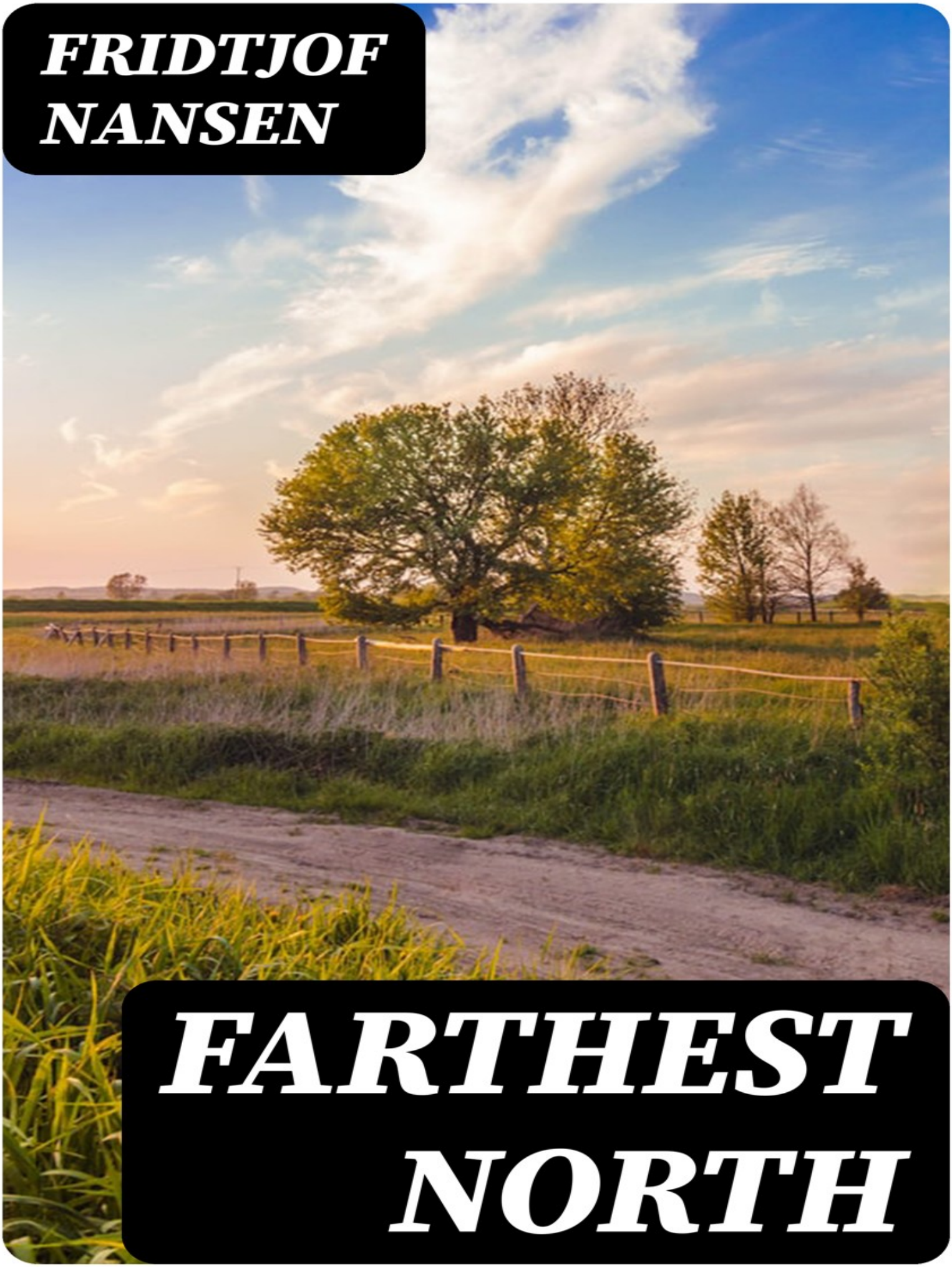
FRIDTJOF NANSEN



FARTHEST NORTH

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Farthest North

Historical Record of a Voyage of Exploration of the Ship 'Fram' 1893-1896

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Introduction

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> “A time will come in later years when the Ocean will unloose the bands of things, when the immeasurable earth will lie open, when seafarers will discover new countries, and Thule will no longer be the extreme point among the lands.”—Seneca.

Unseen and untrodden under their spotless mantle of ice the rigid polar regions slept the profound sleep of death from the earliest dawn of time. Wrapped in his white shroud, the mighty giant stretched his clammy ice-limbs abroad, and dreamed his age-long dreams.

Ages passed—deep was the silence.

Then, in the dawn of history, far away in the south, the awakening spirit of man reared its head on high and gazed over the earth. To the south it encountered warmth, to the north, cold; and behind the boundaries of the unknown it placed in imagination the twin kingdoms of consuming heat and of deadly cold.

