THURSDAY, NOVEMBER 30, 1871

ARCTIC EXPLORATION

IN 1865 Captain Sherard Osborn proposed an exploration of "the blank space around our Northern Pole," by a route which he and his brother Arctic explorers, from considerations based on the history of the subject during three centuries, and on their own experience in the ice, were convinced was the best, and the most sure to lead to useful scientific results.

Their reasons for adopting the views then set forth, the correctness of which has since been confirmed by Swedish and German explorers, were as follows :—

The immense tract of hitherto unvisited land or sea which surrounds the northern end of the axis of our earth, is the largest, as it is the most important field of discovery that remains for this or a future generation to work out. The undiscovered region is bounded on the European side by about the 80th parallel of latitude, except where Parry, Scoresby, and a few others have slightly broken through its circumference; but on the Asiatic side it extends south to 75° and 74°, and westward of Behring's Strait our knowledge is bounded by the 72nd parallel. Thus in some directions it is more than 1,500 miles across, and it covers an area of upwards of 2,000,000 square miles, with the North Pole towards its centre. Unlike the ocean-girt region of the Southern Pole, the northern Polar region is surrounded, at a distance of about 1,000 miles from its centre, by three great continents, while the glacier-bearing mass of Greenland stretches away towards the Pole for an unknown distance. There are three approaches by sea to this land-girt end of the earth, namely, through the wide ocean between Norway and Greenland, through Davis Strait, and through Behring's Strait. One wide portal and two narrow gates.

It was through the wide portal that men naturally sought, in the first instance, to reach the mysterious region of the Pole; and they continued to persevere in that direction until experience had taught those who were capable of learning from it that, as in other cases, the longest way round was the shortest way home. The first true Arctic voyager was William Barents, who sailed from the Texel in 1594. He discovered all we now know respecting the Spitzbergen seas; first, the open lane of water which almost always enables vessels to sail up the western side of that land; second, the impenetrable Polar pack to the north, and between Spitzbergen and Novaya Zemlia; third, that the young ice formed in the early autumn and rendered the sea unnavigable; and, fourth, that winds and currents caused open water even in the winter and early spring, but again drove the ice upon the coast at every change of wind. Hudson, in two voyages, explored the whole of the pack-edge from Greenland to Novaya Zemlia, and found it to be impenetrable; and many others followed him with the same result. In later years four expeditions sailed up the west coast of Spitzbergen beyond the 80th parallel, and Dutch and English whalers collected a vast mass of information, which has been ably brought together by Scoresby and Jansen, and which pretty well exhausts the subject.

During the winter and early spring the ice extends in a line from the east coast of Greenland to the northward of Jan Mayen Island, crossing the meridian of Greenwich between the 71st and 72nd parallel, then passing up north for several degrees, and leaving a deep bay, and finally stretching away to Novaya Zemlia. The deep bay in the ice, left to the eastward of the Greenwich meridian in the winter, is probably caused by the so-called Gulf Stream. It forms the route by which the whalers proceed to their fishing-ground, and is known as "the whale-fisher's bight." In the spring the Polar pack begins to drift to the southward and westward, so that the western or lee sides of large masses of land, such as Spitzbergen, are usually left with open navigable lanes of water; while the eastern or weather sides are generally close packed with ice. The pack, consisting of vast fields of thick ribbed ice, has never been penetrated, though whalers annually sail through streams of lighter floes until they reach its edge. The Polar pack is met with in different parallels according to the season and the meridian. Between Spitzbergen and Novaya Zemlia it is usually in 75° or 76°; but occasionally vessels have reached as far as 81° without encountering it, and in the very exceptional year when Parry attempted to reach the Pole, he was only coming in sight of it at his extreme point in 82° 43′, although he had been travelling for 92 miles over closely-packed floes of ice through which no steamer could have forced her way. In another exceptional year, that of 1806, Scoresby sailed along the edge of the pack for 300 miles, between the parallels of 81° and 82°; and at his extreme point in 81° 30′, on the meridian of 19° E., the margin of the ice trended to E.N.E., while to the eastward there was an open sea to the horizon, with no ice blink. Farther east a latitude of 82° or even 83° might possibly have been attained in that year, before arriving at the edge of the Polar ice. Analogous conditions of the ice were found by James Ross in the Antarctic sea. He sailed through pack ice met with in the 62nd parallel, which was drifting north, and then reached the edge of the impenetrable Polar pack which he found extending for 400 miles in a wall 150ft to 180ft. high in the parallel of 78° 30′ S. In the northern sea the Gulf Stream flows up until it meets the ice-laden Polar current between Spitzbergen and Novaya Zemlia. It keeps the ice off the shores of Norway and Lapland, but the parallel on which the warm current meets the ice-bearing stream, and is cooled down to 27°, varies in different seasons. Even if it were possible, by extraordinary luck, to force a steamer through the pack to the open water supposed to be left by its southerly drift, the autumn would be so far advanced by the time she reached it that young ice would be forming on the surface, and all navigation would be at an end. In 78° N. ice forms on the sea during eight months in the year, and Scoresby often saw it grow to a consistency capable of stopping the progress of a ship, even with a brisk wind blowing.

