On the Exploration of the North Polar Basin, with a Résumé of Recent Swedish, German and Austrian Attempts to Reach the Polar Circle from the Atlantic Ocean

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sideration that might lead to his being communicated with, if only a fair prospect of success offered. This, I think, Mr. Stanley will accomplish.

"As to Livingstone's position, we know that, at Cazembe's town, he was out of all stores, and living on the generosity of various Arab parties met with. These Arabs have long since reached the coast, and returned on other expeditions; some of them to Ujiji, others to Cazembe.

"At Ujiji we knew, from Dr. Livingstone himself, that he found a few of the things sent off years ago; he had been ill, and illness had affected his temper: he warned us, indeed, that we might expect no further details of his proceedings, until such time as he came to publish them in person; this, he said, he regretted, as an accident on the way might lose for ever the whole results he had accumulated. Such a letter was obviously penned when African fever lay heavy upon him, and when he was also out of quinine.

"It was before the large supply of all sorts of stores reached Ujiji; then he had set out to a place, distant about twenty or thirty days' journey, to the west of the sea of Ujiji. The object of this expedition was clearly to learn the truth regarding that lake, to which he had been told the waters of Cazembe and the chain of lakes he had followed all converged. No one with whom I have come in contact, has yet been able to describe the country of Manyema; it is an ivory-country, visited by the Ujiji traders, but these men seldom come to the coast.

"Livingstone followed an Arab caravan; and we have heard of their safe arrival at Manyema, but not of their return to Ujiji. On their way back both the Arab caravan and Dr. Livingstone came to a standstill, and the men I had sent to be his servants had left Ujiji with stores to assist him. Objection has been taken to the story that Livingstone wrote to Ujiji for assistance, because no one in Ujiji could read his letters. This is no objection whatever, as, no doubt, he would get his companion, Mohammed bin Gharib, to use his pen and write in Arabic or Swaheli.

"If Dr. Livingstone reaches Ujiji, we know he will find supplies, diminished, no doubt, by expenses on the way, and losses in passing that awful march, where the men died from cholera, but yet, I trust, sufficient for all he requires. If he takes up goods at Ujiji from the traders at five hundred per cent., his drafts will be duly honoured here by me; and, once at Ujiji, I do not see any difficulty in his way either to return to Zanzibar, or to push on, as he seems to have intended, by taking canoes and following the lake to the north. Livingstone's whole aim and object has been to trace the Nile further south than had been done by others; and, we may rest assured, he will not come out of Africa to leave that undone. My own conviction is that he has by this time left Ujiji and passed north, to trace the Tanganyika, and discover its connection if any, with Baker's Lake. If he returns without doing this, we may be quite sure he has made some great discovery regarding the course of those lakes that pass Cazembe's town. One thing we must keep in mind,—there is nothing discouraging in the last news we have received of him, and we cannot expect to hear again until the war at Unyanyembe has been closed.

(Signed) "JOHN KIRK."

The following Paper was then read :—

On the Exploration of the North Polar Basin, with a Résumé of recent Swedish, German and Austrian attempts to reach the Polar Circle from the Atlantic Ocean. By Capt. SHERARD OSBORN, R.N., F.R.G.S., F.R.S.

OUR able and indefatigable secretary, Mr. Clements Markham, has recently, in a valuable Memorandum, called the attention of the

President and Council of the Royal Geographical Society to the necessity of public interest, in this country, being again directed to a scientific exploration of the 1,131,000 square miles of the globe's surface, which still lie unexplored around the northern pole of our earth. It will be in the recollection of the members of this Society that, in 1865, I read a paper on this subject, and therein to the best of my ability, urged the necessity, on many grounds, for an exploration of the Polar basin, and set forth the arguments in favour of reaching that unknown area by way of Baffin Bay and Smith Sound.

That route, it is maintained, is the one which two hundred and odd years of experience have given to British navigators and explorers the best assurance of reaching the 80th degree of north latitude, with the greatest certainty, and smallest amount of risk, to ship and life.

Backed by all the scientific bodies of this country, our late distinguished President and Council took immediate steps for a revival of English Arctic enterprise, and wrote to, as well as had an interview with, the then First Lord of the Admiralty, His Grace the Duke of Somerset, with a view to obtaining that assistance from the Navy, which we believed would give the best guarantee for a successful geographical exploration of the area under consideration. Unfortunately for the purpose we had in view, an eminent German geographer renewed a theory which he had first started at a still more inopportune time during the search for Franklin,—and had English navigators then listened to it, that search would have been a failure, the North-west Passage would not have been discovered, and the geography of the lands between Baffin and Behring Straits would still have remained unknown; his theory being that the true way to reach this unknown area, was by following in a very different direction what he believed to be a current of warm water, flowing to the north-east from the tropical regions of the Atlantic towards the shores of Spitzbergen and Nova Zembla. He maintained, in the face of three centuries of experience, that a route could be found into the area round our pole in that direction, and that a navigable sea existed there.