But the limits of the unknown had to recede step by step before the ever-increasing yearning after light and knowledge of the human mind, till they made a stand in the north at the threshold of Nature’s great Ice Temple of the polar regions with their endless silence.

Up to this point no insuperable obstacles had opposed the progress of the advancing hosts, which confidently proceeded on their way. But here the ramparts of ice and

the long darkness of winter brought them to bay. Host after host marched on towards the north, only to suffer defeat. Fresh ranks stood ever ready to advance over the bodies of their predecessors. Shrouded in fog lay the mythic land of Nivlheim, where the “Rimturser”[1] carried on their wild gambols.

Why did we continually return to the attack? There in the darkness and cold stood Helheim, where the death-goddess held her sway; there lay Nåstrand, the shore of corpses. Thither, where no living being could draw breath, thither troop after troop made its way. To what end? Was it to bring home the dead, as did Hermod when he rode after Baldur? No! It was simply to satisfy man’s thirst for knowledge. Nowhere, in truth, has knowledge been purchased at greater cost of privation and suffering. But the spirit of mankind will never rest till every spot of these regions has been trodden by the foot of man, till every enigma has been solved.

Minute by minute, degree by degree, we have stolen forward, with painful effort. Slowly the day has approached; even now we are but in its early dawn; darkness still broods over vast tracts around the Pole.

Our ancestors, the old Vikings, were the first Arctic voyagers. It has been said that their expeditions to the frozen sea were of no moment, as they have left no enduring marks behind them. This, however, is scarcely correct. Just as surely as the whalers of our age, in their persistent struggles with ice and sea, form our outposts of investigation up in the north, so were the old Northmen, with Eric the Red, Leif, and others at their head, the pioneers of the polar expeditions of future generations.

It should be borne in mind that as they were the first ocean navigators, so also were they the first to combat with

the ice. Long before other seafaring nations had ever ventured to do more than hug the coast lines, our ancestors had traversed the open seas in all directions, had discovered Iceland and Greenland, and had colonized them. At a later period they discovered America, and did not shrink from making a straight course over the Atlantic Ocean, from Greenland to Norway. Many and many a bout must they have had with the ice along the coasts of Greenland in their open barks, and many a life must have been lost.

And that which impelled them to undertake these expeditions was not the mere love of adventure, though that is, indeed, one of the essential traits of our national character. It was rather the necessity of discovering new countries for the many restless beings that could find no room in Norway. Furthermore, they were stimulated by a real interest for knowledge. Othar, who about 890 resided in England at Alfred’s Court, set out on an errand of geographical investigation; or, as he says himself, “he felt an inspiration and a desire to learn, to know, and to demonstrate how far the land stretched towards the north, and if there were any regions inhabited by man northward beyond the desert waste.” He lived in the northernmost part of Helgeland, probably at Bjarköi, and sailed round the North Cape and eastward, even to the White Sea.

Adam of Bremen relates of Harald Hårdråde, “the experienced king of the Northmen,” that he undertook a voyage out into the sea towards the north and “explored the expanse of the northern ocean with his ships, but darkness spread over the verge where the world falls away, and he put about barely in time to escape being swallowed in the vast abyss.” This was Ginnungagap, the abyss at the world’s end. How far he went no one knows, but at all events he

deserves recognition as one of the first of the polar navigators that were animated by pure love of knowledge. Naturally, these Northmen were not free from the superstitious ideas about the polar regions prevalent in their times. There, indeed, they placed their Ginnungagap, their Nivlheim, Helheim, and later on Trollebotn; but even these mythical and poetical ideas contained so large a kernel of observation that our fathers may be said to have possessed a remarkably clear conception of the true nature of things. How soberly and correctly they observed may best be seen a couple of hundred years later in *Kongespeilet* ("The Mirror of Kings"), the most scientific treatise of our ancient literature, where it is said that "as soon as one has traversed the greater part of the wild sea, one comes upon such a huge quantity of ice that nowhere in the whole world has the like been known. Some of the ice is so flat that it looks as if it were frozen on the sea itself; it is from 8 to 10 feet thick, and extends so far out into the sea that it would take a journey of four or more days to reach the land over it. But this ice lies more to the northeast or north, beyond the limits of the land, than to the south and southwest or west....

"This ice is of a wonderful nature. It lies at times quite still, as one would expect, with openings or large fjords in it; but sometimes its movement is so strong and rapid as to equal that of a ship running before the wind, and it drifts against the wind as often as with it."

This is a conception all the more remarkable when viewed in the light of the crude ideas entertained by the rest of the world at that period with regard to foreign climes.

