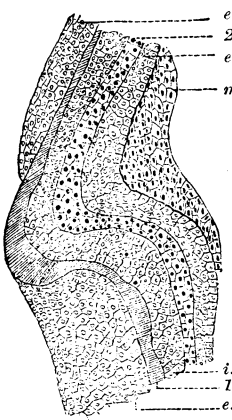
enamel-organ of the other vertebrates, and originate in the same way. So far, at least, the lamprey does not show an essentially different type of tooth-development from that known in other groups.

The cells of the 'enamel-organ' are rapidly proliferating, and have thrown off from their outer surface a conical cap of cells (*2d t.*), which are flattened, and which show an incipient formation of pigment among them. This hollow cone of cells is the rudiment of the youngest tooth, which in the stage here described is the second of the series. Outside of the rudimentary tooth is a cone of polygonal epiblastic cells, several layers deep (*i.e.*); and this is again followed by the first tooth, now almost completely cornified and pigmented, so that traces of cellular structure are but faintly discernible (*1st t.*). The tip of this tooth has just penetrated the skin of the mouth, and is elsewhere covered by the many-layered epiblast (*e. m.*).



Section through inner side of lip of metamorphosing lamprey. *e.m.*, epiblast of mouth; *1st t.*, oldest tooth; *2d t.*, youngest tooth; *e.o.*, enamel-organ; *i.e.*, intermediate epiblast-cells between successive teeth; *m.p.*, mesoblastic papilla.

We see, therefore, that the essential parts of the typical vertebrate tooth are here present; namely, the mesoblastic papilla, and the over-lying epiblastic enamel-organ. But the ordinary type of dental development is here greatly modified. The papilla is never ossified; and the enamel-organ secretes no enamel, but functions as a sort of tooth-gland, throwing off successive hollow cones of flattened and cornified epiblastic cells. The actual tooth of the lamprey is therefore not the homologue of the entire tooth of a selachian, but simply of the enamel-cap. It is not difficult, however, to understand how the process seen in Petromyzon could be derived from that in the selachian. In consequence of this change, another difference arises: as the papilla never ossifies or becomes protruded, it is no longer necessary that for every new tooth a new enamel-organ should be formed by budding from the old one; so each enamel-organ is converted into a permanent tooth-gland, functional throughout the life of the animal.

This view of the peculiarities of dental development in Petromyzon implies, of course, that this group of fishes was derived from ancestors possessed of teeth of the ordinary or selachian type. Further, as it is now very generally admitted that teeth are only modified placoid scales, it follows that the lampreys are descended, ultimately at least, from forms provided with placoid scales.

Such a conclusion, however, does not by any means commit us to the view that the myxinoids are degenerate descendants of some gnathostomatous group, as this is no more implied in the possession of ordinary calcareous teeth than in the presence of the horny teeth which the group has long been known to possess.

W. B. Scott.

Morphological laboratory, Princeton, N.J.,
Nov. 3, 1883.

NORDENSKIÖLD ON THE INLAND ICE OF GREENLAND.[1]

In a series of letters to Mr. Oscar Dickson, Baron Nordenskiöld has given a detailed report of the leading incidents and results of his recent expedition, though it will still be some time ere we can learn what are the full gains to science. The leading novelty of the expedition was, of course, the journey into the interior of Greenland.

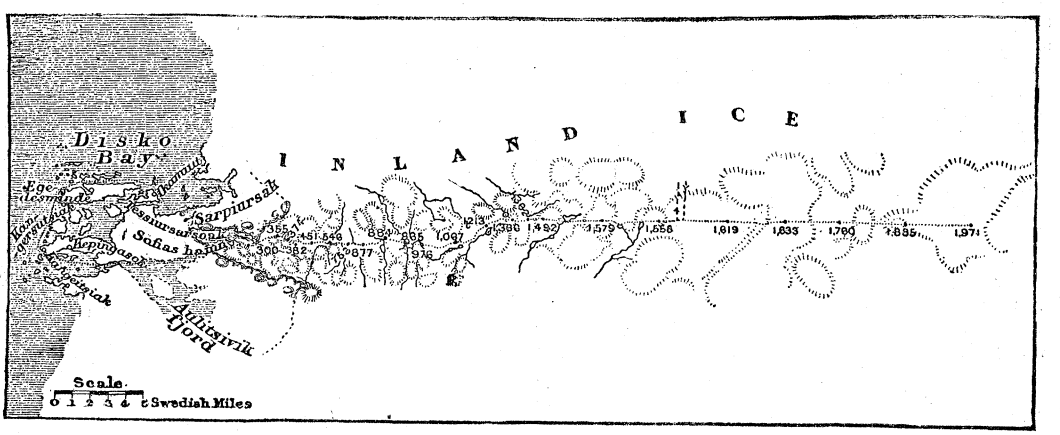
After landing Dr. Nathorst and his party at Waigatz Sound, Nordenskiöld went back to Egedesminde, which he reached on June 29. The following day he left for Auleitsivik Fjord, from which the expedition was to start. He then proceeds: —