His arguments and opinions caused a division amongst Arctic authorities in this country; and the First Lord of the Admiralty, though apparently sufficiently enlightened to entertain the general proposal, very naturally declined verbally to assume the responsibility of deciding which route was the right one, until geographers and Arctic authorities could themselves agree on so important a point.

Disappointed though I and others naturally felt at this first result of our efforts, still we could not but acknowledge the justice of the course taken by the Admiralty; and, as a matter of policy and common sense, I advised Sir Roderick Murchison to be patient, and wait till time had proved the fallacy of theories based upon the existence of an imaginary open Polar ocean, and upon the possibility of ice-navigation late in the autumn.

Seven years have now elapsed, and though I am prepared to do justice to the zeal, enterprise, and courage, with which the German explorers have endeavoured to give effect to the theories of their speculative geographer, and to the noble fortitude with which they have faced severe hardships in trying to reach the Polar basin, between the east coast of Greenland and the meridian of Nova Zembla, yet I maintain that the result proves the learned but purely theoretical German geographer to be wrong, and the experienced Arctic voyagers, who thought with me, to be right. I do not propose, in a short paper adapted for our evening discussion, to attempt to give full details of the two German Expeditions of 1868 and 1869, which sailed from Bergen and Bremen respectively; and there is the less need to do so, as our distinguished Associate, Admiral Sir Leopold M'Clintock, in January, 1871, gave us a paper containing an excellent *résumé* of the last expedition.

The result of those two German efforts was, in my estimation, calculated only to confirm our opinion that between Spitzbergen and the coast of Greenland there was no navigable passage through the ice-drift from the Pole, either for steamer or sailing-ship, to the northward of points reached by Hudson two centuries, by Phipps one century, and by Scoresby, Buchan, Parry, Clavering, and Sabine, half a century ago. The Pendulum Islands and adjacent coast of Greenland were the furthest point northward of the German, as it had been fifty years before of the English navigators. Captain Karl Koldewey, who commanded both expeditions, happily relieves me from the pain of feeling that I differ, in this respect, from one who so gallantly endeavoured to test Dr. Petermann's theory. In May, 1871, after his experiences of Petermann's route to the Polar basin, he writes as follows:—

“One can hardly resist the conviction that the hope of attaining the North Pole by ship, or of finding an open sea around the Pole, are alike among the most improbable of things.

* * * * *

“I confess that I myself was misled by representations in Dr. Petermann's ‘*Geographische Mittheilungen*,’ and held it to be at

least possible, by following a line of coast, to penetrate by ship far into the central Arctic Regions, and then certainly to make one's way to the Pole. A winter in East Greenland, the most careful observation of those mighty masses of ice, their movements and formation, and of the whole conditions of temperature, and finally the careful study of Arctic literature in its original form, and not by means of one-sided extracts, have radically cured me and all my companions of this idea.

* * * * *

"If its principal object is to be the nearest possible approach to the Pole, I am quite of Osborn's opinion that the best way appears to be through Smith Sound. Here one can penetrate by ship every year to the 78th parallel, and then one has a continuous line of coast running north, which has been sighted as far as the 82nd parallel. Along this coast one would have to work one's way, in spring, with dog-sledges.

* * * * *

"I consider it a wild undertaking to penetrate towards the Pole by ship, between Spitzbergen and Nova Zembla."

Comment on this honest seaman's opinion is unnecessary, and no amount of specious reasoning, spread over any amount of pages, by any mere theorist, be he German or English, can undo the effect of evidence so strong and conclusive.

Before touching on the voyage undertaken last year by Lieut. Payer, I must refer to the results of the Swedish expeditions to Spitzbergen; and it is the more incumbent upon me to do so, because the Duke of Somerset rested his decision (to delay further action with respect to the representation that was made to him) upon the importance of first being furnished with the conclusions arrived at by the Swedish explorers.

Nordenskiöld, Von Otter, and other intrepid Scandinavian men of science, have led no less than four expeditions to the verge of the unknown Polar Region, on the Spitzbergen meridian, between the years 1858 and 1868, with the object of making researches into natural history, and achieving such discoveries as might prove to be feasible.

The opinions of Nordenskiöld and Von Otter are most valuable, and they fully confirm the experience of centuries, that in the summer or actual sailing season in the Polar Seas, it is not possible to penetrate through the pack. They observe, however, that at the season when, in consequence of the heat of the summer and the influence of ocean waves and streams, the ice-masses have been

reduced to their minimum—that is to say, in the autumn—theorists had thought it possible to advance further than in summer.

They therefore made the attempt, and are most emphatic in its condemnation. Their conclusion is, that during the autumn a vessel might possibly reach a latitude considerably higher than that which has been obtained by the early summer expeditions. But they further point out that progress would soon be rendered impossible by the cold and darkness, the winds accompanied by snow-storms, the heavy seas covered with drifting floes, and the young ice. They also record their opinion that an open Polar Sea is a mere hypothesis, destitute of all foundation in the experience which has been gained, and that the only way to approach the Pole, which can be attempted with any probability of succeeding, is that proposed by English authorities of exploring on sledges in the spring. Here, then, are the reports for which the Duke of Somerset desired to wait, and by them we find that the Swedish and German Commanders of Arctic Expeditions, after gaining actual experience in ice-navigation, fully agree with their brother-explorers of England in the route that should be taken, and in the means by which success must be achieved.