The strength of our people now dwindled away, and centuries elapsed before explorers once more sought the northern seas. Then it was other nations, especially the

Dutch and the English, that led the van. The sober observations of the old Northmen were forgotten, and in their stead we meet with repeated instances of the attraction of mankind towards the most fantastic ideas; a tendency of thought that found ample scope in the regions of the north. When the cold proved not to be absolutely deadly, theories flew to the opposite extreme, and marvellous were the erroneous ideas that sprang up and have held their own down to the present day. Over and over again it has been the same—the most natural explanation of phenomena is the very one that men have most shunned; and, if no middle course was to be found, they have rushed to the wildest hypothesis. It is only thus that the belief in an open polar sea could have arisen and held its ground. Though everywhere ice was met with, people maintained that this open sea must lie behind the ice. Thus the belief in an ice-free northeast and northwest passage to the wealth of Cathay or of India, first propounded towards the close of the 15th century, cropped up again and again, only to be again and again refuted. Since the ice barred the southern regions, the way must lie farther north; and finally a passage over the Pole itself was sought for. Wild as these theories were, they have worked for the benefit of mankind; for by their means our knowledge of the earth has been widely extended. Hence we may see that no work done in the service of investigation is ever lost, not even when carried out under false assumptions. England has to thank these chimeras in no small degree for the fact that she has become the mightiest seafaring nation of the world.

By many paths and by many means mankind has endeavored to penetrate this kingdom of death. At first the attempt was made exclusively by sea. Ships were then ill adapted to combat the ice, and people were loath to make

the venture. The clinker-built pine and fir barks of the old Northmen were no better fitted for the purpose than were the small clumsy carvels of the first English and Dutch Arctic explorers. Little by little they learnt to adapt their vessels to the conditions, and with ever-increasing daring they forced them in among the dreaded floes.

But the uncivilized polar tribes, both those that inhabit the Siberian tundras and the Eskimo of North America, had discovered, long before polar expeditions had begun, another and a safer means of traversing these regions—to wit, the sledge, usually drawn by dogs. It was in Siberia that this excellent method of locomotion was first applied to the service of polar exploration. Already in the 17th and 18th centuries the Russians undertook very extensive sledge journeys, and charted the whole of the Siberian coast from the borders of Europe to Bering Strait. And they did not merely travel along the coasts, but crossed the drift-ice itself to the New Siberian Islands, and even north of them. Nowhere, perhaps, have travellers gone through so many sufferings, or evinced so much endurance.

In America, too, the sledge was employed by Englishmen at an early date for the purpose of exploring the shores of the Arctic seas. Sometimes the toboggan or Indian sledge was used, sometimes that of the Eskimo. It was under the able leadership of M’Clintock that sledge journeys attained their highest development. While the Russians had generally travelled with a large number of dogs, and only a few men, the English employed many more men on their expeditions, and their sledges were entirely, or for the most part, drawn by the explorers themselves. Thus in the most energetic attempt ever made to reach high latitudes, Albert Markham’s memorable march towards the north from the *Alert’s* winter quarters, there were 33 men who had to draw

the sledges, though there were plenty of dogs on board the ship. It would appear, indeed, as if dogs were not held in great estimation by the English.

The American traveller Peary has, however, adopted a totally different method of travelling on the inland ice of Greenland, employing as few men and as many dogs as possible. The great importance of dogs for sledge journeys was clear to me before I undertook my Greenland expedition, and the reason I did not use them then was simply that I was unable to procure any serviceable animals.[2]

A third method may yet be mentioned which has been employed in the Arctic regions—namely, boats and sledges combined. It is said of the old Northmen in the Sagas and in the *Kongespeilet*, that for days on end they had to drag their boats over the ice in the Greenland sea, in order to reach land. The first in modern times to make use of this means of travelling was Parry, who, in his memorable attempt to reach the Pole in 1827, abandoned his ship and made his way over the drift-ice northward with boats, which he dragged on sledges. He succeeded in attaining the highest latitude (82° 45′) that had yet been reached; but here the current carried him to the south more quickly than he could advance against it, and he was obliged to turn back.

Of later years this method of travelling has not been greatly employed in approaching the Pole. It may, however, be mentioned that Markham took boats with him also on his sledge expedition. Many expeditions have through sheer necessity accomplished long distances over the drift-ice in this way, in order to reach home after having abandoned or lost their ship. Especial mention may be made of the Austro-Hungarian *Tegethoff* expedition to Franz Josef Land, and the ill-fated American *Jeannette* expedition.

It seems that but few have thought of following the example of the Eskimo—living as they do, and, instead of heavy boats, taking light kayaks drawn by dogs. At all events, no attempts have been made in this direction.

The methods of advance have been tested on four main routes: the Smith Sound route, the sea route between Greenland and Spitzbergen, Franz Josef Land route, and the Bering Strait route.

