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ORIGINAL ARTICLES.

I.—Account of an Expedition to Greenland in the year 1870.

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Part I.

(PLATE VII.)

THE information gained by us during the first three Swedish expeditions to Spitzbergen having, either directly through our own experience, or indirectly through conversation with most of the intelligent and bold whalers and walrus-hunters of Northern Norway, fully confirmed the observations of Scoresby, Phipps, Tschitschagoff, Parry, Buchan, Franklin, Clavering and others, respecting the impossibility of penetrating by ship during the summer through the crowded ice-masses to the north of Spitzbergen, far beyond the 80th degree of latitude, an Arctic Expedition was sent out from Sweden in 1868, having for its object, among other things, to renew during the autumn months the attempt to sail towards the pole from the northern coast of Spitzbergen. I have, in a report[1] of the expedition of 1868, given a brief account of the result of that undertaking, which showed that even at that period of the year, when the water is most free from drift-ice, the polar basin, at least to the north of Europe, and doubtless also to the north of America and Asia, is so full of drift-ice that all possibility of passing through it in a ship is out of the question.

This unsuccessful attempt did not, however, diminish the interest in Sweden for the polar question, but seemed, on the contrary, to excite to new exertions in the same direction. Almost immediately on the return of the expedition (1868), preparations were set on foot in Gothenburg to collect the necessary means for a new polar expedition, the object of which was to proceed during winter from the Seven Islands by sledge towards the Pole, and in less than a year the amount considered necessary for the purpose was collected.

It was our intention to use Greenland Esquimaux dogs for the proposed sledge-journeys. I determined, however, first personally to convince myself of the applicability of these animals as beasts of draught, and of the possibility of obtaining a sufficient number, and

[1] Proceedings of Royal Geogr. Soc., xiii., No. iii., p. 151 (1869).

this gave occasion to the expedition to Greenland, which forms the subject of the present description. But, before specially entering upon this subject, I take the opportunity to offer a few brief observations on the many suggestions that have been made and discussed by geographers concerning the most practicable way of approaching the Pole, and thus explain more in detail the reasons for the choice made by us of the proposed starting-point, plan, etc., of our expedition.

The real polar basin north of the 80th degree may be approached by the following ways:—

1st.—*Way to the east of Spitzbergen.*—Petermann has proposed that an attempt be made to pass, *by ship*, through the broad channel that separates Spitzbergen from Nova Zembla.

Respecting the condition of that sea ("Spitzbergen Sea," Petermann), as regards ice, we are in possession of numerous observations, made partly by older polar travellers, or rather searchers after a north-east passage; partly by the expeditions repeatedly sent to that part by the Russian Government; and lastly by sundry German, English, and especially Norwegian hunting and fishing expeditions of late years. These observations all agree that an unbroken ice-belt extends between these islands, at least as far as the 78th or 79th degree of latitude, leaving, in favourable years only, a broad channel running to 80°, partly along the east coast of Spitzbergen, and partly along the western coast of Nova Zembla.

How difficult it is, east of Spitzbergen, to reach as far as 80°, is evidenced by the circumstance that out of all the many attempts that have been made to sail round Nova Zembla, only one has succeeded, viz., Johannessen's remarkable voyage in the summer of 1870.[1] Norwegian fishermen from the south, though attracted by a rich booty, have never, on the eastern coast of Spitzbergen, reached 80°, and, although one might probably on the western coast reach the Seven Isles every year, the passage round the north-eastern extremity to the Thousand Isles has only once been successfully attempted, and even then with the hazard of being driven by the adjacent ice-fields upon the steep glaciers of the north-east land, and there crushed, as happened in 1864 to three fishing vessels. It is therefore utterly impossible to proceed by ship in this direction, nor does either Nova Zembla, or the eastern coast of Spitzbergen, or the as yet but little known Gillies Land, offer any easily accessible starting-point for sledge-journeys, situated sufficiently north. This course is then hardly to be thought of for a polar expedition with any prospect of success.

2nd.—*The way along the eastern coast of Greenland*, also ardently urged by Petermann. Numerous expeditions—of which only a few have been able to penetrate the ice so as to approach the coast, and only two, viz. Clavering and Sabine's in 1823, and the German polar expedition of 1869–70, reached 75°–76°—have made known that portion of the Arctic Ocean; and we know that the sea here, even at

[1] This was written in December, 1870. The expedition of the last summer seems to me wholly to confirm the result of the older expeditions, but by no means to prove the existence of an open polar sea extending to the Pole.

60° lat., is more impassable than at a corresponding latitude in any other part of the northern hemisphere. A broad, almost always densely-crowded, stream of ice is constantly carried down by the north polar stream, not only along the whole eastern coast of Greenland, but, during a great part of the year, past Cape Farewell a considerable distance into Davis Strait. Among the many empty reasons often adduced for the existence of an open polar basin, this stream is also appealed to, by which it is alleged that the ice in the polar basin must shortly be carried down into the Atlantic. A simple comparison of the extent and velocity of the ice-stream with the area of the polar-basin is sufficient to show the futility of this argument. If we suppose the entire limit of the stream to lie in 5° west longitude from Greenwich, its breadth will be about 200 miles. With a velocity of four miles a day—(the German expedition, 1869–70, after the wreck of the "Hansa," drifted about 600 miles southward in 200 days)—by this process about 100,000 square miles would be removed from the polar basin during June, July, August, and September; that is to say, in the course of the months during which new ice is not forming in the polar basin, an area which does not constitute the tenth part of that basin north of 80°.

The following enumeration of the attempts which have been made to penetrate to the eastern coast of Greenland fully shows the difficulties met with in this part of the polar basin.

1579.[1] Jakob Allday was sent out by the Danish King, Frederick II., to rediscover Greenland, advanced so far as to see the east coast, but returned, as the ice nowhere permitted him to land (Rink).