Such were the results of the German and Swedish Arctic Expeditions up to the year 1871. I now proceed to give you a *précis* of a very interesting voyage, made under Austrian auspices last year, into the sea between Spitzbergen and Nova Zembla.

Lieutenants A. Weyprecht and Julius Payer, of the Austrian Navy—the latter of whom was associated with Captain Koldewey in his voyages to the North—appear to have very ingeniously thought of following the supposed Gulf Stream into the Polar Basin, by keeping more to the eastward of Spitzbergen, and towards Nova Zembla, than Koldewey had done, and especially directed their attention towards Gillies Land.* After many delays, Payer and his associate, Lieutenant Weyprecht, put forth from Tromsø, in Norway, on the 21st June, 1871, in a small hired native vessel of 70 tons, and a crew, all included, of eight souls. Finding they could not reach Gillies Land in a direct course, they endeavoured to work their way up the Stor Fiord. Here they were met by southerly currents and heavily drifting ice, against which they struggled fruitlessly until the 19th August, when, for good and sufficient reasons, they abandoned the Stor Fiord route towards Gillies Land, and attempted then to reach it by following the eastern coast of the outermost islands of the Spitzbergen group.

* 'The Polar Expedition of A. Weyprecht and Julius Payer in the year 1871.' Geographical Society, Vienna, 1872.

On the 19th August they reached Hope Island. It was free from ice, and they anchored there, and logged a current running past the ship w.s.w. three knots per hour. Leaving Hope Island on the 21st August, they had reached lat. $77^{\circ}17'$ N., and between the 28th and 36th degree of long. E. found much lighter ice than had hitherto been met with. On the evening of the 22nd the Report says:—

“Of King Charles Land we saw nothing, although only 40 to 50 miles distant. In the evening, for a short time, we had a clear sky towards the northward; otherwise we were enveloped in eternal fog. The vicinity of the land, however, was proclaimed by the decreasing depth of the sea, and numerous bear-tracks on the ice.”

Between that date and the 29th they appear, on the parallel of $77^{\circ}30'$, to have been beating about in perfectly navigable ice, but the fogs were so extensive they could not see far.

On the 29th August they had reached 42° E. long., and were much astonished to be able, on the 30th, to pass 78th degree lat. and $41^{\circ}30'$ E. long. without encountering ice; but that night they struck against the ice-edge. The ice, however, was moving to the north instead of to the east. On the 31st, at mid-day, the Report states they were in $78^{\circ}25'$ N. lat., 42° E. long.; at eight o'clock in the evening, in $78^{\circ}41'$ N. lat., amongst ice, which seemed to be moving north-east. To the west the ice lay dense, with strong ice-glare and detached icebergs, but to the north it was loose or open. On the 1st September, midnight, they reached their highest latitude, $78^{\circ}48'$ N., dead reckoning, and by indifferent observations at noon, on the 2nd, they were in $78^{\circ}37'$ N., $42^{\circ}32'$ E.

I now particularly call your attention to the two following paragraphs of the Report:—

“Very thick fog, with a stiff, contrary wind, prevented our getting forward in a northerly direction. The condition of the ice would have been no obstacle. The 79th parallel we could, without very great effort, have passed, only, with the stiff north wind, it would have taken at least a day's cruising, and the short time which still stood at our disposal was too precious for us to be willing to sacrifice a whole day for a few miles.

“Many signs led us here to infer the near neighbourhood of land. We saw much drift-wood, which, further south, we had hardly ever met with; and at one spot, where we were fishing, there was fresh mud, also sea-weeds, and much fresh-water ice, which is easily known by its transparency. An almost infallible sign was six southward-flying eider-ducks, which never go far away from the land. Unfortunately, however, the fog was always so thick that

we never got a wide prospect. These thick fogs with a north wind are very remarkable in such high latitudes.

"A further energetic northerly advance was no longer to be thought of: the obstacles being our scanty provisions, the disinclination, already mentioned, of the crew, and, lastly, the condition of our prow.

"The quality of the ice in these high latitudes was by no means difficult. Except detached and small icebergs, and one solitary larger old slice, we saw nothing implying heavy pack-ice in the north."

All these signs, read by the light of Arctic experience, point, in my opinion, to the existence of land not very far north of the position reached in the 42nd Meridian by the Austrian Expedition, and by no means towards an opening into the Polar Sea.