These facts, the results of thousands of observations extending over many years, proved that an attempt to force a vessel through any part of the Polar pack between Greenland and Novaya Zemlia was not the best way to explore the unknown region of the north.

Sir Edward Parry was the discoverer of the true method of Polar exploration, by sledge travelling. He proposed to attempt to reach the North Pole, in 1827, by travelling

with sledge boats over the ice to the north of Spitzbergen; and he actually reached the farthest northern point that has yet been attained by civilised man. But the rainfall was exceptional that year; and the ice was in a very unfavourable condition. It was not until he reached 82° 43′ N. that he descried the strong yellow ice blink overspreading the northern horizon, and denoting the vast ice fields over which he hoped to travel. His provisions then only sufficed to take him back to his ship, and he was obliged to return. He made a mistake in the route and in the time of year; but he has the credit of having been the pioneer of Arctic travelling, and of having pointed out the true way of exploring the unknown Polar region.

In deciding upon the best route, Sherard Osborn had his own great experience in the ice, and the recorded observations of Parry and Ross, and of generations of previous explorers to guide him. The first Arctic canon is, "Never take the pack if you can possibly avoid it, but stick to the land floe." The second is, "Reach the highest possible parallel in your ship, and then complete the exploration by sledge travelling." A glance at a Polar chart will show that the first canon can only be followed by passing up the west coast of Spitzbergen, or the west coast of Greenland. But the Greenland coast reaches a higher parallel than that of Spitzbergen. Therefore the Greenland coast is the route to follow,—up Smith Sound and Kennedy Channel to the farthest point attainable. A vessel can almost always reach Smith Sound in one season, for the same reason that a vessel seldom finds it difficult to sail up the west coast of Spitzbergen, namely that she is to windward of the ice. She sticks to the land floe and lets the pack drift past her. Out of thirty-eight exploring vessels that have gone up Baffin's Bay from 1818 to 1860, only two have failed to reach the open water at its head which leads to Smith Sound, before the navigable season was over. From the position that may thus always be reached by an exploring ship, sledge parties could be despatched to the North Pole and back—a distance of 968 miles—a distance often exceeded by the Arctic sledge travellers in search of Franklin; as well as to complete the exploration of the northern coast of Greenland, and of the land to the westward. Such was the plan proposed by Osborn in 1865. It was feasible; it promised useful scientific results; it ensured a vast accession of new geographical knowledge; and the Government could scarcely have refused to adopt it if there had been unanimity in the counsels of geographers nd explorers.