1588 (1581 Rink, 1578 Graah). Mogens Heinesen was sent to rediscover Greenland for the benefit of Denmark, but returned without having been able to land.

1605. A new Danish expedition was sent out, under Godske Lindenow, and reached a harbour, probably on the south-western part of the coast (Rink).

1607. Carsten Richardsen was sent out to Greenland, but was everywhere prevented by ice from landing.

1607. H. Hudson reaches the eastern coast of Greenland, at 73½° latitude.

1652—54. Three expeditions, provided by H. Möller, and commanded by David Danel. These expeditions sailed along a considerable part of the west coast of Greenland, and had *nearly, but only nearly*, succeeded in landing on the east coast.

1670. A Danish expedition, sent out under Otto Axelsen. The expedition returned without accomplishing its object; hindered, in all probability by drift-ice from landing on the eastern coast.

[1] In this account, in which I have principally confined myself to the last generally known Danish expeditions, because their especial object was to reach East Greenland, I have followed partly W. A. Graah, *Undersögelses-Reise til Östkysten af Grönland. Kjöbenhafn*, 1832, and partly H. Rink, whose excellent work, richly stored with observations, "*Grönland, geographisk och statistisk beskrevet*," 3 Delar. *Kjöbenhafn*, 1852–1857, I have frequently made use of in this account.

1671. A new expedition, sent out under the same person. The expedition never returned, being most probably wrecked amidst the drifting ice.

1751—1753. Peder Olsen Vallöes' remarkable expedition in an "umiak" (Greenlandish boat rowed by women) from the west coast round Cape Farewell, in which he, in spite of a thousand difficulties amidst the crowded ice-masses, succeeded in reaching 60° 28′.

1786—1787. Expeditions under Lövenörn, Egede, and Rothe endeavoured to penetrate from Iceland to east coast of Greenland, but could only see its lofty hills at a distance. The land being rendered quite inaccessible by ice.

1819. Scoresby succeeded in reaching the east coast of Greenland, which during his many years of whaling-voyages he had always previously found completely blockaded by ice.

1823. Sabine and Clavering sail from Spitzbergen to the eastern coast of Greenland, which they reach in latitude 74°—75°.

1828—1831. Graah's journey round Cape Farewell, in a "koneboad." He succeeded with great difficulty in reaching 65° 15′ N.L. His account of his journey, which Dr. Petermann adduces as evidence that the east coast is free from ice, gives us clearly to understand, that it is only under very unusually favourable circumstances that a ship can make its way in these parts through the packed ice-masses.

1868. Dr. Petermann's expedition, under Capt. Koldewey, strenuously but vainly endeavoured to approach the eastern coast of Greenland.

1868. The Scottish whaler *David Gray* finds the east coast of Greenland free from ice at 74° N.L.

1868. The Swedish Polar expedition endeavours twice to approach the eastern coast of Greenland to the north of the 78th degree, but was, in the longitude of Greenwich, hindered by impenetrable masses of ice from proceeding farther towards the east.

1869. The second German Polar expedition under Koldewey and Hegemann. One ship lost in 70° 50′ N.L. among the ice-masses on the eastern coast, and the brave crew borne down among the densely packed ice-masses to the southern extremity of Greenland. The other ship reaches land at 75°—76°, but finds the ocean to the north completely blockaded by ice.

When we consider that all the Danish expeditions were undertaken with the expectation of recovering almost a northern Eldorado, which (as they imagined) had formerly been every year sailed over in frail Vikings' vessels,—and that these expeditions were conducted by efficient seamen well practised in their work by expeditions to Iceland and Finmark, at a time when not only Dutchmen and Englishmen, but also the Danes themselves, in other parts of the polar regions, had penetrated so far that even up to the present time in many places no farther advance has been made,—their repeated failures must surely prove, not only the impossibility of reaching the Pole by this course, but also the unfitness of East Greenland as

the starting-point for such expeditions, whether the object be to attain the Pole on board ship, or in a boat, or by dogs, or any other method of conveyance.

3rd. *The way through Behring's-strait,* proposed by Gustave Lambert. The waters north of Behring's-strait are one of the least known parts of the Arctic Ocean; it is, however, known that the sailor is there met by impassable ice-masses in a latitude where to the north of Europe scarcely any signs of ice are met with, even in the midst of winter, and that only a most unusual occurrence made it once possible for a whaler in these parts to reach 73° 30′ N.L. To choose this course for an expedition towards the Pole would therefore be contrary to all reason; and when the proposer of this plan, in a public lecture, stated that it might be confidently expected in France that the Tricolour would be waving at the North Pole of the Earth by the time the news of the expedition's arrival at the Sandwich Isles should reach Paris, it showed but a sorry acquaintance with the state of the Polar Seas—unless, indeed, we are to consider the words as a mere rhetorical phrase. Nevertheless, it may be adduced as one among various reasons that might be given for an Arctic (not Polar) expedition to these parts, that here, in the narrow strait between the old and new worlds, so many circumstances are as yet unexplored in natural history, geology, ethnography, and geography, that such an expedition, even if unable to proceed to the 80th degree, would probably furnish important scientific results, and greatly extend our knowledge of the wonderful kingdom of nature than a polar expedition following any other of the possible routes (over Spitzbergen or Smith's Sound), even if that expedition were crowned with perfect success. But if an expedition to Behring's Straits is to be of any value, it is an indispensable condition that it be manned, not with curious and adventurous tourists, but with men fully competent for scientific research.

4th. *The way over Spitzbergen,* and

5th, *that over Smith's Sound.*—These routes have been recommended by English, American, and Swedish polar voyagers, and as, in my opinion, it is only by choosing one or other of them as a starting-point that any prospect of attaining the proposed end can be entertained, and as moreover the advantages they each offer are in general of the same kind, I shall accompany this reference to them by a few short remarks on them in common.

