On North Polar Problems: Discussion

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Before the paper, the **PRESIDENT**: I have now to introduce to you His Excellency, Dr. Nansen. It is a work of supererogation, but it affords an opportunity of saying how sincerely we always welcome amongst us our distinguished Honorary Corresponding Member, and especially when, as to-night, he is good enough to give us, from this platform, the benefit of his experience and his thought. It seems almost yesterday that Dr. Nansen received from the hands of our former President, Sir Clements Markham, that special Gold Medal which our Society awarded to Dr. Nansen for his Polar Expedition. That award was ten years ago. It was about six years earlier that Dr. Nansen first came amongst us to receive our Patron's Gold Medal for his scarcely less memorable explorations in Greenland, which he was the first to traverse in its entirety. During those sixteen years our Society has learned to look upon him as in some way belonging to itself, and that feeling was, if possible, strengthened when His Excellency came to the Court of St. James's as the accredited representative of that old kingdom of Norway, of which the reigning sovereigns are so closely related to our own King and Queen. The sympathy of Britons with Scandinavia runs warmly in our blood, in which the Norse element is not only considerable, but also extremely active, as I think is evidenced in our maritime history and in our conquests beyond the seas, which recall the gallant actions of the Norsemen of the Middle Ages. But the affections of our Society for Dr. Nansen do not rest only on the fact of his being a hardy Norseman; they are based mainly on his remarkable personality, which cannot fail to impress itself upon all who come in contact with him. Among his many virtues is that of thoroughness, and in hearing to-night his address on Polar Problems we shall have the satisfaction of feeling that we are listening to one whose experience and thought in that direction are absolutely unrivalled. I now call upon His Excellency to give us his address.

After the paper, Sir **CLEMENTS MARKHAM**: We have all listened with great pleasure to this most interesting address. We are always glad to welcome our friend Nansen here, not only owing to our admiration for him, but because many of us regard him with affection. He never comes here unless his addresses contain something that is important and often that is memorable. He came here to propound his plan before his great expedition, and he met with a quantity of adverse criticism which all turned out to be entirely wrong, while what Nansen said was perfectly accurate and correct. He had studied the subject with very great care, and I am glad to say that I was not one of those to criticize him adversely, because I entirely agreed with him on every point. I was not present at the meeting. The next time that he appeared amongst us was after he had returned from that great expedition. He deprecates my saying that he then drew the veil from the Arctic mystery; but at all events we may say that he gave us entirely new ideas about Arctic problems. I have only time now to allude to what we ought to do in the future. He has shown us that if this continental shelf right round the polar basin was explored, we must necessarily discover all the undiscovered Arctic land. We should, therefore, turn our attention to this point. I regret that he was unable to dwell a little longer on the question of the driftwood, which I look upon as a most important one. If Colonel Feilden is present—there is no man who knows so much about it—I should like to hear from him his opinion as to where that driftwood came from, whether it was from America or Siberia, because that is a matter which must be taken into our consideration. We must remember now that it will be no use, geographically speaking, it will be absolutely of no use, for Arctic sledge travellers to attempt exploration without the means of sounding at least 100 fathoms. I discussed that matter very carefully with Mr. Mikkelsen, and he was deeply impressed with its importance. He will not take it for granted that he has come to the edge of the continental shelf when he finds no bottom at 100 fathoms,

because it is possible he may have come upon one of those submarine fjords or valleys, and he will always take care to make certain that he is not mistaken on that point. We may now, I think, look upon it as an axiom in Arctic exploration in future, that we must devote ourselves to the examination of the continental shelf. Indeed, I look upon what Nansen has said as having given us the watch-word of the continental shelf. I thank him very much for the great interest he has given us this evening, and for the rich material for thought with which he has furnished us in his address.