To gratify their curiosity, and to allay the fears of the Norwegian seamen, the ship now stood towards the coast of Nova Zembla, to ascertain whether they had been merely steering up a bight in the ice. The result proved that, from their furthest, on the 1st September, to the coast of Nova Zembla, the sea was free from ice. They then appear, owing to the south-west winds, to have been forced back on the 6th September in a northerly direction to 78°5' N. lat., and 56° E. long., where, it is worthy of remark, they met ice, in an east and west direction, with a heavy sea beating against it. The expedition now struggled homeward through heavy continual storms from the south-west, and anchored in Tromsø on the 4th October; and the Austrian navigators do not fail to remark that the increasing length of the nights and heavy snow-storms would have rendered the navigation highly perilous, had they had the misfortune to have fallen amongst ice. A contingency which was avoided by the heavy south-west gales, and consequent warm-water drift pressing the pack-ice away to the northward and westward, and northward and eastward.

Lieutenants Weyprecht and Payer, having been unable to trace this open water on the north shore of Nova Zembla to its furthest limit, appear to jump at the conclusion that they have discovered a key, to use their own words, "to the mystic Polynia, the open sea to the north of Siberia."

This may be so: the word Polynia means spaces of open water in a frozen ocean; and there may be many such spaces, if not a continuous channel of open water, late in the autumn, say October, extending from Nova Zembla, along the shores of Asia, to Behring Straits; and I do not deny that an exploration of this open water may yield most valuable results in a geographical and generally

scientific point of view. But, with all kindness and sympathy for them, I appeal to their own Report, and the results obtained, whether in observations of ice, water, depths, and temperatures, in proof of the fact that, at their furthest north, they were merely approaching those lands which previous visitors to Spitzbergen have frequently reported were seen to the east and north-east, and generally known under the term "Gillies Land," or, more recently, King Charles Land; and I only regret to learn from Sir Leopold McClintock that the gallant Austrians, who are again about to put forth on a voyage of discovery, do not intend to return there, and explore a region so likely to yield such interesting results in a geographical point of view; though I feel confident that the Polar basin will not be explored by any expedition in that direction.

To sum up, another seven years' labour only goes to confirm old Arctic experience, that the outpour of Polar ice is too heavy and continuous, from Gillies Land to Greenland, for any ships to penetrate through it. I believe that outpour to be incessant, both summer and winter, and that sledging expeditions at any season of the year, northward from Spitzbergen, would encounter to-day the same difficulties Parry did in the summer of 1827.

With respect to the Nova Zembla Sea, there is evidently land to the northward, and the south-west gales of the Atlantic force up a body of warm water in the autumn, by which a route may be found round Nova Zembla into the open water on the Siberian coast. Indeed this is already proved to be possible by a Norwegian, Captain Mack. On these grounds, and on those already stated in my previous paper, I would again appeal to the President, Council, and Members of the Royal Geographical Society, to turn their earnest attention during this summer and autumn towards a resumption of the exploration of the Polar area, by way of Baffin Bay and Smith Sound, and by means of sledge travelling parties, such as explored so many hundreds of miles of coast-line in former years.

This route recommends itself on the three following grounds:—

First. That it is the most advanced known position towards the Polar area, with almost continuous land extending to the 82° lat. N.

Secondly. That from it, to the north-east and west, important geographical discoveries and scientific results await us.

Thirdly. That this route offers the best guarantee for the safety of the people employed in the exploration of a vast unknown area.

If the Arctic Committee now sitting under the able presidency of our distinguished and veteran Associate, Admiral Sir George Back, can show, on these grounds, that Polar exploration can and

ought to be carried out, I trust, for the sake of my country and profession, that our Admiralty may be induced to open to the Royal Navy, this field for glorious enterprise and national renown. The First Lord of the Admiralty, Mr. Goschen, in a recent speech to the House of Commons, speaking of our Navy Estimates, justly said: "It must not be supposed that all this money was spent on war, but that a great portion was spent on duties, which, notwithstanding the reputation this country had most unjustly got of pursuing a selfish policy, redounded to the benefit of the world at large as much as of our own country."

The cheers with which such a statesmanlike view of the duties of the Royal Navy was received, would, I am sure, be re-echoed throughout the length and breadth of our land; and knowing as I do that there never was a time in the history of our Navy, when a finer body of seamen and gallant officers, highly trained in scientific acquirements, could be better made available, or more earnestly rejoice at such a field for individual enterprise being thrown open to them, I think it would be a crying disgrace if the accomplishment of Polar discovery, a labour undertaken by English seamen and explorers in the time of Queen Elizabeth, and continued to that of Queen Victoria, should be achieved by the sailors or explorers of any other nation. Rather than see those laurels wrung from us, I would, much as I believe in the advantage and certainty of a Government Expedition, advocate an appeal, on the part of this Society, to send forth a private expedition, in the spring of the year 1873.

The PRESIDENT, before calling for any remarks on Captain Sherard Osborn's paper, wished to remind the Society that the Arctic Regions had been for a long period the proudest field of triumph, not only of the Royal Geographical Society, but of the British navy and the British nation. He was glad the subject of an expedition to the North Pole was again brought forward, by a gentleman so competent to discuss it as Captain Sherard Osborn. He was also pleased to see nearly all our great Arctic authorities present, men who had carried the flag of England into those seas, and who had been mainly instrumental in obtaining for this nation that Arctic glory we were so proud to possess. There were also present authorities in matters of science, who, he trusted, would give their opinions as to the scientific results to be looked for from an Arctic expedition.