On July 1 the Sophia anchored in the bay. We found here a splendid harbor with clay bottom, some seven fathoms deep, surrounded by gneiss rocks from six hundred to a thousand feet in height, the sides of which are in some places covered with low but close shrubs, or clothed with some species of willow, mosses, and lichen, which, when we arrived, were ornamented with a quantity of magnificent blossoms. From one of the slopes a torrent descended, the temperature of which was 12.3° C. The weather was fine, the sky cloudless, and the air very dry. July 1 to 3 were employed in making preparations for the ice-journey, while the naturalists made excursions to various places in order to collect objects relating to the conditions of the country. On the night of the 3d every thing was ready for a start; and, after some difficulty in reaching the spot where the baggage was, we were fairly off. The spot from which we set out on the journey was only five kilometres from the actual shore, and situated below a little lake into which a number of glacier rivers fell. We proceeded up the river in a Berton boat, purchased in England. On the night of the 4th we camped for the first time on the ice. The expedition consisted of nine men besides myself. After a great deal of hard work in getting the sledges over the ice, which was here very

[1] From *Nature*, Nov. 1 and 8.

rough, we found, on the morning of the 5th, that it was impossible to proceed eastwards, but were compelled to return to the border of the ice, and then continue to the north or north-east until finding smoother ice. This first part of the ice was furrowed by deep crevasses and ravines, causing us much trouble. We covered, however, a good distance that day, and pitched our tent near a land-ridge in the ice, two hundred and forty metres above the sea.[1] On July 6 I sent the Lapp Lars forward to reconnoitre; and he reported that it was still impossible to proceed eastwards, but, if we marched for a day or so to the north, we would find the country accessible to the east. As I feared, however, the impossibility of dragging the sledges with the weight on them over the rough ice, I selected provisions, etc., for forty-five days, and left the rest in a depot in the ice. We now resumed the march. It was very interesting to witness the great ease with which the Lapps proceeded among the ice-ravines, how easily they traced a road dis-

a circle by Pistor and Martin, a small sextant (in case of the former being damaged), a mercury horizon, three aneroid barometers, thermometers, magnets (for the study of the clay deposit in the snow), a topographical board, a photographic apparatus, blowpipes, flasks, nautical tables, etc. The sledges, 'kalkar,' six in number, were of the same kind as those on which Swedish peasant women bring their wares to market. The harness was made so strong that it would hold a man, in case of his falling into a crevasse. In addition to these things, we had a Manila rope specially spun for the expedition at the Alpine purveyor's in Paris. The food supplied per day may perhaps interest explorers. It was, — breakfast, coffee, bread, butter, and cheese (no meat or bacon); dinner, forty-two cubic centimetres Swedish corn brandy (*bränvin*), bread, ham or corned beef, with sardines; supper, preserved meat, Swedish or Australian. Sometimes preserved soup was served with dried vegetables. Five men were teetotalers, but there



THE HEIGHTS ARE GIVEN PROVISIONALLY IN METRES. SWEDISH MILE = 6.64 ENGLISH MILES.

covered, and with what precision they selected the least difficult track.

The Lapp Lars carried, instead of an alpenstock, a wooden club, with which he had slain more than twenty-five brown bears, full of marks from their teeth; and his eyes sparkled at the thought of encountering a white one. On the night of the 6th we held our third camp on the ice; and now several officers and men from the Sophia, who had accompanied us thus far, left us. Besides the most advantageous requisites for such a journey, we had with us a cooking-apparatus for petroleum: and here I beg to say that I found this kind of oil far more suitable than train or vegetable oils, which I had used on my former expeditions; and I recommend the same most warmly to arctic explorers. Of scientific instruments I may mention compasses, two chronometers,

