germania* Harbour on 12th July to select a site for the observatory. Wordie says that the Pendulum Islands are almost entirely volcanic, and thick masses of ash were discovered. Even more interesting were the fossil trees found in the ash. This fossil timber was charred, and an eruption or series of eruptions had apparently destroyed the forest while it was still growing, probably in Tertiary times.

The Bass Rock was visited, and the hut in which Mikkelsen wintered in 1911-12 found to be in fair condition, but not now provisioned. Wordie made several landings in Clavering Strait, and on 27th July sailed round Wollaston Foreland into Gael Hamkes Bay. New land was seen to the W. of Clavering Island, where a new inlet named Granta Fjord was also discovered, though the way was blocked by an immense glacier. This region was one of great beauty, as the photographs show. There is perhaps no finer fjord mountain and glacier scenery in the world. Much of the new country was surveyed; and many long-abandoned Eskimo settlements were found and examined on Clavering Island where Clavering had met living Eskimos in 1823.

Early in August a move was made to Franz Josef Fjord, 100 miles long, and its head was reached on 5th. The scenery here was most impressive and the colouring magnificent, with red and grey rock precipices surrounding the ice-strewn waters under brilliant sunshine. Added to this was a surprising richness of vegetation in sheltered places. One of Wordie's objects was to explore the great mountain ranges west of the fjords. Copeland and Payer, in 1870, had ascended more to the east, to a height of 7,000 ft., from where they had seen a mountain, far to the west, the height of which they estimated at 11,000 ft., and which they named Petermann Peak. As the Nordenskiöld Glacier was unapproachable through floating ice, a flank attack was made by a party of 6 from Kjerulf Fjord, and the first camp pitched at a height of 3,000 ft. Wordie wrote :

The tents were pleasantly pitched on springy turf formed of heath plants in which crowberry and blaeberry were prominent. Ahead were vast snow-



*By courtesy of M. M. F. PARKINSON*

BERENBERG, JAN MAYEN, FROM THE SOUTH SOUTH WEST



*By courtesy of F. M. WOODRIF*

RETURNING FROM JAN MAYEN IN *POLARFRONT* IN 1921

J. M. WOODRIF

J. L. C. MUSTERS

W. S. BUSTOWE

RICHMOND BROWN

F. C. LETHBRIDGE





fields rising to the west, and on them we hoped to reach not only the ridge which bounded the western horizon but to find there the plateau region generally postulated in the interior. From the camp we could see the ship far below us in Kjerulf Fjord, but in a by no means enviable position. The fjord was filled to its head with a perfect phalanx of bergs. . . . It was a risk, therefore, to retain the ship in this position.

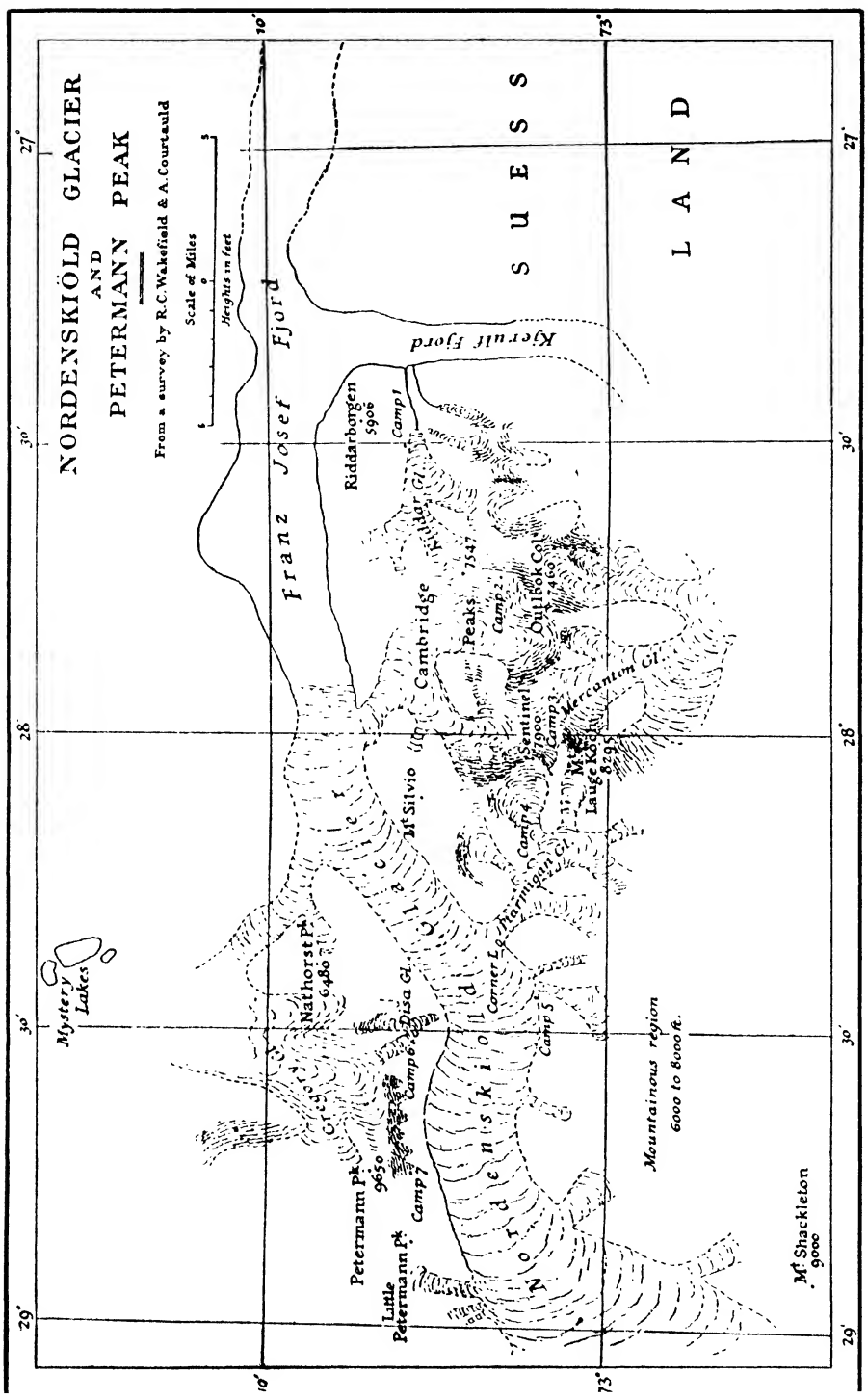
The climbing party had only 5 days at its disposal. On 6th August 4 miles were made to the west and a height of 7,000 ft. attained, whence the first view of Petermann Peak was gained. There was no doubt of its great height, but it lay more than 20 miles distant over mountainous country, and at least a week would be needed to reach it and return. Other peaks near at hand, named the Cambridge Peaks, were therefore climbed before returning to the ship. Though the view extended for many miles westwards, no inland ice could be seen. A new mountain that might be as high as Petermann Peak was discovered and named Mt. Shackleton; two other high mountains were called Gog and Magog. The ship then steamed to the head of Muskox Fjord to continue the survey westwards of Hold-with-Hope. A very large valley, named Great Valley, extending NW., was an unexpected discovery seen from the summit of Ladder Mountain. By 19th August this part of the map was complete and the ship could work southwards. A course was followed down the outer coasts of Ymer Island, Geographical Society Island and Traill Island. No ship had ever been along these coasts before, and they were now visited and mapped for the first time. Thus was the first charting of East Greenland, begun by Scoresby in 1822, completed in 1926. Landings were made at Cape Mackenzie on 20th, at Vega Sound on 21st and at Cape Simpson on 22nd, whence the ship sailed for Scoresby Sound. A sharp look-out was kept for any survivors of the *Anni* (see p. 201), but nothing was seen, and there is now little hope that any of the 5 men reached land. Dr. Lauge Koch was met at Scoresby Sound, and the Cambridge Expedition sailed for home the same night, 23rd August. Aberdeen was reached, after a rough passage, on 8th September.

This was a scientific expedition on modern lines and did excellent work, especially in geology and cartography. Very few seals were seen, though musk-oxen and bears were abundant. Wordie's map in the "Geographical Journal" (Sept., 1927) completed the coastal survey. Following the record of his lecture on the expedition given in the same issue of the "Journal," are 7 appendices on different branches of research: the survey, place-names, pack ice, weather, geology, Eskimo remains and the pendulum observations. The

results obtained were extremely good and the expedition was most efficient, but the leader, up to the present, has avoided publicity ; hence it is necessary to seek diligently in scientific journals for the precious stones of knowledge that he brings home.

During the next 2 years Wordie's college and university duties absorbed most of his time ; and work on the *Discovery* Committee, the Council of the R.G.S., the Polar Research Institute and other honorary activities, left him little leisure. It was not until 1929 that he was able to gratify his ambition of combining an Arctic expedition with the first ascent of the highest peak then known within the Arctic Circle. The East Greenland Expedition of 1929, supported by the R.G.S., was the 3rd of Wordie's Cambridge series. A party of 9 sailed in the *Heimland* from Aberdeen on 2nd July. Augustine Courtauld made his 2nd trip to Greenland and helped R. C. Wakefield who was responsible for the survey. There were 3 geologists, one of whom, V. E. Fuchs, has since led an expedition to East Africa. When 60 miles from the Liverpool Coast the air was darkened by enormous flocks of little auks which flew out in the morning to feed among the ice-floes and returned to land at night. The pack that year was as bad as in 1923. On the first attempt to pierce it the ship was fortunate to escape damage, and on 13th July a retreat was made. A second attempt farther N., in lat.  $74^{\circ} 20' N.$ , was in the end successful, but only after a terrific struggle lasting 3 weeks. During most of this time the land was in sight, though little progress could be made towards it. For one whole week the *Heimland* was held almost stationary. Four times she was nipped by the pack ; she was lifted out of the water and the rudder damaged. Not until 4th August, when the short Arctic summer was nearing its end, could land be reached at Mackenzie Bay, thus leaving only 3 weeks in which to carry out the programme. I had asked to accompany this expedition, but it was fortunate in not being handicapped by older men. What could be done by younger men was done, and the success of this party, in the short time at their disposal, was nothing less than brilliant.

They sailed nearly to the head of Franz Josef Fjord, and, early on 6th August, landed a party of 6 near the mouth of Kjerulf Fjord. Two of the geologists, Whittard and Parkinson, were left on board to continue the 1926 surveys between lat.  $72^{\circ}$  and lat.  $74^{\circ} N.$  During the next fortnight they were hard at work on the rocks and fossils, making great discoveries from the remote geological past. Meanwhile Wordie led the land party consisting of Wakefield, Courtauld, Fuchs, Varley and Forbes, on an exploration of the western moun-



tains, with the intention of ascending Petermann Peak. Food for about 12 days was relayed up the Riddar Valley to a height of approximately 3,000 ft. on 6th, and camp was pitched above the Riddar Glacier. The next 3 days brought intensely hard work, especially after the prolonged inactivity in the ship, carrying heavy packs up and down hill at about 7,000 ft. above the sea. On 10th August a small depot was left at Outlook Col (7,460 ft.) and camp made at the head of the Mercanton Glacier.

On 11th August Petermann Peak came into full view, and 2 mountains of about 8,000 ft., N. and S. of Sentinel Col, were climbed to prospect the route. The upper part of the Ptarmigan Glacier was then descended and camp pitched at 5,900 ft. Flowers were numerous on the slopes near this camp, the snowline in this part of East Greenland being seldom lower than 6,000 ft. Next day a spectacular fall of rock was seen 10 miles away on the Nordenskiöld Glacier, and the sun was darkened by the dust. A route was reconnoitred down the Ptarmigan Icefalls, and on 13th they were safely descended among yawning crevasses and dangerous seracs. Corner Lake (2,300 ft.), at the junction of the Ptarmigan and Nordenskiöld Glaciers, was reached and a mineral paradise discovered, with yellow granites and other coloured rocks brightly lighted by the sun. Camp 5 was made that night 2 miles higher up on the right lateral moraine of the great Nordenskiöld Glacier. It was crossed on 14th at a point where it was 4 miles in width. Varley had to remain here as his boots were practically worn out. The others ascended the Disa Glacier to 5,500 ft. and camp was pitched here.

Wordie was now within striking distance of the peak, and 15th August, 1929, is a red-letter day in the annals of Greenland exploration. The col above the Disa Glacier (7,170 ft.) was crossed, followed by a descent of 1,200 ft. to the Gregory Glacier, and the slope under the SW. Ridge of Petermann Peak was reached in 6 hours. It was then evident that the only chance of climbing the mountain was to make the attempt immediately, for after 4 beautiful days the weather showed ominous signs of a change. A rapid ascent was therefore made up hard snow slopes to the crest of the SW. Ridge—reached at 5 p.m. at a height of 8,200 ft. The ridge presented the normal mountaineering features of rock pitches connected by short patches of ice, but both needed caution. At 7.30 p.m., when within 100 ft. of the summit, progress was checked by an ice-cone that would take at least an hour to surmount by step-cutting, and a very strong gale was now blowing. Courtauld and Fuchs were therefore left at this point, while Wordie with Wakefield and Forbes traversed along



*By courtesy of R. C. W. Benson.*

VIEW SOUTH WEST TOWARDS INLAND ICE FROM 8,200 FT ALTITUDE ON PETERMANN PEAK  
Mount Shackleton left centre



the foot of the cone to the exposed NW. rock face of the mountain. Wordie's own description must now be given.

We were now [he writes] fully exposed to the wind and on ice-glazed rocks where the climbing was much more difficult. Nearly an hour passed before we reached the top of the rocks and ultimately stood on top of the ice slope, though it was only 100 feet above where we had left Fuchs and Courtauld. We shouted to them that they must return down the S.W. Ridge. The gale was now force 8 [40-50-m.p.h.]. Before leaving, however, Courtauld accomplished the feat of boiling water and taking hypsometer readings to determine the height, Fuchs meanwhile acting as a wind screen. The ice cone was separated by a drop of 30 feet from a still higher but rocky point. . . . We were able to climb across it with ease and so reach the actual summit. The gale was now at its height, and to maintain ourselves steady we had to adopt a semi-crouching position. We managed to avoid frostbite. While a record was being prepared, Wakefield took a round of photographs. It was evident that no mountain higher than Petermann was in sight.

The aneroids all read over 10,000 feet, but corrections later make the accurate height 9,650 feet. Mount Shackleton proved ultimately to be about 9,000 feet: beyond it and slightly to the left we could see a region of high mountains. . . . ("Geographical Journal," June, 1930.)

Many miles of new mountains and glaciers as well as 2 lakes, the Mystery Lakes, were seen from the summit, and the inland ice was sighted about 15 miles to the west, approximately in long.  $30\frac{1}{2}$  W. As nunataks projected above its surface it was difficult to fix an exact line of demarcation between the mountains and the ice-cap. Cold and exhausted, the climbing party found a more sheltered route for the descent, by the SE. Ridge, where the geological eye was not dimmed to the "ripple-marked quartzites, pink and green in colour." In 3 hours the foot of the ridge was reached at 7,950 ft. and the party struck diagonally across a snow apron to rejoin their companions at 2 a.m. on 16th at Camp 7. From this camp they overlooked the Nordenskiöld Glacier 3,000 ft. below, and the surveyors, after a few hours' rest, made good use of such a splendid station, in spite of a bitterly cold wind. The return journey was made by tired but happy men, and finally, on 18th August, the ship was reached after a very long day's march.

Five days later the ship's course was set homeward when more difficulties were encountered with the pack than on the outward voyage. Cape Mackenzie passed out of sight on 27th, but on 29th the ship was nipped and the propeller shaft bent in negotiating the floes. Next day they opened and the ship drove forward into the open sea. She was fortunate to have got through. Wordie's last expedition was probably the most compact on record, and with his previous work in East Greenland merited the congratulations of

Dr. Lauge Koch, the great Danish explorer, who credits him with the discovery of "the extensive alpine country W. of Franz Josef Fjord." A remarkable first ascent had been made under unfavourable conditions, and Wordie's capacity as a leader was seen in his selection of the route to the peak through unexplored mountainous country. He received the Founder's Medal of the Royal Geographical Society in 1933. He has now taken part in 1 Antarctic and 6 Arctic expeditions, all of which have been rich in scientific results. At the time of writing he is about to set out on a new and ambitious expedition to Ellesmere Land and the Canadian Arctic.





*By courtesy of R. C. WAKFIELD*

#### CROSSING NORDENSKIÖLD GLACIER

On return from Petermann Peak (seen on extreme left)  
Wordie leading, followed by J. F. Varley, A. Courtauld and A. E. Fuchs



*By courtesy of R. C. WAKFIELD*

LOOKING SOUTH FROM OUTLOOK COL., GOODENOUGH LAND,  
EAST GREENLAND



## CHAPTER XVI

### SPITSBERGEN AND THE BRITISH EXPEDITION OF 1925

**S**PITSBERGEN is the Arctic outpost of Europe, 400 miles N. of Norway, with Bear Island as a stepping stone about half-way between them. The name "Spitsbergen" was given by the Dutch in the seventeenth century, though the islands were possibly discovered by the Norsemen, who named them Svalbard—the name bestowed upon the Spitsbergen Archipelago and Bear Island by Norway on acquiring their sovereignty in 1925. As the islands are situated between lat.  $76^{\circ}$  and  $81^{\circ}$  N., they are well within the Arctic Circle, yet their western coasts are very mild, with the summer no colder than in Scotland. This is due to warm currents of air and water. The Atlantic drift or gulf stream follows the Norwegian coast and divides in lat.  $72^{\circ}$  N., part of it reaching the south and west of Spitsbergen.

The archipelago consists of West Spitsbergen, the largest island, 235 miles long and 130 miles wide, usually referred to simply as Spitsbergen, and with the island known as Prince Charles Foreland off its western coast; North-East Land, Edge Island and Barents Island. The total area is approximately equal to that of Scotland. Most of the coastline is indented by long narrow fjords, 1 or 2 of them 50 miles long. West Spitsbergen is mountainous and rises to a height of 5,676 ft. in Mt. Newton; it is a fine alpine country with numerous rock peaks and valley glaciers.

While the western coasts of the archipelago are mild, the eastern coasts are chilled by a cold Arctic current that carries the pack ice southwards between North-East Land and the Franz Josef Archipelago. Hence North-East Land is almost completely covered with island ice, similar to the inland ice of Greenland on a much smaller scale, which has buried most of the land. The largest glacier in West Spitsbergen is 20 miles long; but few glaciers reach the sea, and most of them appear to be receding. A large amount of drift-wood, mainly Siberian pine, litters the bays on the W. coast. Flowering plants of 150 species are found on the islands, and occa-

sionally wide stretches of moss, creeping willows, crowberries and saxifrages are to be seen. As the islands are far beyond the timber line, there are no shrubs except the dwarf birch, only 2-3 inches high.

Bear Island is 12 miles long, 9 miles wide, and 120 miles S. of Spitsbergen. The Norwegian Government had a meteorological and wireless station on the NE. coast ; but its chief interest is that, though a rock of desolate appearance, it is the meeting place of polar and European fauna. A British troopship was wrecked on its iron-bound coast during the war.

The Prince of Monaco led 4 expeditions to the islands before our period, and has rendered assistance to other explorers. In 1899 he began a triangulation of West Spitsbergen, continued in 1906, and again in 1907 when W. S. Bruce accompanied him. Thus was inaugurated one of the longest series of surveying cruises and expeditions ever undertaken in the polar regions (Hoel, "The Norwegian Svalbard Expeditions, 1929"). They lasted without a break for 21 years, most of them financed by the Norwegian Government. The first two, indeed, were private ventures supported by the Prince of Monaco, and the third was undertaken by Oslo University. The university lecturer in geology, Adolf Hoel, led 17 and Capt. Isachsen 4 of these expeditions. In 1911 the Norwegian Geographical Society appointed a committee to deal with them. Finally the government established an institution, the name of which explains its purpose : The Norwegian Scientific Exploration of Svalbard and the Polar Regions." Meteorology is excluded, remaining under the Oslo Meteorological Institute, and fishery was still attached to the Bergen Fisheries Board. A publication is issued which also speaks for itself : "Skrifter òm Svalbard og Ishavet" ("Papers on Spitsbergen and the Arctic Ocean").

The greater part of the work carried out by these expeditions consisted of surveying—cartographical, hydrographical and geological ; but all the usual scientific researches were undertaken. Approximately half West Spitsbergen was mapped and examined ; also Bear Island and the sea-floor for some miles off the western and southern coasts. All this was important work, but it does not appear to have included many incidents of general interest. In 1927 the Storting made another grant for continuing the work, and by 1929 no less than 111 Norwegian and 17 other scientists and technicians had been engaged on the expeditions. In the same year the results were published in 37 papers ; the total cost of the expeditions from 1906 to 1932 was about £100,000. Several other ships have

also been at work, and the Norwegian Government established a meteorological station at Green Harbour in 1911 and a geophysical station in King's Bay from 1920 to 1924.

In 1910 Lieut. W. Filchner chose Spitsbergen as his preliminary training ground for the greater Antarctic expedition of 1911-12; he made a journey of 50 miles to test his equipment and gain experience. Whaling in Spitsbergen waters ceased in 1912, when Dr. W. S. Bruce led a small geological expedition to Prince Charles Foreland. Bruce met Lieut. Schroeder-Stranz who visited Spitsbergen without any conception of the nature of his venture. His ship, the *Herzog Ernst*, had a crew of 6 Norwegians and anchored off the N. coast on 12th August, 1912. From here Stranz set out with 3 companions on a wild sledge journey across Hindlopen Strait to North-East Land, intending to meet the ship afterwards in Treurenburg Bay. They were never seen again; but see p. 205. The ship became frozen in by September, and 9 of the 12 men on board set out on a mad attempt to walk to Advent Bay on Ice Fjord and catch the last ship for Norway. Three of the Norwegians remained on board, but Capt. Ritschel left the ship. Two men went ahead of the others in Widje Bay and were lost. Two others, one of whom was frostbitten, remained behind in a hut and eventually returned to the ship, as did two Norwegians who accompanied Ritschel farther. His last companion was a German who was afterwards lost.