Admiral Sir GEORGE BACK said, Captain Osborn had so completely exhausted the subject that he had little else to say, than to give his perfect approbation of every word he had uttered. The expeditions which had recently gone east and west of Spitzbergen, however encouraging, might be considered simply tentative to the great object of Polar research. The direct route to the North Pole remained very much as it had been left by his own dear friend, Sir Edward Parry. Without undervaluing the persistent and zealous efforts of our gallant contemporaries, but rather honouring them for what they had done, the Arctic Committee had considered the question seriously, and had come to the determination that the route which offered the greatest probability of success for Polar exploration, was by Smith Sound, or

the route taken by the gallant American, Dr. Kane. The difficulties and contingencies of such an exploration cannot be calculated beforehand, though it is well known they partly vanish in making the attempt. It would be most mortifying to reflect, that the very prize for which our country had been contending more or less for over three centuries, should, through an unwonted and unnatural apathy on our part, glide away from us into the hands of a younger and more energetic nation. There had been Swedes, Danes, Germans, Norwegians, Russians, Americans, and, prior to their great calamity, even the French were fitting out an expedition to Behring Straits; while we, whose birthright it was, were left ingloriously in the eddy. Captain Osborn had given the most convincing reasons for our making another attempt; and he was certain that, when the time came for carrying it out, they would have the active co-operation of every member of the Royal Geographical Society.

Dr. HOOKER said, as a botanist he took great interest in Arctic exploration, for the vegetation of the Arctic Regions threw as much light upon the geographical distribution of plants on the surface of the globe as any that he knew of. On the return of Sir Edward Belcher's expedition from those regions, a series of rocks collected in the neighbourhood of Disco, by his former fellow voyager, Dr. Lyall, were placed in his hands, containing an accumulation of fossil leaves of plants, totally different from any now growing in that latitude. These fossils he forwarded to Professor O. Heer, of Zurich, for investigation, who had brought forward the most convincing proofs that that latitude was once inhabited by extensive forests, presenting fifty or sixty different species of arborescent trees, most of them with deciduous leaves, some 3 or 4 inches in diameter,—the elm, pine, oak, maple, plane, &c.; and, what was more remarkable still, evidences of apparently evergreen trees, showing that these regions must have had perennial light. It seemed extremely probable that the vegetation, which belonged to the miocene period, extended over a large portion of the Northern Arctic Regions. It would be of great interest to ascertain whether such vegetation extended even to the Pole; and he knew of nothing that would give greater assistance in solving this problem than the proposed expedition along Smith Sound. Turning to the existing flora of Greenland, he pointed out that, though one of the most poverty-stricken in the globe, it was possessed of unusual interest. It consisted of some 300 kinds of flowering plants (besides a very large number of mosses, algæ, lichens, &c.), and presented the following peculiarities:—1. The flowering plants were, almost without exception, natives of the Scandinavian peninsula; 2. There was in the Greenland flora scarcely any admixture of American types, which nevertheless were found on the opposite coast of Labrador and the Polar Islands; 3. A considerable proportion of the common Greenland plants were nowhere found in Labrador and the Polar Islands, nor, indeed, elsewhere in the New World; 4. The parts of Greenland south of the Arctic circle, though warmer than those north of it, and presenting a coast 400 miles long, contained scarcely any plants not found to the north of that circle; 5. A considerable number of Scandinavian plants which are not natives of Greenland, are nevertheless natives of Labrador and the Polar Islands; 6. Certain Greenland and Scandinavian plants, which are nowhere found in the Polar plains, Labrador, or Canada, re-appear at considerable elevations on the White and the Alleghany and other mountains of the United States. No other flora known to naturalists presents such a remarkable combination of peculiar features as this, and the only solution hitherto offered is not yet fully accepted. It is, that the Scandinavian flora—which he (Dr. Hooker) had shown evidence of being one of the oldest on the globe—did, during the warm period preceding the glacial—a period warmer than the present—extend in force over the Polar regions, including Greenland, the Polar American Islands, and, probably, much now submerged land in places connecting or lying between