The name "Polynia," imported from Siberia, has unfortunately produced a very considerable confusion of ideas in geographical science. In the first place, Polynia has been erroneously interpreted as a sea free from ice and accessible to ships, whereas, on the contrary, that word signifies sometimes a sea covered with broken ice (but not on that account navigable), sometimes a greater or smaller opening in an ice-field produced by accidental circumstances. Again, contrary to all real experience, the whole polar basin has been declared navigable simply because the famous Russian polar explorer, Wrangel, found a Polynia some miles north of the northern coast of Siberia, in about the latitude of North Cape, and Stewart,

in an American polar expedition, (as we now know through Petersen's more critical description,) gave a very exaggerated account of a larger opening in the ice in a part of the Polar Sea situated to the north of Smith's Sound, which nevertheless was not accessible even to a boat from the adjoining Rensselaer Harbour. In the observations of Wrangel, Kane, and Morton, I cannot discover any signs of a reason for assuming the existence of an open Polar Sea. It is, however, of importance in fitting out such expeditions as endeavour to approach the Pole on the ice by sledge, inasmuch as it shows that one cannot, even in the midst of winter, reckon on an unbroken field of ice. The travellers in these sledge-journeys will thus be obliged to take with them a boat of sufficient dimensions to contain the whole company, and so light as not too much to limit the number of days for which they can carry provisions. This circumstance renders it necessary to choose for starting-point an easily accessible spot situated as far north as possible; and a glance at the terrestrial globe shows us that only two points can be thought of for such a purpose, viz. the northern coast of Spitzbergen, and the most northerly part of the west coast of Greenland, or perhaps rather the corresponding part, Grinnel-land, situated on the other side of the narrow Smith's Sound. Each of these routes has its advantages. Spitzbergen lies near Europe, and is accessible all the year up to a latitude somewhat exceeding 80°, and one can almost every year sail over a sea free from ice even north of the Seven Islands.

An expedition, with the north coast of Spitzbergen for its base, might then choose as its starting-point a spot situated very considerably nearer the Pole, than if it set out from Smith's Sound, where it is hardly possible to reckon on penetrating by ship much beyond 78°. This advantage on the side of Spitzbergen is however, in a great measure, if not wholly, counterbalanced by the circumstance, that in proceeding from Smith's Sound one advances for a considerable distance with land alongside, an immense advantage in the establishment of depots, etc., as also, though perhaps in a less degree, by the fact that the coasts at Smith's Sound are inhabited by an Esquimaux tribe, which, although now since its contact with Europeans thinned and dying out, can nevertheless, in spite of its helplessness, during the long and dangerous winter night, offer an assistance to an expedition that is to pass the winter there, which can hardly be compensated by any outfit from home, though designed with all the aids of civilization. For an expedition that can command unlimited pecuniary means, that is furnished with provisions for several years, and can afford to lose one or two of its ships in attempting to advance to winter quarters north of Rensselaer Harbour, I conceive, therefore, that this route may be preferable.[1] But with

[1] An expedition sent from America or England over Smith's Sound ought undoubtedly to have at its disposal several ships provided with steam, one large vessel, which should never proceed to parts from which it cannot with safety return, and several smaller (60 to 100 tons), which at different times and by different routes should endeavour separately to advance through the ice, secure, in case of wreck, of

the means at the disposal of the Swedish expedition, Spitzbergen ought to be chosen as the starting-point, more especially as we are thus enabled to lay the last stone upon a series of researches carried on during the course of several years concerning the physical condition and natural history of Spitzbergen.

These are the considerations to which most weight has been assigned in devising the plan of the Swedish expedition, which is to proceed to the north in 1872. It is intended that the expedition shall consist of three or four scientific men (among whom are to be a natural philosopher and a zoologist, the latter for the study of marine animal life during the winter), with the necessary crew, and that it shall pass the winter in a cot erected for the purpose, if possible, on the Seven Isles, with a magnetic observatory, storehouse, etc. From this point the expedition is to make during the latter part of the winter sledge-journeys northward, and, if the time admit of it, eastward toward Gillies Land. But it will be time to communicate further notices of this proposed polar colony, its composition, preparations, etc., when it is in possession of that of which it is as yet destitute—the interest of a *fait accompli*. I therefore proceed to a description of this summer's journey to Greenland, undertaken, as has been already mentioned, as preparatory to the polar expedition itself, occupying myself less with our own adventures, which for the public in general are but of little interest, than with giving an account of the scientific results obtained.

Greenland is not only the first land discovered in the new world, but it is the oldest European colony on the other side of the Atlantic, which, ever since its first planting, near a thousand years ago by Norse-Icelandic Vikings, has constantly, though for a time forgotten, belonged to the same mother-land; and it is honourable to that mother-land that the wild tribes, which for a while after the foundation of the colony came in contact with the colonists, have not been brought into that degraded condition indicative of speedily impending extinction which is the case with the original inhabitants of many other lands visited by European civilization. The Greenlanders, on the contrary, seem to be in a fair way of development to a small peculiar nationality, which is in a certain degree acquiring the culture of the Caucasian race. Already almost every West-Greenlander can read and write; a number of small works, not only on religion, but on history, geography, and natural history, are printed in Greenlandish; and a Greenlandish newspaper, which in respect of typography may vie with most of the European popular newspapers, is printed at Godthaab.

