made. In a vessel of sea water was moored, at a small distance from the surface, a piece of clear ice (see Fig. 1). By means of a pipette the end of which was drawn out into a long capillary tube, a fine line was drawn through the water in aniline blue dissolved in some of the sea water. The tube being very fine, no disturbance was made by its passage through the water, and the coloured line remained quite distinct. A straight line was drawn horizontally a little above the top of the ice and its deformation by the currents was watched, and the results are shown in the figure. The end of the line over the ice quickly curved upwards towards the surface. At a short distance from the ice it slowly bent downwards, and the successive positions it assumed are shown in the figure. Next the ice the line kept only a small distance from it all the way down, the upward current flowing between it and the ice, while the downward current carried the line down to the bottom of the ice, where it curved under the ice and was carried to the bottom of the water.

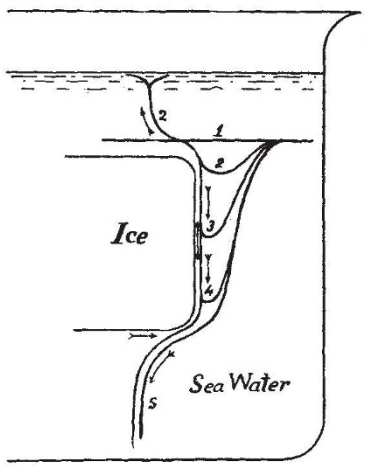

FIG. 1.—1, the coloured line drawn through the water; 2, 3, 4 and 5, position of the line at successive intervals of time produced by the currents.

There is still another question to which an answer is required. In these experiments all the water is at the same temperature, while in the sea this is not the case; the temperature there falls with the depth. And the question now is: How will this affect the circulation? Will the cold melted ice and sea water rise up through the warmer water? To get an answer to this question a tall jar about one foot deep was filled with sea water and surrounded for fully half its depth with ice and water. No salt was put in the cooling mixture lest the low temperature so produced should cause some of the sea water to freeze and so increase the density of the bottom water and interfere with the circulation. The water in the jar was cooled until the bottom temperature was 34° F., the surface temperature 41°, and the temperature at mid-depth 37·5°. A long rod of blue ice was now placed in the water. The rod extended from the bottom to the surface. The result was that all the blue as before came to the surface, showing that even the fall of temperature with depth in the sea does not seem likely to interfere with the rise of the ice-cooled water. This result might have been anticipated, because the ice-cooled water tends to rise at whatever temperature the melting takes places, and, having started to rise, it gradually acquires the temperature of the warmer water through which it rises.

All these tests tend to prove that the ice-cooled sea water will come to the surface, while Prof. Barnes's latest investigations on icebergs show that in certain cases it does not. I am sure the readers of NATURE will look forward with interest to any further observations Prof. Barnes may make with his very ingenious and delicate microthermograph, which may help to clear up the difference he has observed in the surface water surrounding different icebergs, and also the difference he has found in actual icebergs compared with laboratory experiments. Prof. Barnes, in your issue of December 12, gives a sketch to show the way in which he thinks an iceberg is eaten away by the sea water. The current is shown flowing on the surface towards the iceberg and eating it away quickest at the line of flotation. On looking at the sketch one cannot help asking, What has become of the light ice-cooled water? Should anyone be fortunate enough to see an iceberg tumble over on its side he may gain some information from an examination of its shape and from noting where the greatest amount of eating away had been done. But for his observations to be of value he would require to know something about the temperature of the sea at the bottom of the iceberg as well as at the surface; because, while ice melts quickest at the bottom, where the rising current first comes in contact with the ice, if the temperature is the same all the way down, yet we cannot expect this to happen if the temperature at the bottom of the berg is much lower than at the surface.

JOHN AITKEN.

Ardenlea, Falkirk, December 27, 1912.

AMUNDSEN'S ANTARCTIC EXPEDITION.