Greenland and Scandinavia, at which time Greenland no doubt presented a much richer Scandinavian flora than it now does. On the accession of the glacial period, this flora would be driven slowly southward, down to the extremity of the Greenland peninsula in its longitude, and down to the latitude of the Alleghanies and White Mountains in their longitudes. The effect in Greenland would be to leave there only the more Arctic forms of vegetation, unchanged in habits or features; the rest being, as it were, driven into the sea. But the effect on the American continent would be to bring the Scandinavian flora into competition with an American flora that pre-occupied the lands into which it was driven. On the decline of the glacial epoch, Greenland, being a peninsula, could be re-peopled with plants only by the northward migration of the purely Scandinavian species that had been previously driven into its southern extremity; and the result would be a uniform Scandinavian flora throughout its length, and this an Arctic one, from north to south. But in America a very different state of things would supervene: the Scandinavian plants would not only migrate north, but ascend the Alleghanies, White Mountains, &c.; and the result would be, that, on the one hand, many Scandinavian plants which had been driven out of Greenland, but were preserved in the United States, would re-appear on the Polar Islands and Labrador, accompanied with sundry American-mountain types, and, on the other, that a few Greenland-Scandinavia types, which had been lost in the struggle with the American types during their northward migration, and which hence do not re-appear in Labrador and the Polar Islands, might well be preserved in the Alleghanies and White Mountains. And, lastly, that a number of Scandinavian plants, which had changed their form or habit during the migration in America in conflict with the American types, would appear in the Polar Islands as American varieties or representative species of Scandinavian plants. Whether or no this be a true hypothesis, it embraces all the facts; and botanists look anxiously to further explorations in the northern parts of Greenland for more light on the subject, and especially for evidence of rising or sinking of the land in Smith Sound and the countries north and east of it, and for evidence of ancient connection between Greenland and Scandinavia; for observations on the temperature, direction, and depth of transporting currents in these seas, and on the habits of its ruminant migrating animals that may have influenced the distribution of the vegetation by transporting the seeds. Such facts as those of the existence of ancient forests in what are now Arctic regions, and of the migration of existing floræ over lands now bound fast in perpetual ice, appear to some naturalists to call for vaster changes than can be brought about by a re-disposition of the geographical limits of land and sea, and to afford evidence of changes in the direction of the earth's axis to the plane of its orbit, and perhaps of variations in the ellipticity of the orbit itself.

Admiral G. H. RICHARDS said he had always looked upon Greenland as a country that had reason to complain of the way in which it had been treated. It was a body without head, tail, or limb. Although Greenland was no child of ours, he had felt that, geographically, we had adopted it. It was our duty, he thought, to complete the symmetry of Greenland, by exploring the northern end, and in doing so we should probably find the North Pole. He did not attach much importance to finding the North Pole; if it was found incidentally, well and good. He would call attention to the fact, that for the last twenty-five years this country had made small progress in the way of Arctic Exploration, except in the searching for Sir John Franklin; and although we had made many discoveries during that time, they had been incidental discoveries. Had we been purely exploring for only one-tenth part of that period, there would be nothing left to discover. Therefore, he hoped the Government would send out an expedition. He was not himself in favour of private enterprise. Private enterprise laboured under many

disadvantages: he did not know of any private expedition that had succeeded, except one, and that was the expedition under Sir Leopold McClintock. The chief was an experienced Arctic navigator, he was supported by officers of his own profession, and the crew was composed principally of British seamen who had just returned from a Government Arctic Expedition, many of them under his own command. Although they were bound by no ties or laws of hard discipline, it was a point of honour with them to conduct themselves in every way as if they were on board a ship of war. To that he attributed its success, and it was for that reason he was in favour of a Government expedition. He fully appreciated the efforts of the Swedes, Prussians, and others,—they had accomplished much to the advantage of science; but he maintained that they had been productive of little in the way of new discovery. He would as soon undertake an Arctic expedition in a penny river-boat. If any expedition succeeded, it would be one sent by this country; and he trusted it would be effectively carried out.

The PRESIDENT was sure the meeting had been much gratified at hearing the observations of Admiral Richards, the more especially as he was the professional adviser of the Admiralty. He trusted Admiral Richards would imbue the Admiralty with the sentiments he had expressed to the meeting.

Captain Sir LEOPOLD MCCLINTOCK said, as a naval officer and an Arctic explorer, he was sorry to say that our experienced Arctic men were passing away. It was now twenty years since Government had sent an expedition to the Arctic Regions, and at the present moment we could find but few officers or men competent to undertake another expedition. A few years hence we should probably have to fit out an Antarctic expedition to observe the transit of Venus. We should have to entrust that costly and difficult expedition to unskilful persons, unless we kept up our practice in the mean time. Thirty-three years ago, the only Antarctic expedition ever sent out by the British Government, was placed under the command of that most experienced Arctic navigator, Sir James Ross, and nothing could have been more complete and triumphant than his success. Therefore, he was for Arctic exploration in any direction even; the attempt to reach the North Pole was the highest object remaining for the exercise of geographical and maritime enterprise. An expedition by Smith Sound would give us as much practical experience in ice-navigation as would suffice for the next ten or fifteen years. He believed that route afforded the best chance of reaching the North Pole, and also the safest retreat in the event of a reverse. Of all the suggested routes, it was the least dependent upon the accidents of season. We had heard lately of the N.E. route as a favourable one, because open water had been seen off Siberia by Wrangel and others. Yet it was remarkable that, in 1847, Wrangel himself proposed that an attempt should be made by Smith Sound, in dog-sledges; showing that, in his opinion, there was no open Polar sea. In connection with what Dr. Hooker had said, he might state that, in Banks Land and Prince Patrick Land, there were hill-sides covered with semi-fossilized wood, much of it still fit to be used as firewood; from this he inferred that the time when those lands were covered with trees was not very remote. The proposed expedition did not contemplate any commercial advantages, such as were derived from the expedition to Baffin Bay in 1818, which opened up a whale-fishery; and from Beechey's voyage to Behring Straits, which opened up the whale-fishery now carried on there; nor were we to expect the discovery of vast deposits of fossil ivory, such as had been found in the Liakhov Islands off the coast of Siberia.