Greenland, as is known, belongs to Denmark, but is not governed by the ordinary state authorities, but by a Trading Directory (origin-

the possibility of returning to the depot-ship. Should any of these small vessels succeed in reaching an anchoring-place, e.g. in 81° lat., the success of the expedition would be much better secured than if the large vessel wintered in say 79° lat.; and if one of the small vessels should be lost, the loss is comparatively trifling. Such an event need not be accompanied by loss of life.

ally a private trading company), which has for its object to trade with the inhabitants for the benefit of the Danish state, that is to say, to buy up at certain, often merely nominal prices, train oil, skins, down, and other of Greenland's hunting and fishing productions, and to supply the Greenlanders with European wares instead, many of which, as for example firearms, ammunition, coffee, sugar, bread, have long been necessaries to the inhabitants. The chief management of the Greenland trade is confided partly to certain Directors residing at Copenhagen, partly to two resident Inspectors immediately appointed by the ministry. Under these are at present eleven Colonial Governors resident in Greenland (Juliansh aab, Fredrikshaab, Godthaab, Sukkertoppen, Holsteinsborg, in the inspectorate of South Greenland; and Godhavn, Egedesminde, Jakobshavn, Ritenbenk, Omenak, Upernivik, in the inspectorate of North Greenland). To aid the Colonial Governors, they have "assistants" and "volunteers" (aspirants to the place of colonial governor), as also "emissaries" ("utliggare"). These last-mentioned offices are sometimes given to Greenlanders, the others exclusively to Danes. There are also in every colony some Danish artisans.

The shipping business in Greenland is carried on by the Greenland trade in the Company's own ships, which, as the cabins are fitted up to receive three or four passengers, offer a cheap though slow passage. The time of starting from Copenhagen is from the month of April to June, and all the vessels, unless hindered by ice, as sometimes happens in the harbours of South Greenland, return in the autumn, usually in the middle or at the latter end of September. A few of the ships, that have sailed earliest, return however in July, so as to make a second journey during the summer. The passage out usually occupies five to eight, the return voyage three to six weeks.

In the veteran ship of the company, the brig "Hvalfisken," commanded by Captain Sejstrup, the Swedish expedition departed from Copenhagen on the 15th of May, 1870. My original intention was only to make a short visit to Greenland, in order to take some steps preparatory to the contemplated polar expedition. I was however but little inclined to consecrate the whole summer to that purpose, and determined accordingly, with the permission of one of the most liberal patrons both of the preceding and the coming expeditions, Mr. Oscar Dickson, to expand the tour to Greenland into a little unpretending expedition, having for its object not only to make preparations for the future polar expedition, but also to carry on such researches in natural history, geology and geography as might be of importance in arranging the collections and observations made at Spitzbergen. For this reason the number of members of the new expedition was increased to four, including, besides myself, Dr. Sv. Berggren from Lund, also Dr. P. Öberg and Dr. Th. Nordström from Upsala.

Our plan was, on arriving in Greenland, to set in order and completely man, either with Danes or natives, two whale-boats. With one of these Dr. Nordström[1] and I were to penetrate into Auleitsi-

[1] During the voyage over Dr. Nordström caught a cold, which fortunately was not

vikfjord, never previously visited by European, and up to the present time not mapped; afterwards, for the purpose of geographical investigations, and especially for collecting fossil plants, we were to go round the shores of the Waigat, Disko Bay and Omenakfjord. Dr. Öberg and Dr. Berggren were, on the other hand, to travel in their boat round Disko Bay, and collect contributions to its flora and fauna. Öberg was for this purpose furnished with abundant zoological apparatus.

The undertaking excited, as usual, much interest at home. His Swedish Majesty's fleet, among other things, provided the expedition with the necessary apparatus for sounding, and the Royal Academy of Science in Stockholm lent chronometers, astronomical instruments, etc.

In the earlier times of communication with Greenland, the passage out was united with great difficulties, owing to the quantities of drifting ice met with in doubling Cape Farewell; experience however afterwards showed that this inconvenience might be almost entirely got rid of by entering Davis Strait between 57½° and 58½° N.L., that is, at least 1° or 2° south of that dangerous headland, which few of the Greenland travellers of our time have ever seen, and by this means one may in the spring sail up to North Greenland from Denmark, not indeed without now and then fetching a compass on account of the ice, but without being exposed to any very much greater risk than in other channels free from ice. On the present occasion also the "Hvalfisk" made that (by long experience) approved circuit, and, after four weeks' voyage, reached the longitude of Cape Farewell. Here we were exposed to a very violent storm, during which the ship was obliged to lie to nearly a fortnight, afterwards north of 60° lat. we were further obliged to make a number of delaying circuits, to avoid the ice driven by the storm to the mouth of the Strait. In consequence of this, our voyage out occupied about eight weeks. In fact, we landed on the 2nd of July at Godhavn, originally a Danish whalers' station, now, since the Danish whale-fisheries have been discontinued, one of the minor Danish colonies in that tract, but still, in consequence of its central position and of old custom, the seat of the principal magistracy in North Greenland, the *Inspectorate of* North Greenland.

Hudson, and other veteran mariners of the Arctic seas, mention the variety of colours that distinguish the water in certain parts of the polar sea, which are frequently so sharply distinguished that a ship may sail with the one side in blue and the other in greyish-green water. It was at first supposed that these colours were indications of different currents—the green of the Arctic, the blue of the Gulf-stream. Later, Scoresby affirmed that the phenomenon arose from the presence of innumerable organisms, which he seems to have considered as crustacea, in the water. This observation has since

of long duration, but hindered him from taking part, as had been intended, in the journey on the ice. His place was supplied by Berggren, who accordingly accompanied me to Auleitsivik.

been continued, partly by the former Swedish arctic expedition, and partly by Dr. Brown,[1] during the voyages made by him in the arctic seas as Surgeon in a whaler, and as a member of Whymper's expedition. We also endeavoured to divert the tedious monotony of the voyage by observations on this phenomenon.