In later times, the point from which the Pole has been most frequently assailed is Smith Sound, probably because American explorers had somewhat too hastily asserted that they had there descried the open Polar Sea, extending indefinitely towards the north. Every expedition was stopped, however, by immense masses of ice, which came drifting southward, and piled themselves up against the coasts. The most important expedition by this route was the English one conducted by Nares in 1875–76, the equipment of which involved a vast expenditure. Markham, the next in command to Nares, reached the highest latitude till then attained, 83° 20′, but at the cost of enormous exertion and loss; and Nares was of opinion that the impossibility of reaching the Pole by this route was fully demonstrated for all future ages.

During the stay of the Greely expedition (from 1881 to 1884) in this same region, Lockwood attained a somewhat higher record, viz., 83° 24′, the most northerly point on the globe that human feet had trodden previous to the expedition of which the present work treats.

By way of the sea between Greenland and Spitzbergen, several attempts have been made to penetrate the secrets of the domain of ice. In 1607 Henry Hudson endeavored to reach the Pole along the east coast of Greenland, where he was in hopes of finding an open basin and a waterway to

the Pacific. His progress was, however, stayed at 73° north latitude, at a point of the coast which he named “Hold with Hope.” The German expedition under Koldeway (1869–70), which visited the same waters, reached by the aid of sledges as far north as 77° north latitude. Owing to the enormous masses of ice which the polar current sweeps southward along this coast, it is certainly one of the most unfavorable routes for a polar expedition. A better route is that by Spitzbergen, which was essayed by Hudson, when his progress was blocked off Greenland. Here he reached 80° 23′ north latitude. Thanks to the warm current that runs by the west coast of Spitzbergen in a northerly direction, the sea is kept free from ice, and it is without comparison the route by which one can the most safely and easily reach high latitudes in ice-free waters. It was north of Spitzbergen that Edward Parry made his attempt in 1827, above alluded to.

Farther eastward the ice-conditions are less favorable, and therefore few polar expeditions have directed their course through these regions. The original object of the Austro-Hungarian expedition under Weyprecht and Payer (1872–74) was to seek for the Northeast Passage; but at its first meeting with the ice it was set fast off the north point of Novaya Zemlya, drifted northward, and discovered Franz Josef Land, whence Payer endeavored to push forward to the north with sledges, reaching 82° 5′ north latitude on an island, which he named Crown-Prince Rudolf’s Land. To the north of this he thought he could see an extensive tract of land, lying in about 83° north latitude, which he called Petermann’s Land. Franz Josef Land was afterwards twice visited by the English traveller Leigh Smith in 1880 and 1881–82; and it is here that the English Jackson-Harmsworth expedition is at present established.

The plan of the Danish expedition under Hovgaard was to push forward to the North Pole from Cape Chelyuskin along the east coast of an extensive tract of land which Hovgaard thought must lie to the east of Franz Josef Land. He got set fast in the ice, however, in the Kara Sea, and remained the winter there, returning home the following year.

Only a few attempts have been made through Bering Strait. The first was Cook's, in 1776; the last the *Jeannette* expedition (1879–81), under De Long, a lieutenant in the American navy. Scarcely anywhere have polar travellers been so hopelessly blocked by ice in comparatively low latitudes. The last-named expedition, however, had a most important bearing upon my own. As De Long himself says in a letter to James Gordon Bennett, who supplied the funds for the expedition, he was of opinion that there were three routes to choose from—Smith Sound, the east coast of Greenland, or Bering Strait; but he put most faith in the last, and this was ultimately selected. His main reason for this choice was his belief in a Japanese current running north through Bering Strait and onward along the east coast of Wrangel Land, which was believed to extend far to the north. It was urged that the warm water of this current would open a way along that coast, possibly up to the Pole. The experience of whalers showed that whenever their vessels were set fast in the ice here they drifted northwards; hence it was concluded that the current generally set in that direction. "This will help explorers," says De Long, "to reach high latitudes, but at the same time will make it more difficult for them to come back." The truth of these words he himself was to learn by bitter experience.

The *Jeannette* stuck fast in the ice on September 6th, 1879, in 71° 35′ north latitude and 175° 6′ east longitude, southeast of Wrangel Land—which, however, proved to be a

small island—and drifted with the ice in a west-northwesterly direction for two years, when it foundered, June 12th, 1881, north of the New Siberian Islands, in 77° 15′ north latitude and 154° 59′ east longitude.

Everywhere, then, has the ice stopped the progress of mankind towards the north. In two cases only have ice-bound vessels drifted in a northerly direction—in the case of the *Tegethoff* and the *Jeannette*—while most of the others have been carried away from their goal by masses of ice drifting southward.

On reading the history of Arctic explorations, it early occurred to me that it would be very difficult to wrest the secrets from these unknown regions of ice by adopting the routes and the methods hitherto employed. But where did the proper route lie?