Ritschel reached Advent Bay on 27th December, 3 months after leaving the ship, alone and severely frostbitten. A relief party set out at once, but failed for want of proper equipment. Nothing more could be done till March, 1913, when, in response to a wireless message, Dr. Kurt Wegener made a search as far as Widje Bay without success. Two relief expeditions were then coming out from Europe. The first of these was led by Capt. Staxrud, who landed in Advent Bay early in April and marched across to Treurenburg Bay, where he found only 2 men in the *Herzog Ernst*. The 6 Norwegians had left the ship in March and made their way safely to Advent Bay. Staxrud saved the lives of the 2 men who were in the ship. The other relief expedition accomplished nothing except the loss of its own ship. Staxrud salvaged the *Herzog Ernst*, but 8 men out of 15 had been lost and 2 of the survivors suffered amputations as a result of their frostbites.

Dr. W. S. Bruce had been assisted in his work by J. Mathieson of the Ordnance Survey, Dr. Rudmose Brown, J. M. Wordie and others. On his 1912 and 1914 trips important geological and hydro-

graphical researches were carried out, but the war brought the second to an untimely end. Bruce's work in Prince Charles Foreland is a model in miniature of the way in which such work should be done; he left a complete survey of the island, cartographical, geological, botanical and zoological. His map on a scale of 1 to 140,000 was published by the Prince of Monaco in 1913. Two years earlier Count Zeppelin had led an expedition of a very different character to King's Bay in the liner *Mainz*. Prince Henry of Prussia was on board, and a meteorological station was set up on Ice Fjord; a small party was left for a year and relieved annually till 1914. The station was removed to Cross Bay in 1912 and Dr. Kurt Wegener spent the next winter there. In 1913 the Prince of Monaco enabled Dr. Stoll (Swiss) to cross Spitsbergen. On the outbreak of war the Germans handed over the station to the Norwegian Meteorological Institute and the building was again moved, this time to Quade Hook. During the winter of 1921-2 a distressing fatality occurred.

Dr. Stoll was then Director of the observatory and sent 2 members of his staff to search for a lost seal hunter; they went in a well-provisioned boat, but failed to return. In 1923 their bodies were found in Cobbe Bay on the NW. of Spitsbergen, together with their diary which showed how near they had been to rescue. They lived in a cave, without exhibiting a flag or other sign of occupation, and Stoll actually searched the shores of the bay from his ship. He did this very thoroughly, but the men never saw the vessel until it was sailing away. They then shouted and fired shots without avail, knowing that this was their last hope, for only a week's food remained. Dr. Stoll, in spite of being blameless, died from the shock.

In 1919 Bruce made a business trip to Spitsbergen, and two Swedish geologists were there, Messrs. Hagerman and Coster; their results will be found in "Geografiska Annaler," Vol. VII.

The Worsley-Algarsson Expedition, later re-named the British Arctic Expedition, 1925, visited both the Spitsbergen and Franz Josef Archipelagoes; but as less than a fortnight was spent in the latter group, the record of the voyage comes more suitably here than in Chapter VI. In 1924 Grettir Algarsson, a young British Columbian, made an attempt to sail for the Arctic, and the following year invited Commander F. A. Worsley, D.S.O., O.B.E., R.N.R., to command his new ship; she was the brigantine *Island* (formerly the *Lady of Avenel*) of 114 tons net. Worsley's previous experience was remarkable.

He is a skipper of the Capt. Kettle type in the realm of fact,

and one of those men who are commonly called "dare-devil"; but his admitted ability has hitherto enabled him to escape from the tightest corners. Shackleton first brought him into prominence by appointing him Sailing Master of the *Endurance* in 1914; he always acted as captain of the ship and was called "Skipper" by Shackleton. Worsley navigated the *James Caird* on her dangerous voyage to South Georgia, and was one of Shackleton's two companions on his famous crossing of the island. On returning from this expedition Worsley was appointed commander of a mystery ship, and in September, 1917, rammed and sank a German submarine of twice his own tonnage as she was attacking a tanker of 7,000 tons. Worsley had 8,000 lbs. of high explosive on board; but he towed the damaged tanker into Milford Haven, and for these services received the D.S.O. In October, 1918, he accompanied Shackleton to Murmansk, and afterwards became Director of Equipment to General Ironside; here he received a bar to his D.S.O. In 1920 Shackleton appointed him Hydrographer and Sailing Master in the *Quest*. Worsley was the last to have a long conversation with the great explorer before he died.

The skipper, on accepting Algarsson's invitation, had commanded 20 vessels of various kinds. An excellent staff of volunteers clustered round the leaders, and the total complement was 15, including 4 scientists, of whom J. W. S. Marr, M.A., B.Sc., is the best known. He was the boy scout selected by Shackleton for the *Quest*, and has fully justified the choice by making 5 voyages in 8 years, including expeditions in the *William Scoresby*, the *Discovery* under Sir Douglas Mawson, and the *Discovery II*.

The purpose of Worsley's cruise was to carry out scientific researches north and east of Spitsbergen. Liverpool Docks were left on 21st June, 1925, and Belfast Lough entered next day. Members of the Royal Ulster Yacht Club contributed £70 towards the expedition which sailed from Bangor, Co. Down, on 27th. The ship had a small semi-Diesel engine, capable of driving her at 6 knots. Spitsbergen was reached in 18 days from Bangor, and, after touching at Green Harbour, a call was made at King's Bay. Then the Norway Islands were passed and Liefde Bay was entered. Here great flocks of eider ducks and geese were seen, the eggs of which varied the menu. A human jawbone was found on the beach, as well as Binney's abandoned seaplane. On 23rd, when sailing for North Cape, a northerly gale sprang up and the ship ran before it down Hinlopen Strait.

Coasting along the S. and SE. of North-East Land on 25th,

Worsley was surprised to find much open water, and next day he began his corrections of the Admiralty Charts. The ship's chronometers were corrected daily by wireless; and as Worsley is one of the most accurate navigators afloat, his re-survey may be accepted as correct. The positions of Cape Leigh Smith and Great Island were altered and the channel between them hydrographically surveyed for the first time. Worsley says the channel is navigable but risky, though there may be another channel to the west. The ice-capped Great Island was a fine sight, 500 ft. high and 7 miles long. Several patches of rock were seen at the foot of the ice-cliffs of North-East Land. On emerging from the channel on the northward course many icebergs appeared; but the pack was not met with until near lat.  $80^{\circ} 52' N.$ , when the course became SE. for 7 miles. A north-easterly course then became possible through the pack, but a propeller blade was broken and the ship reduced to sails. Worsley therefore stood E. for the Franz Josef Archipelago in the hope of repairing there; the ship was not built to withstand ice-pressure. An exploration of the ocean floor resulted in the discovery of a submarine plain between North-East Land and Alexandra Land; it is a northern extension of the Continental Shelf, previously suspected but unproved. The average depth over it was about 100 f. Bear tracks were seen on the pack every day and many of the animals shot. Victoria Island was nearly circumnavigated and carefully surveyed; it was found to be charted several miles W. of its true position, and no rock was visible. On 30th July Shackleton's old ship, the *Quest*, hove-to near the *Island* and Worsley went aboard. Next day at 11 a.m. only 31 f. on rock were found in lat.  $80^{\circ} N.$  and long.  $38^{\circ} 31' E.$ ; at 9 p.m. about 10 miles away the depth was 202 f. on yellow ooze. Sometimes the ship was worked through the floes under sail, and rotten ice was charged; at other times she lay becalmed and drifted with the pack. The scientists worked continuously. For nearly 3 weeks before 4th August the ship was beset and drifted S. at about 10 m.p.d.; during this period there was much fog. When the sun broke through the clouds on 5th the colours of the ice, water and sky were ravishing; birds, seals and walrus abounded.

On 14th August the last blade of the propeller was broken; and 4 days later 14 miles were made in open water. Then more ice was encountered and a dash was made through a passage, a yard wider than the ship, that lay between the pack and an iceberg. On 19th the *Island* was free, and headed for the land that lay 200 miles NE. A large school of seals was passed next day, and the air was alive



with birds. On 21st the ship approached Northbrook Island with little ice in sight. What Worsley terms the majestic Atlantic front of the archipelago presented an imposing appearance as the island was weathered and the British Channel entered. London music was heard on the wireless, while surrounded by ice-clad land and water littered with floes and icebergs. Progress was stopped next day by the pack, and, as a northerly gale arose, Worsley ran S. and W. for shelter. Cape Flora was rounded and a new islet discovered north of Windward Island; lat.  $80^{\circ} 24'$  was reached a few miles N. of Cape Murray, and here the ship was again stopped by the pack. Another gale then blew up from the SW. with a steep and heavy sea, driving before it a mass of floes that the *Island* was forced to face. A terrific test of seamanship then followed, and all hands worked gallantly to save the ship from being crushed. Small floes of ice were used as fenders against large ones, but for half an hour the issue was doubtful as the ice battered the struggling ship; then the pack was left behind and open water entered.

A few hours later, when in thick fog, Worsley found an ice-cliff close to the ship, on the lee beam. It was part of an iceberg, and, when its corner was passed, a stranded berg, 200 yds. ahead, appeared through the thinning mist. The water was too deep for anchoring, and a current set into the channel between the bergs; this channel was 300 yds. long and little wider than the length of the *Island*. Worsley then performed one of the finer feats of seamanship, known as "backing and filling," which needs very smart work on the part of all hands. The ship was too light to answer her helm properly and had to be ballasted with rocks. She was anchored for the night between Cape Barents and the Robertson Islands in an unnamed bay that was called Wander Bay. Worsley took a party ashore and formed a camp, but a sudden squall sent him back post-haste to his ship; and, as it was unsafe to remain any length of time, the shore party was recalled in a few hours. The geologist had collected 1 cwt. of specimens; pink and yellow-green snow, caused by *algæ*, was also found and the immediate district explored. A bear's glissade was discovered, and the charge of a hungry bear, shot by Algarsson, was fortunately filmed. Fogs made navigation dangerous, and Worsley twice averted a crash on steep rocky shores by a few feet. Scott Keltie and Eaton Islands were visited, and a large part of the British Channel was found to be over 200 f. deep. The solidity of the pack made a high latitude impossible, but Cape McClintock was sighted. Worsley says the land behind Cape Richthofen is charted too high at 5,000 ft.

There was the usual abundance of life near lat.  $80^{\circ}$  N. in the British Channel. The tow-nets were slimy with diatoms that also discoloured the sea, and that myriads of small organisms, jelly-fish and other creatures, fed upon, to be food, in turn, for higher forms of life. On 29th and 30th August the ship sailed south, with the scientists finding plenty to interest them, and with much beautiful atmospheric colouring to enjoy. The archipelago was left behind in fog and rain. At 5 a.m. on 2nd September, in a dead calm, the current carried the ship towards an iceberg 100 ft. high, and Worsley called lustily for all hands. The *Island* was in danger, for the berg had been undermined by the sea, and there were only 40 yds. between the expedition and disaster when a mass of ice fell. This sent out a wave that drove the ship forward, and the corner of the berg was cleared by 2 ft. It was found to be aground on a submarine bank, 40 f. below the surface, and 15 miles S. of Northbrook Island. Between this bank and the island is a submarine valley more than 160 f. deep. Dredging over the bank resulted in a dozen species of marine organisms being collected. Oceanographical work was interspersed with bear hunting. Many heavy floes were discoloured with earth and sand, possibly from Siberia. By 4th September, when 36 miles S. of Bell Island, there was some danger of the ship being frozen in for the winter. Next day, in lat.  $79^{\circ} 24'$  N. and long.  $46^{\circ} 38'$  E., the compass variation was found to be  $6^{\circ}$  more than given on the Admiralty charts. One of the largest tabular bergs reported from the Arctic was seen on 6th; it was 1 mile long, 70 ft. high and probably aground.

The pack was cleared on 8th and a period of beating about under sail began, as far as the Wyches Islands in the SW. and northwards past White Island and Great Island. The charts were frequently corrected and the usual scientific work was carried out. When farther N., on 14th September, in lat.  $80^{\circ} 27'$  N. in long.  $30^{\circ} 40'$  E., an appearance of land was seen. Two snow buntings appeared to confirm this, as they are land birds. On returning southwards a submarine bank was discovered 7 miles N. of White Island, on the northern edge of which many icebergs were stranded. One of them with a flat top was 18 ft. high and aground in 16 f. Worsley says that the ratio of the depth to the height of icebergs varies from 4 to 1 to 8 to 1. He was anxious to round North Cape before the ship should become frozen in for the winter; but much beating to and fro was necessary before this was accomplished on 19th September. A full gale then caught the little vessel, whose rudder had long been damaged, and all movables on deck were hurriedly secured; the

lee boat descended over 12 ft. at every roll. Soon the decks was swept fore and aft with the waves, until oil bags in the bows stopped all the white water. Oil cannot flatten the seas, but it stops their crests from breaking. In the height of the gale Algarsson led an impromptu song :

*She ain't gonna roll no mo'.*

When all was snug and the *Island* hove-to, Worsley turned in for a good sleep while the gale was ridden out. The farthest north of the cruise was afterwards reached in lat.  $81^{\circ} 15' N.$ , and the homeward voyage then began. When another gale struck the ship, Worsley ran under North Cape for shelter, and much work was done in its vicinity. He believes that he made the first circumnavigation of North-East Land in the retrograde direction. A southerly gale worked up a terrific sea on 29th, and drove the ship rapidly northwards again ; she sheltered in King's Bay for a few hours and was off Ice Fjord on 1st October. Some dogs had to be returned to Green Harbour, or Worsley would have run for home. On 3rd the ship was still tacking and wearing, but the land breezes prevented the harbour from being entered.

The *Island* had then made only 120 miles in 11 days, and there was little more than twilight left. As the ship was damaged, with the rudder hanging on, Worsley said, mainly by force of habit, he felt it necessary to take risks. At 8 p.m., when quite dark and land was assumed to be 9 miles away, rotting seaweed was smelt, and the ship immediately seen to be in the midst of a complicated nest of reefs and white water. The anchor was dropped, but there was no space to swing clear of the rocks, so the boats were swung out to kedge the ship clear. She bumped once and the boats were provisioned in readiness for abandoning the vessel. She made no water, however, and the boats took soundings until a channel was found, though its passage could not be attempted before morning. Worsley set an anchor watch and turned in for 3 hours. At dawn, more than 100 breakers appeared within a radius of about 600 yds., and it seemed impossible for a ship either to have entered or to escape ; but the men had rested and were now ready for the struggle. The channel was buoyed by the boat-crews and the ship made secure against all probable contingencies—except for an onshore gale which would have pounded her to pieces. The wind was too squally the whole day for making the attempt to escape, and another night was spent among the reefs. All hands again had some sleep, but lay fully dressed. At 5 a.m. on 4th October coffee was served, and the work

of kedging out the *Island* began. Then a breeze sprang up, all sail was set in 4 minutes and the danger was over.

It was 7th October before the ship was towed to Green Harbour, and 17th when the long tow to Norway began. Gales added to the difficulties, but Tromsö was reached in safety. Another stormy crossing then remained to the Shetlands which were reached on 4th November, and the expedition ended in Granton Harbour on 8th. Good work had been done in land and marine surveying, zoology and geology. The correction of the charts was important; White Island was found to be chartered 16 miles out of its true position. Interesting observations were made on the currents, and the magnetic results should be collated with those of the Oxford expeditions. A good account of the 1925 expedition was written by Worsley in his book: "Under Sail in the Frozen North," reviewed by Wordie ("Geographical Journal," Jan., 1928). The reviewer said that it was a fine achievement to have reached the Franz Josef Archipelago in the circumstances, and that the expedition confirmed Worsley's reputation already made under Shackleton.

The accessibility of Spitsbergen has made it a favourite place for the bases of aerial voyages across the Arctic Sea (Chap. XVII), and it has been visited by British, Norwegian or German tourist ships every summer for many years; as many as 2,000 tourists have made their bow to the archipelago during a busy season. Should any reference be expected to the mining in Spitsbergen, it may be noted that Dr. W. S. Bruce staked a claim on which the Scottish Syndicate was founded in 1909, the year in which the Northern Exploration Co. also started. There are now Norwegian, Swedish and Russian companies. Coal and marble are the principal minerals excavated, and industrialism is now at the door of the Arctic.

## SCHEDULE No. 7

## PIONEERS OF POLAR FLIGHT

(Note.—This is not a complete list, and other references to the subject will be found in several chapters.)

- |        |             |   |
|--------|-------------|---|
|        | 1897.       | Andrée.   |
|        | 1909.       | Wellmann.   |
|        | 1914.       | Nagurski made the 1st Arctic flight.                |
| (1919, | June.       | Alcock and Brown made 1st Atlantic flight.)         |
| 1923   | { May.      | Dahl and Wisting's flights from the <i>Maud</i> .   |
|        | { May.      | Amundsen's trial trip in Alaska.                    |
|        | { July.     | Mittelholzer's fine flights in Spitsbergen.         |
|        | 1924.       | { Binney introduced aerial exploration.             |
|        |             | { Amundsen's second unsuccessful attempt.           |
| 1925   | { May.      | Amundsen's flight to lat. 87° 43' N.                |
|        | { August.   | Byrd's flights over Ellesmere Land.                 |
| 1926   | { March 31. | Wilkins' first flight over the sea, N. of Alaska.   |
|        | { May 8.    | Byrd's flight to the North Pole.                    |
|        | { May 11.   | Amundsen began his flight in the <i>Norge</i> .     |
|        | 1927.       | Wilkins' 500-mile flight N. of Alaska.              |
| 1928   | { April.    | Wilkins' trans-Arctic flight.                       |
|        | { May.      | Nobile's flights in and loss of the <i>Italia</i> . |
|        | 1930.       | Eckener's flights in the <i>Graf Zeppelin</i> .     |

## CHAPTER XVII

### ARCTIC AVIATION

**A**S the European war broke out 5 years after Bleriot had flown the channel, a new and powerful weapon was placed in the hands of the combatants. The war then became a forcing-house for many mechanical plants, and, when it ended, aircraft were well hardened off and ready for peaceful pursuits. Though not generally known, the first Arctic flight was made before the cessation of hostilities.

The immense activity of Russia in the Arctic since 1910 has only recently come to light. When Amundsen wrote his undated book, "The First Flight across the Polar Sea," he had not heard of a Russian flight made in 1916, for he claimed that Dahl and Wisting's short flights in 1923 were the first. In connection with the relief measures for Sedow's expedition in 1916, Lieut. Nagurski ascended from Novaya Zemlya in a Farman hydroplane. He made several flights, of which one was over the Barents Sea in the direction of Cape Mauritius, when he remained in the air for 3 hours ; and another was to the Barents Islands, 200 miles distant. But though Nagurski had the honour of being the first aviator to fly in the Arctic, his feat was isolated from the main course of Arctic aviation. Not until 1923, 7 years later, did Amundsen and Mittelholzer make the first of a long series of Arctic flights ; and 8 years elapsed after Nagurski's flight before Binney successfully used a seaplane for geographical exploration. In 1914 Amundsen bought a Farman biplane, with which the *Fram* was nearly ready to sail for Bering Strait when war broke out. Thus it was not until 1918 that he set sail in the *Maud* with the purpose of drifting across the Arctic Sea and testing aircraft. On the way to his objective he became the first navigator to make the North-East as well as the North-West Passage (see Chap. VII). In 1922 he had a Curtiss machine on the N. coast of Alaska, but storms prevented him from flying during the whole season. Next year Dahl and Wisting made 2 short trips in the Curtiss, which was smashed in landing (" My Polar Flight," 7). The same year Amundsen hoped to fly from Alaska to Spitsbergen in

a Junker monoplane; it was so badly damaged, however, on landing from its first flight that monoplane and flight had to be abandoned.

In connection with this proposed trans-Arctic flight, arrangements had been made at short notice for depots to be laid by aeroplane on the pack, a few hundred miles N. of Spitsbergen. H. H. Hammer secured the services of the Junker Company, and with great rapidity the Junker-Hammer Expedition was organized. On 9th June, 1923, Lieut. Mittelholzer of the Swiss Air-force, the principal aviator who was in Berlin, was informed that he must reach the edge of the pack ice by 21st of the month. He actually left Berlin in 7 hours, during which time he collected his kit, and Goerz supplied a complete aero-photographic equipment. Dr. Kurt Wegener was the only member of the expedition with previous Arctic experience; and on 15th they all assembled at Bergen whence a collier took them to Ice Fjord, West Spitsbergen. Air-pilot Neumann was responsible for the monoplane, which was fitted with floats. A wireless message was received from Amundsen saying that his flight was abandoned; but Hammer decided to carry on and test aerial photography in the Arctic. When Spitsbergen was reached a base was established in Green Harbour, Ice Fjord.

Aeroplanes are now the eyes of explorers, though hands and feet are still needed on the surface of the earth to complete the surveys of new lands. Navigation is the greatest difficulty of the aviator. The work of the aerial observer is not so much to see as to photograph the features beneath him; and the full value of his reconnaissance appears when his plates or films are developed. Data for maps as well as pictures are collected.