But a fatal apple of discord was thrown into their midst by the eminent geographer of Gotha; and the Admiralty seized on this want of unanimity as an excuse for postponing indefinitely the consideration of the subject. Dr. Petermann has done serious injury to the cause of Arctic exploration by thus forcing his theories into notice at a time so extremely inopportune. It was in 1852 that he first brought forward the theory that there is an open navigable sea between Spitzbergen and Novaya Zemlia leading straight to the Pole especially late in the autumn. He assured the Admiralty that the *Erebus* and *Terror* were somewhere near the Siberian coast, and that they could be reached without serious difficulty by this wonderful route. Had he been listened to, and had our gallant countrymen been then alive, it makes one shudder to think of the consequences if the searchers had thus been led off the true scent. That time no harm was done. But in 1865 Dr. Petermann found more willing listeners. He again declared that the sea between Spitzbergen and Novaya Zemlia was the easiest and most navigable entrance to the unknown region; and he added two new discoveries; first, that Parry, at his farthest point, found a perfectly navigable sea extending far away to the north; and second, that Smith Sound is a *cul de sac* (of which he published a map), and unconnected with the Polar Ocean. The first discovery is surely a dream, for Parry himself saw a strong ice blink overspreading the northern horizon at his farthest point. The second exists only in Dr. Petermann's imagination, and, before he announced it, he should have called to mind the fate of a certain range of mountains named after the late Mr. Wilson Croker. The only tangible grounds for believing in an open Arctic ocean navigable to the Pole, are that the Russian explorers Hedenstrom, Anjou, and Wrangell, saw patches of open water and rotten ice off the northern coast of Siberia in March and April, and that Dr. Kane's ship's steward reported having seen a wide extent of open water in June to the north of Smith Sound. The Russian *polynias* or water holes are in all probability caused by winds and currents acting on a shallow sea, and, so far as we yet know, they are merely local. The same thing was observed by Barents off Novaya Zemlia in November, and an off-shore wind will carry the ice from the head of Baffin's Bay at all seasons. But this does not make the sea navigable. The open water of Dr. Kane's steward in June was only what might be expected at that season, though Dr. Hayes found the same spot covered with ice within a few days of the same time of year, in 1861. Dr. Petermann's arguments unfortunately had the effect of destroying that unanimity, without which it was hopeless to attempt a successful representation of the importance of Arctic exploration at the Admiralty.

The ostensible reason given by the Duke of Somerset for postponing the question, was in order that the results might be learnt of a Swedish expedition then engaged in exploring Spitzbergen, under the direction of Professor Nordenskiöld. Those results fully confirmed the correctness of Sherard Osborn's views. Nordenskiöld reported that no vessel could force its way through the closely-packed ice north of Spitzbergen; but that the ice moves, after long southerly winds, considerably to the north. "All experience seems to prove," adds Nordenskiöld, "that the polar basin, when not covered with compact, unbroken ice, is filled with closely-packed, unnavigable drift-ice, in which some large apertures may be found; though in favourable years it may be possible to sail a couple of degrees north of the 80th parallel in September or October."

Dr. Petermann has since promoted the equipment of Arctic expeditions, which were expected to prove his theory, and to disprove the opinions of Captain Osborn. But he has sent prophets to curse his opponent, and behold, they have blessed him altogether! In 1868 the first German Arctic Expedition sailed under the command of Captain Koldewey, with instructions to penetrate as far north as possible along the east coast of Greenland, or to try to reach Gillis Land, east of

Spitzbergen. They made four attempts to press through the ice, and failed, as all their predecessors had failed. But it is stated by German writers that this expedition attained the highest point ever reached by a sailing vessel, namely, 81° 5′ N. This is a mistake. Parry reached 81° 5′ N. in the *Hecla*, and 81° 13′ in his boats, and Scoresby reached 81° 30′ N. in 1806, on board the *Resolution* of Whitby. In 1869 the second German expedition sailed, also under command of Captain Koldewey, with instructions from Dr. Petermann to penetrate through the belt or girdle of ice which encircles the open polar basin of his imagination, to winter at the pole, and then to sail across it and explore the Siberian islands. All very easy to write at Gotha! But, as usual, Captain Koldewey was stopped, as all his predecessors had been, by the closely-packed ice, and wintered on the east coast of Greenland, at a part which was visited by Sabine and Clavering in 1823. The German explorers made careful scientific observations, and partly examined a very interesting navigable fiord running into the heart of Greenland. The expedition returned to Bremen in September 1870, and the experience acquired by two seasons in the ice has enabled its talented and energetic commander to orm an authoritative opinion on the best route for north polar exploration. Captain Koldewey, the first German authority on Arctic navigation, fully concurs with Captain Osborn that the way to explore the unknown region is by sending an expedition up Smith Sound.