It was in the autumn of 1884 that I happened to see an article by Professor Mohn in the Norwegian *Morgenblad*, in which it was stated that sundry articles which must have come from the *Jeannette* had been found on the southwest coast of Greenland. He conjectured that they must have drifted on a floe right across the Polar Sea. It immediately occurred to me that here lay the route ready to hand. If a floe could drift right across the unknown region, that drift might also be enlisted in the service of exploration—and my plan was laid. Some years, however, elapsed before, in February, 1890, after my return from my Greenland expedition, I at last propounded the idea in an address before the Christiania Geographical Society. As this address plays an important part in the history of the expedition, I shall reproduce its principal features, as printed in the March number of *Naturen*, 1891.

After giving a brief sketch of the different polar expeditions of former years, I go on to say: “The results of

these numerous attempts, as I have pointed out, seem somewhat discouraging. They appear to show plainly enough that it is impossible to sail to the Pole by any route whatever; for everywhere the ice has proved an impenetrable barrier, and has stayed the progress of invaders on the threshold of the unknown regions.

“To drag boats over the uneven drift-ice, which moreover is constantly moving under the influence of the current and wind, is an equally great difficulty. The ice lays such obstacles in the way that any one who has ever attempted to traverse it will not hesitate to declare it well-nigh impossible to advance in this manner with the equipment and provisions requisite for such an undertaking.”

Had we been able to advance over land, I said, that would have been the most certain route; in that case the Pole could have been reached “in one summer by Norwegian snow-shoe runners.” But there is every reason to doubt the existence of any such land. Greenland, I considered, did not extend farther than the most northerly known point of its west coast. “It is not probable that Franz Josef Land reaches to the Pole; from all we can learn it forms a group of islands separated from each other by deep sounds, and it appears improbable that any large continuous track of land is to be found there.

“Some people are perhaps of opinion that one ought to defer the examination of regions like those around the Pole, beset, as they are, with so many difficulties, till new means of transport have been discovered. I have heard it intimated that one fine day we shall be able to reach the Pole by a balloon, and that it is only waste of time to seek to get there before that day comes. It need scarcely be shown that this line of reasoning is untenable. Even if one could really suppose that in the near or distant future this frequently

mooted idea of travelling to the Pole in an air-ship would be realized, such an expedition, however interesting it might be in certain respects, would be far from yielding the scientific results of expeditions carried out in the manner here indicated. Scientific results of importance in all branches of research can be attained only by persistent observations during a lengthened sojourn in these regions, while those of a balloon expedition cannot but be of a transitory nature.

"We must, then, endeavor to ascertain if there are not other routes—and I believe there are. I believe that if we pay attention to the actually existent forces of nature, and seek to work *with* and not *against* them, we shall thus find the safest and easiest method of reaching the Pole. It is useless, as previous expeditions have done, to work *against* the current; we should see if there is not a current we can work *with*. The *Jeannette* expedition is the only one, in my opinion, that started on the right track, though it may have been unwittingly and unwillingly.

"The *Jeannette* drifted for two years in the ice, from Wrangel Land to the New Siberian Islands. Three years after she foundered to the north of these islands there was found frozen into the drift-ice, in the neighborhood of Julianehaab, on the southwest coast of Greenland, a number of articles which appeared, from sundry indubitable marks, to proceed from the sunken vessel. These articles were first discovered by the Eskimo, and were afterwards collected by Mr. Lytzen, Colonial Manager at Julianehaab, who has given a list of them in the *Danish Geographical Journal* for 1885. Among them the following may especially be mentioned:

> "1. A list of provisions, signed by De Long, the commander of the *Jeannette*.
>
> "2. A MS. list of the *Jeannette's* boats.

> “3. A pair of oilskin breeches marked ‘Louis Noros,’ the name of one of the *Jeannette’s* crew, who was saved.
>
> “4. The peak of a cap on which, according to Lytzen’s statement, was written *F. C. Lindemann*. The name of one of the crew of the *Jeannette*, who was also saved, was F. C. Nindemann. This may either have been a clerical error on Lytzen’s part or a misprint in the Danish journal.

“In America, when it was reported that these articles had been found, people were very sceptical, and doubts of their genuineness were expressed in the American newspapers. The facts, however, can scarcely be sheer inventions; and it may therefore be safely assumed that an ice-floe bearing these articles from the *Jeannette* had drifted from the place where it sank to Julianehaab.

“By what route did this ice-floe reach the west coast of Greenland?

“Professor Mohn, in a lecture before the Scientific Society of Christiania, in November, 1894, showed that it could have come by no other way than across the Pole.[3]

“It cannot possibly have come through Smith Sound, as the current there passes along the western side of Baffin’s Bay, and it would thus have been conveyed to Baffin’s Land or Labrador, and not to the west coast of Greenland. The current flows along this coast in a northerly direction, and is a continuation of the Greenland polar current, which comes along the east coast of Greenland, takes a bend round Cape Farewell, and passes upward along the west coast.

“It is by this current only that the floe could have come.

“But the question now arises: What route did it take from the New Siberian Islands in order to reach the east coast of

Greenland?

