

a little more information, for instance, as to the constitution of the International Council and its administrative bureau, the address of the office and a brief statement of the objects for which the organisation has been brought into existence. The salient features of the maps of the physical conditions of the surface water might also be expressed in words, and the stations at which observations were made ought to be indicated on the map of each cruise by dots. We are inclined to lay stress on this point, as without some indication of the kind the maps are difficult to interpret, and the scale is not large enough to permit the figures of each observation to appear.

The August and November cruises were carried out in the Baltic by Finland, Sweden, Denmark, and Germany, in the North Sea by Germany and Scotland, and in the North Atlantic and Arctic Sea by Norway and Russia. To these there were added in February observations in the North Sea by Holland, and in the English Channel by England, England and Scotland being separately represented, mainly on account of the different nature of the fishery problems in their respective areas. It may be noted that these bulletins do not touch on the fishery observations, nor on the biological work (the determination of plankton excepted), which occupy the whole time of the various national staffs between the quarterly cruises. They do not refer either to the work of the Central Laboratory at Christiania.

The importance of the bulletin lies in the fact that it gives particulars of the temperature and salinity at a great number of points from latitude 45° to 75° N., observed nearly simultaneously and with comparable instruments of the highest precision, the temperature being determined by means of the Pettersson-Nansen insulating water-bottle and thermometers graduated to the fifth or even the tenth of a degree centigrade, the salinity by estimation of chlorine.

Both for August and November the central part of the North Sea appears to have been left without observations, but this gap was partly filled up in February when the system of quarterly cruises was more complete, and a number of supplementary observations by trading steamers had been added. The indications in the published maps are of a slight freshening along the British coast, a belt of maximum salinity running parallel to the coast towards the middle of the North Sea, increasing in salinity rapidly to the north-west between Scotland and Faeroe, and to the south-west towards the English Channel. The whole of the eastern half of the North Sea shows a rapid freshening towards a stream issuing from the Baltic close along the west coast of Jutland.

Where the temperature observations were sufficiently close and regular to permit of isotherms being drawn, they present a remarkable relation to the isohalines. In August the one isotherm shown is that of 12° C., which runs from Aberdeen to Lindesnaes, cutting the isohalines at right angles. In the November map, however, the isohalines and isotherms exhibit a most striking parallelism, so that the circulation of the water in that month could be studied with equal facility by considering either the temperature or the salinity. Thus at the southern end of the North Sea the isotherm of $13^{\circ}.5$ C. coincides with the isohaline of 35.25 per mille, and the isotherm of 13° C. with the isohaline of 35.00 per mille. At the mouth of the Baltic the two sets of lines though parallel, do not correspond symmetrically, while on the north-west side of the Baltic stream 10° lies close to $34^{\circ}/_{32}$, on the east side it lies close to $32^{\circ}/_{32}$. Still the axis of the Baltic stream is the same, whether it is drawn from the one set of lines or the other.

The February map shows the isotherms parallel with the isohalines in the south and east of the North

Sea, but cutting them nearly at right angles in the more open waters of the north and west. The difference in the broad action of the Atlantic in the wide part of the sea and the river-like action of the Channel in the southern part is brought out in a most interesting manner.

It is very important to secure a great extension of surface observations, and this, we believe, is now being done by many shipmasters who make regular observations on the various trade routes across the North Sea. Even if these fall short of the high accuracy attained by the special scientific vessels, they will prove invaluable in fixing the general run of the isotherms during the quarterly cruises, and of following the changes which take place between them.

We consider that these bulletins are satisfactory and full of the promise of large results. The too scanty letterpress is printed in parallel columns in German and English; the title only is in French.

ARCTIC GEOLOGY.

DR. P. SCHEI'S preliminary sketch of the geological work accomplished during Captain Sverdrup's four years' exploration of the region west of Smith Sound, an account of which is given in the *Geographical Journal* for July, makes important additions to our knowledge of Arctic geology.

About a quarter of a century ago Sir G. Nares's expedition examined the northern and eastern coasts of Grinnell Land down to the north-east corner of Ellesmere Island. The collections brought back by the *Fram* continue the geological information from this district round the southern part of that land mass, now named King Oscar Land, and all up its western shore to the north of Greely Fjord, including also the eastern coast of a newly-discovered island called Heiberg Land, and the coast of North Devon, south of Jones Sound, thus filling in the angle between Smith Sound and the group of the Parry Islands. Possibly they complete our general knowledge of this region, for Captain Sverdrup is disposed to think no more land exists to the north and north-west of Heiberg Land.