[1] The altitudes were ascertained by comparing three aneroid barometers, while observation was simultaneously made at Egedesminde with a splendid sea-barometer I had left there for that purpose. As the figures have, however, not yet been verified, they may be slightly altered. They seem, on the whole, too low.

was no need of supplying them with extra rations. For cooking, 0.7 litres of spirits were consumed per day. Our whole baggage weighed a ton, — a weight which might easily have been drawn across a smooth snow or ice field, but which was very difficult of transporting over the rough and cut-up surface we had to traverse. Our daily march between July 7 and 9 was therefore not great, viz., five kilometres a day. In addition to the crevasses and ravines, we encountered innumerable rivers, swift, and with steep banks, which were difficult of crossing, which was generally accomplished by laying three alpenstocks across them. If I had not selected these of the toughest wood obtainable, we should often have had to make *détours* of many kilometres.

On these days we found, on several occasions, large bones of reindeer on the snow; and it was but a natural and pardonable conclusion to arrive at, that they were those of animals who had fallen in their wandering over the 'Sahara of the arctic regions.' But that good signs are not always true ones we soon discovered.

During the entire journey, we had great difficulty in finding suitable camping-places. Thus, either the ice was so rough that there was not a square large enough for our tent, or else the surface was so covered with cavities, which I will fully describe later on, that it was necessary to pitch it over some hundred smaller and a dozen larger round hollows, one to three feet deep, filled with water, or else to raise it on a snow-drift so loose and impregnated with water that one's feet became wet, even in the tent. An exception to this was the place where we camped on July 9; viz., camping-place no. 6. We encountered here a small ice-plain, surrounded by little rivers, and almost free from cavities, some thirty metres square. All the rivers flowed into a small lake near us, the water from which rushed with a loud roar through a short but strong current into an enormous abyss in the ice-plateau. The river rushed close to our tent, through a deep hollow, the sides of which were formed of magnificent perpendicular banks of ice. I had the spot photographed; but neither picture nor description can give the faintest idea of the impressive scene, viz., a perfectly hewn aqueduct, as if cut by human hand in the finest marble, without flaw or blemish. Even the Lapps and the sailors stood on the bank, lost in admiration.

At first we had followed the plan of bringing the baggage forward in two relays; but, finding this very fatiguing, I decided to bring all with us at once. I found this to answer better. On July 10 we covered thus nine and a half, on the 11th ten, and on the 12th eleven, kilometres. The road was now much better than before, although stiff enough. An exception to this was, however, formed by the part we traversed on the 11th, when we proceeded alongside a big river, the southern bank of which formed a comparatively smooth ice-plain, or rather ice-road, with valleys, hills, cavities, or crevasses, some five to ten kilometres in width, and five kilometres in length. This plain was in several places beautifully colored with 'red' snow, especially along the banks of the river. It was the only spot on the whole inland ice where we found 'red' snow or ice in any quantity. Even yellow-brown ice was seen in some places; but, on the other hand, ice colored grayish-brown or grayish-green, partly by kryokonite, and partly by organisms, was so common that they generally gave color to the ice-landscape.

Even on July 12, between camps nos. 7 and 8, we found blades of grass, leaves of the dwarf-birch, willows, crackberry, and pyrola, with those of other Greenland flora, on the snow. At first we believed they had been carried hither from the interior; but that this was not the case was demonstrated by the circumstance that none was found east of camp no. 9. The only animals we discovered on the ice were, besides the few birds seen on our return-journey, a small worm which lives on the various ice algae, and thus really belongs to the fauna of the inland ice, and two storm-driven birds from the shore. I had particularly requested each man to be on the lookout for stones on the ice; but, after a journey of about half a kilometre from the ice-border, no stone was found on the surface, not even one as large as a pin's point. But the quantity of clay-dust ('kryokonite') deposited on the ice was very great, — I believe, several hundred tons per square kilometre.

We now ascended very rapidly, as will be seen from the subjoined statement of our camps: —

3d	camp,	300	metres	above the sea.
4th	"	355	"	"
5th	"	374	"	"
6th	"	382	"	"
7th	"	451	"	"
8th	"	546	"	"
9th	"	753	"	"

The 9th camp lay on the west side of an ice-ridge close by a small, shallow lake, the water from which gathered, as usual, into a big river, which disappeared in an abyss with azure-colored sides. From this spot we had a fine view of the country to the west, and saw even the sea shining forth between the lofty peaks on the coast; but, when we reached east of this ice-ridge, the country was seen no more, and the horizon was formed of ice only.