“It is conceivable that it might have drifted along the north coast of Siberia, south of Franz Josef Land, up through the sound between Franz Josef Land and Spitzbergen, or even to the south of Spitzbergen, and might after that have got into the polar current which flows along Greenland. If, however, we study the directions of the currents in these regions so far as they are at present ascertained, it will be found that this is extremely improbable, not to say impossible.”

Having shown that this is evident from the *Tegethoff* drift and from many other circumstances, I proceeded:

“The distance from the New Siberian Islands to the 80th degree of latitude on the east coast of Greenland is 1360 miles, and the distance from the last-named place to Julianehaab 1540 miles, making together a distance of 2900 miles. This distance was traversed by the floe in 1100 days, which gives a speed of 2.6 miles per day of 24 hours. The time during which the relics drifted after having reached the 80th degree of latitude, till they arrived at Julianehaab, can be calculated with tolerable precision, as the speed of the above-named current along the east coast of Greenland is well known. It may be assumed that it took at least 400 days to accomplish this distance; there remain, then, about 700 days as the longest time the drifting articles can have taken from the New Siberian Islands to the 80th degree of latitude. Supposing that they took the shortest route—*i. e.*, across the Pole—this computation gives a speed of about 2 miles in 24 hours. On the other hand, supposing they went by the route south of Franz Josef Land, and south of Spitzbergen, they must have drifted at much higher speed. Two miles in the 24 hours, however, coincides most remarkably with the rate at which the *Jeannette* drifted

during the last months of her voyage, from January 1 to June 12, 1881. In this time she drifted at an average rate of a little over 2 miles in the 24 hours. If, however, the average speed of the whole of the *Jeannette's* drifting be taken, it will be found to be only 1 mile in the 24 hours.

"But are there no other evidences of a current flowing across the North Pole from Bering Sea on the one side to the Atlantic Ocean on the other?

"Yes, there are.

"Dr. Rink received from a Greenlander at Godthaab a remarkable piece of wood which had been found among the drift-timber on the coast. It is one of the 'throwing sticks' which the Eskimo use in hurling their bird-darts, but altogether unlike those used by the Eskimo on the west coast of Greenland. Dr. Rink conjectured that it possibly proceeded from the Eskimo on the east coast of Greenland.

"From later inquiries,[4] however, it appeared that it must have come from the coast of Alaska in the neighborhood of Bering Strait, as that is the only place where 'throwing sticks' of a similar form are used. It was even ornamented with Chinese glass beads, exactly similar to those which the Alaskan Eskimo obtain by barter from Asiatic tribes, and use for the decoration of their 'throwing sticks.'

"We may, therefore, with confidence assert that this piece of wood was carried from the west coast of Alaska over to Greenland by a current the whole course of which we do not know, but which may be assumed to flow very near the North Pole, or at some place between it and Franz Josef Land.

"There are, moreover, still further proofs that such a current exists. As is well known, no trees grow in Greenland that can be used for making boats, sledges, or other appliances. The driftwood that is carried down by the polar

current along the east coast of Greenland and up the west coast is, therefore, essential to the existence of the Greenland Eskimo. But whence does this timber come?

“Here our inquiries again carry us to lands on the other side of the Pole. I have myself had an opportunity of examining large quantities of driftwood both on the west coast and on the east coast of Greenland. I have, moreover, found pieces drifting in the sea off the east coast, and, like earlier travellers, have arrived at the conclusion that much the greater part of it can only have come from Siberia, while a smaller portion may possibly have come from America. For amongst it are to be found fir, Siberian larch, and other kinds of wood peculiar to the north, which could scarcely have come from any other quarter. Interesting in this respect are the discoveries that have been made on the east coast of Greenland by the second German Polar Expedition. Out of twenty-five pieces of driftwood, seventeen were Siberian larch, five Norwegian fir (probably *Picea obovata*), two a kind of alder (*Alnus incana*?), and one a poplar (*Populus tremula*? the common aspen), all of which are trees found in Siberia.

“By way of supplement to these observations on the Greenland side, it may be mentioned that the *Jeannette* expedition frequently found Siberian driftwood (fir and birch) between the floes in the strong northerly current to the northward of the New Siberian Islands.

“Fortunately for the Eskimo, such large quantities of this driftwood come every year to the coasts of Greenland that in my opinion one cannot but assume that they are conveyed thither by a constantly flowing current, especially as the wood never appears to have been very long in the sea—at all events, not without having been frozen in the ice.

“That this driftwood passes south of Franz Josef Land and Spitzbergen is quite as unreasonable a theory as that the ice-floe with the relics from the *Jeannette* drifted by this route. In further disproof of this assumption it may be stated that Siberian driftwood is found *north* of Spitzbergen in the strong southerly current, against which Parry fought in vain.

“It appears, therefore, that on these grounds also we cannot but admit the existence of a current flowing across, or in close proximity to, the Pole.