The sea-water in the neighbourhood of Spitzbergen is marked by two sharply distinguished colours—greyish-green and fine indigo blue. In the Greenland seas we also find water with a very decided shade of brown. These colours are seen most pure if one looks vertically down from the ship to the surface of the water through a somewhat long pipe. The green, or rather grey-green, water is generally met with in the neighbourhood of ice (whence it was supposed to arise from the arctic current); the blue where the water is free from ice; the brown, as far as I am aware, chiefly in that part of Davis Strait which is situated in front of "Fiskernaes." When specimens of the water are taken up in an uncoloured glass, it appears perfectly clear and colourless, nor can one with the naked eye discover any organisms to account for the colour. But if, when the velocity of the ship allows of it (i.e. when the ship makes from one to three knots an hour), a fine insect net be towed behind the ship, it will soon, in the green and brown water, be found covered with a film of in the former case green, in the latter case brown slime, of organic origin, and evidently the real cause of the abnormal colour of the sea-water. Just in these parts may be found swarms of small crustacea, which live upon this slime, and in their turn, directly or indirectly, become the food of larger marine animals. The blue water on the contrary, at least in these seas, deposits no slime upon the insect-net, and is far less frequented by Crustacea, Annelides, etc., than the green. Thus, as Brown, in the article above referred to, remarks, the presence of this slime, inconsiderable as it is, but spread over hundreds of thousands of square miles, is a condition necessary for the subsistence, not only of the swarms of birds that frequent the northern seas, but also of that giant of the animal creation, the whale, and all branches of industry dependent on whale-fisheries.

Of these remarkable organisms Dr. Öberg collected specimens when possible, during the voyage, which it is intended hereafter to submit to a careful scientific examination, in conjunction with similar specimens from preceding expeditions. Here we need only mention that the slime itself in each particular place is formed only of a few species of Diatomacea, often so large that after drying the mass, the siliceous frustules may be discerned with the naked eye; but on the other hand, different parts of the ocean exhibit entirely different forms, so that, for example, the green slime in one place has sometimes not a single species identical with that in another. A long continued collection will therefore be required to explain this scanty but, nevertheless, so remarkable and, we may safely say, important flora of the ocean's surface.

In Copenhagen our expedition was most kindly received by the

[1] A very interesting essay on this subject has been published by Dr. Brown: *The Farmer*, Jan. 1, 1868, p. 16.

Board of Directors of the Greenland trade, who not only granted us the same favourable terms for our voyage out in the "Trade's" ships which they grant to their own officers, but also gave us an unlimited letter of credit on their various stations, together with a letter patent of recommendation to their Governors, who also everywhere received us in the most hospitable manner, and assisted us in getting boats, provisions, and particularly crews. The obtaining of crews in Greenland is an especially difficult matter. A Greenlander's desire to earn is, in general, confined to the day's necessities; his unwillingness to undertake any service is particularly great; and lastly, he is so attached to his home, his wife and his children, and, if not provided with these, to his in general very ill-treated dogs, that already, after a fortnight's separation, he is quite homesick. This is equally true of the thoroughbred Greenlander and of the mixed races, which form a considerable portion of the population of the colony. The Danish artisans in Greenland, in fact, often marry natives. The children in these cases are said seldom to learn their father's language, but in general only Greenlandish, which language—difficult as it is to elder persons consciously or unconsciously accustomed to totally different linguistic rules,—perhaps on account of the abundance of expressions for the objects and actions amid which the children grow up—is caught by them with such ease and partiality that even pure European parents find it difficult to get their children to speak their real mother-tongue. Moreover, the necessity of earning their bread soon compels these children to have recourse to purely Greenlandish sources of gain, and to adopt Greenlandish customs. The child of a Danish father and a Greenlandish or mixed-race mother thus becomes, both in language and manners, a complete Greenlander; perhaps, however, a little less given to think *only* of the day actually passing, and therefore with a somewhat better prospect of maintaining himself than the more careless original natives.

Thus, while European customs of society and European language are almost powerless when in competition with those of Greenland, the European features and form of the body are preserved, almost without any alteration. The mixed-race, therefore, which meets us in almost every colony, is distinguished by a tall figure, often with light hair, and not unfrequently a very handsome person, if not too completely spoiled by Greenlandish dirt.

European features seem to have something more attractive to a Greenlander's sense of the beautiful than the flat form of countenance common among themselves, and thus many skin-clad canoe-men are descended, through several generations, from purely European fathers, married with women of mixed race; and there is, therefore, more Danish, Norwegian, Swedish, or English, than Greenlandish blood in their veins. Anything of that readiness to face danger and seek adventures, which, inherited from the wild piratic and chivalrous ages, forms a feature in our national character, will be looked for in vain in the descendants of Europeans in Greenland; and the European with Greenlandish blood in his veins is as timid and faint-

hearted as the Greenlander himself. Real service, in the European sense of the word, he will seldom bear long. He is unwilling, for any length of time, to leave his turf-house, his wife, children, and dogs. He avoids every danger to which his fishing does not drive him—nay, not only danger, but what he vainly imagines to be such; as, for example, a longer sail in a capacious and safe whale-fishing boat.

A Greenlander cannot now, at least in winter, dispense with several articles of food imported from Europe, e.g. bread and coffee, but he can never spare sufficient to purchase at once enough even for a week. He is accordingly obliged to reside so near a Danish trading-station (colony or depot) as to be able daily to barter the train and skin of the captured seal for bread, coffee, sugar, etc. The Greenlanders' winter dwellings are, therefore, seldom situated far from the trading-station, but in general crowded together in its immediate neighbourhood. But a Greenlander, who is active and able to hunt, is glad to leave his close hut in the summer, and betake himself, together with the women and children of his household, to a fishing or hunting district, at a distance of several dozen miles, where the family settles in a summer tent made of reindeer hides, to live for a time exclusively on the produce of the land.