MR. MURRAY has produced in a singularly attractive form a remarkably clear and readable translation by Mr. Chater of Captain Roald Amundsen's account of his expedition to the Antarctic regions in the *Fram*, which culminated in the attainment of the south pole, and settled the last of the old romantic problems of exploration. The main and avowed object of Amundsen's expedition was to reach the pole; everything else, including scientific observations, was merely incidental, so that at first sight it might appear that little notice need be taken in a scientific journal of the story of a big piece of record-breaking. In other places the ethics of record-breaking have been freely discussed in connection with this expedition, and the question has been raised whether it is decent and permissible for two explorers to try to reach the same point at the same time from different bases and by different means. The controversial aspects of Captain Amundsen's book do not concern us here, nor need we allow our national feelings to affect our opinion as to the manner in which the Norwegian expedition was designed, executed, and described.

The pursuance of the main aim of the expedition was a splendid example of efficiency in plan, equipment, transport, physical strength and skilled leadership. The plan was simplicity itself. It was to land and set up winter quarters on the Great Ice Barrier at 163° 30′ W. and 78° 30′ S., to form depots at intervals as far south as 82° before winter set in, and to store the farthest depot with sufficient food to carry a sledge-party from there to the pole and back and leave enough in reserve to secure their return to the base; then in the Antarctic spring to travel with light sledges and many dogs to the farthest depot, there to complete supplies and proceed due south to the pole, trust-

1 "The South Pole." An Account of the Norwegian Antarctic Expedition in the *Fram*, 1910–1912. By Roald Amundsen. Translated from the Norwegian by A. G. Chater. Vol. i., pp. xxxv+392+plates+map. Vol. ii., pp. x+449+plates+maps. (London: John Murray, 1912.) Price, 2 vols. 2*l* 2*s*. net.

ing to find a way from the surface of the Barrier to the summit of the plateau on the meridian along which the route was directed, lightening loads by depositing sufficient supplies for the return journey to the next depot to the north at intervals of a degree of latitude.

Thanks to the careful choice of his companions, his dogs and his stores, Amundsen succeeded without a hitch. He took great risks, but the skill and preparedness of himself and his companions reduced these risks to a minimum. On the whole, the weather favoured him; but that was largely because he was able to distinguish the nearly invisible line between perseverance and stubbornness and to return to winter quarters after his first start on the great journey to the south when the severity of the weather began to tell on the dogs.

What distinguishes this expedition from all other polar sledging journeys is the fact that there was never a lack of provisions, not even of fresh meat, for no less than sixty tons of seal carcases had been prepared, and three tons of provisions carried to the depots at 80°, 81°, and 82°, the last being one-third of the way to the pole.

The incidents were only those familiar in Antarctic travel, the avoidance of crevasses on the Barrier, not only near the land, but in one or two places where the vast block of ice seems to have yielded locally to stresses of unknown origin, the negotiation of the Devil's Glacier, by which the ascent of the plateau was made through the mountain range about 160 miles south-east of the Beardmore Glacier, which served as Sir Ernest Shackleton's stairway, and the long journey across the lofty snow surface of the plateau until the immediate neighbourhood of the pole was reached. The telling of them reveals the point of view of the explorers, which differs somewhat from that often taken by persons of other nationalities, displaying an indifference to physical comfort and a resistance to fatigue that appear remarkable, while at the same time there is a general levity of spirits which, unless one reads between the lines, might mask the unshakable determination which drove the united party of five straight to their goal. Unfortunately, no precise data as to the health conditions are available, as the expedition did not include a medical man. As regards clothing, the system of woollen underclothing and wind-proof outer garments introduced by Captain Scott was used only for moderate temperatures. In extreme cold Captain Amundsen's party fell back on fur clothing. They introduced a new form of tent more quickly erected and more proof against the weather than that hitherto used, and of a particularly dark colour to reduce the glare of light which interferes with sleep in the unending sunshine of the polar day.