“As an interesting fact in this connection, it may also be mentioned that the German botanist Grisebach has shown that the Greenland flora includes a series of Siberian vegetable forms that could scarcely have reached Greenland in any other way than by the help of such a current conveying the seeds.

“On the drift-ice in Denmark Strait (between Iceland and Greenland) I have made observations which tend to the conclusion that this ice too was of Siberian origin. For instance, I found quantities of mud on it, which seemed to be of Siberian origin, or might possibly have come from North American rivers. It is possible, however, to maintain that this mud originates in the glacier rivers that flow from under the ice in the north of Greenland, or in other unknown polar lands; so that this piece of evidence is of less importance than those already named.

“Putting all this together, we seem driven to the conclusion that *a current flows at some point between the Pole and Franz Josef Land from the Siberian Arctic Sea to the east coast of Greenland*.

“That such must be the case we may also infer in another way. If we regard, for instance, the polar current—that broad current which flows down from the unknown polar regions between Spitzbergen and Greenland—and

consider what an enormous mass of water it carries along, it must seem self-evident that this cannot come from a circumscribed and small basin, but must needs be gathered from distant sources, the more so as the Polar Sea (so far as we know it) is remarkably shallow everywhere to the north of the European, Asiatic, and American coasts. The polar current is no doubt fed by that branch of the Gulf Stream which makes its way up the west side of Spitzbergen; but this small stream is far from being sufficient, and the main body of its water must be derived from farther northward.

“It is probable that the polar current stretches its suckers, as it were, to the coast of Siberia and Bering Strait, and draws its supplies from these distant regions. The water it carries off is replaced partly through the warm current before mentioned which makes its way through Bering Strait, and partly by that branch of the Gulf Stream which, passing by the north of Norway, bends eastward towards Novaya Zemlya, and of which a great portion unquestionably continues its course along the north coast of this island into the Siberian Arctic Sea. That a current coming from the south takes this direction—at all events, in some measure—appears probable from the well-known fact that in the northern hemisphere the rotation of the earth tends to compel a northward-flowing current, whether of water or of air, to assume an easterly course. The earth’s rotation may also cause a southward-flowing stream, like the polar current, to direct its course westward to the east coast of Greenland.

“But even if these currents flowing in the polar basin did not exist, I am still of opinion that in some other way a body of water must collect in it, sufficient to form a polar current. In the first place, there are the North European, the Siberian, and North American rivers debouching into the

Arctic Sea, to supply this water. The fluvial basin of these rivers is very considerable, comprising a large portion of Northern Europe, almost the whole of Northern Asia or Siberia down to the Altai Mountains and Lake Baikal, together with the principal part of Alaska and British North America. All these added together form no unimportant portion of the earth, and the rainfall of these countries is enormous. It is not conceivable that the Arctic Sea of itself could contribute anything of importance to this rainfall; for, in the first place, it is for the most part covered with drift-ice, from which the evaporation is but trifling; and, in the next place, the comparatively low temperature in these regions prevents any considerable evaporation taking place even from open surfaces of water. The moisture that produces this rainfall must consequently in a great measure come from elsewhere, principally from the Atlantic and Pacific oceans, and the amount of water which thereby feeds the Arctic Sea must be very considerable. If we possessed sufficient knowledge of the rainfall in the different localities it might be exactly calculated.[5]

"The importance of this augmentation appears even greater when we consider that the polar basin is comparatively small, and, as has been already remarked, very shallow; its greatest known depth being from 60 to 80 fathoms.

"But there is still another factor that must help to increase the quantity of water in the polar basin, and that is its own rainfall. Weyprecht has already pointed out the probability that the large influx of warm, moist atmosphere from the south, attracted by the constant low atmospheric pressure in the polar regions, must engender so large a rainfall as to augment considerably the amount of water in the Polar Sea. Moreover, the fact that the polar basin

receives large supplies of fresh water is proved by the small amount of salt in the water of the polar current.

“From all these considerations it appears unquestionable that the sea around the Pole is fed with considerable quantities of water, partly fresh, as we have just seen, partly salt, as we indicated further back, proceeding from the different ocean currents. It thus becomes inevitable, according to the law of equilibrium, that these masses of water should seek such an outlet as we find in the Greenland polar current.

“Let us now inquire whether further reasons can be found to show why this current flows exactly in the given direction.