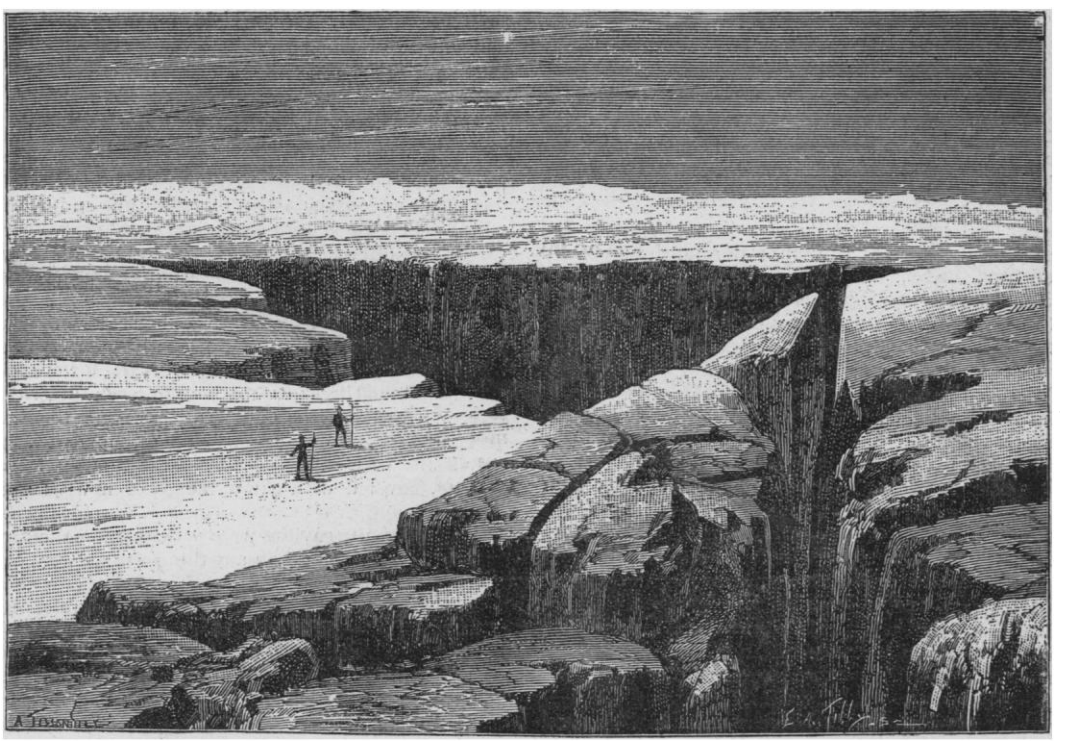
Through an optical illusion, dependent on the *mirage* of the ice-horizon, it appeared to us as if we were proceeding on the bottom of a shallow, saucer-shaped cavity. It was thus impossible to decide whether we walked up or down hill; and this formed a constant source of discussion between us, which could only be decided by the heaviness of the sledges in the harness. The Lapps, who seemed to consider it their sole business that we should not be lost on the ice, came to me in great anxiety, and stated that they had no more landmarks, and would not be responsible for our return. I satisfied them, however, with the assurance that I would find the way back by means of a compass and solar measurements. In spite of this, the Lapps easily traced our route and our old camps with an accuracy quite marvellous.

During our outward journey, I determined the site of each camp astronomically; and thus the distances which, when the determinations have been calculated, will be given on the map to be drawn of the journey, will be absolutely correct. But the distances covered by the Lapps have been made according to their own judgment. The kilometres we covered every day, including the numerous *détours*, were ascertained by two pedometers.

Up to the 9th camp we were favored by the finest weather, generally with a slight south-east wind, cloudless sky, and a temperature in the shade, three feet above the ice, of 2° to 8° C., and in the sun of even 20° C. The centre of the sun's disk sank in this spot for the first time below the horizon on July 15, and the upper rim, if allowance is made for refraction, on July 21. After the middle of July, when at an elevation of four thousand to seven thousand feet, the nights became very cold, the thermometer sinking to 15° and 18° below freezing-point of Celsius.