The second successful Arctic flight was made on 5th July, 1923, to pay a friendly call in Advent Bay, by Neumann, Mittelholzer and 2 other men. The flight, made with calm efficiency, seemed as easy as a 19-mile run in the car at home, with the difference that the flight was over in about 20 minutes. After supper the visitors took off at 9 p.m., made a circuit at a height of 300 ft. and reached Green Harbour at 9.40 p.m. Next day a longer trial trip began at 10.30 a.m. when Neumann and Mittelholzer again rose without a hitch. In 5 minutes a height of 2,820 ft. was attained and the Junker was headed NW. In half an hour it had risen to 4,000 ft. and a wonderful picture of coast scenery was unfolded beneath. After rising to 6,000 ft., a good landing was made at 12.45 p.m. Mittelholzer found flying conditions more favourable than in the Alps, where he had gained considerable experience. On 7th another trial flight was

made of nearly 3 hours' duration, and a height of 6,560 ft. was attained.

The main flight of over 500 miles was begun by the same aviators at 11.40 a.m. on 8th July. With a heavy load, Klaas Billen Bay was left behind on a NE. course, and the Nordenskiöld Glacier followed until Widje Bay came into view. The mountains ahead then appeared higher than the ceiling of the monoplane which was only 5,520 ft., but the aviators decided to dodge the summits. They brushed peaks higher than the level of the camera until Lomme Bay was passed. At 90 m.p.h. Hinlopen Strait was crossed, and they turned NW. over North-East Land at the 80th parallel. They flew across Treurenburg Bay at over 6,000 ft., and at 3 p.m. passed Grey Hook with open water beneath. The south of Mofsen Island was skirted; then bending south with the coast at 4 p.m. Danes Island was seen. The aviators enjoyed the last 2 hours of their splendid flight, for the sun was pleasantly warm, their tension was relaxed and the scenery superb. At 6.15 p.m. they landed at Green Harbour, after 6 h. 40 minutes in the air, and exhilarated by the success of the first extended flight in Spitsbergen and the second in the polar regions.

There was petrol for a further flight of 1,500 miles, but a new magneto was needed and this was unobtainable nearer than Europe. Mittelholzer was disappointed, as he wished to study the problem of navigation over the pack and to test some landings on its surface. The expedition left for home on 16th July. An excellent record of its work will be found in "By Airplane towards the North Pole."

In September of the following year, 1924, Mr. Lincoln Ellsworth bought Amundsen 2 flying-boats for a joint expedition to the North Pole ("My Polar Flight," 8-9, 85-6), and on 15th April, 1925, they were landed at Kings Bay, West Spitsbergen. The principal pilot was Lieut. Hj Riiser-Larsen, R.N.N., who then entered upon a distinguished career of polar exploration. On 21st May at 5.10 p.m. the flight began with 3 men in each machine. The coast was passed at a height of 1,300 ft. and then fog blinded the aviators for 2 hours. At 8 p.m. the air was again clear and the pack gleamed below. Amundsen was concerned to see no landing-place, should a forced descent have to be made; and particular attention may be drawn to his report, and the reports of other airmen, on the condition of the pack, with reference to claims of excessive sledging speeds over its surface. At 1 a.m. on 22nd (*op. cit.*, 267; not 5 a.m. as on p. 35), when half the petrol had been consumed, a landing was made in a channel among broken ice. The latitude was  $87^{\circ} 43' N.$  and the longitude  $10^{\circ} 20' W.$ , which showed that the flying-boats had



drifted W. Before descending, Amundsen could see to within 90 miles of the Pole.

The safety of his machine was the first consideration ; after which a runway was made from which to take off for the return flight. There were rations for a month, but they were reduced to make them last longer. On 23rd the other machine was sighted and communication established. Two days later a seal was seen. One was also observed from the other machine, though it may have been the same animal ; and, except for 2 wild geese, no more life was seen in the pack. The boats drifted nearer to each other until Ellsworth's crew could join Amundsen's. Ellsworth describes the surface of the ice as so rough that the first attempt had to be given up after covering  $\frac{1}{4}$  mile ; and Amundsen said the pack would be the same all the way to the Pole. As the one machine was wrecked, all 6 men lived in the cabin of the other. A sounding in 2,031 f. was made.

On 21st May the engines were started, but a fog prevented flight. For the second attempt the flying-boat was taxied to a better position, though there was continual danger from the moving floes. Rain fell on 5th June when Amundsen privately regarded the situation as hopeless. Next day the rations were still further reduced, though they were already insufficient for the men's laborious work. They were worn out with the toil of making the runway, a mile long, from the wet snow which had to be trodden firmly down. On 14th June another attempt to start was made, but the summer thaw had now set in and the boat sank into the surface. The following day everything was abandoned except the barest necessities, and at 10.30 p.m. the machine rose into the air. The clouds were so low that for 2 hours the aviators flew at a height of 160 ft. A course was set for Spitsbergen, and the flight was a race with death. There was again no open water on which to alight, had the engines failed, and a forced landing would have been certain destruction. Fog covered much of the pack, but they then flew above it in brilliant sunshine. At last a mountain peak was sighted with open sea below, and the goal was reached. Almost at once the controls refused to function and a descent had to be made in Hinlopen Strait. At 7 a.m. the boat began to taxi towards land—reached in an hour. All went ashore and found they were on Nord Kap (op. cit., 67) ; from here they were rescued by a little cutter.

The chief credit of this flight should be given to Riiser-Larsen, who says that the speed had been about 90 m.p.h. Ellsworth writes that had they been forced to attempt the walk of 400 miles to Greenland, none of them would have survived. When the aviators were

supposed to be lost in the far north, several expeditions began preparations for their relief, including one to be led by Charcot the French explorer.

In the same year, 1925, Commander Byrd planned an expedition to test aeroplanes in the Arctic, and asked his navy for 2 machines. D. B. MacMillan also desired one or more of these amphibians for his second expedition to the same locality, Smith Sound, and 3 were provided on the condition that Byrd and MacMillan joined forces. Etah was reached on 1st August and the amphibians prepared for flight, though the conditions were unsuitable. On 16th after several trial flights over Ellesmere Land, Byrd and Floyd Bennett made a longer flight over unexplored land NW. of the base. They had an awful experience, for the air was the roughest Byrd had ever flown in and below them lay glaciers and precipices. Fortunately they returned in safety. The last flight was E. over the Greenland plateau. More than 5,000 miles had then been flown without a forced landing, and 30,000 sq. miles had been seen, much of it for the first time. Byrd was now experienced in Arctic flying and ready for an attempt to fly to the North Pole.

In January, 1926, he was granted leave for an expedition to Spitsbergen whence he would take off. He sailed from Brooklyn on 5th April with a 3-engined monoplane of 200 h.p. ; there were 50 members of the expedition, mostly volunteers. King's Bay, Spitsbergen, 750 miles from the Pole, was reached on 29th and Amundsen found there, preparing for his flight in the *Norge*. Byrd's supporters expected him to reach the Pole first, so risks had to be taken, although the wreck of the expedition would have ruined Byrd financially. The first trial flight ended in a snowdrift with broken gear, but on 8th May the great flight was to be made. The machine was then too heavy to rise, and hundreds of pounds' weight were unloaded. As the weather was perfect, and this attempt would probably be the last, Byrd and Floyd Bennett set off soon after midnight, though neither had slept for 36 hours.

The monoplane rose with a total load of 10,000 lbs., including food for 10 weeks and sledging equipment. An hour after the start land was left behind and the pack seen 2,000 ft. below. Navigation and not scenery, however, absorbed most of the aviators' attention ; for this and the reliability of the engines are the crucial factors in flying over desert areas. Byrd had made air navigation his hobby, and, as he affirms that he afterwards flew straight back to Spitsbergen, he probably located the Pole to within a few miles. Bennett steered at first while Byrd navigated ; Byrd then relieved Bennett at the

wheel. The wind conditions were excellent. Not a sign of life was seen as they flew northwards. One of the oil tanks leaked, but afterwards corrected itself. Thus at 9 a.m. on 9th May, 1926, the vicinity of the North Pole was at last attained, and, as was most fitting, by citizens of the United States. This great country, after the efforts of Peary and Cook, deserved the honour and appeared to value it. The character of the pack ice at the Pole was no different from that elsewhere on the Arctic Sea. Byrd circled several times at a height of 2,000–3,000 ft. and took observations of the sun. After a quarter of an hour he headed for Spitsbergen.

The main feature of the return flight was the sleepiness of the aviators. Their speed, with the help of a fresh breeze, was 100 m.p.h. At last Grey Point, Spitsbergen, lay directly ahead and the effort was crowned with success. The flight had lasted 15½ hours and the distance was approximately 1,500 miles. It was most creditable, not only to Byrd and Bennett, but also to the makers of the machine and all who aided the enterprise.

Amundsen regarded his flight to lat. 87° 43' N. as a reconnaissance for a trans-polar trip; and the lesson he had learnt was the unsuitability of aeroplanes for flying over the pack ice. He wished to try a dirigible balloon; and when, in 1925, Ellsworth contributed £20,000, the *Norge* was bought and Col. Nobile appointed commander. After reaching Spitsbergen, Byrd arrived with his monoplane, fully prepared to take the risks that Amundsen had declined.

On 11th May, 1926, 3 days after Byrd's flight, the *Norge* sailed with 16 men, of whom Riiser-Larsen was navigator. Amundsen significantly said that the pack seemed exactly the same as in the previous year, and that from Spitsbergen to Alaska he did not see a single landing-place for an aeroplane. On passing lat. 81° 30' N. he received a telegram from Melbourne by wireless. When the North Pole was reached next day at 1.25, presumably *ante meridiem* (though this is not stated), he was the first man to have visited both the Geographical Poles. The Norwegian, United States and Italian flags were dropped on the ice which was much broken up into small floes. The survey of the pack from above was one practical result of the flight, but little attempt was made to carry out scientific researches. The only animal life seen on the whole trip consisted of a couple of bears that ran for the water and dived. An immense area of fog, entered at 8.30 a.m. on 13th, caused an unforeseen danger. Ice was formed from the moisture on all the external metal of the *Norge*; this ice was shaken off and some of it driven by the propeller into the thin covering of the balloon. The rents were repaired as long as the

material lasted. Progress seemed extremely slow after the high speed of aeroplanes.

The journey as far as the Pole occupied about 15 hours at a speed of approximately 50 m.p.h. Another 30 hours elapsed before Alaska was reached at 6.45 a.m. on 13th, and thus 2 whole days were taken to cross the Arctic Sea. The voyage had been most monotonous except for the danger from the pieces of ice; but a formidable combination of fogs, mountains and gales marked its end. Many hours were wasted in trying to find the position, and the *Norge* wandered in circles over Bering Strait. She was blown before a storm for several hours before landing 50 miles from Nome, where Amundsen intended to descend, all safe after 70 hours in the air.

G. H. Wilkins saw the *Norge* from Barrow village in Alaska whence he was hoping to explore by air an unknown area of the Arctic Sea. His first proposal to fly in the Arctic had been in 1913. In 1919 he had the money for an airship, but no manufacturer or owner would provide one for a trip which they considered fantastic. Thus it was not until 1926 that he found himself on the N. coast of Alaska, equipped for flight. Unfortunately he was hindered by the weather, and encumbered by the help of a huge organization generously provided by American well-wishers. His great compensation was the assistance of Lieut. Carl Ben Eielson, one of the finest aviators in the world, who made some splendid flights between Fairbanks and Barrow. On one of these trips, in 1926, Wilkins and Eielson flew 150 miles over the pack, N. of the coast at the end of a 900-mile flight from Fairbanks. Then on 13th May they saw the *Norge* among the clouds, and a month later abandoned the expedition for that year.

Wilkins believed he could descend on the pack with a suitable aeroplane and planned to fly northwards over the unexplored area; then to alight and take soundings. A Stinson biplane fitted with skis was used for this flight, though other machines and a small army of assistants were provided by Wilkins' supporters. At 6 a.m. on 29th March, 1927, he took to the air from Barrow, piloted by Eielson, and equipped for the most probable contingencies. The speed was 88 miles an hour. Patches of smooth ice large enough for landing fields were seen, as well as one channel a mile wide. At 10.30 a.m. an area of pressure-ice was reached, and 20 minutes later the engine started kicking; but soon after 11 a.m. a smooth place was seen on which the aviators descended. Wilkins cut through the ice, 3 ft. thick, and took an echo sounding while Eielson examined the engine. The depth, if correct, was 2,700 f., the deepest sounding ever made

in the Arctic Sea ; but the position could not be fixed astronomically as the sky was overcast ; it was approximately in lat.  $77^{\circ} 45'$  N. and long.  $175^{\circ}$  W. or 550 miles NW. of Point Barrow.

Five attempts were made before successfully taking off, and the air was misty. In 10 minutes the engine again gave trouble, and thrice they essayed a second descent before the biplane safely rested on the ice. The wind was rising rapidly and Eielson's finger-tips became frozen solid. By 2.30 p.m. the engine emitted a steady roar as it lifted the machine to 3,500 ft. with the course set for Point Barrow. The first meal was eaten—hot coffee from a thermos flask, biscuits and pemmican. A gale was blowing and the air was thick, until at 7 p.m. the pack could not be seen. At 8.40 p.m. a band of open water was dimly discerned, and then the position became critical. They were in the clouds at a height of 5,000 ft. ; the distance from Point Barrow was 100 miles and they could see nothing. At 9 p.m. the engine suddenly stopped, and the only sound was the hum of the wind through the wires. Wilkins and Eielson felt the biplane falling, and for 20 minutes they floated down through the darkness—to what fate ? They knew not and their predicament seemed beyond remedy. If they fell into open water they would perish, and pressure ridges would smash the machine. They felt helpless in the Hand of the Almighty.

When a few hundred feet above the pack the ridges appeared and the gale tossed the machine from side to side. Driving snow obscured the cabin windows. Then the left wing and ski struck ; the biplane bounced and alighted smoothly. When the aviators jumped out their eyes were filled with snow and they returned to the cabin, entered their sleeping bags and, worn out with the strain, they slept. The petrol had failed, after a splendid flight over an unexplored district, and they awoke on 30th March to marvel at their escape. They had alighted, we are told, on a patch of smooth ice only 30 yds. long and 15 wide, surrounded by pressure ridges. Their approximate position was in lat.  $72^{\circ} 30'$  N. and long.  $155^{\circ}$  W. ; they were drifting N. of E. at  $5\frac{1}{2}$  m.p.h. (" Flying the Arctic," 153). The wind was blowing at 30 m.p.h. Wireless messages were repeatedly sent out. The blizzard increased and little could be done until 2nd April when the sun shone and preparations were made for walking ashore. Next day they set out with a fortnight's food on an improvised sledge, being then in long.  $150^{\circ}$  W. and 80 miles from land. Wilkins built snow igloos to sleep in, and on 10th some seals were seen ; 5 days later Beechey Point was reached after a rough journey.

A valuable piece of exploration had been accomplished. Wilkins had proved the possibility of descending to and ascending from the pack, and had shown that no land existed over hundreds of miles of the Arctic Basin. Little more could then be done, though another aeroplane was available, and the expedition reached Seattle on 18th June. Wilkins went down to Los Angeles and was sitting in the window of his hotel, planning a solo flight from Barrow to Etah, when the most beautiful monoplane he had ever seen sailed into view ; it was the materialization of his dreams and was found to be a Lockheed Vega. The third machine to be built was secured.

Wilkins was now in sole control of his affairs and the result was a brilliant success. Eielson again was pilot ; Fairbanks was reached on 26th February, 1928, and a height of 11,000 ft. attained during the flight to Barrow. It was amusing to find that aeroplanes were now *passé* with the Eskimos, and their children played round the Lockheed as if it had been a cart. Frozen lagoons formed ideal surfaces for taking off and landing. The great flight was to be made from Alaska to Spitsbergen, not over the Pole, but crossing the largest unexplored area of the Arctic Basin, in which there was a bare possibility of discovering new land. All preparations were completed by 3rd April, but not until 15th could the monoplane take to the air. Then 50 miles of pressure ice were crossed at 108 m.p.h., and for 80 miles, as the machine rose to 800 ft., no landing-place was seen. About 100 miles from Barrow the pack became heavily ridged, and narrow channels extended E. and W. During the second 100 miles there were channels every 30-40 miles ; but then, as the unexplored area was approached, low clouds covered the earth. These clouds extended for another 100 miles, though Wilkins believes no land exists in this locality. Masses of small pressure ice emerged beyond the clouds, and the pack from this point is almost certainly afloat, though no open water appeared. The height of the monoplane was then 3,000 ft., and from here old weathered hummocks could be seen. They were succeeded by typical pack with much pressure and a few small cracks.

When a distance of 1,100-1,200 miles had been flown Wilkins began to look out for Dr. Cook's Bradley Land which should lie to the north of his course. No land was seen, but it may possibly exist, if low-lying and beyond his limit of vision. A grey belt that was probably a cloud appeared, but the issue is still uncertain. Had Mac-Millan in 1913, during his search for Crocker Land, taken an accurate line of soundings over the pack, this uncertainty might then have been ended. Wilkins and Eielson, flying at 6,000 ft., and turning

southwards to avoid a mass of clouds that lay ahead, soon saw the mountains of Ellesmere Land 20 miles away, and they checked the position. The aviators flew north-eastwards parallel to the coast, and as they were now over charted country, they enjoyed a meal. If they continued on their course a storm would be encountered at Spitsbergen, but they decided to carry on ; they had been flying for 13 hours and were tired.

All went well for another 200-300 miles and then, at a height of 8,000 ft., clouds were entered. When 200 miles from Spitsbergen there was petrol for at least 4 hours, but the air was turbulent and the outlook doubtful. As the land was approached, dark patches of water were seen through occasional openings in the mist, though for the most part the clouds extended from the sea below to the summits above, and there was danger of crashing into the mountain sides. Two peaks suddenly appeared, and then another mountain, directly ahead, which Eielson narrowly avoided ; the open sea below was equally treacherous. These two voices of the mountains and the sea that had charmed the ancient Psalmist :

*The strength of the hills is His also.  
The sea is His and He made it*

here sang a duet of death. A landing must soon be made, but where ? Snow and frozen oil obscured Eielson's windscreen and Wilkins directed him from the cabin. They were flying low along a mountain coast in a snowstorm, when a possible landing-place was sighted, and after circling a few times a perfect landing was made.

The force of the wind was so great that the monoplane was stopped in 10 yds. after the skis touched the snow. Visibility was limited to a few feet by blinding snow, as the engine was covered and the oil drained out of the tanks before it could freeze. They quickly returned to the shelter of the cabin, thankful that the machine was safe. They had been 20 h. 20 minutes in the air and had flown 2,200 miles. After sleeping, observations of the sun showed that they were opposite the middle of Prince Charles Foreland. Another blizzard then kept them inactive until 22nd April when Wilkins nearly lost his life during the take-off.

The monoplane could not be started on its skis unless someone pushed the tail. Wilkins did this, and then as the machine began to move he tried to climb into the cabin, but slipped and fell. Eielson could not see what had happened and rose into the air alone. He soon saw his companion, however, looking very forlorn on the ice, and landed. A second attempt was made with a rope ladder ; but

Wilkins was not a good climber and was forced to bare his hands in the freezing cold to obtain a firm grip. As the machine gathered speed his hands became numbed and he clung to the rope with his teeth. There he hung for his life, unable to climb higher, while the monoplane took to the air. He then saw in a flash that his only chance was to let go, and he fortunately fell on soft snow. All his front teeth were loose and he was half-stunned, but otherwise unhurt. Had he hung on a few more seconds he would have been dashed to pieces. Eielson again saw him below and for the second time returned.

They were then in a desperate plight—but necessity is the mother of invention. Wilkins pushed one end of a log of driftwood from the machine, with one leg in the opening of the cockpit. They hung in the balance as he strained every nerve, and then with a lurch off they went. Wilkins tumbled inside, utterly exhausted but safe. After a few minutes flying, southwards along the coast, 2 tall wireless masts appeared and they landed near them in Green Harbour. They had only been 5 miles away on Dead Man's Island. Thus ended an exceptionally fine flight. The King afterwards recognized this by conferring the honour of knighthood upon Wilkins. Of the whole distance, 1,300 miles had been over an unexplored area, and the accuracy of aerial navigation had been fully demonstrated. In concluding this account of Sir Hubert's achievement, the sympathetic reader may perhaps be permitted to wonder why he chose for his book, "Flying the Arctic," the excellent motto: "Now faith is the substance of things hoped for, the evidence of things not seen"; though faith is substance if it is confidence in the invisible.

The Canadian Government has found flying the most convenient method of making investigations for minerals, and operations of this character were carried out in Hudson's Bay in 1928 and 1929. The Northern Aerial Mineral Exploitations have now followed suit, but all the work is near to or S. of the Arctic Circle. Aerial surveys have also been carried out.

In 1927 a Russian hydroplane flew from Cape North to the colony at Rodgers Harbour, Wrangel Island. The following year the island could not be reached, but in 1929 a ship relieved the station. In November of the same year Eielson and Dorbanot, in an aeroplane, rescued 6 men from the *Nanuk*, ice-bound near Cape North. On a second trip in bad weather Eielson disappeared. After constant searching his wrecked machine was found, on 25th January,



1930, and several more days of digging in the snow disclosed his body. This seems to be all that is known of the end of a brilliant airman.