On this account, there is in most of the colonies, during the summer, a dearth of men, and especially of such as are able and willing to undertake a longer journey in a whaling-boat. Immediately on our arrival at Godhavn we experienced this, finding it utterly impossible here to get together sufficient crews to man the two whaling-boats indispensably necessary for us. After more than a week's vain parleying, we were, therefore, glad to avail ourselves of the opportunity offered by one of the Trade's vessels of a passage for ourselves and our apparatus (the zoologists' chests, lines, dredges, etc., alone loaded a couple of boats) to Egedesminde, where we were assured we should meet with less difficulty.

We arrived at Egedesminde, a colony situated on the southern side of Disko Bay, after scarce half a day's voyage, and, thanks to the assistance given us by the hospitable governor of the place, Mr. Bollbroe, we found ourselves, within a few hours after our arrival, in a condition to begin our summer's work in earnest. One whaling-boat was purchased, and another was borrowed of Bollbroe, who also procured the crews necessary for manning the boats.

Dr. Öberg remained with one boat, in the neighbourhood of Egedesminde, for the purpose of dredging, and other zoological researches. Dr. Berggren, Dr. Nordström, and I proceeded with the other boat southward, past Manermiut and Kangaitsiak, to the most northerly of the long, narrow, almost river-like fjords, which penetrate far into the land between Egedesminde and Holsteinsborg. We left Egedesminde on the 12th of July, in the afternoon.

We took up our night-quarter, the 12th of July, at Manermiut, the 13th at Kangaitsiak, the 14th, 15th, and 16th on islands in Auleitsivik. On the 17th we at length arrived at the nearest object

of our voyage, the northern side of the glacier that shoots out from the inland ice, that occupies the bottom of the northern arm of Auleitsivikfjord, that is to say, the spot selected as the starting-point for our journey over the ice.

The tract through which we passed, like the whole west coast of Greenland south of the basalt region, bears a strong resemblance to the Scandinavian peninsula, and that resemblance is not the result of any accident, but of a similar geological formation, and a similar geological history. The surface of Greenland, like that of Scandinavia, is for the most part occupied by stratified crystalline rock (gneiss, hornblende-schist, hornblende-gneiss, mica-schist, etc.), crossed by dykes and veins of granite, which even bear the same peculiar minerals which distinguish the Scandinavian granite-veins; and, as in the case of our mountains, the mountains of these regions have once been covered with glaciers, which have left unmistakable marks of their presence in the boulders, which are met with scattered high up on the sides of the mountains, in the rounding off, in the polishing and grooving of the surface, and in the deep fjords, evidently scooped out by glaciers, which distinguish both Scandinavia's and Greenland's western coasts. There is, however, this difference, that whereas the glacial period of Scandinavia belongs to an age long past, that of Greenland, though it is receding,[1] still continues. While, in fact, numberless indications show that the inland-ice has in ancient times covered even the skerries round the coast, these are now so free from ice that a traveller in most places has to advance several miles into the country before reaching the border of the present inland-ice. It is at least certain that wherever any one hitherto has penetrated into the land, he has met with its border,[2] and in all instances has seen it from some neighbouring mountain-top, rising inwards with a gradual and regular ascent, till it levels undistinguishably hill and dale beneath its frozen covering, like the waves of a vast ocean.

Of this inland-ice the natives entertain a superstitious fear, an awe or prejudice, which has, in some degree, communicated itself to such Europeans as have long resided in Greenland. It is thus only that we can explain the circumstance, that in the whole thousand years during which Greenland has been known, so few efforts have been made to pass over the ice farther into the country. There are many reasons for believing that the inland-ice merely forms a continuous ice-frame, running parallel with the coast, and surrounding a land free from ice, perhaps even in its southern parts woody, which might perhaps be of no small economical importance to the rest of Greenland. The only serious attempt that has hitherto been made,

[1] Certainly receding, although the inland ice sometimes makes its way to the sea, and thus tracts that have been free from ice are again covered. We have an example of this in the ice-fjord of Jacobshavn, of which more hereafter.

[2] I have, however, met with persons in Greenland who do not consider it as fully proved, that the inland-ice really does form an inner border to the whole of the external coast. Many Danes have resided several years in Greenland without ever having seen the inland-ice.

in the parts of Greenland colonized by Danes,[1] to advance in that direction was made by—

A Danish expedition, fitted out for the purpose in 1728.—A Danish governor, Major Paars, with an armed company, artillery, etc., was that year sent from Denmark to Greenland, and took with him, among other things, also horses, with which it was intended to ride over the mountains, in order to rediscover, by an overland course, the lost (East) Greenland. The horses, however, died, either during the voyage out or shortly after their arrival in the country; and thus this expedition, really magnificent, but prepared in entire ignorance of the real nature of the country, was abandoned.

Dalager's attempt, 1751.—This year the Danish merchant Dalager made an attempt, in about 62° 31′ latitude, to advance in the beginning of September over the inland ice to the east coast. In the first volume of Kranz's "History of Greenland"[2] there is a short description of this journey, interesting, among other reasons, as recording an instance of a glacier, which since Greenland has been an inhabited land has forced its way forward and closed the entrance of a previously open fjord. We find further from that account, that Dalager, partly on foot and partly in a canoe, in company with five natives, reached the border of the inland ice near the bottom of a deep fjord situated north of Fredrikshaab. For two days they continued their journey over the ice, but succeeded during this time in advancing only eight English miles to some mountain summits rising above the ice-field, where a reindeer hunt was undertaken. Dalager would willingly have continued the journey a day or two longer, but was unable to do so, partly because the two pairs of boots taken with them for each person were so cut to pieces by the ice that they walked "as good as barefoot," partly because the cold at night was so severe that their limbs became stiff after a few hours of rest. On the other hand, the route chosen by Dalager seems not to have been interrupted by very many or deep chasms—in the beginning of the journey the surface of the ice was even "as smooth as a street in Copenhagen." Further on however it was extremely rough.