The constant sunshine by day and night, reflected from every object around, soon began to affect our eyes, — more so, perhaps, because we had neglected to adopt snow-spectacles at the outset of our journey; and snow-blindness became manifest, with its at-

tendant cutting pains. Fortunately Dr. Berlin soon arrested this malady, which has brought so many journeys in the arctic regions to a close, by distributing snow-spectacles, and by inoculating a solution of zinc vitriol in the blood-stained eyes. Another malady — if not so dangerous, at all events quite as painful — was caused by the sunshine in the dry, transparent, and thin air on the skin of the face. It produced a vivid redness and a perspiration, with large burning blisters, which, shrivelling up, caused the skin of the nose, ears, and cheeks, to fall off in large patches. This was repeated several times, and the pain increased by the effect of the cold morning noon of July 13, with a heavy wind from south-east. It continued all the night, and the next morning turned into a snow-storm. We all got very wet, but consoled ourselves with the thought that the storm coming from south-east argued well for an ice-free interior. When it cleared a little, we strained our eyes to trace any mountains which would break the ice-horizon around us, which everywhere was as level as that of the sea. The desire soon 'to be *there*' was as fervent as that of the searchers of the Eldorado of yore; and the sailors and the Lapps had no shadow of doubt as to the existence of an ice-free interior; and at noon, before reaching camp no. 12,



Fissure in Greenland's inland ice, seen by Nordenskiöld on his visit in 1876. From a sketch by Dr. Berggren, published in *La Nature*.

air on the newly-formed skin. Any similar effect the sun has not in the tropics. With the exception of these complaints, none of us suffered any illness.

On July 13 we covered thirteen, on the 14th ten, and the 15th fourteen, kilometres (9th to 12th camps). At first the road gradually rose; and we then came to a plain, which I, in error, believed was the crest of the inland ice. The aneroids, however, showed that we were still ascending: thus the 9th camp lies 753, the 10th 877, the 11th 884, and the 12th 965, metres above the sea. Our road was still crossed by swift and strong rivers; but the ice became more smooth, while the kryokonite cavities became more and more troublesome. This was made more unpleasant by rain, which began to fall on the after-

everybody fancied he could distinguish mountains far away to the east. They appeared to remain perfectly stationary as the clouds drifted past them, — a sure sign, we thought, of its not being a mass of clouds. They were scanned with telescopes, drawn, discussed, and at last saluted with a ringing cheer; but we soon came to the conclusion that they were unfortunately no mountains, but merely the dark reflection of some lakes farther to the east in the ice-desert.

In my report of the expedition of 1870, I drew attention to a clayey mud which is found in circular cavities, from one to three feet in depth, on the surface of the inland ice, not only near the shore, but even as far inland as we reached on that occasion.

My companion on that occasion, Professor Berggren, discovered that this substance formed the substratum of a peculiar ice-flora, consisting of a quantity of different microscopical plants (algae), of which some are even distributed beyond the clay on the ice itself, and which, in spite of their insignificance, play, beyond doubt, a very important part in nature's economy, from the fact that their dark color far more readily absorbs the sun's heat than the bluish-white ice, and thereby they contribute to the destruction of the ice-sheet, and prevent its extension. Undoubtedly we have in no small degree to thank these organisms for the melting-away of the layer of ice which once covered the Scandinavian peninsula. I examined the appearance of this substance in its relation to geology, and demonstrated, —

1. That it cannot have been washed down from the mountain ridges at the sides of the glaciers; as it was found evenly distributed at a far higher elevation than that of the ridges on the border of the glaciers, as well as in equal quantity on the top of the ice-knolls as on their sides or in the hollows between them.

2. That neither had it been distributed over the surface of the ice by running water, nor been pressed up from the hypothetical bottom 'ground' moraine.

3. That the clay must therefore be a sediment from the air, the chief constituent of which is probably terrestrial dust spread by the wind over the surface of the ice.

4. That cosmic elements exist in this substance, as it contained molecules of metallic iron which could be drawn out by the magnet, and which, under the blowpipe, gave a reaction of cobalt and nickel.

Under these circumstances, the remarkable dust which I have named 'kryokonite,' i.e., ice-dust, obtained a great scientific interest; particularly as the cosmic element, viz., the matter deposited from space, was very considerable. Even later students who have visited the inland ice have observed this dust, but in places surrounded by mountains, from which it might with more probability have been washed down. They have, therefore, and without having examined Professor Berggren's and my own researches of 1870, paid little attention to the same; while the samples brought home by Dr. N. O. Holst from South Greenland in 1880 were not very extensive.

