WILEY

Summary of Geological Results: Discussion

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great height above the sea, running immediately in front of the existing glaciers, and in such a position that it is scarcely conceivable they could have been formed with the sea at its corresponding elevation if there had existed glaciation of even the same intensity as that which now obtains, to say nothing of a greater intensity. I believe I may venture to say, that in those regions the existing glaciation represents a maximum, such as has never been attained before, and if this conclusion should turn out to be sound, it is one, I need hardly say, of considerable importance from the point of view of physical as well as of biological geography.

After the reading of the Papers, the PRESIDENT said : We have present with us this evening several of our old English arctic officers, who all, I am sure, are delighted to welcome Captain Sverdrup, and I hope some of them will address the meeting.

Admiral Sir LEOPOLD M'CLINTOCK : I very gladly avail myself of this opportunity of expressing my, not merely satisfaction, but pleasure, at hearing the report of the expedition, and I desire heartily to compliment Captain Sverdrup upon the great success which has attended his efforts. His well-sustained energy for fully four years has brought about results which are of very great use to geographical knowledge. He entered a part of the arctic regions which we English people thought to be peculiarly our own. The Parry archipelago had been discovered by Sir Edward Parry. I may say a word or two before we leave the Parry archipelago : its southern side was discovered by Parry eighty-three years ago, and exactly fifty years ago the northern part was discovered by our own sledge parties when searching for Sir John Franklin. I am glad to notice that the Sverdrup methods of exploring by sledges were very similar to those we used in our own expeditions, but with this remarkable difference, that he was supplemented by dogs to draw the sledges ; we had to draw our own. We looked upon that part of the arctic regions as so peculiarly our own that we spoke of it as if the Queen's writ was free to run through it even to the north pole. But we can no longer make that boast ; Captain Sverdrup has been there, and he has discovered other lands farther north, so that we cannot look for any immediate increase to the British Empire in that direction. This evening must be given up altogether to geographical matters, and I heartily congratulate Captain Sverdrup on his great success and wonderful achievements, and I hope he may long live, and enjoy good health and wear his honours and distinctions.

Admiral Sir VESEY HAMILTON : I have very little to add to what Sir Leopold M'Clintock has said of the admiration in which we hold Captain Sverdrup and his followers for the way in which they performed their work. We may say of Captain Sverdrup that he is the Captain Cook of arctic expeditions. He has brought back all his men but one. They possessed advantages which we did not possess in the way of dogs ; we had some, not many, but he has not described anything with regard to the difficulties of dog-driving. We once had an admiral 150 years ago, and it was said of him that "he was never known to swear, not even at sea," but he was never known to drive a dog-sledge, or he probably would have. In my earlier days we had not the advantage of being able to take photographs, and most of us were not of very big stature. But those photographs which we have seen on the screen make the members of the expedition look like giants. The work that has been done by Captain Sverdrup has my great admiration, and I cannot speak of it too highly. One thing, it shows the enormous uncertainty of

ice-navigation, for, after spending two years in a harbour, there were but 5 miles of ice between them and the open sea, and but for that 5 miles of ice they would have been able to get back one year earlier. Dogs were first introduced into the arctic regions by Captain Penny, who was in charge of an expedition by the Admiralty in 1850. One curious thing about these dogs was that they were divided amongst the two ships, but the men who fed the dogs on the one ship did not dare go near the others. They are a very peculiar race are Eskimo dogs, for if anything happens to the leader of a dog-sledge, he pitches into number two, and number two pitches into number three, and so it goes on to the end. It is a curious fact that in this room at present there are arctic navigators representing various expeditions from 1847 up to the present time—fifty-five years—and if we go back a little further, we may add Sir Joseph Hooker, who accompanied Sir James Ross in 1837 in his antarctic expedition, so that we can trace back ice-navigation for sixty-five years, and I do not think there are many kinds of work that can go back so many years. I can certainly say, in the name of all arctic navigators, that we welcome Captain Sverdrup here most heartily, and congratulate him on the successful conclusion of that expedition.

The PRESIDENT: We now come to the arctic officers on the eastern side, and we will begin with Admiral Markham, who I hope will address the meeting.