FIG. 1.—On Scott's Nunatak. From "The South Pole."

The scientific results, with the exception of those on oceanography, are of trivial importance, but they yield some scraps of new information and help to confirm the important facts discovered by Captain Scott, Sir Ernest Shackleton and others.

The results of the expedition, as regards geography, consist in the confirmation of Shackleton's discovery that the south pole was probably situated on a plateau more than 10,000 feet above sea-level; and of the extension of the great coast range of South Victoria Land with peaks of undiminished height in a south-easterly direction to latitude 88° S. at least.

It appears that this can no longer be regarded as merely a coast range, for Amundsen brings evidence to show that the Barrier, which represents the area believed to belong to the sea, terminates about 80° S., and there a spur of mountains runs off at right-angles to the main range in a north-easterly direction. There is no

FIG. 2.—Hell's Gate on the Devil's Glacier. From "The South Pole." Reproduced by permission of *The Illustrated London News*.

certain indication as to whether this range runs on to King Edward Land or not. The determination of the position of the pole on the uniform level surface of the plateau was accomplished by sextant observations with artificial horizons, the altitude of the sun being observed at hourly intervals by four separate observers for more than twenty-four hours. The readings are not given, but the result, as calculated by Mr. Anton Alexander, shows a latitude between 89° 57′ and 89° 59′ S.

Geological observations were confined to bringing home about fifty rock specimens from the mountains of South Victoria Land and from Scott's Nunatak on King Edward Land, which was visited for the first time by Lieutenant Prestrud in an interesting subsidiary expedition. The examinaton of the specimens shows that they consist only of granitic and schistose rocks.

The meteorological observations taken at the Bay of Whales at 78° 38′ S. do not cover a full year, but were taken three times daily from April 1, 1911, to January 29, 1912. The warmest month was December, with an approximate mean temperature of −6·6° C.; the coldest, August, with an approximate mean temperature of −44·5° C. The highest reading observed on the warmest day was just below freezing point. There was a marked predominance of easterly winds, this direction being most frequent with storms. It is almost incredible that there were no minimum thermometers on the expedition, and the maximum thermometers proved unworkable. Much snow was experienced at the base, but the stakes set out on the Barrier farthest south to mark the depots in autumn remained unconcealed after the winter's snowfall in the following spring, showing no appreciable accumulation of snow in eight months.

The oceanographical observations are discussed by Prof. Helland Hansen and Dr. Nansen, who point out that the preliminary trip in the North Atlantic in 1910 furnished results of great value for comparison with those of the simultaneous voyage of the *Michael Sars* under the charge of Sir John Murray and Dr. Hjort.

During the wintering of the land party in 1911 the *Fram* made two complete oceanographical sections in the South Atlantic about 700 miles apart and comprising sixty stations between South America and Africa, furnishing material of the utmost value concerning the circulation of the ocean. This will certainly prove to be by far the most valuable result of the expedition, and will be of special importance in comparison with Dr. Bruce's fine work in the *Scotia*.

There is little reference to biological observations, the most interesting point noticed being the discovery of lichens on Scott's Nunatak on King Edward Land. HUGH ROBERT MILL.