Sir ARCHIBALD GEIKIE: Even if a geologist were disposed to criticize Dr. Nansen's opinions, his critical tendency would be apt to be silenced by his personal admiration of the man who displayed such marvellous endurance among the trials and dangers of the north, and who, since he returned safe and sound from these perils, has shown such a continued and enlightened interest in the subject of polar exploration and in inculcating the views to which his studies have led him. Listening, as I have done, with keen interest to what Dr. Nansen has said this evening, I gather that in the geomorphological part of his subject, he regards the most important problem to be the further investigation of the great sea-basin which he was himself the first to discover. In this opinion I am sure that most geologists will concur. He has referred a good deal to what he has termed the "continental shelf." I do not know that geologists generally would attach quite the same importance to that feature that he does. We are in the habit of regarding this continental shelf as a certain zone of instability where the relative levels of sea and land from time to time may vary, where the atmospheric agencies and the sea are at work, and where, in the course of ages, a certain more or less level platform has been cut out of the land. Whether the zone so eroded be a broad platform or a narrow one will depend partly on the angle of the slope of the edge of the continent, partly upon the length of time during which the continental margin has been exposed to denudation, and partly upon the nature and activity of the agents of destruction. In the case of the continental shelf of the polar basin, to which Dr. Nansen has referred, he spoke of the possibility of its formation having begun in Jurassic time. That may be true, though as yet we know little about the age of some of these great depressions on the surface of the Earth. But if the origin of this polar sea-basin started so recently as Jurassic time, the probability is that the terrestrial movements to which it was due have been continued in more recent periods. During the Tertiary ages some of the most voluminous volcanic eruptions which Europe has ever seen took place in our own region. It was then that the immense sheets of basaltic lava were poured forth, of which mere fragments are left in the Inner Hebrides, Antrim, the Færoe islands, and again in Iceland. The modern descendants and representatives of these volcanoes are not yet extinct; they are still vigorous in Iceland and Jan Mayen. Whether or not they have extended further north into the great polar basin remains to be discovered. It is quite possible, though the chances are perhaps against it, that if some future *Fram* shall direct its course right across the centre of that north polar basin, it may come across some volcanic vent still blazing away as Mounts Erebus and Terror are doing in the southern polar regions. Of the many important questions to which the lecturer has alluded this evening, that which to the geologist presents special interest is the further exploration of Dr. Nansen's great northern polar basin. We would like to have its margin traced, and to know by what kind of rocks it is encircled, whether or not it is one great basin, and whether from any part of its area a volcanic vent rises to the surface.

Colonel FEILDEN: Sir Clements Markham asks me to express an opinion from whence the driftwood found on the north shores of Grant Land and Greenland

is derived. It must come either from the Mackenzie and Coppermine rivers of America, or from the rivers of Siberia. The enormous beds of driftwood found by McClure on the west coast of Banks Land, and in lesser quantities on Prince Patrick island, are unquestionably the products of the American rivers. This wood from Banks Land was pronounced to be coniferous, and a cone to be identical with the present spruce pine of North America. During the passage of the *Investigator* along the west shore of Banks Land floating wood was seen. We may therefore assert with some confidence that the transportation of driftwood by the currents of Beaufort sea is still in progress, and must have continued for ages. Captain Amundsen kindly informed me that he met with no driftwood on the shores of King William island. This is explained, probably, by the Great Fish river emerging from extensive lakes north of the limit of tree-growth, and the currents drifting the Coppermine and Mackenzie wood to the westward into Beaufort sea. The problem that confronts us is, whether a current sweeps past Banks Land and Prince Patrick island, along the fringe of the yet unexplored North American archipelago, and deposits driftwood on the shores of Grant Land and North Greenland, or whether, diverted say at Prince Patrick island, it crosses the Beaufort sea and eventually joins into the *Fram* drift. The easterly drift met with by Peary north of Cape Columbia, and the drift tree embedded in the floe seen by Peary, are suggestive. On the other hand, can we doubt that the vast deposits of driftwood on the New Siberian islands and on Bennett island are products of the Siberian rivers, and following the track of the *Fram*, a large amount of driftwood must ever be passing across the polar area, some of which would be deposited on the north and east shores of Greenland, and presumably on Grant Land. Is it not possible that the ocean currents, in their vast gyrations within the polar area, may commingle the driftwood of the Asiatic and American rivers? We might gain some information from a careful examination of the drift-timber stranded on the north shores of Iceland. If it comes from the Siberian rivers, in all probability it is accompanied by the wooden perforated horseshoe-shaped net-floats used by the Russian and Samoyede fishermen of Siberia. I have found these along with great accumulations of driftwood on the east coast of Waigats, thrown up by the Kara sea. There is another interesting drift to be met with on the north shores of Grant Land and North Greenland. I refer to the ice-rafted erratics of granite, syenite, and archaic rocks, which are to be seen from present shore-line to high elevations in those regions. None of these rocks are known in North Greenland, nor in Grant Land, nor in Ellesmere Land north of the 79th parallel, nor in any of the islands of the North American archipelago yet discovered. It seems to me impossible that these erratics could have been translated by the ice-floes from Baffin bay, or up Smith sound to the shores of the polar ocean. The question is, From whence do they come?