Prof. S. Obruchev made an air-reconnaissance for scientific purposes in July, 1932, over the extreme NE. of Siberia ("Petermanns Mitteilungen," 9, 10, 33). He and his 3 companions received a wireless S.O.S. from the Wrangel Island colonists who had been there 3 years. A relief ship was held up 50 miles from the island, and a 4th winter was threatened. The scientific work was therefore interrupted, and 8 colonists with a large stock of furs were carried by air to the relief ship. Those who remained were re-provisioned for the winter. Obruchev made many interesting geographical discoveries, but few details are to hand (see "Geographical Journal," Dec., 1933, and p. 32).

## CHAPTER XVIII

### NOBILE AND ANDRÉE

**T**HE aerial tragedies of Andrée and the *Italia*, though separated in time, were united in place and had much in common. For shipwrecked men to live on the pack ice was no new experience in 1897 ; but Andrée and his men were the first in history to descend upon it from the sky, and the survivors of the *Italia* were the first to be wrecked from a modern dirigible on the Arctic Sea. In 1928 Nobile's airship passed over the position where Andrée's balloon had fallen on the pack ; the *Italia* was in difficulties at the time and a few hour later was wrecked, 120 miles south of where Andrée had landed on the ice. The 2 courses of Andrée's and Nobile's parties, after their descent to the pack and due mainly to its drift, were southwards and little more than 50 miles apart. They are the only Arctic fatalities with lighter-than-air machines.

When Sir Hubert Wilkins ended his great flight at Green Harbour, Spitsbergen, in April, 1928, the *Italia's* stores were being unloaded there. Nobile had conceived the idea of an Italian flight 3 days after landing from the *Norge* in 1926, and it was intended to be of a scientific character. Most of the new country over which they had flown was hidden in fog, and the achievement was mainly aeronautical. Nobile had an arrangement in the *Italia* for lowering men down to the pack on which much of his work would be done. He has given an excellent record of his ill-fated expedition in his book, "With the *Italia* to the North Pole." Mussolini approved the scheme in October, 1927 ; the Italian R.G.S. undertook the responsibility of its scientific work, and the city of Milan shouldered the financial burden amounting to 5,000,000 lire. The Italian Air Ministry supplied the dirigible, a sister ship to the *Norge*, named the *Italia*, as well as the crew. Three scientists were taken, of whom the chief was Prof. Finn Malmgren, a Swede of Upsala University who had been meteorologist in the *Norge*. A steamship named the *City of Milan* was the floating base of the expedition.

The first flight was from King's Bay, Spitsbergen, on 11th May, 1928, when 13 men were carried ; but as the weather became un-

favourable, the *Italia* turned back from the N. coast. On 15th a longer voyage was begun in beautiful sunshine; Cape North was flown over on an easterly course, and then as an unexplored area was entered fog blotted out the view. Ice formed on the airship and increased its weight. The N. coast of the Franz Josef Archipelago was followed in clearer air to Cape Fligely, whence a SE. course was set over the large unknown area that extended as far as Severnaya Zemlya. Banks of low-lying cloud eventually reduced visibility and Nobile turned back in long.  $91^{\circ} 40'$  E. and lat.  $79^{\circ} 16'$  N., setting the course to the N. point of Novaya Zemlya. Cape Leigh Smith was passed and King's Bay reached at 10.30 a.m. on 18th. Nearly 20,000 sq. miles of unexplored sea was flown over without new land being discovered.

On 23rd May the last voyage of the *Italia* began with 15 men, an ominous number, on board. At 4.51 a.m. the airship sailed northwards in long.  $11^{\circ}$  E. at a speed of nearly 50 m.p.h. A strong north wind opposed progress, and at 6.40 a.m. a course was set on Cape Bridgman, North-East Greenland. In 10 minutes the pack appeared, but was soon covered with fog which persisted until 2.45 p.m., when Greenland was sighted. The speed was then only 37 m.p.h. At 5.29 p.m., near Cape Bridgman, the course was set to the North Pole in long.  $27^{\circ}$  W., and this part of the voyage was most enjoyable. The sun shone brightly, there was a following wind, and an unexplored area of the pack lay beneath the airship. The Pole was reached at 2.20 a.m. on 24th May, but the wind prevented a descent from being made on the pack, and the Pole was slowly circled while the Pope's cross and Italian flag were dropped from a height of 500 ft. Wireless messages were then sent to Italy. Seven of the personnel had previously crossed the Pole in the *Norge*. At 2.20 a.m. Nobile started south in long.  $25^{\circ}$  E., flying at a height of 3,000 ft.

The atmospheric conditions were unfavourable throughout the homeward voyage. Clouds enveloped the *Italia* until 10.20 a.m. when a descent was made to 700 ft., from which height the pack was seen, and the speed found to be only 26 m.p.h. The strong SW. wind brought occasional snowstorms, and for nearly 24 hours the airship remained at 500 ft. above the pack. She became encased in ice, pieces of which were hit by the propeller blades, with a noise like a rifle shot, and tore holes in the balloon. The rents were repaired as far as possible, but difficulties increased until the voyage became a nightmare.

Little headway could be made with the usual 2 engines against

the steady wind of 30 m.p.h., so at 7 p.m. the 3rd engine was started. Even then, at 3.25 a.m. on 25th, the speed was only 43 m.p.h., and there were 2 serious objections to running all 3 engines: the increased speed was not in proportion to the fuel expended, and the strain on the structure of the dirigible was so great that a fracture was feared. It was evident that the *Italia* could not endure the excessive tension caused by fighting the gale much longer, and the surrounding gloom of the chilly fog depressed the spirits of all on board. They had entered the shadow of impending tragedy, and their depression was deepened by the uncertainty of their position. The course was changed towards the SW., and hour after hour the coast of North-East Land was expected to loom up ahead; but it never appeared. From 7.40 to 8.10 a.m. on 25th Nobile steered W., and then resumed the southern course, hoping that he was 10 miles NE. of Moffen Island. The head wind was stronger, and probably the structure of the ship was being strained, for at 9.25 a.m. the elevator-wheel refused to move.

The dirigible was descending from a height of 800 ft. and would soon have struck the pack had not Nobile immediately stopped the engines, when the ship began to rise. While repairs were effected, a height of over 3,000 ft. was reached without seeing land. The sun shone above the fog, and a solar observation was taken. At 9.55 a.m. 2 engines were started, and Nobile descended to 1,000 ft. He was 45 miles NE. of the Ross Islands at 10.30 a.m. when a strong list towards the stern developed and the whole ship fell rapidly. The 3rd engine was started and the other engines accelerated without arresting the descent. Then, as nothing could avert a crash, Nobile stopped the engines, to reduce the impact. Perfect order was maintained as the rough surface of the pack rapidly loomed larger. Finally, with great violence, the cabin crashed on the ice. Nobile says he was first hit on the head, then held and crushed; lastly he was knocked down head foremost, and shut his eyes expecting to die.

He did not die, though men and materials were dashed against the pressure ridges all around him. He found himself on a landscape of lunar appearance, amid wreckage and human bodies. His airship, with her nose up in the air, was drifting away, horribly lacerated with strips of fabric and metal trailing behind, but was soon lost in the fog. Nobile then noticed the throbbing of his right arm and leg, both of which were broken. His face was covered with blood and his chest painful; he naturally expected to die. Malmgren, Cecione and Zappi were lying a few yards away, with 5 other men on their feet, almost uninjured. A column of smoke was then

sighted far away to the SE., and this was the last ever seen of the 6 men who were left in the *Italia*. Provisions were soon discovered on the ice, and the wireless operator found the emergency set intact among the wreckage. A tent, sleeping-bag, revolver, matches and many other necessities had fallen with the men from the sky.

Nobile was placed in the sleeping-bag carefully, as the slightest movement caused him agony. The uninjured men pitched the tent and scouted for food, of which enough was found for 25 days. Only one man's body was seen, and there were 9 survivors. An S.O.S. was at once sent out to the *City of Milan*. Nobile and Cecione were bandaged as well as possible; the latter had a compound fracture of the leg; and Malmgren's arm was put in a sling. More food had meanwhile been found, also the navigating instruments by means of which the position of the camp was found to be in lat.  $81^{\circ} 14'$  N. and long.  $28^{\circ} 14'$  E. An S.O.S. was sent out every hour, as arranged with the *City of Milan*; but the ship never listened for messages. This lack of response to their wireless appeals filled the shipwrecked men with despair. They heard the news from Rome and learnt that their countrymen were alarmed at their silence.

On 27th May Nobile arranged for the rations to last 45 days. The only kettle was an empty petrol tin, and their one cup was the cap of a large thermos flask. On 28th Charles XII Island came into view, for the pack had drifted 28 miles SE. in 2 days. Strange to say, the one book picked up on the pack was the book of greatest value in the world to the party—"The Arctic Pilot." Mariano and Zappi wished to walk to land, and Malmgren said this was their only hope of rescue, as it was evident that the *City of Milan* was not listening for their messages. The suggestion was fully discussed. On 29th Charles XII Island was out of sight, but Broch and Foyn Islands had come into view only 10 miles away. Nobile says that while the actual cause of the catastrophe will never be known, part of the *Italia's* framework probably broke under the strain and tore the envelope. The smoke seen about 6 miles away, half an hour after the crash, was almost certainly from the burning of the ship which was 2 tons lighter after the disaster. The fate of the 6 men on board is still uncertain.

On 29th May a polar bear caused some alarm until shot with a revolver; the store of fresh meat was then welcomed. Next day the camp was 7 miles from Foyn Island; but Malmgren, Mariano and Zappi, who were to march for land, did not leave immediately. Their direction when they set out was towards Cape North or against the general drift of the pack. Two of the 6 men who remained at

Nobile's red tent were helpless cripples and could hardly be moved a yard. The wireless S.O.S. was sent out almost unceasingly. On 3rd June the camp was 4 miles NNE. of Foyt Island and remained within sight of the land for a month. Seals were seen only near land. Not until 6th June had the shipwrecked party any hope of rescue; and then they heard from the Rome wireless station that the Archangel station had at last received the S.O.S. The establishment of communication was celebrated by a feast of 5 lumps of sugar for each man, with 10 malted milk tablets and some chocolate.

To rescue the party was difficult, and the difficulties were increased by many of the rescuers. Never before had there been such a wealth of relief expeditions, but there was no co-ordination of effort. A good account from the rescuers' standpoint will be found in "The Tragedy of the *Italia*," by Giudici, the correspondent of an Italian newspaper. On 26th May a meeting of Norwegian explorers was held at which Sverdrup suggested the dispatch of the Russian icebreaker *Krassin*, while Amundsen and Riiser-Larsen advocated the use of seaplanes and offered their services. Amundsen had been displeased with Nobile, but when his life was in danger he completely forgave him and set out for his rescue. On 10th June Samoilovitch was appointed to lead the *Krassin* expedition, financed by the Norwegian Government, and on 15th she sailed from Leningrad to follow the W. coast of Spitsbergen while the *Malyguin* went along the E. coast of North-East Land. Sweden, Finland and France also initiated rescue measures and Germany offered assistance.

Amundsen obtained a seaplane from France and was given a national demonstration in Norway on setting out. Before leaving he said he wished to die in the Arctic chivalrously, in the fulfilment of a high mission. The French aviator Guilbaud, who flew the seaplane, was one of the best French pilots. They left Tromsø on 18th June for a flight to Kings Bay, Spitsbergen, and were never heard of again, though wreckage from the machine was picked up in the Barents Sea. No man knoweth of their sepulture unto this day. Amundsen died the hero's death he desired, at the early age of 56, and the world lamented the loss of a great explorer.

Nobile's men were cheered by the wireless news that rescuers were on their way, and on 8th June the event was celebrated by a wash—the first since the disaster. The ablutions were followed by the good news that Riiser-Larsen had reached Moffen Island and that 3 Swedish aeroplanes were also on their way. The latitude and longitude of the camp was sent out repeatedly. On 17th June 2 aeroplanes came within about a mile of the camp and turned back, as

the airmen had not been given its exact position. These were the Norwegian machines of Riiser-Larsen, who was then delayed by engine trouble. Two days later an Italian hydroplane was seen hunting for the camp and thrice came within sight without seeing it. Then on 20th June Nobile was able to direct the hydroplane by wireless, and food for 20 days was dropped.

Nobile expected his party to be picked up by aeroplanes as soon as they were able to land on the pack, and he arranged the order in which the men should be taken. He wished to go last, but the risk to an aviator with a helpless invalid was too great, and he saw the need of the wireless operator remaining to direct the aeroplane. He was surprised, therefore, when Lundborg the Swedish aviator landed with definite orders to take Nobile first. Neither Malmgren's party nor the men who had remained in the *Italia* had been seen. Nobile left final instructions and was lifted into the aeroplane. In an hour he was landed on the shore of Ryss Island and treated with every consideration. Lundborg returned to the red tent, where his machine overturned on landing and he had to remain with the survivors of the *Italia* until picked up later in a little Moth biplane.

The ice-breaker *Krassin*, of 10,000 tons and 10,500 horse-power, had been built at Newcastle in 1917 and sailed under Samoilovitch with 138 people on board, nearly all Russians. On 30th June the ship passed Virgo Bay, where the *City of Milan* was moored, and soon entered the pack. It was an impressive spectacle to see the powerful *Krassin* breaking ice 2-3 yds. thick; she rose upon it and broke it with her weight (op. cit., 67-8). On 2nd July the Seven Islands were passed, but the ice was very heavy and only a mile's progress was made in 4 hours with an expenditure of 20 tons of coal. The pack retaliated upon the ice-breaker on 5th July by damaging the steering-gear and one of the 3 propellers. Next day a Junkers monoplane was "landed" on the pack from the ship by means of a sloping stage. The Russian aviator flew over Great Island and saw Malmgren's party 5 miles ESE. of Charles XII Island, but was forced to land near Cape Platen in a fog. On 11th July the *Krassin* went through ice over 6 ft. thick at a speed of  $1\frac{1}{2}$  m.p.h. Mariano and Zappi were rescued in an exhausted condition in lat.  $80^{\circ} 30' N.$  and long.  $26^{\circ} 7' E.$  Malmgren had been left to die, it appeared at his own request, nearly a month earlier. Two men were seen on Foyn Island as the *Krassin* passed on her way to the red tent, but they were well able to look after themselves; one of them was Capt. Sora of the Italian Alpini and the other was Van Dongen, a Dutchman. They were out with a dog sledge to rescue Nobile's

men ; they drove 47 miles in 14 hours from Cape North, and 50 miles on their 2nd day ; a third march of 31 miles brought them to open water. They were taken off shortly after in the *Quest*.

The survivors at the red tent were then asked by the *Krassin's* wireless to make a smoke signal, and directed by this Lundborg's capsized monoplane was shortly seen, and the remaining survivors taken on board. Had the ice-breaker then been able to search for the last 6 men in the *Italia*, there might have been a prospect of saving them ; but the *Krassin* was in need of repair, as well as of 1,500 tons of water, and on 23rd July she left for Norway. On her return to the ice in September nothing was found.

Although the Andrée tragedy occurred in 1897-8 nothing was known of it until 1930 ; hence it claims a place in this volume. Andrée, like Nobile, set out on his balloon voyage from the NW. of Spitsbergen and was carried by the wind over the locality afterwards visited by the *Italia*. A reference to Chart No. 4 will show that Andrée's outward and return routes are astride the last route of the dirigible, while the survivors at Nobile's red tent were rescued by the *Krassin* within about 30 miles of Andrée's camp on White Island. "The Andrée Diaries" (John Lane, 1931) are the authorized translation of the official Swedish record.

Salomon August Andrée was born in Sweden in 1854, and while at an impressionable age became fascinated by aeronautics—an affection that never wavered until it cost him his life. In 1882 he was in charge of the aero-electrical observations undertaken by the Swedish expedition to Spitsbergen in connection with the International Polar Year. On 13th February, 1895, he announced his plan for a flight over the North Pole. The estimated cost of the expedition was £7,000 ; and the capacity of the balloon, named the *Eagle*, was 170,000 cubic ft. In June, 1896, the expedition reached Danes Island, Spitsbergen. On 14th August, while waiting for a favourable wind, the *Fram*, homeward bound under Sverdrup, entered the harbour. Three days later the flight was abandoned for the year.

On 11th July, 1897, though with some doubts as to the atmospheric conditions, Andrée started with 2 companions, Strindberg and Fraenkel. The car touched the sea, and ballast had to be thrown out while the cheers from the shore were still ringing in their ears. Then the *Eagle* soared, though only to descend again until 450 lbs. of sand were thrown overboard, when it rose to 1,800 ft. and disappeared to the NE. in a cloud. Nothing more was seen or heard



of the balloon or its occupants, but a carrier pigeon, released in lat. 82° N., brought the message : " All well on board." The *Eagle* had flown only 190 miles, however, when this message was dispatched, and all was seen to have been far from well when the balloonists never returned. Several buoys, also thrown out of the balloon, were found, but none of them contained later information, and after many years the incident was almost forgotten. It was a quixotic idea, with little chance of success ; and, though search was made, nothing was found for 33 years when the relics were discovered accidentally.

On 6th August, 1930, a party from the Norwegian sealer *Bratvaag*, under Dr. Gunnar Horn, were ashore on White Island and found the remains of a camp, with a canvas boat, and in the boat a book, on the front page of which were the words : " The Sledge Journey, 1897." At a distance of 33 ft. from the boat a decapitated human body was found ; the coat was intact and marked with the monogram A. In one of the pockets was Andrée's diary. A grave was also found, with the skeleton frozen to the ground, and many camping articles too numerous to mention. The public interest was aroused, and a journalist chartered the *Isbjorn* to conduct a further search on the island. The greater part of a 3rd skeleton was found, also Fraenkel's almanac and 3 memorandum books, Strindberg's almanac-diary and some other objects, previously covered with snow. Andrée's diary was by far the most important relic because it gave the history of the expedition ; but there were also letters, maps and other documents in a fair state of preservation. The following account is compiled from the diary, and the comments upon it made by the members of the Swedish commission appointed to deal with the relics. The expedition falls into 3 stages : the short balloon flight ; the longer journey over the pack ice ; and the final rest on White Island.

The aeronauts were in a merry mood as they drifted to the NE. over the pack on 11th July, 1897. Carrier-pigeons were liberated, but the first 4 failed to reach their destination. The balloon ascended until its maximum height of 2,270 ft. was attained, and from this altitude land could be seen to the SE. The *Eagle* soon began to descend, and ballast was thrown out at 1,600 ft., also a buoy that gave the height at 830 ft. ; this buoy was found on the coast of Norway on 27th August, 1900. After this, various articles as well as sand ballast were repeatedly heaved overboard in a vain attempt to counteract the contraction of the gas due to entering the cold clouds. The balloon sank to a height of about 100 ft. until, at 1.20

a.m. on 12th July, wind and progress ceased. An easterly wind next arose and the *Eagle* was blown many miles due W., descending to 50 ft. above the pack ice. At 3 p.m. the car started to bump on the ice. Andrée had expected to guide his flight by ropes dragging on the pack, but they were left behind.

Frantic attempts were made to induce the *Eagle* to rise, by throwing nearly everything overboard, but without success. As the night was calm there was no motion for 13 hours, and at 9 a.m. on 13th the sun came out. The heat expanded the gas and made the balloon an unconscionable time dying. Four more pigeons were released, one of which was found in the sea, with its message, less than 150 miles south of where it was sent out. Another pigeon returned to the balloon—then being blown back to the east with the car bumping against the pressure ridges. Even the medical chest was heaved overboard, though in vain, and 440 lbs. of provisions followed it on to the pack; but the bumping continued until 8 a.m. on 14th July, in lat.  $82^{\circ} 56' N.$  and long.  $29^{\circ} 52' E.$  when the aeronauts climbed out of the car and the flight ended. Its duration, 65 hours, had been normal for a balloon, and the distance from the nearest land was 192 miles.

The second stage of the expedition began with a great change in the life of the explorers who were not experienced ice-craftsmen; they readily adjusted themselves, however, to their new and unfamiliar circumstances. Though Andrée's balloon scheme was visionary and unpractical, he showed another and very fine side to his character when the fight for life on the pack began and he was able to explore an area not previously visited. The preparations for the journey occupied from 15th to 21st July. Seals and fulmars were seen on 18th. Next day Andrée shot his first bear, and by 20th the camp had been carried nearly 20 miles to the SSW. On 22nd the party set out for Cape Flora, where Jackson's hut and ample food would be found. The equipment appears to have been good, but the sledge-loads were about 3 times heavier than the men could pull continuously without relaying, when all 3 men had to haul one sledge. Progress therefore was slow. A canvas boat had been provided for crossing open channels. In the tent, at the end of each march, Strindberg wrote to his fiancée and described the day's proceedings before turning in. There was an attractive selection of provisions.

By 26th July it was evident that relaying must be given up, and a complete inventory of their stock was taken. Much food and equipment were then left behind and provisions for 45 days taken on. The second bear was shot by Strindberg, and the meat found to be

excellent after being soaked for an hour in sea water. Next day Fraenkel shot their third bear, but most of the meat was wasted because it could not be hauled. Astronomical observations on 31st showed that the pack had carried the party farther to the west than they had sledged to the east ; to pull the sledges 4 m.p.d. was good progress. Andrée made many scientific observations, and he collected specimens such as clay and algae, found in the pack. Animal life became richer : fulmars and seals were common, and Ross gulls appeared. On 2nd August the last of the bear's meat was eaten, and an hour later the 4th bear was shot. Next day the party was carried backwards 8 miles, and the attempt to reach Cape Flora was abandoned. A course was then set to the Seven Islands where there was said to be a small depot. They had been sledging for 13 days and did not feel as strong as when they started, for the going had been difficult and the work very hard.