Admiral A. H. MARKHAM: Like my old friend, Sir Leopold M'Clintock, I am only too glad to avail myself of this opportunity of offering my congratulations personally, and I think I may also say in the name of the officers who served under Sir George Nares, our congratulations on the excellent geographical work that has been performed by Captain Sverdrup during his recent expedition in the arctic regions. We were all very much pleased and very much relieved when we heard of the safe arrival of the *Fram* last September in Norway, after having been lost sight of to the world for something over four years, and the pleasure we then felt was enhanced when we heard of the excellent work that Captain Sverdrup had done in those regions—work which displayed that spirit of endurance, that spirit of pluck, and that determination which we were well assured, from our knowledge of what Captain Sverdrup had already done in the arctic regions, he possessed. Thoroughly realizing as I do the great difficulties he had to contend with, I can all the more appreciate and admire the skill, the energy, and the perseverance which he and his gallant followers displayed in overcoming those difficulties. Sir Leopold M'Clintock has taken us back fifty and eighty years, and I can remember almost as if it were yesterday the meetings that were held in this very theatre thirty years ago—meetings at which your President of to-day was the leading and guiding spirit; meetings that were held with the object of the renewal of geographical exploration in the arctic regions. I am sorry that there is not a north circumpolar map of that date hanging in juxtaposition to the one now in front of you, so that you would be able to see at a glance the large amount of geographical work that has been performed during the period that I have referred to. What was then almost a *terra incognita*, as was shown by Captain Sverdrup just now on the screen in the region of Jones sound, has been explored, the coast-line has been delineated on your map, and now we have Captain Sverdrup coming back and giving us an account of his discoveries in a portion of that region which was a *terra incognita* in those days from Jones sound, along the west coast of Ellesmere Land, until he almost joined hands with Aldrich's farthest on the north coast of Grinnell Land. I am one of those who feel pretty sure that before many years have elapsed, such is the spirit of geographical enterprise in the present day, that we shall have a very fair knowledge of the conditions of land and ice and of sea in the polar regions. And I say polar regions in contradistinction to arctic regions, because we must not

forget an expedition now in the far south that has already done good work, and we hope is continuing to do good work, under the command of Captain Scott and his brave associates in the *Discovery*, an expedition whose despatch is almost entirely due to the never-tiring energy of our President, Sir Clements Markham. There are one or two points on which I should like to ask for information, but our President has told us that Captain Sverdrup has a very limited knowledge of our language, and perhaps it would not be fair to ask him, but perhaps Mr. Schei would be able to answer one or two questions which I should like to put. We have seen some excellent illustrations from photographs on that screen. There were one or two of sledges. Sir Leopold M'Clintock told us just now that these sledges were different from those in use in his time because they were supplemented by dogs. But I saw a big wheel on the screen, and I am not quite sure of the utility of that wheel, whether it was to guide the sledge or whether it was to increase its motive power. There was another question I should like to put. I understand that Captain Sverdrup never saw anything of what we called palæocrystic ice. He alludes in his paper, in the neighbourhood of some place with a most unpronounceable name, but which our President has just told us had something to do with butter and porridge, to the fact that there was some very heavy arctic ice near this place, and I should like if Mr. Schei could tell us if he could estimate the thickness of that ice, because I have a shrewd suspicion that it was our old friend—or old enemy—of 1876, to which we gave the name of palæocrystic, on account of its very massive character. In conclusion, I should like, in the name of the officers who served under Sir George Nares, to offer to Captain Sverdrup our warmest and sincere congratulations on the great and valuable geographical results he has brought home with him from this expedition.

The PRESIDENT: That wheel was a pedometer for measuring the route, and the ice is about 30 feet thick.

Admiral ALDRICH: I am delighted to add my remarks to those of Admiral Markham in saying how sincerely I congratulate Captain Sverdrup on the success of his expedition, and not only Captain Sverdrup but all those who went with him. I think Admiral Markham has pretty well thrashed out all the points. Up here we all noticed the presence of that wheel, and the pedometer must have been a useful thing on smooth ice. I can only wish that Captain Sverdrup had completed the gap between his exploration and the one which I made under Sir George Nares. It is a very little gap, and apparently on the map it is a very simple thing to do, but I have no doubt that along that coast some of that ice which Admiral Markham calls our enemy would be met with. It is just thereabout one would expect to find it, although I think, so far as I can remember, the ice along the coast was not so heavy as it was in the neighbourhood of the north end of Smith sound; yet, as Captain Sverdrup thinks—and I think he has good reason for stating what he thinks—there is no land to the north of where he was, we may assume that for some reason or another there must be something to prevent the formation of the heavy ice on that part of the coast. One can scarcely see why it should not be along the north-west coast. That remains among other interesting items to be discovered in the future. Whether any one will ever deem it worth while to go out and look I know not, but I firmly believe in my own mind that we were put on this Earth's surface to discover as much as we can about it. And all I can say in regard to those who began and those who have continued and those who may in the future continue is, that one wishes that the same success may attend their endeavours as has attended Captain Sverdrup and his followers.

The PRESIDENT: Is there any one present who would address us on the geology of these regions?