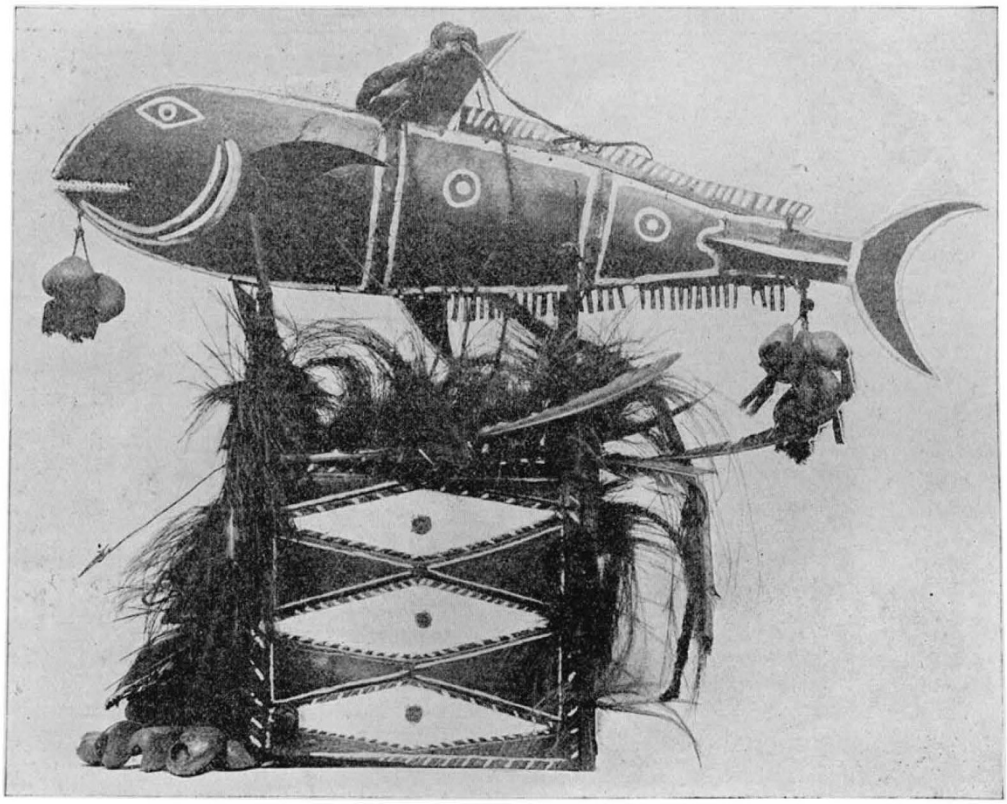

FIG. 1.—Box-mask with a bonito, made in Moa, obtained in Nagir. British Museum. The fish is 71 cm. (28 in.) long. From "Reports of the Cambridge Anthropological Expedition to Torres Straits." Vol. iv., Arts and Crafts.

ARTS AND CRAFTS IN THE TORRES STRAITS.[1]

THE fourth volume of the Reports of the Cambridge Anthropological Expedition to Torres Straits deals with the arts and crafts of the islanders, and the labour involved in its production is probably greater than that which went to the making of any other volume of this almost classical series. The writing up of technological data is laborious in the extreme, and, moreover, requires a special knowledge in many departments of human activity. Yet in spite of this the greater portion of the volume is the work of Dr. Haddon, the catholicity of whose anthropological knowledge appears to full advantage. He is responsible for the sections on daily life, decoration of the person, personal ornaments and clothing, domestic utensils and tools, food and its preparation, horticulture, hunting and fishing, weapons, transport and canoes, sound-producing instruments, songs, dances and dance-paraphernalia, games and toys, and the important chapter on art. He has also edited and completed the section on houses, which the untimely death of its author, the late Anthony Wilkin, had left unfinished. A very valuable chapter on textiles (baskets and mats) is contributed by Mrs Hingston Quiggin; Dr. Rivers deals with astronomy, Dr. Myers with music, and Mr. Ray with greetings and salutations and the calendar. Mr. J. Bruce contributes to the section on various social customs.

The book gives a practically complete picture of the economic and artistic life of a people who were hampered by several important restrictions; on the one side lack of water, ignorance of pottery and the carving of wooden vessels, on the other the want of efficient tools and the entire absence of metal. To deal with it at length is beyond the scope of a short notice, and it is possible only to direct attention to a few of the most interesting features.

Torres Straits has not been untouched by ex-

[1] "Reports of the Cambridge Anthropological Expedition to Torres Straits." Vol. iv., Arts and Crafts. Pp. xxiv + 393 + xl plates. (Cambridge: University Press, 1912.) Price 25s. net.