A new phase of the journey began on 5th August with a second stocktaking ; they still carried jam, sardines and a bottle of port. Pools of fresh water in the hollows of the pack were now met with, and the channels became more numerous ; one " lead " was a mile wide. Andrée gives many *menus* in his diary, of which those for 6th August are a fair sample and show they had ample food at this time : breakfast consisted of bear meat with bread, coffee and biscuits ; lunch, bread, biscuits, butter and water ; dinner, 2 lbs. bear meat each, pear-purée, bread and biscuits. Two days later they all suffered from nasal catarrh, and Fraenkel had an abdominal disorder. A third stocktaking was made on 10th August in order to re-load the sledges. The party was then in lat.  $81^{\circ} 56'$  N. and long.  $29^{\circ} 5'$  E. On 13th, when the bear-meat was again finished, another bear and 2 cubs appeared. Enough meat for 23 days was taken ; 5 bears and 2 cubs had now been shot. On 15th Strindberg cut his hand, and both he and Andrée suffered from internal disorders. Two days later the 8th bear was killed, but only 22 lbs. of the meat could be carried ; and on 21st the 9th and 10th bears were shot. Four miles were made on 23rd, and next day Andrée records in his diary that they were eating 3 lbs. of meat per man per day, though not more than  $7\frac{1}{2}$  oz. of biscuit. They all had small ailments that might become serious on the Arctic pack.

The fourth stocktaking was carried out on 25th August when the going improved, and a piece of turf was found in the ice. Clay, leaves and shells also were seen and specimens collected. Fraenkel's internal pains were worse and he was given opiates. On 29th the temperature was  $22^{\circ}$  F., and the travellers began to feel cold. Next

day their 11th bear was shot and 66 lbs. of meat, or a fortnight's supply, was taken on the sledges. Summer was now over and the wind daily increased, but all were in good spirits in spite of needing rest; Andrée's stomach, however, was out of order. On 3rd September they all took to the boat and enjoyed 3 hours' rowing towards the Seven Islands; then the waterway was blocked. Strindberg celebrated his birthday by falling, with his sledge, into the sea, which ruined the sugar and biscuits; but their increasing discomforts were bravely borne.

Andrée's diary is decisive in showing an increase in animal life as land is approached. His party, of course, was also advancing southwards, and the open-water areas increased as time went on, yet much life was seen as late as September. The boat was used as much as possible, for sledging was very slow, and Strindberg's left foot was so painful that he could not pull. The diary is a blank from 9th to 17th September when the third stage of the journey began. The men were tired at the beginning of the second stage, and it ended with Fraenkel's strength failing and Strindberg suffering from a painful foot. They had then been carried by the pack to the SE., away from the Seven Islands. Despite their difficulties and dangers, however, every man was still good-humoured, though naturally hard and grim.

When Andrée again takes up his pen it is to admit that his party is being carried between North-East Land and the Franz Josef Archipelago, and that they must winter on the pack; he added with much restraint that the position was not good. To be frank, it was foreboding; unless land could be reached they would perish in the open sea. They were worn out, and faced the winter at the mercy of the pack—that merciless mass of drifting ice that has taken such a heavy toll of human life. Strindberg has left a note, dated 13th–15th September, of the decision to build a snowhouse or igloo and winter on the pack. A seal was secured, but bears were now scarce. For several days the rate of drift was over a mile an hour; and on 17th September White Island was in sight at a distance of 6 miles, but was regarded as inaccessible. It is ice-capped and nearly surrounded by vertical ice-cliffs. On 18th a seal was killed with small shot, for the skull was remarkably thin. Next day 3 more seals were killed, and, with a large bear, their 12th, secured on 20th, the winter store was complete, as the meat would last until April, 1898.

The snowhouse, having been built, it drifted with the pack to within 1,000–2,000 yds. of White Island, but no attempt was made to reach the island and secure an immovable site on which to spend the winter. The "signs of difference" between the men, mentioned

by Andrée on 20th September, may well have been over this subject. Andrée indicates that he wished to get away from the island and was sorry when his floe went aground ; it was driven against the S. end of the island, and on 1st October was cracked and the igloo flooded. Here this interesting diary, that has conducted us so far, comes to an end, but a little more information is available.

On 5th October the camp was moved to a beach that lay conveniently between the pack ice and the cliffs. Andrée's landing was probably the first made on White Island, though it was visited by Nathorst 10 months later, on 19th August, 1898, while actually looking for Andrée, without his camp being seen. His party was thus saved, for the time, and the move ashore ended the journey of 2½ months ; excellent results had been obtained during the sojourn on the pack. Andrée made many notes after landing, but they are illegible. The book in which he wrote was found in a fragmentary condition in his coat pocket, and had been alternately frozen and thawed many times ; mould had grown on the glue of the binding. Strindberg's notes, however, help us a little, and the following appears to have happened.

Heavy rain fell as the men dragged their feet over the stones of the beach on the SW. of the island. Higher up, near the foot of the cliffs, they chose a site for the tent, evidently the camp found by the *Bratvaag*. They may have built a snow hut ; but Andrée's and Fraenkel's remains were found under the relics of the tent. The temperature on 1st October had been as low as 14° F., or 18° of frost, and it would have become colder after that. The actual cause of death is unknown, though the most probable hypothesis appears to be that the 2 survivors were suffocated by the fumes from the stove, and thus may have died in their sleep. The last word is by Strindberg, written on 17th October, 1897 ; " Home 7.5 o'cl. a.m.," from which it is clear that some journey had been made. How much longer they lived will never be known ; but food, oil, matches and 150 cartridges were found with the relics. Strindberg must have died first, as his body had been buried about 100 ft. from the camp. They had only one 3-man sleeping bag, but the remains were not found in it.

## CHAPTER XIX

### THE GERMAN EXPEDITIONS : WEGENER AND ECKENER

*By Theodore Savory*

**D**R. ALFRED WEGENER, leader of the German Inland Ice Expedition to Greenland, was born in 1880. He was meteorologist on Mylius-Erichsen's expedition of 1906-8 and returned to Greenland with J. P. Koch in 1911-13, when he was one of the party which made the longest crossing of the ice-cap. During the War he was appointed to the meteorological service of the German Army and was weather expert on a number of Zeppelin raids. In 1925 he became professor of geophysics and meteorology at the University of Graz. Recently his name has been well known as the author of a book on the theory of continental drift, a conception that has not found general acceptance but has acted as a great stimulus to research.

His last expedition to Greenland was part of the simultaneous schemes of British, German and American investigations into the weather conditions over the inland ice. In the summer of 1929 a preliminary reconnaissance under Wegener's leadership set out to determine a route from the coast to the ice-cap, and to test equipment and an improved method of measuring the thickness of land ice by echo-soundings, a method due to Dr. Mothes. In this work an explosion on the ice is used as the origin of a vibratory disturbance similar to the waves produced by an earthquake. At a measured distance from the explosion is a seismograph which records the arrival of the wave which travels horizontally through the surface ice and of the wave which is reflected from the rocks below the ice. From the intervals of time between the explosion and the arrivals of the waves, the depth of the ice can be calculated.

The main part of the expedition was to operate in the Umanak district on the W. coast in lat.  $71^{\circ}$  N. where a narrow glacier flowing into Kamarujuk Bay was found to afford an easily passable road to the interior. A party of 4 : Dr. Wegener with Georgi, Loewe and



Prof. Dr. Wegener

PROFESSOR DR. ALFRED WEGENER IN THE SUMMER OF 1930





E. Sorge, with 8 Eskimos and dog sledges, made an advance of 120 miles in an easterly direction, reaching a height of 8,157 ft. They carried out some preliminary experiments with the Mothes apparatus in which the first measurements of the ice were recorded, and made a limited set of meteorological observations.

The expedition proper, of 1930, consisted of 20 members in 3 parties. On the E. coast a station was set up in Scoresby Sound and was operated by Dr. W. Kopp and 2 assistants. Like the other stations it was on lat.  $71^{\circ}$  N. As the fjord was blocked with ice, it was first established there, in July, at the Danish Wireless Station; but in August the melting of the ice enabled the party to move 60 miles farther up Scoresby Sound by motor-boat. Meteorological observations were taken without a break throughout the winter, from 26th October to 2nd May, 1931, by which time provisions were running low and the work had to cease. The party abandoned their camp on 11th May and made with some difficulty a 6-days' journey back to the Danish settlement. The east coast party worked almost independently of Wegener's party.

The main expedition reached Kamarujuk in the *Gustav Holm* on 4th May, 1930. Difficulties met them at the start: there was no ice in the bay so that sledges could not be used in unloading. A landing was therefore made at Urkusigat and on 17th June the Upper Camp was established at Kamarujuk. The first task was the transport of the stores and equipment up to the edge of the inland ice. In this, 25 Iceland ponies assisted, each pony carrying about 180 lbs. on a journey, but they could only work on alternate days and much equipment was therefore transported by the Eskimos and the Germans. A heavy thaw made travelling difficult, for it was impossible to keep to the same track all the time. Moreover, the equipment included 2 air-propeller sledges, and these required the help of winches to haul them over the rocks. Altogether the moving of 125 tons of supplies occupied 120 days, and it was not until October that winter quarters were set up on the Kangerdluaksuk Glacier. But the scientific work had been begun immediately on landing at Urkusigat and had been continued during the time of transport.

The establishment of the plateau station, one of the most important parts of the programme, was undertaken in July. The position chosen was 240 miles E. of Kamarujuk, or almost midway between the E. and W. coasts, at a height of 9,700 ft. This camp was given the appropriate name of Eismitte (literally, "the middle of the ice"). It was necessary to make 3 sledge journeys to

establish it, each with 10 dog sledges which are said to have dragged nearly 4 tons of stores. The propeller-driven sledges were not ready to help in this work, with the result that many of the necessities of life were scarce at Eismitte. This station in the heart of Greenland was to be occupied by Georgi and Sorge. They sent a message to Wegener by the last dog team saying that if they did not receive sufficient petroleum and other stores by 20th October they would have to abandon the project of wintering inland and would leave Eismitte on foot. This would not only have meant the abandonment of a most valuable part of the expedition's work, but the journey in the Arctic winter might have been fatal to them both.

To meet this situation, which indeed had been already foreseen, Wegener had sent out a party with one of the air-propeller sledges, at the end of August. The machine worked well and travelled easily over smooth ice where in favourable circumstances it attained a speed of 25 m.p.h. It amazed the Eskimos, to whom the idea that sledges could travel without dogs was inconceivable. But on this occasion the propeller-sledge did not succeed in reaching Eismitte. At a distance of 124 miles from the coast it encountered deep soft snow and, unable to proceed, had to depot its load and return. A dog-sledge party that was acting as support to the propeller-sledge also met obstacles in the shape of low temperatures and fresh snow. Wegener therefore decided to proceed himself with Loewe and an Eskimo, Rasmus Willemsen, and 2 dog-sledges. His intention was to remain at Eismitte with Loewe and to give Georgi and Sorge the opportunity of returning with the dogs to Kamarujuk. He arrived at Eismitte on 27th October.

Georgi and Sorge had already had a foretaste of the severity of the conditions on the ice-cap. The temperature had fallen below  $-50^{\circ}$  C. ( $-58^{\circ}$  F.)—so cold that even petroleum was difficult to burn. But by the arrival of Wegener they had decided that wintering would be possible, and had built from packing-cases a wooden hut that was much less cold than the tent. Loewe was in no condition to return to the coast. His toes had been frostbitten, and amputated by primitive methods, and Sorge expresses his admiration for the man who in such circumstances travelled for several days through temperatures of  $50^{\circ}$  below zero C. Wegener, on the other hand, is described as being as fresh and as full of energy after 40 days' sledging as if he had just had a short walk. Consequently it was agreed that Wegener and Rasmus should return and that Loewe should stay at Eismitte with Georgi and Sorge. On 1st

November, his 50th birthday, Wegener set off with Rasmus, 2 sledges and 17 dogs, on what proved to be his last journey. At the start the weather conditions were good and the sledges ran easily.

Nine men under the leadership of K. Weiken awaited in vain Wegener's return to winter quarters. At first no great anxiety was felt, since it was assumed that all 5 men must be stopping at Eismitte. There was no wireless at that camp, which was completely isolated for 6 months. The winter at the Base passed uneventfully. The first work of 1931 was the sending of the relief party to Eismitte. After a short depot-laying journey, Weiken, with one companion, 5 Eskimos, 7 sledges and 81 dogs, set out on 23rd April. The propeller-sledges, which had spent the winter in the snow, were not ready to start till 1st May when they sped E. in splendid style. They overtook the dog teams before they had gone 200 miles and reached Eismitte a day before them, on 6th May. This was the first successful journey with air-propelled sledges. Here Weiken learnt of Wegener's departure in the autumn and realized his fate.

The men at Eismitte immediately organized a search for Wegener. It was known that he had hoped to travel half the way with both sledges and then to complete the journey with one, driven by Rasmus, while he followed on ski. Weiken on his outward journey had already found Wegener's ski at a point 113 miles from the coast, and had dug there without finding anything but an empty box. It was now decided that Georgi should remain at Eismitte to continue the observations while the others returned. The propeller-sledges actually made the return journey of 140 miles in 16 hours' travelling. The dog-sledges reached Wegener's ski, and deeper digging revealed his body, carefully buried by Rasmus. It is stated that he had died in his tent from exhaustion, not from freezing, and that Rasmus had taken his diary and attempted to complete the journey alone. But the flags that marked the track were covered with snow, and the Eskimo did not know how to steer a course. His body was never found, although another search was made by Sorge in June.

The remainder of the season was occupied in completing the very full scientific programme. In addition to all the customary observations in meteorology and glaciology a large amount of surveying was accomplished. The most interesting and important work was the measuring of the thickness of the inland ice by the echo-sounding apparatus. Charges of as much as 150 lbs. of T.N.T. set up an icequake. At a distance of about  $2\frac{1}{4}$  miles from the explosion is the seismograph, similar to that used for ordinary earthquakes, which shows two disturbances for each explosion.

The results showed that at Eismitte, 9,700 ft. above sea-level, the ice is 8,775 ft. thick. At the coast, 5,850 ft. above the sea, the ice is 2,600 ft. thick. This suggests that Greenland is an ice-filled bowl or saucer, surrounded by mountains and only about 900 ft. above the sea in the middle.

The news of the disaster to Alfred Wegener's party was communicated to Berlin, and in July, 1931, Kurt Wegener, brother of the deceased, arrived to complete the work of the expedition. This was accomplished by 10th October, 1931, 17 months after arriving in Greenland, and most of the members of the expedition reached Copenhagen on 13th November.

The Arctic cruise of the German airship, *Graf Zeppelin*, commanded by Dr. Eckener, was undertaken at the end of July, 1931, for geographical and scientific purposes. For the former, a panoramic camera with nine lenses capable of recording a wide field of view was included in the equipment, but the latter purpose was more important and the Zeppelin was in effect a flying laboratory. A continuous record of air conditions below the vessel was made by a set of instruments in a suspended float, and measurements of the conditions at great heights were made by releasing small balloons which telegraphed observations until they burst. This was a new method necessitated by the impossibility of actually recovering any self-recording instruments.

The first stage of the polar flight was over Berlin and Helsingfors to Leningrad where at 7 p.m. on 25th July a landing was made for gas and water. The airship left for the Arctic at 8 a.m. on 26th.

At first the weather was good, with high temperatures and favouring winds, as the Zeppelin flew at a height of nearly 1,000 ft. over the vast Russian forests, showing many signs of active Soviet industry. In the evening, cyclonic conditions were encountered, rain fell, the temperature dropped from 79° F. to 39° F. and a head wind reduced speed to 18 m.p.h. A deep bank of mist at first hid the sea, but later the clouds dispersed, revealing a small field of pack ice, with the track of the ice-breaker *Malyguin* passing through it. Then followed pictures of amazing beauty and rich colour. In the distance lay the Franz Josef Archipelago; above were layers of cloud with rose-tinted edges; the horizon was deep blue and the sea, scarce moving, was clear blue-green save where it reflected the red of the sky.

For 6 hours navigation had been by gyro-compass, but now Hooker Island in the Franz Josef Archipelago was sighted and the *Malyguin*

was asked by wireless to approach. There followed the first descent of an airship upon the polar sea. Scarcely was the "landing" made than the Zeppelin was driven against the belt of ice surrounding the island and there was danger of damage to the gondola. The Zeppelin therefore immediately rose, to the cheers of the *Malyguin's* crew. This incident was an important event in view of the application of airships to polar travel; it was no "ball play," and showed that only in favourable conditions and with an experienced commander and crew is such a "landing" without great danger. The airship flew over Cape Fligely and then passed across the island group of Hviteland, where Nansen and Johansen first set foot on solid earth in 1895. Over Liv's Island lay a light ground mist, rolled into waves by the breeze; and a tongue of brush ice could be seen driven together in the lee of the island.

Next came the part of the trip that was most interesting geographically—the flight over unexplored regions of Severnaya Zemlya. Here was exposed an immense photogrammetric prize, which showed the rolling edges of glaciers and the courses of these streams of ice. Unfortunately the W. coast of the island was hidden in fog. The ice in Schokalsky Sound showed a curious regular arrangement in parallel furrows, 1 or 2 yards high and all but impassable for sledge or kayak. The fine weather continued, and the flight over the Taimyr Peninsula revealed fog banks in the coastal districts only: the interior was clear and its conformation could be followed. In the Taimyr Sea was seen a huge field of ice-structures which promised to repay special investigation.

From Dickson Island the course lay W. to the N. point of Novaya Zemlya. Here was an inland ice-sheet, with steep slopes and almost alpine formations. A great moraine could be seen, and in the southern part of the island, which was quite free from ice, terrace forms gave evidence of a post-glacial uprising of the land. Uninterrupted pictures of glacier-falls and ice-streams, and of deltas with sharp contrast between white snow and the blue sea, formed before eyes already tired with 5 days' gazing.

As the Zeppelin neared the high-pressure region of the land the temperature again rose to the tropical conditions of the outward voyage. In these few days, observations in geography, geophysics and meteorology had been amassed which by sledge or steamship would have taken many months. The air-view of the Arctic, now for the first time properly photographed, had revealed to the experts on board much that was new and hitherto unsuspected. The voyage had more than justified itself.



WATKINS' ROUTES

## CHAPTER XX

### WATKINS

TEN years after the death of Shackleton in the Antarctic there came a similar shock, this time from Greenland, with the news of the fatal accident to Watkins. The young explorer bore a certain resemblance to his great predecessor—in his highly-strung and magnetic personality, in his unconventionality, in his sureness of touch and rapidity of action, in his genius as a leader and his brilliance of success. Had Watkins lived, he might have equalled Shackleton's magnificent record of exploration. Hence we deplore his loss, made more poignant by his youth, for he was only 25 years of age.

*Splendid you passed, the great surrender made,  
Into the light that nevermore shall fade.*

Henry George Watkins, to whom this book is dedicated, was born on 29th January, 1907, the son of Col. Henry George Watkins; and as an Amurath an Amurath succeeded he became known as "Gino" (the Italian diminutive of "George") to distinguish the son from the sire. At Lancing College he met Quintin Riley, and a friendship began that lasted throughout Gino's short life. Riley noticed that cold-water bathing did not suit his friend, who soon became blue. This would seem to make Arctic exploration the least likely of occupations for his later years. But though Gino looked frail he began rock climbing during his holidays, and a little later his father took him chamois-hunting in the Tyrol. Here in 1925 he had a fall of 150 ft. that would have killed most men, though this narrow escape seemed to increase, instead of diminishing, his zest for dangerous sports. By the following year he had accomplished many of the big Swiss climbs, and, except in age, was qualified for membership of the Alpine Club; he had to wait 3 years for election. In 1925 he had entered Trinity College, Cambridge. Riley was at Pembroke, and the 2 friends were attracted to polar exploration by R. E. Priestley's lectures on the subject. Watkins then sought an interview with Wordie, as an active explorer of Fellow's rank, and was promised

a place in his next Greenland expedition. The postponement of this trip incited Watkins to a personal effort, and although only 20 years of age he chartered a small sealing-ship and in 1927 led a party of 8 to Edge Island, Spitsbergen.

His natural gifts of leadership emerged on this excursion, even with men older than himself, and an opportunity soon arose of going farther afield. On the return from Edge Island he became interested in the Labrador Boundary dispute between Canada and Newfoundland, and this led to a winter expedition from 1928 to 1929. Watkins was accompanied by J. M. Scott, the son of Judge Scott and a Cambridge Rugby Blue, who came to the front on this expedition. His record of their experiences will be found in "The Land that God gave Cain" (1933), which is recommended to all who are attracted by an open-air life in rough country. When Watkins and Scott went out to Labrador the coast was badly mapped and the interior almost unknown. Their purpose was to make a preliminary inland survey and fix the main divide or water-parting, then in dispute. The Royal Geographical Society supported the expedition. It was characteristic of Watkins that the first time Scott met him in his rooms at Trinity he said, with reference to a possible hitch: "If we can't go to Labrador we'll go to Greenland"—showing that already he intended to pay this great country a visit.

Shortly before sailing on 26th June, 1928, they were joined by Lionel Leslie, who had travelled in Africa and Burma. At St. John's, Newfoundland, Watkins saw the Prime Minister and made final arrangements for his work; then on 13th July the party sailed, and on 18th were put ashore at Rigolet on Lake Melville. Thence 3 journeys were made through splendid country of Western Canadian character, wild and spruce-forested: the 1st, a reconnaissance of 200 miles to the south; the 2nd, in midwinter, northwards to Hopedale through largely unexplored country—a journey over 400 miles in length on which several new lakes were discovered. The 3rd journey of about 600 miles to the west was the hardest and most important. Unexplored rivers of great beauty were traced and new waterfalls discovered. Many square miles of fine country in this Falls District were surveyed for the first time and the latitude fixed astronomically. The sledging was an excellent preparation for the future. Watkins and Scott were well tested for Arctic exploring. They bore 70° of frost, which stuck Watkins' fingers to the metal of his theodolite. For weeks they were short of food, though Watkins ate less than the others; and though dog after dog failed, the men did not. Scott delineates Gino's character with faithfulness and force; we see him





BOAS

WALKINS IN 1981



tirelessly trotting with his sledge at 6 m.p.h. and treating all discomfort with disdain. The cold troubled him so little that Scott thought he must be warmed by the fervour of his exploring mind.