The PRESIDENT: The hour is now so late that I must propose the usual vote of thanks to Dr. Nansen, and ask him if he has any remarks to make upon the discussion.

Dr. NANSEN: It is so very late that I am afraid I must not detain you very long. But there are a few things I should like to say a few words about. As to the possibility of unknown volcanoes in the north, I may mention one thing which might speak in favour of Sir Archibald Geikie's views. On the coasts of Norway there are found great quantities of two kinds of pumice-like stones, which have been examined by the Swedish geologist, Dr. Bäckström. The one kind is not real pumice-stone, but is iron slag thrown into the sea by some of the Scotch ironworks. The other kind is, however, real pumice-stone of a peculiar nature, it being composed of andesitic rocks. As no known volcanoes on this side of the North Pole

produce pumice-stones of this composition, it was assumed that they must have come from the volcanoes in Alaska; and as great quantities of them are found near old post-Glacial shore-lines high above present sea-level, it seemed probable that there had been a regular drift of these pumice-stones with the North Polar current across the North Polar sea from Alaska during previous post-Glacial times. There is, however, a possibility that they have not come from Alaska, but from some unknown volcanoes in the north producing andesitic lavas. With regard to the driftwood, I should like to have heard Colonel Feilden say still more about that subject. The great quantities found during the Nares Expedition on the coasts of Ellesmere Land interest me especially very much; some was found at heights of even above 150 feet.

Colonel FEILDEN: Found at 1800 feet.

Dr. NANSEN: That is very high indeed; and it may be that the wood found there has to be considered more as fossil wood. But, at any rate, comparatively modern driftwood is found high above present sea-level, and the wood cannot have been lifted to its present situation by ice-pressures or in any other way from the present shore-line. These pieces of old driftwood must have been drifted ashore during previous periods when the sea was nearly as much higher as the land where they are now found. And as there seems to be much driftwood of this kind, the probability is that the sea was then more open than it is now, because when the coasts are ice-bound, like the northern coast of Ellesmere Land is to-day, then we cannot expect much driftwood to be thrown ashore. I think the study of that driftwood is most important from a geological point of view; it may give valuable informations about the changes of sea-level or the shore-line in that region, and when there was a milder climate in the north, with more open polar seas. Perhaps those milder periods were simultaneous to the similar ones we have had in Europe in post-Glacial times, and evidences of which have been found in Norway, Sweden, Spitzbergen, and even Franz Josef Land. At that time our coasts were also somewhat more elevated than they are at present; but the elevation, at least at some places in Scandinavia, was then hardly more than 20 feet and less. It was, consequently, very little compared with the elevations mentioned in Ellesmere Land. I entirely agree with Colonel Feilden as to the origins of the driftwood, and I think that in those regions it chiefly came from Siberia, and it proves that not only at present, but also during previous geological times, there has been a continuous drift across the North Polar sea from the Siberian side towards the Greenland side. I wish, before I sit down, to use this opportunity of thanking you for your kindness, and the way in which you have received me and patiently listened to my lecture, which was very long, I am sorry to say, but I have the fault, I know, that when I begin a subject I have difficulty in giving it up again.

LORD CURZON ON FRONTIERS.*

By Colonel Sir T. H. HOLDICH, K.C.M.G., K.C.I.E., C.B., D.Sc.

No subject that could have been selected by the Chancellor of the University of Oxford for the Romanes lecture of 1907 could have been more appropriate than that of "Frontiers." As Lord Curzon remarked

* "The Romanes Lecture, 1907. Frontiers." By the Right Hon. Lord Curzon of Kedleston, D.C.L., LL.D., F.R.S., Chancellor of the University. Oxford: Clarendon Press. 1907.