But now Dr. Berlin brings home from a great variety of places ice algae, which, I feel convinced, will contribute fresh materials to our knowledge of the flora of the ice and snow. For my own part, I have re-examined my first researches of the kryokonite, and they are fully corroborated. Everywhere where the snow from last winter has melted away, a fine dust, gray in color, and, when wet, black or dark brown, is distributed over the inland ice in a layer which I should estimate at from 0.1 to 1 millimetre in thickness, if it was evenly distributed over the entire surface of the ice. It appears in the same quantity in the vicinity of the ice-border surrounded by mountains as a hundred kilometres inland; but in the former locality it is mixed with a very fine sand, gray in color, which may be separated from the kryokonite. Farther inland this disappears, however, completely. Gravel or real sand I have never, in spite of searching for them, discovered in the kryokonite. The kryokonite always contains very fine granular atoms, which are attracted by the magnet, and which, as may be demonstrated by grating in an agate mortar and by analysis under the blowpipe, consist of a gray metallic element; viz., nickel iron. In general, the dust is spread equally over the entire surface of the ice. Thus it was found everywhere where the snow from the previous year had melted away; while, to judge by appearances, there seemed to be little difference between the quantity found near the coast, and in the interior. The dust does not, however, form a continuous layer of clay, but has, by the melting of the ice, collected in cavities filled with water, which are found all over the surface. These are round, sometimes semicircular, one to three feet in depth, with a diameter of from a couple of millimetres to one metre or more. At the bottom a layer of kryokonite one to four millimetres in thickness is deposited, which has often, by organisms and by the wind, been formed into little balls; and everywhere where the original surface of the ice has not been changed by water-currents, the cavities are found so close to each other that it would be very difficult to find a spot on the ice as large as the crown of a hat free from them. In the night, at a few degrees below freezing-point, new ice forms on these hollows; but they do not freeze to the bottom, even under the severest frost, and the sheet which covers them is never strong enough to support a man, more particularly if the hole is, as was the case during half our journey, covered with a few inches of newly-fallen snow.

The kryokonite cavities were perhaps more dangerous to our expedition than any thing else we were exposed to. We passed, of course, a number of crevasses without bottom as far as the eye could penetrate, and wide enough to swallow up a man; but they were 'open,' i.e., free from a cover of snow, and could with proper caution be avoided; and the danger of these could further be minimized by the sending of the two-men sledges in front, and, if one of the men fell into the crevasse, he was supported by the runners and the alpenstock, which always enabled him to get up on the ice again. But this was far from being the case with the kryokonite hollows. These lie, with a diameter just large enough to hold the foot, as close to one another as the stumps of the trees in a felled forest; and it was therefore impossible not to stumble into them at every moment, which was the more annoying as it happened just when the foot was stretched for a step forward, and the traveller was precipitated to the ground with his foot fastened in a hole three feet in depth. The worst part of our journey was four days outward and three days of the return; and it is not too much to say that each one of us, during these seven days, fell a hundred times into these cavities, viz., for all of us, seven thousand times. I am only surprised that no bones were broken, — an accident which would not only have brought my explo-

ration to an abrupt close, but might have had the most disastrous consequences, as it would have been utterly impossible to have carried a man in that state back to the coast. One advantage the kryokonite cavities had, however; viz., of offering us the purest drinking-water imaginable, of which we fully availed ourselves without the least bad consequences, in spite of our perspiring state.

On July 16 we covered thirteen, on the 17th eighteen and a half, and on the 18th seventeen and a half, kilometres. The country, or more correctly the ice, now gradually rose from 965 to 1,213 metres. The distances enumerated show that the ice became more smooth; but the road was still impeded by the kryokonite cavities, whereas the rivers, which even here were rich in water, became shallower but stronger, thus easier of crossing. Our road was, besides, often cut off by immense snow-covered crevasses, which, however, did not cause much trouble.

On the night of the 18th, when arrived at camp no. 14, the Lapp Anders came to me and asked if he might be permitted to 'have a run;' viz., to make a reconnaissance on 'skidor,'[1] to see if there was no land to the east. This granted, he started off without awaiting supper. He came back after six hours' absence, and reported that he had reached twenty-seven kilometres farther east; that the ice became smoother, but was still rising; but there was no sign of land. If his statement was true, he had, after a laborious day's journey, in six hours covered about sixty kilometres! At first I considered his estimate exaggerated, but it proved to be perfectly correct. It took us, thus, two whole days to reach as far as he had got, as shown by the track in the snow. I particularly mention this occurrence in order to show that the Lapps really did cover the estimated distance of their journey eastward, of which more below.