E. Whymper's expedition, 1867.—All that I know about this expedition is, that Mr. Whymper, in company with Dr. R. Brown, three Danes and a Greenlander, endeavoured to make their way

[1] Dr. Hayes's remarkable journey, in October, 1860, over the fields of ice that cover the peninsula between Whale Sound and Kennedy Channel (78° N.L.), was performed, not upon the real inland-ice, but upon a smaller ice-field connected with the inland-ice, like the ice-fields at Noursoak peninsula. The character of the ice here seems to have differed considerably from that of the real inland-ice. Hayes ascended the glacier at Port Foulke, on the 23rd of October, and advanced on foot, the first day 5, the second 30, the third 25 miles, in all 60 English miles. He was here forced to return, in consequence of a storm. The height of the spot where he turned back over the level of the sea was 5000 feet (*The Open Polar Sea*, by Dr. J. J. Hayes, pp. 130–136).

[2] I have not had access to Dalager's original account. "Grönlandske Relationer, indehaaldende Grönländernes Liv og Levnet, deres Skicke og Vedtägter, samt Temperament og Superstitioner, tillige nogle korrte Reflexioner over Missionen, sammenskrevet ved Fredrickshaabs Colonia i Grönland, by Lars Dalager, Merchant.

upon the inland ice with dogs immediately to the north of the ice-fjord at Jacobshavn, but that they turned back again on the second day, after having proceeded only some few miles. The reason of this was probably the unfitness of dogs for such a purpose.

It was originally my intention to renew these attempts, but on conversing in Copenhagen with Messrs. Rink and Olrik, who had formerly been Inspectors in North Greenland, as also with several other persons who had visited Greenland, I found all so unanimous in considering further advance over the inland ice as impossible, that I determined not to risk the whole profit of the summer on an undertaking of the kind beforehand disapproved of by everybody. Nevertheless, I was unwilling entirely to abandon my plan, and determined therefore to make a little attempt at a journey on the inland ice only of a few days' extent.

If the inland ice were not in motion, it is clear that its surface would be as even and unbroken as that of a sand field. But this, as is known, is not the case. The inland ice is in constant motion, advancing slowly, but with different velocity in different places, towards the sea, into which it passes on the west coast of Greenland through eight or ten large and a great many small ice-streams. This movement of the ice gives rise in its turn to huge chasms and clefts, the almost bottomless depths of which close the traveller's way. It is natural that these clefts should occur chiefly where the movement of the ice is most rapid, that is to say, in the neighbourhood of the great ice-streams, but that on the other hand at a greater distance from these the ground will be found more free from cracks. On this account I determined to begin our wanderings on the ice at a point as far distant as possible from the real ice-fjords. I should have preferred one of the deep "Strömfjords (stream-fjords) for this purpose, but as other business intended to be carried out during the short summer did not permit a journey per boat so far southward, I selected instead for my object the northern arm of the above-mentioned Auleitsivikfjord, which is situated 60 miles south of the ice-fjord at Jakobshavn, and 240 miles north of that of Godthaab. The inland ice, it is true, even in Auleitsivikfjord reaches to the bottom of the fjord, but it only forms there a perpendicular glacier, very similar to the glaciers at King's Bay in Spitzbergen, but not any real ice-stream. There was accordingly reason to expect that such fissures and chasms as might here occur would be on a smaller scale.

On the 17th July, in the afternoon, our tent was pitched on the shore north of the steep precipitous edge of the inland ice at Auleitsivikfjord. After having employed the 18th in preparations and a few slight reconnoitrings, we entered on our wandering inwards on the 19th. We set out early in the morning, and first rowed to a little bay situated in the neighbourhood of the spot occupied by our tent, into which several clayey rivers had their embouchures. Here the land assumed a character varied by hill and dale, and further inward was bounded by an ice wall sometimes perpendicular and sometimes rounded, covered with a thin layer of earth and stones,

near the edge, only a couple of hundred feet high, but then rising at first rapidly, afterwards more slowly, to a height of several hundred feet. In most places this wall could not possibly be scaled; we however soon succeeded in finding a place where it was cut through by a small cleft, sufficiently deep to afford a possibility of climbing up with the means at our disposal, a sledge, which at need might be used as a ladder, and a line originally 100 fathoms long, but which, proving too heavy a burden, had before our arrival at the first resting-place been reduced one-half. All of us, with the exception of our old and lame boatman, assisted in the by no means easy work of bringing over mountain, hill, and dale, the apparatus of the ice expedition to this spot, and after our dinner's rest, a little further up the ice-wall. Here our followers left us. Only Dr. Berggren, I, and two Greenlanders (Isak and Sisarniak) were to proceed farther. We immediately commenced our march, but did not get very far that day.

The inland ice differs from ordinary glaciers by, among other things, the almost total absence of moraine-formations. The collections of earth, gravel, and stone, with which the ice on the landward edge is covered, are in fact so inconsiderable in comparison with the moraines of even very small glaciers, that they scarcely deserve mention, and no larger, newly formed ridges of gravel running parallel with the edge of the glacier are to be met with, at least in the tract visited by us.

The landward border of the inward ice is however darkened, we can scarcely say covered with earth, and sprinkled with small sharp stones. Here the ice is tolerably smooth, though furrowed by deep clefts at right angles to the border—such as that made use of by us to climb up. But in order not immediately to terrify the Greenlanders by choosing the way over the frightful and dangerous clefts, we determined to abandon this comparatively smooth ground, and at first take a southerly direction parallel with the chasms and afterwards turn to the East. We gained our object by avoiding the chasm, but fell in instead with extremely rough ice. We now understood what the Greenlanders meant, when they endeavoured to dissuade us from the journey on the ice, by sometimes lifting their hands up over their heads, sometimes sinking them down to the ground, accompanied by to us an unintelligible talk. They meant by this to describe the collection of closely heaped pyramids and ridges of ice over which we had now to walk. The inequalities of the ice were, it is true, seldom more than 40 feet high, with an inclination of 25 to 30 degrees. But one does not get on very fast, when one has continually to drag a heavily-laden sledge up so irregular an acclivity, and immediately after to endeavour to get down uninjured, at the risk of getting one's legs broken, when occasionally losing one's footing on the here often very slippery ice in attempting to moderate the speed of the downward rushing sledge. Had we used an ordinary sledge, it would immediately have been broken to pieces, but as the component parts of our sledge were not nailed but tied together, it held together at least for some hours.