Six weeks' delay, before they could embark for home, was spent in planning a Greenland expedition. Watkins was now an explorer of the pre-aerial type ; but at once he moved ahead, and on reaching home learnt to fly. He realized that the quickest method of making geographical discoveries was by air, though detailed explorations must still be made on the ground. He now moved with the impetuosity of a Shackleton, and the new expedition rapidly took shape. Its objects were to prospect for the shortest flying route between England and Canada, by surveying and exploring the parts of East Greenland where landings would be made, and to take meteorological observations on the inland ice as well as near the coast. The first flight over the route to Canada was also on the programme. A Base was to be established near Cape Dan.

The British Arctic Air-Route, or Watkins' 3rd, expedition had the support of the Royal Geographical Society and the assistance of the Air Ministry, War Office and Admiralty ; the Danish Government also was helpful. H.R.H. the Prince of Wales became Patron of the Advisory Committee. Watkins was then 23, and chose J. M. Scott as his Second-in-Command and in charge of the dogs. Augustine Courtauld paid his third visit to Greenland ; but these were the only men with previous Arctic experience, for Watkins preferred men to learn under himself. The surveyors were A. Stephenson, A. Courtauld and J. R. Rymill ; F. S. Chapman was ornithologist ; L. R. Wager, an experienced mountaineer who has since been nearly to the top of Mt. Everest, was geologist ; and Flight-Lieut. D'Aeth was the principal aviator, with W. E. Hampton as Second Pilot and ground engineer for the 2 seaplanes. Flight-Lieut. Cozens was photographer and pilot ; Capt. Lemon, R.E., was in charge of the wireless ; Surgeon-Lieut. Bingham was medical officer ; Gino's old schoolfellow Quintin Riley was meteorologist, and Lieut. Martin Lindsay completed the personnel, 14 in all. Ten of them were Cambridge men, and the average age was 25.

On 6th July, 1930, the famous little *Quest* bore the expedition down the Thames, and on 11th the Faroe Islands were reached, where Scott was waiting with 50 dogs, and a ton of whale-meat for their food, was taken on board. A call was made at Iceland on 16-18th for coal, and the pack entered on 20th. As seals are more palatable than whales, 27 were killed. The pack was quickly crossed, and on

23rd July the ship anchored near Cape Dan. After a short call next day at Angmagssalik, the *Quest* proceeded up Sermilik Fjord in search of a suitable site for a Base. This was found 40 miles to the west of the settlement and met nearly all the expedition's requirements. The most important of these were access to the interior, water deep enough for the ship, open water and a beach for the seaplanes, a southern aspect and suitability for the wireless. Except that the water supply was some distance away and that the amount of game proved insufficient, the site chosen was excellent. Early in August the hut was occupied. Brilliant sunshine encouraged while flies and mosquitos afflicted the workers who toiled for a fortnight in 2 relays of 12 hour each. The seaplanes were assembled, and 2 wireless masts, 70 ft. high, erected. On 3rd August Watkins flew to Angmagssalik; and afterwards, with Scott and Chapman, began to stake out a route towards the plateau. The route started at the head of the fjord, 3 miles beyond the Base, and everything had to be carried across a mile of stones to the foot of a glacier that led, very steeply, to the inland-ice. The hardest part of the ascent was an icefall, appropriately named Bugbear Bank. After marking the route for about 5 miles, to an area of crevasses, Watkins turned back. On 8th August he made another flight on which he saw that the crevasses were worse than he supposed; he also saw that the existing maps were inaccurate.

Before recording the numerous journeys made it is advisable to set them in order, as follows:

### SCHEDULE No. 8

#### THE PRINCIPAL EXPLORING AND OTHER JOURNEYS made on Watkins' 1930-1 Expedition.

Left Base

1930:

- |       |     |   |
|-------|-----|---|
| Aug.  | 3.  | Watkins, Scott and Chapman reconnoitred route towards Plateau.  |
| "     | 11. | Scott's party established Plateau Station, leaving Riley and Lindsay, on 28th.                          |
| "     | 12. | Watkins sailed on northern cruise in the <i>Quest</i> .   |
| Sept. | 2.  | Watkins flew back to Base.  |
| "     | 3.  | Scott's party returned to Base.   |
| "     | 15. | Watkins and Scott started Plateau Journey.  |
| "     | 21. | Rymill and Chapman relieved Riley and Lindsay, October 2nd, leaving Bingham and D'Aeth.                 |
| "     | "   | Rymill, Chapman, Riley and Lindsay left for Base on October 4th, arriving 14th.                         |
| Oct.  | 5.  | Watkins and Scott started S. from Plateau Station. Returned to Base, November 12th.                     |
| "     | 26. | Chapman's party struggled to Plateau Station (Dec. 3), left Courtauld, and reached Base, December 19th. |



1931 :

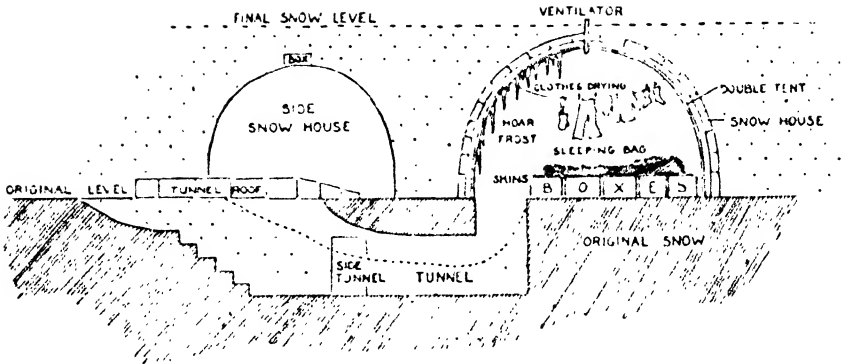
- Mar. 9. Scott's party set out for relief of Courtauld—3rd unsuccessful attempt.
- „ 12. Chapman's party attempted to reach Mt. Forel. Returned April 14th.
- April 21. Watkins started; relieved Courtauld May 5th. Base regained on 11th.
- May 6. Stephenson, Wager and Bingham reached and ascended Mt. Forel.
- July 1. Scott's party crossed plateau to Ivigtut.
- Aug. 13. Rymill and Hampton crossed plateau to Holsteinsborg.
- „ 15. Watkins, Courtauld and Lemon started boat journey, reaching Holsteinsborg October 19th.

The next two operations were the establishment of a plateau station and a survey of the coast. Scott was responsible for the former, accompanied by Dr. Bingham, Rymill, Riley and Lindsay. They set out on 11th August with 4 sledges and 28 dogs; rain was falling and the men were soon soaked. Occasionally all hands were required to move 1 sledge, and at the foot of Bugbear Bank they camped. On 12-14th the loads were relayed up the bank to a height of about 2,000 ft. where slush and water awaited them, followed by a large area of crevasses which made progress dangerous and slow. The risk of sledging here was increased by fog and rain; hence it was 17th before the crevasses were left behind at a distance of 15 miles from the Base and at a height of 4,000 ft. A large flag was placed at this point where a depot, named Big Flag Depot, was afterwards left; it became an important junction for the plateau routes. At last the inland ice lay before Scott's party and rose in a series of long steps, as they advanced to the NW. Unfortunately the dogs had to be reduced to three-quarter ration. The route was marked with red flags every half-mile; distances were measured with a sledgometer and frequent observations for position taken. Ten miles beyond the Big Flag the nearer coastal mountains disappeared; but 30 miles farther, on 20th August, Mt. Forel, discovered by De Quervain in 1912, was sighted to the east.

Only 12 days' dog-food then remained, and the animals were becoming weak. Two days later, however, a distance of 19 miles was covered, leaving 50 miles farther to go. The height was 7,000 ft., and the surface rose and fell in long undulations about 2 miles apart. Observations on 27th showed that the party was in lat. 67° N. and 10 miles E. of the position fixed for the station; but as a declivity appeared after going 7 miles they stopped at a distance of 127 miles from the Base and at a height of 8,000 ft. The station was established by setting up a large dome-shaped tent, 10 ft. in diameter, the floor of which was entered by a tunnel in the snow. Scott, Rymill

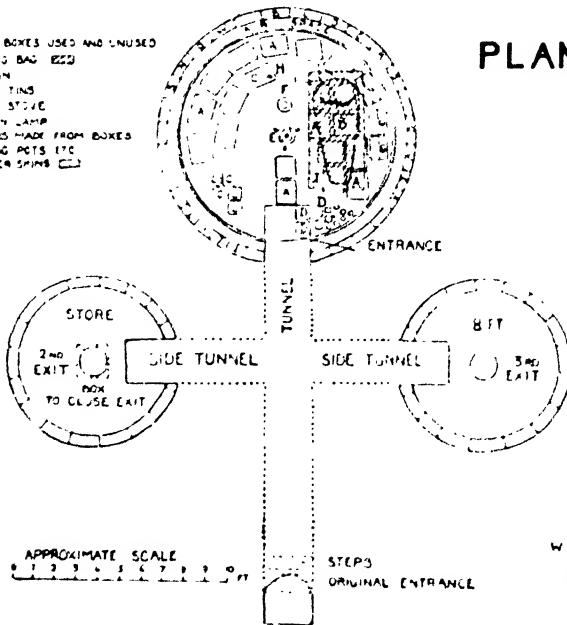
# SECTION

 ORIGINAL SNOW  
 DRIFT SNOW



- AAA RATION BOXES USED AND UNUSED
- B SLEEPING BAG (EGG)
- CCC PARAFFIN
- DDD REFUSE TINS
- E PRIMUS STOVE
- F ALADDIN LAMP
- GGG LICKERS MADE FROM BOXES
- HH COORING PETS ETC
- J RE-USEE SHINS

# PLAN



THE ICE-CAP STATION

and Bingham, who were returning, set off on 28th with only 4 days' dog-food on three-quarter rations, leaving Riley and Lindsay at the greatest height ever inhabited in the polar regions, though Wegener's party was then also establishing a plateau station about 300 miles north. The diagram speaks for itself.

Riley and Lindsay were left in splendid isolation but not in idleness. The tunnel, which was also the fresh air shaft, was enlarged; foul air escaped through a pipe in the roof. Then the station was enclosed by a snow wall, leaving a small courtyard; and, with the Union Jack flying aloft, resembled a small fort. The various instruments were set up; flags were erected towards each of the cardinal points, and snow igloos, connected with the main tunnel, were built for storehouses and other purposes. The men soon became acclimatized to the cold and had a temperature of  $-14^{\circ}$  F. in the tent, though on sunny days they could sit outside in comfort. They had 5-weeks' full rations and, after a month, began to reduce consumption; but they needed very little food. If not relieved before supplies were exhausted they would be obliged to return to the Base. Martin Lindsay, who has published an interesting account of their experiences in "Those Greenland Days," says that he and Riley were quite comfortable at their lofty station: the floor was carpeted with reindeer skins on which the sleeping-bags were spread; and on entering from the outer cold they would revel in the pleasures of tea as much as De Quincey. The instruments were read every 3 hours, and there were books for their leisure. The atmospheric colouring over the plateau on fine evenings was superb, with shades of pink, pale-blue and orange, purple and gold.

Scott, Rymill and Bingham, on leaving the plateau station, reached the Base in 4 days, at an average of nearly 31 m.p.d. with the last march 43 miles. They were able to ride downhill for many miles, but all the food except  $\frac{1}{2}$  lb. was finished on their arrival. One team of dogs fell into a crevasse and hung by their harness. Rymill, who weighs 16 stone, also went through a snow bridge and saved himself by grabbing the sledge.

After Scott had started for the plateau on 12th August, Watkins sailed on an exploratory and surveying cruise in the *Quest* with a seaplane on deck. About 300 miles of coast, N. of Cape Dan, had never been properly surveyed, and on 14th the work began. Photographs were taken from the air and new mountains discovered. On 16th a new fjord, named Lake Fjord, was discovered and explored; it was afterwards found to be known to the Eskimos as Tugtilik. A salmon river flowed into its head from a lake 3 miles long that

formed an excellent base for seaplanes. Courtauld, Wager, Stephenson and Chapman started work in a 16-ft. boat and met with several adventures. They were nearly wrecked and had to sleep on a ledge, 200 ft. high, on a cliff; they also made many interesting geological and other discoveries. On 23rd August the ship reached Kangerdlugsuak Fjord near lat. 68° N.—previously unentered—and here Watkins made discoveries daily for 10 days. The fjord was 40 miles long, very beautiful, and flanked by snow peaks rising to 7,000 ft. On 24th the *Quest* anchored at its head where a large depot was left. Many kinds of life were found in the fjord, including the only walrus seen on the expedition. Watkins discovered from the air a new range of mountains, possibly over 12,000 ft. high, extending 40 miles to the north. On 2nd September he flew the 300 miles to the Base, followed by the *Quest* from which the survey was made; some new islands were also discovered. The ship reached Lake Fjord on 8th and the Base on 14th September. Watkins began his 2nd journey next day when he and Scott set out for the Plateau Station with Bingham, D'Aeth and a supporting party; they were overtaken by Rymill and Chapman who left on 21st September. The combined party left Bingham and D'Aeth at the station in place of Riley and Lindsay; then on 4th October Rymill, Chapman, Riley and Lindsay started for the Base—reached on 14th after a 3-days' blizzard. On 5th Watkins and Scott had started S. from the Plateau Station with 2 teams and 6-weeks' rations, intending to follow the divide as far as the line of Nansen's crossing. This was breaking more new ground, but it was late in the year and conditions were adverse. For the first 3 days 8 m.p.d. were covered over loose snow; the sledges were often upset and the dogs lacked spirit (though fed on 1 lb. of pemmican and 4 ozs. pure fat per day), so that the men had to pull with them. The surface was undulating, with a slight fall towards the south. Blizzard after blizzard stopped all progress until, on 24th October, observations showed that only 100 miles had been made. To save the dogs, Watkins turned NE. for home—a decision that showed his genius, for, had he not turned then, his party would probably have perished. After two days' fine weather the plateau gales returned with great violence, and the estimated velocity of the wind was 80 m.p.h.

The last stage of this journey was a fight for life at a height of 4,000–6,000 ft. Sledging was impossible on 27th and 28th. Next day 15 miles were made, but on 30th only 200 yards. Crevasses were encountered about 20 miles from the Big Flag Depot and one sledge had to be abandoned. On 10th November Chapman's party



was met on its way to the Plateau Station (see Schedule No. 9) and on 12th the Base was reached with all the dogs alive. Watkins was unable to travel on 12 out of the 37 days after leaving the Plateau Station ; his total distance was 350 miles. Scott warns travellers that primus stoves burn badly at great heights, for one evening he became unconscious from the fumes.

Chapman's instructions had been to transport 5-months' stores and the wireless equipment to the Plateau Station, and he set off on 26th October with Courtauld, Wager, Stephenson, Hampton and Lemon. Chapman alone had driven dogs before. Rymill, Cozens and Lindsay were a supporting party, and Riley remained alone at the Base. This was a very hard journey. After it began, the anemometer at the Base registered a velocity of 129 m.p.h. before it broke, and Watkins said it blew harder than this afterwards. The night of 28th on the glacier is described as terrible, and the men lay fully dressed, expecting the tents to be blown away. At 11 p.m. Chapman's tent-cover went, scattering boxes on its way ; and there was great danger that he and Lemon might be blown down the glacier and killed in a gorge below. They crept into Courtauld's tent, in a more sheltered position, and next morning most of the missing articles were found.

## SCHEDULE No. 9

## CHAPMAN'S WINTER JOURNEY TO THE PLATEAU STATION

	Min. T.°	Miles.*
1930 :		
Oct. 26.	Ferrying stores & equipment, 6 teams across fjord	*
„ 27.	Gale. Chapman's tent blown down in night	*
„ 28.	Do. in night. Relaying with 4 men to 1 sledge. Calm in day	*
„ 29.	Blizzard in night. With block and tackle up Bugbear bank	*
„ 30.	800 lbs. on tent-flap. With block & tackle up Bugbear bank	*
„ 31.	Fine. Reach crevasses. Dogs ate 25 lbs. pemmican	*
Nov. 1.	Camp at crevasses. Still relaying	*
2.	Supporting party return. Crevasses. Blizzard	*
3.	Held up all day by blizzard. Crevasses	0
4.	Crevasses. Digging out.	*
5.	Held up all day by blizzard. 10 m. from Base	0
6.	„ Tent expected to go	0
7.	„	0
8.	Height 4,000 ft. Hours of digging. Passed Big Flag Depot	5

	Min. T.*		Miles.*
Nov. 9.		Held up by blizzard	0
" 10.	- 16° F.	Watkins & Scott met. Re-arranging loads	*
" 11.		Cached loads. 3 teams. Courtauld's offer	?
" 12.		Sledges often upset on sastrugi	?
" 13.		Held up by blizzard	0
" 14.	- 33° F.	"	0
" 15.		Hours of digging. Mt. Forel seen	3-4
" 16.		"	0
" 17.		"	0
" 18.		"	0
" 19.		Food depot left to lighten loads. Sledges often upset	5
" 20.		Painful progress. 40 miles from Base	7
" 21.		Killed dog	?
" 22.		Repairing sledges all day. Bad air in tent	0
" 23.	- 25° F.	Feeling both cold & height. ? 6,000 feet	6
" 24.	- 36° F.	Becoming frostbitten. Puppies born	?
" 25.		Held up by blizzard. Sleeping-bags sodden	0
" 26.		" Sledges in a bad state	0
" 27.		Soaked by thaw	4½
" 28.		Failing daylight makes flags hard to find	?
" 29.		Deep soft snow. Dogs very hungry on ½ rations	?
" 30.		Better going. Sledged 2 hours by moonlight	12½
Dec. 1.		Moonlight saved the situation. One primus not working	10½
" 2.		" " Good going	12½
" 3.	- 48° F.	REACHED STATION, 5 weeks overdue. 1 day's dog food left	12
" 4.		Height 8,300 feet. AT STATION. Blizzard	—
" 5.		" " " " 2nd dog killed	—
" 6.	- 46° F.	RETURN. 4 days' rations. Full moon. Courtauld left alone	13
" 7.		About one hour's sunlight. Parselene	14
" 8.		Continuous moonlight	14
" 9.		Dogs exhausted by deep snow & low ration	14
" 10.		Mt. Forel seen. D'Aeth frostbitten	?
" 11.		3 hours' sun	13½
" 12.		Cold wind. Sledge upset	?
" 13.		Held up by blizzard. Only 1 hot meal now	0
" 14.		Deep snow. Visibility bad. Cannot find flags	?
" 15.		Held up by blizzard. Very little food left	0
" 16.		Missed depot. Very deep snow	3½
" 17.		Held up by blizzard. Hungry. Only margarine for dogs	0
" 18.		Big Flag Depot reached. Men becoming faint	?
" 19.		No man-food. Crossed crevasses without seeing them. BASE	15

\* The average distance on days marked with an asterisk was about 1 mile.

A reference to Schedule No. 9 will reduce the need of comment. The blizzard on 2nd November caught the main party before the

tents could be pitched, and the men's faces were covered with masks of ice frozen to their helmets. From the slowness of progress they were on half-rations, and the continual strain of heavy sledging began to exhaust the men. The dogs prudently ate the lash of Chapman's whip when his back was turned. Many hours were occupied after every blizzard in digging equipment out of the snow-drifts. On 10th November Watkins was surprised to find the party so late, but he would not relieve Chapman of his responsibility beyond saying that the wireless might be left behind, and this was done. Next day Courtauld offered to stay alone at the Plateau Station, to prevent its total abandonment, as there would not be enough food for two men.

The rubbing of the men's clothes caused painful sores, and Chapman's toes were frostbitten, making every step agony; the men's finger-tips had long been insensitive. It was remarkable to strike the station, as they did, within 100 yards, on 3rd December, and they entered with a jest, though their faces were again masked in ice. Bingham and D'Aeth were not short of food and gave the sledgers a hot meal. Courtauld was determined to stay alone, against the advice of his companions, and was left with 5-months' food; but this could not be done without cutting down the returning party's supplies to the danger limit. They started for the Base on 6th December and had to struggle for nearly every mile. D'Aeth's hands and toes were so badly frostbitten that he could do no work. On 14th the candles and oil were finished; the tents were in darkness and there was no more hot food. It was well that Chapman had not trusted to the food depot left on 19th November, for it could not be found, and the last 4 days of this journey must have been terrible. All were faint and exhausted on reaching the Big Flag Depot where food for the dogs, though none for the men, was found. The crevasses were so heavily blanketed with snow that they were invisible. On 19th December Watkins flew over the party and dropped a few luxuries; he afterwards met them at the foot of the glacier, greatly relieved to find all safe. This was one of the hardest journeys ever made and was most creditable to Chapman and his associates.