During these days we passed several lakes, some of which had the appearance of not flowing away in the winter, as we found here large ice-blocks several feet in diameter, screwed up on the shore; which circumstance I could only explain by assuming that a large quantity of water still remained here when the pools about became covered with new ice. The lakes are mostly circular, and their shores formed a snow 'bog' which was almost impassable with the heavy sledges.

On July 19 we covered seventeen and a half, on the 20th sixteen and a half, on the 21st seven, and on the 22d seven and a half, kilometres (15th to 18th camp). The ice rose between them from 1,213 to 1,492 metres. The distances enumerated fully show the nature of the ice. It was at first excellent, particularly in the morning, when the new snow was covered with a layer of hard ice; but on the latter days we had great difficulty in proceeding, as a sleet fell with a south-east wind in the night, between the 20th and the 21st. The new snow, as well as that lying from the previous year, became a perfect snow-bog, in which the sledges constantly stuck, so that it required at times four men to get them out. We all got wet, and had great difficulty in finding a spot on the ice dry enough to pitch the tent. On the 22d we had to pitch it in the wet snow, where the feet immediately became saturated on putting them outside the India-rubber mattresses. A little later on in the year, when the surface of the snow is again covered with ice, or earlier, before the thaw sets in, the surface would no doubt be excellent to journey on.

When we, therefore, on July 21, were compelled to pitch the tent in wet snow, as no dry spot could be discovered, and it was impossible to drag the sledges farther, I sent the Lapp, Lars Tuorda, forward on 'skidor' to find a dry road. He came back, and stated that the ice everywhere was covered with water and snow. For the first time in his life he was at a loss what to suggest. It being utterly impossible to get the sledges farther, I had no choice. I decided to turn back.

I wished, however, to let the Lapps go forward some distance to the east to see the country as far as possible. At first I considered it advisable to let their journey only last twenty-four hours; but as both Anders and Lars insisted that they were most eager to find the 'Promised Land,' and said they could do nothing towards discovering it in that short period, I granted them leave to run eastwards for four days and nights, and then return.

On leaving, I gave them the following written orders:—

"Instructions for Lars and Anders's 'skid' run on the inland ice of Greenland; viz.,—

"Lars and Anders have orders to proceed on skidor eastwards, but are allowed to alter the course, if they may deem it advisable, to north or south.

"At the end of every third mile the barometer shall be read, and the direction run noted.

"The absence is to be four days, but we will wait for six days. After that, viz., on the morning of July 28, we return. If not returned, we leave behind, in a sledge, provisions, brandy, mattresses, etc.

"Lars is warned not to be too bold. Should land be reached, you are to collect as much as you may gather of blossoms and grass; if possible, several kinds (specimens) of each.

"Given on the inland ice in Greenland, July 21, 1883. A. E. NORDENSKIÖLD."

They were allowed to select what provisions, etc., they desired, and were furnished with two compasses, aneroid barometers, and a watch.

At 2.30 A.M. on July 22 they started. The days we waited for them were generally spent in the tent, as water surrounded us everywhere. The sky was covered with a thin veil of clouds, through which the sun shone warmly, at times even scorchingly. From time to time this veil of clouds, or haze, descended to the surface of the ice, and hid the view over the expanse; but it was, remarkably enough, not wet, but *dry*,—yes, so dry that our wet clothes absolutely dried in it. We have therefore, I consider, witnessed a

[1] The Swedish 'skidor' and Norwegian 'ski' are long strips of pine wood, slightly bent at the top, polished, and as elastic as if they were of the finest steel, with a strap for the feet in the centre, on which the Lapps and Scandinavians run on the snow with remarkable agility at a tremendous pace.

phenomenon on the inland ice of Greenland which is related to the 'sun-smoke' phenomenon of Scandinavia; viz., what Arago has described under the name 'brouillard sec.'