Already the next day we perceived the impossibility under such

circumstances of dragging with us the 30 days' provision with which we had furnished ourselves, especially as it was evident, that if we we wished to proceed further, we must transform ourselves from draught to pack horses. We therefore determined to leave the sledge and part of the provisions, take the rest on our shoulders and proceed on foot. We now got on quicker, though for a sufficiently long time over ground as bad as before. The ice became gradually smoother, and was broken by large bottomless chasms, which one must either jump over with a heavy load on one's back, in which case woe to him who made a false step, or else make a long circuit to avoid. After two hours' wandering, the region of clefts was passed. We, however, in the course of our journey, very frequently met with portions of similar ground, though none of any very great extent. We were now at a height of more than 800 feet above the level of the sea. Farther inward the surface of the ice, except at the occasionally-recurring regions of clefts, resembled that of a stormy sea suddenly bound in fetters by the cold. The rise inwards was still quite perceptible, though frequently interrupted by shallow valleys, the centres of which were occupied by several lakes or ponds with no apparent outlet, although they received water from innumerable rivers running along the sides of the excavation. These rivers presented in many places not so dangerous though quite as time-wasting a hindrance to our progress as the clefts—with this difference, however, that they did not so often occur, but the circuits to avoid them were so much the longer.

During the whole of our journey on the ice we constantly enjoyed fine weather, frequently there was not a single cloud visible in the whole sky. The warmth was to us, clad as we were, sensible; in the shade, near the ice of course, but little over zero; higher up, in the shade, as much as 7° or 8°; but in the sun 25° to 30° Centig. After sunset the water-pools froze, and the nights were very cold. We had no tent with us, and, although our party consisted of four men, only two ordinary sleeping sacks. These were open at both ends, so that two persons could, though with great difficulty, with their feet opposite to each other, squeeze themselves into one sack. With rough ice for a substratum, the bed was thus so uncomfortable that, after a few hours' sleep, one was awakened by cramp in one's closely contracted joints, and, as there was only a thin tarpaulin between the ice and the sleeping sack, the bed was extremely cold to the side resting on the ice, which the Greenlanders, who turned back before us, described to Dr. Nordström by shivering and shaking throughout their whole bodies. Our nights' rests were, therefore, seldom long; but our midday rests, during which we could bask in a glorious warm sun-bath, were taken on a proportionately more copious scale, whereby I was enabled to take observations both for altitude and longitude.

On the surface of the inland ice we do not meet with any stones at a distance of more than a cable's length from the border; but we find everywhere instead, vertical cylindrical holes, of a foot or two deep, and from a couple of lines to a couple of feet in section, so

close one to another that one might in vain seek between them room for one's foot, much less for a sleeping-sack. We had always a system of ice-pipes of this kind as substratum when we rested for the night, and it often happened, in the morning, that the warmth of our bodies had melted so much of the ice, that the sleeping sack touched the water, wherewith the holes were always nearly full. But, as a compensation, wherever we rested, we had only to stretch out our hands to obtain the very finest water to drink.

(*To be continued in our next.*)

II.—Note on the Discovery of the Oldest Known *Trigonia* (*T. Lingonensis*, Dumortier) in Britain.

By Ralph Tate, Assoc. Lin. Soc., F.G.S.

THE ironstone of Cleveland is a repository for a number of interesting species of Mollusca, amongst which a *Trigonia* deserves especial notice, representing as it does the oldest form of the genus, and now recorded for the first time as British.

Till within the last few years *Trigonia littorata* was the precursor of one of the most important generic forms of Mesozoic life, but the publication by Dumortier (Études Jurassiques du Rhone, p. 275, 1869), of the occurrence of a *Trigonia* (*T. Lingonensis*) in the Marlstone of the Rhone Basin robbed *T. littorata* of its ancient renown.

T. littorata, Phillips, is stated by its describer (Geol. Yorksh. t. 14, f. 11) to be from the Lower Lias Shale, Robin Hood's Bay, and elsewhere in the same work to be from the Alum Shale. The former statement is doubtlessly a clerical error. It is chiefly to be found in the cement stones above the Alum Shale, but it also occurs in the underlying Shale. This position is on an average 200 feet above the ironstone whence *T. Lingonensis* was obtained.

The characters of the fossil are fully displayed, and do not permit a doubt of its generic position; agreeing, moreover, in size and ornamentation, with the type of *T. Lingonensis* from the Basin of the Rhone, it must be quoted under that name.

T. Lingonensis belongs to the Section *Glabræ* as defined by Agassiz, which contains a few Portlandian and Cretaceous species. It is noteworthy that the oldest species of the genus represents the simplest type of ornamentation.

The specimen on which these remarks are based is, however, not the only one of this species in Britain. My friend, Rev. J. F. Blake, informs me by letter April 18, 1872, that a specimen of *Trigonia Lingonensis*—"in fine preservation, better, as far as I remember, even than yours,—is in the York Museum, labelled 'New Trigonia, by Charlesworth, in 1858.' It is from the ironstone, with green grains, at Maroke" (probably from the Upleatham Mines).

Position and Localities. Zone of *Ammonites spinatus.* Lofthouse (?) and Upleatham Mines (York. Mus.).