The PRESIDENT called upon Dr. Carpenter to explain the prospective advantages to physical geography, to be derived from this expedition to the North Pole.

Dr. CARPENTER looked upon the proposal as of peculiar interest, as it would be the complement of another expedition which Government had undertaken to send out, for the prosecution of scientific inquiry into the physical and

biological condition of the deep sea in various parts of the globe, ranging, he hoped, to the edge of the southern ice-field. But he apprehended it would not be able to reach the North Polar basin, and it was extremely important that a North Polar expedition should be carried out in connection with the other. Last year he explained his views on the general oceanic circulation, as dependent upon difference of temperature purely—difference of temperature giving a different specific gravity, therefore difference of pressure; which would necessarily produce a continued outflow of cold water along the floors of the ocean-basins from the Polar areas towards the equator; and, on the other hand, a continual movement of a more superficial stratum of warm water towards each Polar area. The inquiries that had been made during the last twelve months had only confirmed that view. When these researches were commenced, the general notion in this country, and among German physical geographers, was the prevalence of a temperature of 39° in the deep sea. That had been completely exploded, at least so far as the Atlantic was concerned; and it was now well known that salt water at 28° (just on the point of freezing) was heavier than water at 39° , which was formerly supposed to be the temperature of the greatest density of salt water, as it is of fresh. The ignorance which still exists on this subject is shown by the fact that, in a recent paper, Dr. Mühry spoke of cold water overflowing warmer water. This can only be in exceptional cases; as when the surface-water, chilled by the melting of icebergs, is at the same time rendered lighter by the reduction of its salinity. Taking the temperatures obtained by Lieutenant Payer between Spitzbergen and Nova Zembla, he observed that they corresponded exactly with the temperatures he should have expected to find in that region; and, so far from becoming warmer as the thermometer went down to greater depths, the water became colder. The warm stratum at the surface was about 40° ; at 300 or 400 feet down, the temperature was about 32° ; and at 800 feet, the thermometer sank to 29° . Farther north, at $77\frac{1}{2}^{\circ}$ N., they found that the warm stratum had cooled down on the surface to 36° , and became much thinner: for, at 40 or 50 feet down, they came at once to a temperature of 32° , and at 120 feet to 29° . Of course, if there should be land beyond the northernmost point of Payer, the inflow of warm water in that direction would cease; and if Smith Sound had a tolerably deep channel, extending continuously northward, while there would be an outflow of cold Polar water at the bottom, there would be a tendency to inflow of warm water along the surface of that channel, as far as it extended. He merely threw out that hint with reference to the particular route chosen. But, with regard to the general question, the Society would see how important this exploration of the Northern Polar area must be, in connection with the expedition to the Antarctic seas; because, while the southern circle of open Polar water was sending out in every direction its deep outflow of glacial water, the land-locked Polar basin of the north possessed but few, and comparatively narrow, communications with the great oceans of the northern hemisphere. These phenomena were of great interest geologically, since there could be no doubt that the temperature and biological conditions of distant oceanic areas were influenced by the outflow of glacial water from the Polar Regions.

Mr. R. H. SCOTT, Director of the Meteorological Office, said he had recently received letters from Swedes and Germans, who had actually been on these expeditions; and it would be a satisfaction to Captain Osborn to know, that Captain Koldevey had arrived at the conclusion that an open Polar Sea did not exist. With regard to the Swedish expedition, Professor Nordenskiöld intended starting in the course of a few months with three officers and scientific men, and a crew of twenty. He proposed to start from the Seven Islands, a little to the east of Spitzbergen; and before the winter he hoped to reach Gillies Land by

the ice. But the main object of the expedition was to get to the Pole by means of reindeer-sledges.

Admiral OMMANNEY said, all Arctic navigators were not in favour of Smith South. He adhered to his former view, that the right direction to take was by way of Spitzbergen. It was sometimes difficult to reach Smith Sound, but they could always get to Spitzbergen.