The other Arctic voyages that have been made since 1865 are of minor importance. In 1869 Dr. Bessels crossed the sea between Spitzbergen and Novaya Zemlia, and met with field ice between 76° and 77° N. in August. Norwegian fishermen named Ulve, Carlsen, and Johannesen, found the Sea of Kara comparatively free of ice in 1869—70, and the latter is said to have sailed round Novaya Zemlia. In 1870 Count Zeil and von Henglin made some useful observations on the east side of Spitzbergen during a yacht voyage, and obtained a sight of the still more eastern Gillis Land. In the present year Lieut. Payer, who served under Captain Koldewey, made a voyage towards the Polar pack, between Spitzbergen and Novaya Zemlia, and he reports having nearly reached the 79th parallel, between the 40th and 42nd meridians east from Greenwich, and again in 60° E., finding open water. But Mr. Smith, an English yachtsman, in the same season, was more lucky or more adventurous. He reached the latitude of 81° 13′ N., the highest that has ever been ever observed on board a ship. Scoresby, indeed, reached an *estimated* latitude of 81° 30′ on May 24, 1806, but his highest *observed* latitude was 81° 12′ 42″ on the 23rd. These voyages merely confirm the observations of Nordenskiöld and earlier explorers, that, though the pack is usually met with, east of Spitzbergen, between 75° and 77° N., it may not be reached in exceptional years until the 81st, or even the 82nd parallel is attained.

Such have been the results of Arctic exploration since Sherard Osborn submitted his proposal in 1865. They fully confirm the correctness of his views; and the best English and German Arctic authorities are now in complete accord. There is, therefore, no longer any reason for postponing the consideration of this question. Six years have been wasted, and the men who were available to lead an expedition in 1865, may be unable to do so now. But the navy of England still abounds in the same stuff that made a Parry, a James Ross, a McClintock, and an Osborn in former years: and it must always be remembered that it is out of young Arctic explorers that Nelsons are formed. The arguments for Osborn's scheme of exploration by Smith Sound are now strengthened by the experience of Nordenskiöld and Koldewey. The same evidence of the important scientific results to be obtained by an Arctic expedition that was produced by the highest authorities in 1865, is forthcoming now. The argument that such enterprises in the pursuit of Science have an excellent effect upon the naval service is as strong now as it was then. We may, therefore, reasonably hope that (the Duke of Somerset's reason for postponing the question having been entirely removed) the Admiralty would take the subject of Polar exploration into favourable consideration, if the scientific societies once more submitted it, with the same arguments as were used six years ago.

C. R. MARKHAM

ORD'S NOTES ON COMPARATIVE ANATOMY

Notes on Comparative Anatomy: a Syllabus of a Course of Lectures delivered at St. Thomas's Hospital. By W. M. Ord, M.B. (Churchill, 1871.)

DR. ORD may be congratulated on having put together this compact, lucid, and well-arranged Syllabus. It is well adapted to serve as a framework, for lecturers on Comparative Anatomy to fill up, and students may also use it to refresh the memory when once stored with more slowly acquired information. The abuse of it will be for men to bolt this condensed extract of scientific food in order to produce it again under examination. The author seems to have foreseen this danger, and not only warns against it, but has been careful to preserve the bald and dry style which ought to repel those who do not know how to use the book as he intends. Still, experience of the way in which Prof. Huxley's "Introduction to Classification" is misused by being literally learned by rote, shows to what ill uses such compendia may be put.

The Syllabus begins with a short summary of the distinctive characters of the organic and of the animal kingdoms, followed by a scheme of classification which follows that of the introduction just referred to. The several animal classes from Protozoa to Mammalia are then treated, so that the arrangement is a zoological one. It would perhaps have been better if the author had devoted less space to the enumeration of the characters of orders and classes, since these are found in other manuals, and if anatomical points of difficulty had been more fully explained. For example, more detailed exposition of subjects like the morphology of the compound Hydrozoa, the development of Echinoderms, and the formation of the placenta, would have been exceedingly valuable. For such an object, however, diagrams are almost essential, and, accepting Dr. Ord's plan, it must be admitted that he has carried it out with a due regard to symmetry. The only subject which the Syllabus appears comparatively to neglect is the difficult but important one of Embryology. The account given of the Annulata and Entozoa is particularly clear and excellent. The following extract is a fair specimen of the author's style and method:—

"CL. BRACHIOPODA.—Solitary bivalves, in which the