“If we examine the ocean soundings, we at once find a conclusive reason why the main outlet must lie between Spitzbergen and Greenland. The sea here, so far as we know it, is at all points very deep; there is, indeed, a channel of as much as 2500 fathoms depth; while south of Spitzbergen and Franz Josef Land it is remarkably shallow—not more than 160 fathoms. As has been stated, a current passes northward through Bering Strait and Smith Sound, and the sounds between the islands north of America, though here, indeed, there is a southward current, are far too small and narrow to form adequate outlets for the mass of water of which we are speaking. There is, therefore, no other assumption left than that this mass of water must find its outlet by the route actually followed by the polar current. The channel discovered by the *Jeannette* expedition between Wrangel Land and the New Siberian Islands may here be mentioned as a notable fact. It extended in a northerly direction, and was at some points more than 80 fathoms deep, while at the sides the soundings ran only to 40 or 50 fathoms. It is by no means impossible that this channel may be a continuation of the channel between

Spitzbergen and Greenland,[6] in which case it would certainly influence, if not actually determine, the direction of the main current.

"If we examine the conditions of wind and atmospheric pressure over the Polar Sea, as far as they are known, it would appear that they must tend to produce a current across the Pole in the direction indicated. From the Atlantic to the south of Spitzbergen and Franz Josef Land a belt of low atmospheric pressure (minimum belt) extends into the Siberian Arctic Sea. In accordance with well-known laws, the wind must have a preponderating direction from west to east on the south side of this belt, and this would promote an eastward-flowing current along the north coast of Siberia, such as has been found to exist there.[7] The winds on the north side of the minimum belt must, however, blow mainly in a direction from east to west, and will consequently produce a westerly current, passing across the Pole towards the Greenland Sea, exactly as we have seen to be the case.

"It thus appears that, from whatever side we consider this question, even apart from the specially cogent evidences above cited, we cannot escape the conclusion that a current passes across or very near to the Pole into the sea between Greenland and Spitzbergen.

"This being so, it seems to me that the plain thing for us to do is to make our way into the current on that side of the Pole where it flows northward, and by its help to penetrate into those regions which all who have hitherto worked *against* it have sought in vain to reach.

"My plan is, briefly, as follows: I propose to have a ship built as small and as strong as possible—just big enough to contain supplies of coals and provisions for twelve men for five years. A ship of about 170 tons (gross) will probably suffice. Its engine should be powerful enough to give a

speed of 6 knots; but in addition it must also be fully rigged for sailing.

“The main point in this vessel is that it be built on such principles as to enable it to withstand the pressure of the ice. The sides must slope sufficiently to prevent the ice, when it presses together, from getting firm hold of the hull, as was the case with the *Jeannette* and other vessels. Instead of nipping the ship, the ice must raise it up out of the water. No very new departure in construction is likely to be needed, for the *Jeannette*, notwithstanding her preposterous build, was able to hold out against the ice pressure for about two years. That a vessel can easily be built on such lines as to fulfil these requirements no one will question who has seen a ship nipped by the ice. For the same reason, too, the ship ought to be a small one; for, besides being thus easier to manœuvre in the ice, it will be more readily lifted by the pressure of the ice, not to mention that it will be easier to give it the requisite strength. It must, of course, be built of picked materials. A ship of the form and size here indicated will not be a good or comfortable sea-boat, but that is of minor importance in waters filled with ice such as we are here speaking of. It is true that it would have to travel a long distance over the open sea before it would get so far, but it would not be so bad a sea-boat as to be unable to get along, even though sea-sick passengers might have to offer sacrifices to the gods of the sea.

“With such a ship and a crew of ten, or at the most twelve, able-bodied and carefully picked men, with a full equipment for five years, in every respect as good as modern appliances permit of, I am of opinion that the undertaking would be well secured against risk. With this ship we should sail up through Bering Strait and westward

along the north coast of Siberia towards the New Siberian Islands[8] as early in the summer as the ice would permit.

“Arrived at the New Siberian Islands, it will be advisable to employ the time to the best advantage in examining the conditions of currents and ice, and to wait for the most opportune moment to advance as far as possible in ice-free water, which, judging by the accounts of the ice conditions north of Bering Strait given by American whalers, will probably be in August or the beginning of September.

“When the right time has arrived, then we shall plough our way in amongst the ice as far as we can. We may venture to conclude from the experience of the *Jeannette* expedition that we should thus be able to reach a point north of the most northerly of the New Siberian Islands. De Long notes in his journal that while the expedition was drifting in the ice north of Bennett Island they saw all around them a dark ‘water-sky’—that is to say, a sky which gives a dark reflection of open water—indicating such a sea as would be, at all events, to some extent navigable by a strong ice-ship. Next, it must be borne in mind that the whole *Jeannette* expedition travelled in boats, partly in open water, from Bennett Island to the Siberian coast, where, as we know, the majority of them met with a lamentable end. Nordenskiöld advanced no farther northward than to the southernmost of the islands mentioned (at the end of August) but here he found the water everywhere open.

“It is, therefore, probable that we may be able to push our way up past the New Siberian Islands, and that accomplished we shall be right in the current which carried the *Jeannette*. The thing will then be simply to force our way northward till we are set fast.[9]

“Next we must choose a fitting place and moor the ship firmly between suitable ice-floes, and then let the ice screw