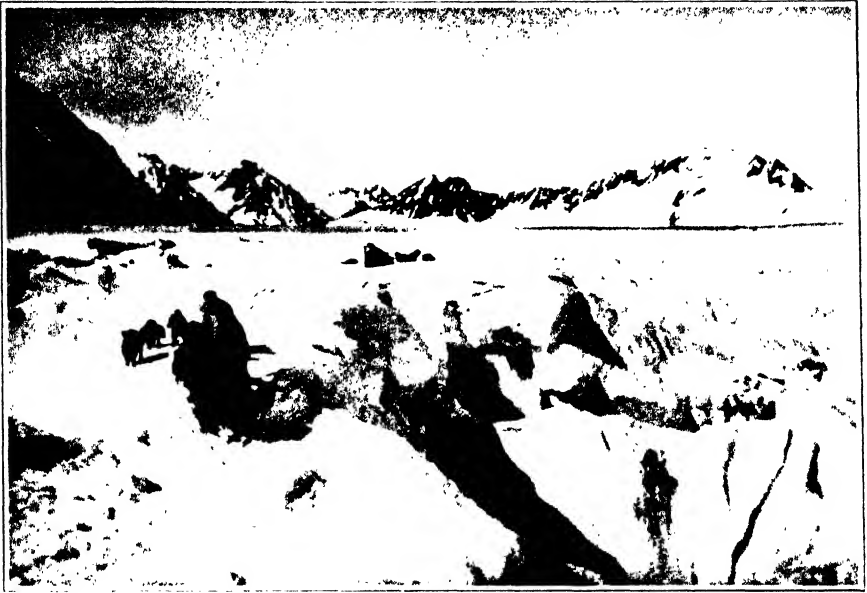
At the Base, life differed little from that at most polar stations in recent years. An unusual feature, for a British expedition, was the staff of Eskimo servants who lived in the loft. Accommodation was very limited, but Watkins could adapt himself indefinitely to any hardship; he kept all his belongings in his bunk, and slept peacefully on rifles, boots, harpoons and other equipment. The wireless

was a solace when the masts were standing, and the announcement of a depression off the E. coast of Greenland caused an elevation of the young explorers' spirits. A record of the minor movements of men and machines is beyond our limits ; but we must notice that the *Quest* sailed for home on 3rd October which may be the latest that any ship has remained on the coast. During the gale of 8-9th October the hut swayed in the gusts and one wireless mast crashed. Blizzards recurred with monotonous regularity throughout the winter, and in a big blow on 28-30th November both masts were blown down. On 11th December the head of the fjord was frozen, and stores were sledged over the sea-ice to the glacier. The country had been relied upon to provide fresh meat, but there was insufficient game, and the expedition lived for " half the year at the Base " on tinned beef.

On 6th January one of the seaplanes was damaged almost beyond repair by a gale. Depot-laying to the Big Flag began in February, and the 30-mile journey that had once taken 3 weeks was then accomplished, with light loads, in a day. On 8th February a flight was made over the plateau, to drop letters and luxuries for Courtauld ; when more than half-way, however, a fog ended the trip. Scott and Cozens made another attempt on 25th, but failed to find the station, and next day the machine was badly damaged ; hence the proposed flight to Canada was abandoned. The other machine was repaired and flew again on 19th March.

The great sledging campaign of 1931 began by Scott and Riley starting off on 1st March to relieve Courtauld ; next day they were back at the Base, as the going was so bad that a sledge had been broken. Watkins neither gave orders nor called for volunteers, and now he simply said to Lindsay : " I say, Martin, do you mind going up with Jamie to relieve August ? " Thus the 3 men set out on 4th March, expecting to reach the Big Flag Depot that day, for the weather was beautiful, and consequently they carried only a light lunch ; there was ample food at the depot. On approaching the rim of the plateau they walked into a blizzard and had to camp. Fortunately Riley had 20 biscuits, which lasted the 3 men for 3 days while the storm raged. On 7th, as the depot could not be found, a dash was made for the Base, leaving the tent and 1 sledge. In 2 days they made their final start ; and on 12th Stephenson, Chapman and Wager set out on an attempt to reach Mt. Forel over the plateau.

The Big Flag was soon reached by Stephenson's party, and, on leaving here, they found the mountain scenery most impressive.



*Entrance to Igloo Bay*

RYMILL AND CHAPMAN SLEDGING, CREVASSE ON RIGHT



*Entrance to Igloo Bay*

ENTRANCE TO NIGRTSUOK



On 17th March Wager fell 20 ft. down a crevasse, but was rescued by his companions. That night a blizzard began which held them up until 23rd, when a dog had to be killed. The weather was unfavourable for the next 6 days, and then another blizzard kept them in the tent for a week. When it ceased on 4th April they were only 100 miles from the Base and farther than this from their objective, with only a fortnight's dog-food. Obviously they had to turn back, and they reached home on 14th. In 4 days Scott's party also returned; they had not found the Plateau Station, and naturally there was some concern for Courtauld, though he had food for another month.

Schedule No. 10 has been prepared by Riley and verified by Scott; it shows that the latter made a journey over the plateau on which the conditions approached the limits of human endurance.

## SCHEDULE No. 10

## SCOTT'S SPRING JOURNEY OVER THE PLATEAU

1931:	Min. °F.	Wind force on Beaufort Scale.	Notes.	Distance Miles.
March 11.	4	8	At Big Flag Depot.	0
" 12.	- 11	2	6 hrs. travel only, owing to gale.	10.5
" 13.	- 20	1	Fine. Blue sky.	14.5
" 14.	- 24	2	Gale. Big snowdrifts.	6.4
" 15.	- 27	2	Fine. "	9.9
" 16.	- 18	5	Heavy drift. Head wind. No march.	0
" 17.	- 18	Rose to 4	Fine. Blue sky. Good going.	12
" 18.	- 23	6	Heavy drift. Head wind. No march.	0
" 19.	- 35	2	Lat. obs. Fine. Blue sky.	9
" 20.	- 34	8	Heavy drift. Head wind. No march.	0
" 21.	- 32	7	" " "	0
" 22.	- 44	1	Fine. " Blue sky.	13.6
" 23.	- 46	1	Began to snow in afternoon.	11.7
" 24.	- 16	9	Heavy drift. Head wind. No march.	0
" 25.	- 34	0	Gale all a.m. Blue sky.	9.4
" 26.	- 29	0	Lat. of Plat. Sta. reached.	12
" 27.	- 10	0	Waited till noon for lat.	9.5
" 28.	+ 7	4		0
" 29.	+ 10	4	} 6 days' wind and drifting snow while waiting to get astronomical position to find Plateau Station.	0
" 30.	+ 2	4		0
" 31.	- 24	6		0
April 1.	- 31	3		0
" 2.	- 33	7		0
" 3.	- 27	1	Near Plateau Station.	9.7
" 4.	- 5	2	Snowing.	0
" 5.	- 7.5	2	Near Plat. Sta. Too overcast for obs.	3.8
" 6.	- 23	0	" Took lat. obs.	13.5
" 7.	- 30	3	" "	12.7
" 8.	- 15	7	Heavy drift. Head wind.	0
" 9.	- 9	3	" "	0

1931:	Min. °F.	Wind force on Beaufort Scale.	Notes.	Distance Miles.
April 10.	- 31	1	Turned for home.	16·6
" 11.	- 31	5	Drift. Wind behind.	22·6
" 12.	- 24	4	" "	20·7
" 13.	- 16	0	Good going.	22·1
" 14.	+ 16	4	Snowing. Visibility bad.	0
" 15.	+ 3·5	3	Going rather heavy.	16·8
" 16.	- 5	1	Fine. 11 hrs. travel.	18
" 17.	11	1	Home. Men & dogs in good condition.	
38 days.			No frostbites.	30

Watkins admitted that Scott's party had started out too early in the season, but he had no serious anxiety about Courtauld. Scott, Lindsay and Riley had reached the Big Flag Depot on the day they started, 9th March, but afterwards the going was the worst experienced on the expedition, with very deeply-drifted snow, hardened by the wind into ridges and hollows. Gale after gale held them up, and the compasses froze, though guaranteed not to freeze above  $-50^{\circ}$  F. The journey was as hard as Chapman's, and food ran short. Navigation was difficult, but Scott's observations with a sextant agreed to within less than a mile of latitude with Lindsay's observations taken with a theodolite; the longitude was less certain. A 6 days' blizzard intervened when they supposed they were about 9 miles from the station. On turning out afterwards they had 6 days' dog-food and 9 days' rations for the men. Camp was made within what they hoped was half-mile of the station, but next day another blizzard obliterated everything. On 5th April, after going 3 miles without seeing the station, more observations were taken; and for nearly another week Scott remained in the vicinity with the temperature as low as  $-31^{\circ}$  F. Blizzards raged most of the time, but during lucid intervals the search was continued without avail. No flag or sign of human occupation appeared.

Scott then had a difficult decision to make, and he turned back to save his dogs. They were on short rations, and only 4 days' supply remained even on this basis; but travelling in high following winds the journey was completed in a week, at an average rate of nearly 20 m.p.d. Scott must be credited with the saving of his teams in terrible conditions; and he strove to save them because he knew that without them another relief journey might be impossible. Watkins was convinced that nothing had happened to Courtauld, though he immediately prepared to lead a party to his relief, taking Rymill and Chapman. The weather prevented a start before 21st April, when they set out with 5 weeks' supplies. Watkins anticipated no difficulty at this time, and none occurred.



There is little to record of the outward journey because it moved according to plan. About 10 m.p.d. were averaged, and the vicinity of the station was reached on 30th April, or one day ahead of schedule. On 1st May visibility was bad, but Watkins considered that his party was within about 2 miles of the station. Then 2 days' blizzard held them up, and on 4th a fruitless search was made. Next day was brilliant, and more accurate observations were taken which showed the station to be  $1\frac{1}{2}$  miles SE. of the camp; and there it was found, though little was to be seen above the snow surface. A fraction of the Union Jack, the tops of a few instruments and of the ventilator, were all that appeared. Watkins shouted down the pipe and received a cheerful reply. Courtauld was soon dug out, with a great beard as his most striking feature; he did not look ill. The following account of his 5 months' lonely vigil has been compiled from his own record and revised by himself.

His main purpose in writing was to "dispel the strange ideas of danger and risk" involved. Many men who love a peaceful life deliberately live alone in wild places. There was work to be done at the Plateau Station: chores, the clearing of snow, and instruments to be read 6 times daily. Nature must have been fascinating, from the great silence of the calms, with which Courtauld attuned his spirit, to the roar of the blizzards. The housework was simple except for complications due principally to drift-snow; working from within, the *debris* could not be disposed of. Nature finally won this contest with the drift, and Courtauld became a prisoner. After 22nd March he was completely snowed under, and the instruments outside could not be read. Other reading consoled him and he digested various books, including the Bible. At first he feared that the air indoors would become vitiated, that the tent would be crushed by the weight of snow and that the relief party might miss the station; but all these anxieties were soon dispelled. The ventilation was perfect; the tent became covered without being crushed, and he trusted to the Union Jack. Courtauld was a practical philosopher and resigned himself to events over which he could exercise no control.

Once in February and again in April a distant rushing noise was heard, with a rapid crescendo to a crash. It was a terrifying sound that may have been due to a settlement in the layers of the inland ice. At Wegener's station similar sounds were heard on different days. Apart from this phenomenon, Courtauld experienced a growing feeling of security and did not doubt that he would be rescued. During the last fortnight, indeed, his comforts were

failing : he had little oil and lived in darkness ; there was no tobacco ; sucked snow was his only drink ; icicles fell on his face from the roof. Very little food was required because he had no exercise, and towards the end 8 ozs. a day was enough. A few minutes after his primus gave its last gasp, on 5th May, he heard a scraping sound, made by Watkins' party. Courtauld felt quite well except for his want of exercise, and is to be congratulated on his effort. The minimum thermometer outside, when uncovered, was recording  $-64^{\circ}$  F. On 6th May the station was abandoned, and the return made to the Base in 6 days, averaging nearly 25 m.p.d. A large aeroplane surprised the party and dropped food. The Base was reached on 11th May at 5 a.m. after a march of 41 miles on the last day. Watkins completed the double journey in 18 days. Courtauld had been on the plateau for 7 months ; he was alone for 5 months and for 6 weeks he was buried. Capt. Ahrenberg was met at the Base ; it was his monoplane they had seen. He had made a splendid flight from Sweden.

On 6th May Stephenson, Wager and Bingham set out to make another attempt to reach Mt. Forel over the plateau. This mountain was reputed to be over 11,000 ft. high, or the highest peak in the Arctic. Sledging conditions were now so good that 176 miles were covered in 13 marches, and the base of the mountain, on its western side, was reached at a height of about 8,000 ft. on 22nd May. After crossing a glacier, camp was pitched near the foot of a col that joined Mt. Forel to Camp Mountain. Stephenson was not a mountaineer until he and Wager made a reconnaissance up the SW. Ridge with the purpose of making a first ascent. As the weather during the next 2 days was unfit for mountaineering, the survey was continued, and then the attack was made. Camp was left at 5 a.m. and the ridge attained at 6.15 a.m. After 200 ft. of rotten rock, steep but good rock was met with, and, above this, patches of snow and rock with the former treacherous. Above this point there was more rotten rock, on which lichens grew and that needed great care. In 6 hours the base of the culminating ice-dome was attained but was very steep and the ice extremely tough ; 300 steps would have been needed to reach the summit, so they turned back from a height of 10,400 ft. This was 800 ft. higher than Petermann Peak, climbed by Wordie in 1929. The height of Mt. Forel is given at 11,100 ft. (" G.J.," July, 1932).

The descent of the mountain took 5 hours, and camp was reached at 7 p.m. On succeeding days the district to the north was explored and surveyed. From the top of a nunatak (10,500 ft.) mountains farther north were seen extending 90 miles from the coast. Most of

them were discovered by this expedition and some of the peaks appeared as high as Mt. Forel. On 30th May the party started for the Base—reached on 10th June after a hot and tiring journey over wet snow. The total distance sledged, entirely on snowshoes, not ski, was 350 miles. The party found that, during their absence, the saxifrages and alpine azaleas near the Base had burst into flower. Summer had come, and the Arctic terns were screaming over the fjord.

Three other important journeys were now made : two crossings of the plateau and Watkins' boat journey. Scott led on the first of these journeys with Lindsay and Stephenson. This trip was too easy and efficient to be eventful, but it showed the pleasure of summer sledging. As there were no adventures, its record can be brief. The party started on 1st July and ascended beyond the crevasses. They then turned S. to survey the coastal mountains, and from the latitude of Imivik set the course SW. for Ivigtut. They were at about 5,000 ft. above the sea for a distance of 400 miles and reached 9,200 ft. on the divide. Travelling at night they found the surface excellent, though the tent was sometimes too hot for sleeping in the day unless all clothing was discarded. The weather was beautiful, and the speed averaged 17 m.p.mar. for the 448 miles of measured distance ; no marches was made on 5 days. Sails were rigged up on the sledges, as Nansen had done in 1888, and a high speed was attained down the western slope towards Ivigtut, the destination. Meteorological and other observations were taken and the journey was a credit to Scott's party.

On 13th August Rymill and Hampton started on their crossing of the plateau to Holsteinsborg. Their experiences were similar to those of other explorers who have crossed the inland ice ; but they had some peculiar difficulties, the 1st of which was to find the Big Flag Depot that contained all their food except the small quantity for consumption as far as this point. When found at last, it was invisible at a greater distance than 30 yards. Kayaks were carried on the sledges, because nearly 100 miles of fjords had to be traversed on the W. coast. One of the highest speeds over the plateau, after Rasmussen's, was then maintained for 11 days, during which a distance of 249 miles was covered and a height of 7,600 ft. attained. By 4th September the western mountains were in sight, but the last 40 miles to the coast took longer than the previous 300 miles.

The effects of the thaw were in full spate and glacial rivers had to be crossed. Everything became soaked and one sledge was abandoned. On 14th September the instruments, too, were left behind and 3 m.p.d. became good progress. Then soft snow a yard deep was

encountered which made it necessary to carry the loads, and on 20th the dogs were killed. Each man had to carry a weight of 100 lbs. on short rations through fog, snow and rain. None but the strongest of men could have done this, but Rymill and Hampton are of Herculean physique. A descent of 800 ft. was made off the inland ice on 30th, and at last the kayaks came into use on a lake, though frost soon made another portage compulsory. On 9th October the two men paddled down a rapid stream in which they nearly lost their lives through being carried under the ice. Mt. Evans, Prof. Hobbs' station, was seen on 14th, and next day they found a search-party sent out by A. C. Rasmussen, for they were a month overdue. A great welcome was given them at the conclusion of their journey on 19th, when Holsteinsborg was reached, and they afterwards returned home with Watkins. The six members of the expedition left at the Base had embarked in the *Gertrud Rask* on 9th August.

The last of the numerous journeys made on this comprehensive expedition was Watkins' Southern Boat Journey with Courtauld and Lemon. Two whale boats with outboard motors and 3 kayaks were taken when the party set out, on 15th August, with ample petrol but insufficient food for the 700 miles before them; Watkins relied on his kayak and gun. A careful survey was made of the 140 miles to Umivik, though storms hindered the work; the boats also were unsuitable for the open water and heavier seas that were encountered; they had been chosen to navigate ice-encumbered channels of which there were few. A new island 40 miles long was discovered. Umivik was left on 8th September, and the coast to the south found to be very beautiful with its islands, channels and vegetation. The explorers, however, had little leisure in which to admire the scenery. Rain fell day after day, and their overloaded boats wallowed in choppy seas; the engines constantly stopped at awkward and often dangerous moments, and several times the boats were nearly swamped. Many hours were spent in working at the engines frequently, with indifferent success. Food and equipment were soaked before the dreaded Puisortok Glacier was reached.

This glacier was a menace for about 50 miles because it was constantly calving. The first attempt to pass it failed owing to the stoppage of an engine; and one of the boats was full of water before land could be regained. On the second attempt bad weather made a retreat necessary. The third attempt was successful in spite of further engine trouble; and beyond the glacier three Norwegians were met, to the delight of both parties. A short cut was taken through Prince Christian Sound, N. of Cape Farewell, where South-West Greenland



Photograph by Ernest M. Roth, Expedition

MAIN GLACIER, HEAD OF KANGERDEUGSUAK FJORD



Photograph by JOHN R. RAMBLE

VIEW FROM TOP OF AILSA  
Looking towards Gmo's Glacier



was found to resemble the W. coast of Ireland more than East Greenland. Knud Rasmussen was met at Julianehab, and Rymill's party found at Holsteinsborg on 19th October. Watkins' Boat Journey was one of the most important coastal explorations of its kind ever made. Most of the personnel had already reached home, and those who returned with Watkins sailed for Denmark in the *Hans Egede*, reaching England in the middle of November.

The results of this expedition were of the highest order and placed Watkins in the forefront of Arctic explorers. Mylius-Erichsen's expedition had reaped as bountiful a harvest in Greenland, but it had spent longer in the field. Watkins was not afraid of being original, in choosing only young men, in leading by comradeship instead of rigid discipline and in the remarkable standard of efficiency attained. In the brilliance of his success, for a man of his tender years, he stands almost alone. Seven major, and many minor, journeys were made on which several thousand miles were covered, and much detailed work was also carried out. Binney at 21 alone was younger than Watkins as leader of a large expedition, and Watkins had led a smaller expedition before he was this age. Six technical appendices are given in the "Geographical Journal" (June, 1932), after the account of Watkins' lecture, on the following branches of the expedition's work: flying, climate, geology, the survey, sledging rations and birds.

Shortly after his return Watkins was good enough to introduce himself to me and we discussed his future plans. At that time he hoped to raise money for a great sledge journey from the Weddell Sea to the Bay of Whales in Antarctica; but he said that, failing this, he should return to Greenland. He made it clear, however, that he did not wish to revisit Greenland, and had he been able to follow his inclination he might have been with us yet. The time was unfortunate for making appeals, and the response proved inadequate. Watkins therefore took Rymill, Chapman and Riley to Lake Fjord, reached on 9th August, 1932. Here an Eskimo hut of earth and stone was built and Watkins started his autumn hunting to lay in the winter's food supply. He had made himself, on his previous expedition, as expert as an Eskimo in the use of the kayak, and on 20th August, at 8 a.m., he went out, as usual alone. He was never seen again.

His companions were some miles away surveying in a motor-boat, and at 3 p.m. were returning to the hut when they saw a kayak, full of water, with the paddle floating 100 yds. away. They immediately searched the fjord and found Watkins' trousers and kayak-belt on

a floe, less than 200 ft. from a very active glacier. Still hoping for the best they went to the hut, but their leader had not returned. The whole fjord was then thoroughly searched by land and water without finding any further traces of the missing explorer. Rymill, who succeeded to the command of the expedition, believes that Watkins landed on a small floe that was upset by the calving of the glacier; that the wind blew his kayak away and he undressed for the swim to recover it ("G.J.," Dec., 1933). The kayak now hangs in the museum of the Royal Geographical Society. In 1933 the King presented all the members of the British Arctic Air-route Expedition with the Polar Medal.

The work of Watkins' last expedition was carried out as he would have wished; it was supplementary to the researches of the previous expedition. On 2nd September the veteran Capt. Mikkelsen sailed into Lake Fjord with the wooden hut and stores he had undertaken to deliver. The survey was continued until 175 sq. miles of the mountainous country that surrounds the fjord had been mapped in detail, while a larger area was also charted in outline. The mountain belt was found to be 80 miles wide. About 100 miles of the coast south of the fjord were also surveyed in detail. The meteorological observations were of great interest because the air in the district was found to be relatively calm. An intensive study was made of the flora and fauna, and specimens collected. Before leaving for home a cross was erected in memory of Watkins, whose short life will long be an inspiration to high endeavour. At the time of writing Rymill is organizing the British Graham Land Expedition, 1934-7, of which he is the leader; he will be accompanied by his old comrades, Hampton, Riley and Stephenson. The Government has contributed £10,000 towards its cost.