On the 24th, after an absence of fifty-seven hours, the Lapps returned. It was the want of drinking-water and fuel which compelled them to return. The surface had been excellent for their journey, and they had covered a distance out and back of two hundred and thirty kilometres, — an estimate which I consider perfectly reliable. During the march forward the barometer was read every third hour. It gave the point of return a height of two thousand metres.[1]

As to the run, Lars rendered the following report. When they had reached thirty miles from the camp, no more water could be found. Farther on, the ice became perfectly smooth. The thermometer registered —5° C. It was very easy to proceed on the 'skidor.' At the point of return the snow was level, and packed by the wind. There was no trace of land. They only saw before them a smooth ice, covered by fine and hard snow. The composition of the surface was this: first four feet of loose snow, then granular ice, and at last an open space large enough to hold an outstretched hand. It was surrounded by angular bits of ice (crystals). The inland ice was formed in terraces, thus: first a hill, then a level, again another hill; and so on. The Lapps had slept for four hours, from twelve midnight on July 23, in a hollow dug in the snow while a terrific storm blew. They had till then been awake for fifty-three hours. On the first day there was no wind; but next day it came from the south, and lasted thus until twenty-four miles on the return-journey, when it changed to west. On the return-journey, when forty miles from our camp, two ravens were seen. They came from the north, and returned in the same direction. The Lapps had for a moment lost the track of the 'skidor' in the snow. The ravens flew at first, they found, parallel with the track, and then turned to the north.

On July 25 we began the return-journey. It was high time, as the weather now became very bad; and it was with great difficulty we proceeded in the hazy air between the number of crevasses. The cold, after the sun sank below the horizon at night, also became very great; and on the morning of July 27 the glass fell to —11° C.

As to the return-journey, I may be very brief. The rivers now impeded us but little, as they were to a great extent dried up. The ice-knolls had decreased considerably in size too, and lay more apart; but the glacial crevasses had greatly expanded, and were more dangerous, being covered with snow. Even the cavities and the glacial wells, of which many undoubtedly leave a veritable testimony of their existence behind them in the shape of corresponding hollows in the rock beneath, had expanded, and increased in number. On a few occasions on the return-journey we saw flocks of birds, most probably water-fowl, which were returning from the north.

[1] I have as yet been unable to verify the barometer calculations, and the figures stated here may suffer some modification.

On July 31 we again sighted land, which was reached on the afternoon of Aug. 4, and proceeded to Sophia harbor, where Eskimos were, as arranged, waiting for us. For convenience' sake I now divided our party into two, one of which sailed in the lifeboat of the Sophia to Egedesminde, where the steamer was to take us on board; and the other, in which was myself, marched to that place across the low but broad promontory which separates Tessiusarsoak and South-East Bay, and then in two Eskimo 'kone' boats to Ikamiut and Egedesminde.

On Aug. 16 the Sophia arrived from the north, embarked us, and made for Ivigtut, where we arrived on the 19th.

Of the expedition carried out under Dr. Nathorst during my absence, he will himself make a report,[1] and I have no doubt that the results of the same will prove very important. Particularly will the very rich collections of fossil plants, which he has made with the greatest regard to the geological condition of the strata, be of great value to science, as they will furnish us with many new materials, and detailed illustrations of the flora of the far north during the epoch when forests of fig-trees, cycadi, gingko, magnolia, and tulip trees covered these regions. Dr. Forsstrand and Herr Kolthoff's collections and studies of the fauna of Greenland will also contribute to extend our knowledge of the naturalistic conditions of the arctic regions; while the careful researches made by Herr Hamberg, of the saltness, composition, and temperature of the sea, will, I am sure, greatly benefit hydrography. His researches have been effected in Davis Strait and Baffin's Bay too, the hydrographical conditions of which are but little known.

With regard to the results of my exploration of the inland ice, I may be permitted to say a few words. That we found no ice-free land in the interior, or that it does not exist between 68° and 69° latitude in Greenland, is due directly to the orographical conditions which exist in this part of the country, as referred to in my programme of the expedition.[2] The land has here the form of a round loaf of bread, with sides which gradually and symmetrically slope down to the sea; i.e., exactly the shape which I then pointed out was a necessary condition if the entire country should be covered with a continuous sheet of ice.

But, thanks to the Lapps, my expedition is the first which has penetrated into the very heart of the enormous Greenland continent, and which has thus solved a problem of the greatest geographical and scientific importance. It is the first exploration of the hitherto unknown interior of Greenland, the only continent in the world into which man had not penetrated.

A new means of locomotion, the 'skidor,' seems also to have been acquired for the arctic explorer of the future, which may greatly assist him in his work, and enable him to reach places hitherto deemed impossible of approach, but of the use of which the Lapp seems to possess, so to speak, the monopoly.

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[1] *Nature*, vol. xxviii. p. 541.

[2] *Ibid.*, p. 37.