The PRESIDENT said, the Council of the Society had appointed a Committee of the most experienced and practical members of their body, to report their opinions upon the subject; and they were unanimously in favour of Smith Sound. The Council, having discovered on a previous occasion that the whole matter broke down, through want of unanimity in the application to the Admiralty, thought they were now justified in proceeding, on the assumption that the Council were at any rate of one mind. When the time came, and the subject had been sufficiently ventilated, and public opinion pronounced in its favour, they purposed to go to the Admiralty with a direct proposal. Considering the enlightened views which had been expressed by the First Lord, and the Chancellor of the Exchequer, with regard to the Deep-sea Exploration, about to leave our shores in the course of the summer, he thought they had a right to anticipate a favourable consideration of their application, especially when it was supported by the professional approval of an officer so thoroughly competent to give an opinion as Admiral Richards. No one could have heard the stirring appeal of Captain Osborn, without seeing that, in a national point of view, independently of all scientific considerations, it was an object of great importance to keep up the high spirit of the navy. In these piping times of peace sailors and officers were apt to get rusty; and an expedition of this sort would have a good effect in rubbing them up, keeping the men up to their work, and stimulating the officers to that career of exertion, emulation, and competition, which was really the soul of the service. On that ground, and on the ground of the progress of geography and the acquisitions of science, he hoped the members of the Society would cordially support the Council in their application to the Government.

Eleventh Meeting, 13th May, 1872.

MAJOR-GENERAL SIR HENRY C. RAWLINSON, K.C.B., PRESIDENT,
in the Chair.

PRESENTATION.—*Robert Reid, Esq.*

ELECTIONS.—*Edward William Barnett, Esq.; F. Le Breton Bedwell, Esq.; A. Bennie, Esq.; Major E. H. Finney; James George Henry Glass, Esq.; Colonel Gourley, M.P.; Colonel P. S. Lumsden, C.S.I.; George Samuel Measom, Esq.; George Henry Ray, Esq., M.D.; William Shuter, Esq.; John Smale, Esq. (Chief Justice, Hong Kong); James Lewis Thomas, Esq.; Captain Henry R. Thuillier, R.E.; Charles Henry Wallroth, Esq.*

ACCESSIONS TO THE LIBRARY FROM APRIL 22ND TO MAY 13TH.
—‘Sir R. I. Murchison.’ Von G. von Helmerson. St. Peters-

burg, 1871. Donor the author. 'Quedah, a Cruise in Japanese Waters.' By Captain Sherard Osborn, R.N. 1865. 'Stray Leaves from an Arctic Journal.' By Captain Sherard Osborn, R.N. 1865. 'The Discovery of a North-West Passage, by H.M.S. *Investigator*, 1850-54.' By Captain Sherard Osborn, R.N. 1865. Donor the author. 'The Martyrdom of Man.' By Winwood Reade. 1872. Donor the author. 'The Oxford and Cambridge Local Examination Record.' By E. S. de Carteret Bisson. 1872. Donor the author.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING, APRIL 22ND.—A Map of the Southern part of Arabia from Aden, north-easterly, showing the routes of Messrs. H. v. Maltzan, Wrede, Munzinger, and Miles. Presented by Dr. A. Petermann. Karte der Zillertaler Alpen. By Carl von Sonklar. Presented by Dr. A. Petermann. A Russian Geological Map of South Russia, North of the Sea of Azov. By B. Nossow, &c. Presented by H. Shirley, F.R.G.S. A Russian Map of European Russia and Finland, showing the River and Canal Communication. By the Russian Government. Presented by J. Pierce, Esq., F.R.G.S. Map of Routes from Leh to Yarkand and Kashgar. By R. B. Shaw, Esq., F.R.G.S. Presented by the author.

LIVINGSTONE SEARCH AND RELIEF EXPEDITION.

On taking the chair the PRESIDENT said, knowing that the interest felt with regard to the movements of Dr. Livingstone had been greatly increased by the recent telegrams, he regretted having nothing authentic to communicate to the Meeting. The Council of the Society had not received any definite detailed intelligence since the arrival of the last telegram. The mails appeared to have left Aden two or three days before the arrival of the *Abydos* at that port; consequently, another week must elapse before they obtained the letters which she brought from Zanzibar. In the mean time he had the satisfaction of stating that the opinion of the Council was generally favourable to the authenticity of the information received by telegram. They had every reason to expect that Dr. Livingstone and Mr. Stanley would meet about the beginning of the year, probably on Lake Tanganyika. But there was one point on which a little *éclaircissement* was desirable, because a belief seemed to prevail that Mr. Stanley had discovered and relieved Dr. Livingstone; whereas, without any disparagement to Mr. Stanley's energy, activity, and loyalty, if there had been any discovery and relief, it was Dr. Livingstone who had discovered and relieved Mr. Stanley. Dr. Livingstone, indeed, was in clover while Mr. Stanley was nearly destitute. By the last accounts, after Mr. Stanley had left Unyamwebe for Ujiji he was without supplies or attendants; whereas, the chief depôt of Dr. Livingstone's supplies being at the latter place, he would have had abundant stores wherewith to help Mr. Stanley. Therefore it was only proper that the relative position of the parties should be correctly stated. At the same time it was very creditable to Mr. Stanley to have performed the journey under such circumstances; and he trusted the expedition sent out by the Society would relieve both Dr. Livingstone and Mr. Stanley, and enable them to continue the researches upon which they were engaged. He fully expected that letters from Zanzibar would be received before the Anniversary Meeting. The Council of the Society had never given countenance, either verbally or

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