Gino Watkins was a remarkable young man and a great Arctic explorer. Of slight physique and dapper appearance, he gave an impression of power—the power of a dynamo or a fast sports car. He was very highly strung. Dr. H. R. Mill has well compared him with Nansen; though Watkins, when he died, was 3 years younger than Nansen when he sailed in the *Fram*. It is natural to compare Watkins with Shackleton, but among Arctic explorers he had much kinship of spirit with Mylius-Erichsen, and they both laid down their lives in East Greenland. Watkins was a genius whom mere words cannot adequately describe—a born leader with a marvellous manner; and his unconventional methods were successful because he brought the best out of every man.



## GINO WATKINS' EXPEDITIONS

1927. Led party of 8 to Edge Island, Spitsbergen.  
 1928-9. Winter expedition to North Labrador.  
 1930-1. The British Arctic Air-route Expedition to East Greenland.  
 1932. Last expedition to East Greenland.

SCHEDULE No. 11  
 A FEW SLEDGING STATISTICS  
 A. IN 1-3 DAYS

Date :		Days	m.p. mar.	m.p.d.
1915. RECORD.	MacMillan across Melville B. Calm. — 50° F.	18 hours	1	100
1915.	Ekblaw of MacMillan's Expedition.	22 "	1	80
1917, April 6.	Rasmussen, Thule to Netsilik, on sea-ice.	10 "	1	56
1916, Mar. 27-9	An Eskimo, Etah to Flagler Pass. Light	150 miles in 3		50
1915.	Dr. Hunt of MacMillan's expedition.	100 " " 2		50
1915, Dec. 27.	MacMillan and Tanquary in 12 h.		1	50
1916, Apr. 4, 13, etc.	MacMillan on several days riding 25 miles.		1	50
1915, 1916.	MacMillan several times in 9-16 h.		1	48
1914, Feb.	MacMillan, Hayes Fd. to Etah. Light.	90 " " 2		45
1907, June 13.	J. P. Koch of Mylius-Erichsen's expedition. Loaded.		1	42½
1907, March 28.	Mylius-Erichsen, with 86 dogs. Light.		1	42
1917, April 20.	Rasmussen, with 185 dogs across Peabody Bay.		1	41
1907, June 4.	J. P. Koch. Loaded. Past North-East Foreland, East Greenland.		1	38
1907, April 1.	Mylius-Erichsen near North Depot Island, East Greenland.		1	36
1914.	MacMillan.	70 " " 2		35
1914.	MacMillan. Etah and Cape Sabine. Light. Often in 6 h.		1	35
1917, April 18.	Rasmussen on sea-ice of Peabody Bay with 185 dogs.		1	34
1907, March 30.	Mylius-Erichsen with loaded sledges and 85 dogs		1	30

## B. LONGER DISTANCES

		Miles.		
1912, May.	Rasmussen's last 6 marches over plateau.	278		46
1906, Nov.-Dec.	Mylius-Erichsen, <i>Germania</i> Harbour to <i>Danmark</i> Harbour.	189		37½
1930, Oct.	Scott's party of Watkins' Expedition over plateau.	127	Nearly	31
1909, May.	MacMillan and Borup, Cape Morris Jesup to Cape Sheridan.	270	34	30
1907, June.	J. P. Koch on E. coast Greenland.	122		30
1908, March.	J. P. Koch and Gabrielsen.	210	c.	30
1907, June.	J. P. Koch. Loaded.	400	Nearly	27
1912, April-May.	Rasmussen and Freuchen over Greenland Plateau.	629	35	24
1912, Aug.	Rasmussen and Freuchen over Greenland Plateau.	510	25½	
1915, June.	Ekblaw. Fort Conger to Etah. Light.	280	31	23
1931, Aug.-Sept.	Rymill and Hampton of Watkins' Expedition over plateau.	249		22.6
1915.	MacMillan's summer journey.	1200		21
1914.	"	1400	c.	25
1931, July.	Scott's party of "Watkins" Expedition. Greenland plateau.	448		17

## APPENDIX I

### ARCTIC EXPEDITIONS, 1909-34

*Note.*—In addition to the following there have been many hunting and trading expeditions to the Arctic as well as Polar Year expeditions in 1932-3 by Great Britain (2), France (Charcot), Russia (a large number), Germany, Norway, Sweden, Poland, Canada, Holland, Austria and the United States. The purpose of the list is to indicate the number and date of expeditions during the period, those already dealt with being also included. The list contains all available information suitable for schedule form ; but further particulars of expeditions after 1929 will be found in "The Polar Record," published by the Polar Research Institute, Cambridge. It would be almost impossible to compile a complete list.

- (1906-8. Mylius-Erichsen's *Danmark* Expedition to North-East Greenland.)
- (1908. Dr. F. A. Cook's attempt to reach the North Pole.)
1909. Bernier returned from the Arctic.  
Bruce in Spitsbergen in *Conqueror*.  
Peary's last attempt to reach the North Pole.
- 1909-12. Mikkelsen's *Alabama* Expedition to North-East Greenland.
1910. Rasmussen founded his colony at Thule.  
Bernier attempted to make the North-West Passage in the *Arctic*.  
Filchner in Spitsbergen.
- 1910-15. The *Taimyr* and *Waigatch* Expedition to the Asiatic Arctic  
—after 1911 under Vilkitski.
1911. Dr. V. Nordman and wife in North Stromford, Greenland.
1912. Rasmussen's 1st Thule Expedition to North-East Greenland.  
Ruslanov visited the Eurasiatic sector in the *Herkules*.  
Bruce at work on Prince Charles Foreland, Spitsbergen.  
Stefansson returned from his 4 years' Ethnological Expedition.
- K. Stephensen and K. Birket-Smith near Julianehab, Greenland.
- 1912-14. Sedow's expedition to the Franz Josef Archipelago in the *St. Foka*.  
Brussilow's expedition to Novaya Zemlya in the *St. Anna*.
- 1912-15. Dr. L. Bobé in Greenland collecting data for "Greenland."

1912. De Quervain's crossing of Greenland from Disco Bay to Angmagssalik.  
Lieut. Schroeder-Stranz' disastrous expedition to Spitsbergen.
1913. J. P. Koch and Wegener's crossing of Greenland from Dove Bay to Proven.  
L. Koch's 1st trip to West Greenland.  
Zacharow in the *Olga*.  
Sverdrup's relief expedition for Brussilow in *Eclipse*.  
Poseidon (Danish) expedition to Barents Sea.
- 1913-17. MacMillan's Borup Memorial Expedition to Ellesmere Land.
- 1913-18. Stefansson's Canadian Arctic Expedition in the *Karluk*.
1914. Bruce reached Spitsbergen when war broke out.  
Nagurski's first Arctic flight from Novaya Zemlya.
- 1916-18. Inspector Bendixen collected data for "Greenland."
1917. Rasmussen's 4th Thule expedition—to North Greenland.
1918. *Taimyr* expedition to Barents Sea.  
Birket-Smith made ethnographic researches in Greenland.
- 1918-25. The Voyage of the *Maud* under Amundsen and Wisting.
1919. Scottish Spitsbergen Syndicate expedition in the *Petunia* under Bruce.  
Hagerman and Coster, Swedish geologists, in Spitsbergen.
- 1919-23. The Danish East Greenland Co.'s expedition in the *Dagny* and *Teddy*.  
1920. Scottish Spitsbergen Syndicate expedition in the *Lady of Avenel* and *Easonian* under Mathieson and Wordie.  
Kamschatka (Swedish) expedition.
- 1920-3. L. Koch's Bicentenary Jubilee expedition to North Greenland.  
1920. Bruce's last visit to Spitsbergen in *Easonian*.
1921. The Oxford University Expedition to Spitsbergen under Jourdain.  
Chaworth-Musters and Wordie in Jan Mayen Island.  
Professor Seward in West Greenland.  
Colonel Jensen worked on the Geodetic Survey of Greenland.  
Russian expedition to the Barents Sea in the *Charlotte* under Samoilovitch.  
Dr. Norlund studied ethnography in Greenland.  
Holtedahl's (Norwegian) expedition to Novaya Zemlya.  
Dr. Stoll in Spitsbergen.  
The *Malyguin* (Russian) expedition to the Asiatic Arctic.
- 1921-3. The *Taimyr* expedition to the Kara Sea.
- 1921-4. Rasmussen's 5th Thule expedition, across Arctic America.
- 1921-7. Samoilovitch's hydrographical cruises in the Barents Sea.  
The Russian astronomical expedition.
1922. Stefansson's colony established on Wrangel Island.

- 1922-34. The annual Canadian Arctic patrols.
1922. Russian expedition to the Barents Sea in the *Charlotte*.  
Derjugin's expedition.
- 1922-3. The Norwegian party in the *Anni* lost with all hands.
- 1923-4. MacMillan's 2nd expedition to the Smith Sound district.
1923. Mittelholzer's flight over Spitsbergen.  
The Merton College (Oxford) Expedition to Spitsbergen under Binney.  
The Cambridge University Expedition to East Greenland in the *Heimen* under Wordie.
- 1923-9. The *Perseus* expeditions to the Franz Josef Archipelago under Professor Meschachew.
1924. The Oxford University Arctic Expedition to North-East Land under Binney.  
Mikkelsen established an Eskimo colony in Scoresby Sound, East Greenland.  
The Russian colony established on Wrangel Island.
1925. Amundsen and Ellsworth's flight to lat.  $87^{\circ} 43' N.$  in 2 flying-boats.  
Byrd's flights over Ellesmere Land.
- 1925-7. Gydansk's (Russian) expedition.
1925. The British Arctic Expedition of Worsley and Algarsson in the *Island*.
- 1925-8. Obrucher's Yakutsk expedition.
1926. The Cambridge Expedition to East Greenland in the *Heimland* under Wordie.  
Byrd's flight to the North Pole from Spitsbergen.  
The Amundsen-Ellsworth flight in the *Norge* from Spitsbergen to Alaska.  
Russian colony established on Wrangel Island.  
Obruchev's expedition to Siberia.
- 1926, 1927. Danish expeditions to the Barents Sea.
- 1926-7. L. Koch's (Danish) expedition to East Greenland.
1926. Wilkins' first flight over the sea N. of Alaska.
- 1926-7. W. H. Hobbs near Holsteinsborg, West Greenland.
1927. Watkins' Cambridge expedition to Edge Island, Spitsbergen.  
Wilkins' 500-mile flight N. of Alaska.  
Miss I. W. Hutchison's first botanical expedition to Greenland.  
Russian expeditions: in the *Yakut*; of Desgl; and station set up on New Siberian Islands.
1928. Wilkins' Trans-Arctic flight from Alaska to Spitsbergen.  
Nobile's flights, and loss of the *Italia*.  
Dr. Longstaff in West Greenland.  
The *Taimyr* (Russian) expedition.  
The Danish oceanographical expedition to Baffin's Bay.  
Hobbs in West Greenland.

- 1928-9. Watkins' and Scott's expedition to Labrador.  
Miss Hutchison's 2nd botanical expedition to Greenland.
1929. The 3rd Cambridge Expedition to East Greenland and 1st ascent of Petermann Peak by Wordie.  
Norwegian expedition to East Greenland in the *Veslekari* under Orvin.  
L. Koch's expedition to East Greenland in the *Godthaab*.
- 1929-30. Samoilovitch's *Sedow* expedition; wintered on Hooker Island.
1929. Inspector Joy sledged 1,700 miles in 81 days from South Devon, past Melville Island to Bache Peninsula.  
The Canadian flights of Major Burwash near the Arctic Circle.  
Mathiassen's archæological work in Upernivik district, West Greenland.
- 1930-1. Watkins' British Arctic Air-Route Expedition to East Greenland.  
Wegener's German Ice-cap expedition to West Greenland.  
Hobbs in West Greenland.  
Russian attempt in the *Beluga* to make the North-East Passage.  
Russian Botanical expedition to Novaya Zemlya.  
Schmidt and Samoilovitch in *Sedow* to Franz Josef Archipelago. Ushakow wintered on Severnaya Zemlya.
1930. Dalgety at Spitsbergen and White Island.  
Norwegian expedition to East Greenland in the *Veslekari* under Hoel.  
Norwegian expedition to Spitsbergen and White Island in the *Bratvaag* under Horn.<sup>1</sup>  
Norwegian expedition to Spitsbergen and White Island in the *Michael Sars* under Kjaer.  
Norwegian expedition. *Sotra* under Iversen.  
Norwegian expedition to Spitsbergen in the *Inger Elizabeth* under Frebald.  
Cambridge reconnaissance to Spitsbergen under R. M. Jackson.  
Capt. R. Bartlett in the *Morrissey* at Shannon Island, East Greenland.  
L. Koch's 2nd expedition to East Greenland, in the *Godthaab*.  
Kruger's journey to Axel Heiberg Land.  
Major Burwash made a flight in the Franklin District of Arctic Canada.  
Mathiassen's 2nd expedition to West Greenland.  
Von Gronau flew over Greenland.

<sup>1</sup> The *Andrée* relics found on White Island.



- Station established on Cape Chelyuskin by Samoilovitch in *Russanow*.
- The *Knipowitch* made the 1st circumnavigation of Franz Josef Archipelago.
- Other Russian expeditions : The *Malyguin* took 15 scientists to Hooker Island for Polar Year ; the 40th oceanographical cruise of *Perseus* ; the relief of the Wrangel Island colonists ; 2 hydrological and other expeditions.
- 1932-3. Watkins' last expedition—to East Greenland, completed by Rymill.
- Hobbs' University of Michigan 5th expedition to West Greenland.
1933. The Glen-Martin Oxford Expedition to New Friesland, Spitsbergen.
- Hoel's expedition to Spitsbergen and East Greenland in *Polar Bjorn*.
- Charcot visited East Greenland in the *Pourquoi Pas ?* (see note above).
- The Bertram, Lack and Roberts Cambridge expedition to Scoresby Sound, East Greenland.
- Miss Louise Boyd's 2nd expedition to Franz Josef Fjord, East Greenland, in *Veslekari*.
- Arctic voyage of Canadian Government ship, *Nascopic*.
- Mathiassen's 4th archæological expedition to West Greenland.
- 1933-4. Schmidt's expedition in the *Chelyuskin*, sunk near Bering Strait.
1934. Wordie's expedition to Ellesmere Land in the *Heimen II*.
- Martin Lindsay's crossing of Greenland from Disco Bay to near Scoresby Sound.
- 1934-5. The Shackleton-Humphreys Oxford University Ellesmere Land Expedition.



## APPENDIX II

### DEPENDENCE UPON GAME IN THE ARCTIC

**D**URING the last few years a great deal has been said on this subject, and its importance in the *charted* parts of the Arctic cannot be denied ; but the only safe rule seems to be to regard all *unexplored* areas as poor in animal life, i.e. as deserts or semi-deserts. When they are explored they will probably be found similar to the charted areas in falling into one or more of the following categories :

1. Areas rich in game throughout the year.
2. Areas rich in game seasonally.
3. Areas sparse in game at all times of the year.
4. Permanent desert areas, completely devoid of game.

We cannot here consider all the Arctic lands, and most of the unexplored Arctic is in its central sea. Along its rim, and possibly as far as about 200 miles from land in summer, game may be found ; but its great central area has not been visited much more than half a dozen times, and on most of these occasions no life was seen. Nansen spent as many *years* in this area as other explorers spent *months* ; he went as far from land as most of them, and was the most reliable observer of them all. Hence, future explorers should be guided by his evidence ; but they will do well to notice that he was very fortunate in the weather during his sledge journey. They should also remember that the data are at present inadequate for a decided opinion as to whether the Arctic Sea, at greater distances than about 200 miles from land, is a desert, a semi-desert or a more fertile area. The evidence seems to be that mammals are very sparse.

Coming farther S., explorers have had every kind of experience, from Stefansson and Storkersen who lived for two-thirds of their total time on game, to parties such as Mylius-Erichsen's which have perished for want of it. Several other parties, Mikkelsen's in 1911, Rasmussen's in 1917 and L. Koch's in 1921, very nearly died from the shortage of game on the coasts of Greenland. Exceptional men may be dangerous examples to young explorers, e.g. an experienced hunter like Stefansson, who claims he can fast for 4 days and walk 80 miles without sleep ; or one who could eat 5 lbs. of blubber for breakfast, as Ekblaw did and no doubt Stefansson could have done—such a man, if also a crack shot, might be able to travel very widely with a few dogs and his gun, though he might perish in one of the extensive desert areas. But if he were not to travel

alone he would need another hunter of equal prowess, and 2 men form an unduly small unit. Yet whether three such men could be found seems doubtful.

Living on game has much in its favour. Reliance upon it, however, is not progress but a return to the primitive. Rasmussen repeatedly complained that his men had to fight for their lives, like cave men, to secure food. Most of Stefansson's time was spent in hunting to keep up the supplies ; but this is moving the emphasis from the scientific purpose of the journey to its commissariat, or from the end to the means. It is marching too literally, like troops, on the stomach. Stefansson admits that no man could live by his gun unless he had the hunter's temperament, defined as the typical Indian or Eskimo attitude to Nature. But the hunter's temperament is a survival from the jungle ; if civilization is to advance we must

*Let the ape and tiger die.*

Hunting is useless for practical purposes because of its uncertainty. For explorers, therefore, to live by hunting is a retrograde step, a return to the primitive life from which we have slowly emerged, and it has little to recommend it. Time is wasted that should be put to better use ; after a big kill, men and dogs are obliged to gorge themselves as a provision for the next lean period. Stefansson admits this (" The Friendly Arctic," p. 208), as well as the deplorable fact that his party was unable to travel next day because of illness from over-eating. Civilization with all its faults has given us efficiency in eating and drinking ; it has also put them in their proper place. The best expeditions are those on which most work is done with the least interruption.

Again, however successfully food and traction may be combined in dog-transport, a system is far from ideal that may necessitate canine cannibalism and the human consumption of dog-flesh. It is not only sentiment that revolts at eating dogs, for many men cannot assimilate their meat, and to some it is poison. This is a detail involved in attempting to live on the country, but it may not apply to the Canadian Arctic where conditions are relatively inartic. Living on the country resolves itself into hunting expeditions on which work is done during the men's spare time. Parties are often mixed by taking half hunters and half scientists, but if there were no hunters half the food would suffice.

Stefansson grafted some of the resources of modern science on the ancient hunting stock and proved the possibility of exceptional men living by their guns for 2 weeks out of every 3 in parts of the Canadian Arctic during the summers of 1914-7. This evidence may be valuable in the future, but it will be a positive danger if men with only a hunting temperament think they can live on game anywhere within the Arctic Circle, as F. G. Jackson pointed out years ago. In 1899 he issued the following warning :

I trust that Dr. Nansen's extraordinary immunity from penalty will not lead the inexperienced to suppose that one may go larking about within the Polar Circle with merely a dog and a gun and that all things will be well with them. If they should fall into this error they will be suddenly—I almost said fatally—deceived. ("A Thousand Days in the Arctic," II, 73.)

To prevent the extermination of game it has been necessary to protect it in some Arctic countries, such as Arctic Canada and Spitsbergen. Hence these countries as well as the desert areas are now closed to shooting, though the former only without a licence. Unless the behaviour of the lower human elements N. of the Circle is different from what it is S. of it, all Arctic game will eventually be exterminated if it is not preserved. Living on the country is a wasteful system, not only from the love of slaughter, exemplified by Eskimos, but sometimes inevitably, as when a mother-bear has been shot and her cubs also must be killed because they are too young to fend for themselves. Even Stefansson has been obliged to abandon tons of meat after caching it. Andrée took no more than 22 lbs. of meat from his largest bear and 17 lbs. from another; but the greatest waste of fresh food is from the sinking of seals and walrus in the sea after being shot.

It may now be possible to sum up the evidence in dependence upon game in the Arctic. Its *ADVANTAGES*, but only *with consistent luck in the chase*, are: 1. Journeys could be indefinitely prolonged. 2. Explorers could eat as much as they killed. 3. Loads would be lighter and less transport required. 4. Apart from any delay caused by hunting, a higher speed could be maintained. (The constant weights, however, are the major part of the load.) 5. Men would be stronger and would not suffer from deficiency diseases, such as scurvy. These and any other advantages are *conditional upon ample game being easily secured*.

The correlative *DISADVANTAGES*, which are *not conditional but absolute*, are: 1. The uncertainty of the supply in most of the Arctic. 2. Gluttony when a large kill is made after the usual period of semi-starvation. 3. The waste of good meat which is very common. 4. The waste of time necessary for hunting instead of working. 5. The denudation of game. 6. Starvation. 7. Death.

Every Arctic explorer has a choice of 3 methods: 1. The primitive method of dependence on game. 2. The modern method of carrying enough food for the journey. 3. A combination of 1 and 2; this may be occasionally suitable. Attempting to live on the country has been too costly in human life. It is condemned by its uncertainty, and there should be no uncertainty when life hangs in the balance. Explorers should eat as much game as possible without wasting time in shooting it. On no account should they depend upon it. Preserved food can be held in reserve when game is abundant, which is what Storkersen did on his drift. He showed the possibility of doing more exploration on the polar pack in a similar manner; and if very large floes are chosen near enough

to land, the risk of experienced men living on the pack does not appear unduly great. The conditions found in one year, however, are an insecure basis for the next.

P.S.—Mr. J. Rymill has kindly read the above and pointed out (29.6.34) that one experienced hunter, in good game country, can support “at least six scientists.”

## APPENDIX III

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