Prof. GARWOOD: In the absence of anybody worthier, I feel it my duty to express the very great admiration I feel for the excellent work which has been done by Mr. Schei and his companions with regard to the scientific portion of the expedition, especially with regard to the geology. At this meeting I cannot go into details about what we have heard, and we have been told that only a portion of the details have been worked out. There are, however, one or two points to which I should like to allude. It is very interesting to me to hear that the geological formations mapped by Mr. Schei are very similar to those which occur in the island of Spitsbergen, and I can appreciate very much the very difficult work Mr. Schei must have had in order to collect this material. After the two holiday trips I made with Sir Martin Conway, which we made in the summer, I can appreciate the difficulties of obtaining collections of this kind. With regard to the details, there are one or two points I would like to call your attention to—one is the enormous widespread occurrence of marine rocks of upper carboniferous age. I did not quite gather whether these rocks are what are spoken of as Permo-Carboniferous, or whether they are the true carboniferous rocks of this country. On the east side of North America the former rocks do not occur, but from Spitsbergen spread right away into Russia and that part of the world. So that now we have evidence of an upper carboniferous sea occupying the present site of the Arctic ocean. Then with regard to old red sandstone formations, those occur right across from Spitsbergen, and the author mentioned many other forms and fossils of alpine marine trias with *Damella cornelli* quite different to the rocks of our own country, again proving an arctic sea at that period also. With regard to raised beaches, it is interesting to find that that part of the country shows changes of level, just like the island of Spitsbergen, Franz Josef Land, and other portions of the far north. In that connection the absence of a more extensive glaciation in the past is very interesting indeed. We have heard a great deal lately about the cause of these raised beaches. We have been told that the raised beaches are due to the melting away of the former ice-sheet which stretched further to the south than it does at the present day. Now that appears to be quite contrary to the recent observations made by the author. If the ice is now at its maximum, how do we account for the raised beaches? That is an interesting point I should be glad to hear something more about. There are many other minor details which we cannot enter into at this early stage, but I should like again to congratulate Mr. Schei on the very important work done by himself and companions in these regions.

The PRESIDENT: I have no doubt Prof. Garwood regrets the want of time in discussing these questions. The whole subject of the northern archipelago is one of deepest interest. It is a homogeneous region in itself, geologically, meteorologically, and geographically, and if Captain Sverdrup could have remained here a little longer we might have had another and fuller discussion on the whole subject of the geography of these regions. I hope that may be possible at some future time. We now have to thank the authors of the papers. It is a very great pleasure, I am sure, to the people of this country that they should be colleagues, as it were, in arctic discovery with our gallant Norwegian kinsmen. The Norsemen were the first arctic explorers on the east and west of Greenland. There are those who believe, as I am inclined to do, that the great cairns discovered on Washington Irving Island are not wholly unconnected with the discoveries of the Norsemen. If that is the case, we must feel that Captain Sverdrup and his companions, when near that island in Hayes sound, were on their own land. I do not venture to say that the round towers mentioned up Jones sound had anything to do with the Normans; but I do feel that we may rejoice in finding that the Norwegian explorers have filled up this gap which we have long wished to have filled up,

more than if it had been filled by explorers from any other country. I rejoice to see those names which we used to study in the old maps now appearing as a sort of wedge between our eastern and western discoveries. It is pleasant to read these old Norse names, for the most part, I think, describing the character of the country or of the cape or the bay, instead of covering the whole map with Jones and Brown and Robinson. I was very much struck, particularly on this point, that Captain Sverdrup has suggested such excellent names, describing the character of the country and the capes and bays. Captain Sverdrup and his companions have set quite an example in the admirable way in which they have conducted their work, and the friendly tone that has existed throughout the expedition, and the way one has helped the other, and this, no doubt, is one of the reasons of their great success. I am sure now the meeting will wish me, by a unanimous vote, to express our warm thanks to Captain Sverdrup for his admirable paper and to the beautiful illustrations, and to Mr. Schei for his most interesting account of the geology of the expedition.

ADMIRALTY SURVEYS DURING THE YEAR 1902.

UNDER the orders of the Lords Commissioners of the Admiralty, eight of His Majesty's vessels, with three small hired steam-vessels, manned by 78 officers and 703 men, have been employed on hydrographical surveys on the home and foreign stations.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament:—

Reports of 318 rocks and shoals which were dangerous to navigation have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 1924 miles of coast have been charted, and an area of 12,661 miles has been sounded.

In *Great Britain*, various resurveys were made—at Portsmouth and Plymouth; in Dover bay, and in the Thames estuary.

The river Yealm was surveyed, and a plan made of Wembury bay.

King road, Bristol channel, was resounded. Great changes have taken place here since the last surveys in 1880.

Loch Roag, a very fine harbour in Lewis, was resurveyed, revealing a great many new rocks.

A remarkable instance of a local magnetic focus was also found in East Loch Roag, where the compass is much deflected.

A survey of Moray firth was carried as far as Burgh head, on a scale of 4 inches to the mile.

Kingstown harbour was resounded, and considerable changes found.

In *Newfoundland*, the survey of the intricate bay of Exploits was continued, and a plan of Peter arm was also made.

In the *China seas*, two ships were at work. The surveys of the East Lamma channel and the western approach to Hong-Kong were finished.

Mirs bay survey was continued, while plans were made of Long and Crooked harbours; and the outer part of Tolo channel, left incomplete last year, was also finished.

A considerable part of the north coast of the British sphere of influence around Wei hai wei was charted, and an area of the Yellow sea was sounded.

A complete survey of the Peiho river entrance and Taku bar was made, for the purpose of planning works for the improvement of the bar.

A part of the approach to Amoy was examined, and several rocky heads discovered.