Previous explorations, summarised by Messrs. Feilden, De Rance and Etheridge in the *Quarterly Journal* of the Geological Society for 1878, proved the existence of crystalline Archæan rocks in the north-east of Ellesmere Island, of ancient sedimentaries, possibly Huronian, along the western coast of Kennedy Channel as far as the north-east angle of Grinnell Land, where they were succeeded by Carboniferous strata (with a little Devonian). West of these were Archæan schists, and those in the south were parted from the Huronians by a tract of Upper and Lower Silurian. Tertiary deposits, presumably of Miocene age, were discovered at more than one spot on both sides of Smith Sound and the channel north of it, and ample proofs obtained of a comparatively recent general elevation of the land, in some cases amounting to a thousand feet. Dr. Schei confirms the existence of the older Palæozoics near the middle of Ellesmere Island. Archæans follow them to the south, and continue along the coasts of Smith and Jones Sounds, appearing also on that of North Devon. On both sides they are succeeded by Cambro-Silurian deposits, and these, just at the western end of Jones Sound, by Devonian, which occur on both sides of the strait and extend some distance up the west coast of King Oscar Land. That formation had been already identified in the Parry Islands, and is now proved to extend over a considerable area. The strait parting Ellesmere Land from Heiberg Land is bordered by Mesozoic strata, which had already been detected in the Parry Islands, and these in the most northern part of

Heiberg Land are underlain by Carboniferous, with some interesting volcanic deposits. Tertiary strata were detected on Baumann Fjord, west of King Oscar Land, containing plant remains in an unusual state of preservation. Towards the western side glaciers are neither frequent nor large, owing probably to a deficient precipitation, and no signs were found of their having had a greater extension.

Thus Dr. Schei's researches corroborate and carry further the work of his predecessors. They show that a plateau-like region of Archæan rocks was submerged—perhaps before the beginning of the Palæozoic—and was buried beneath Cambrian, Ordovician, and Silurian deposits, it may be in orderly succession. These were followed by Devonian and Carboniferous, both marine, and possibly without interruption. After a break, with considerable physical disturbances, some beds of Triassic age were deposited, which are succeeded by Jurassic. Another great break is only

H.M. Inspectors of Fisheries in such circumstances to say that they have carried on no biological, chemical, or other laboratory investigations.

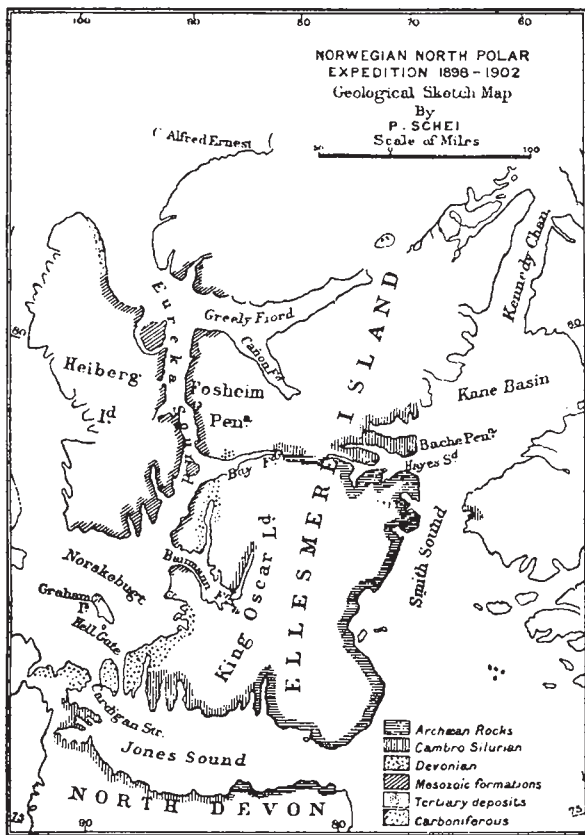
In Scotland there is the well-known Fishery Board, provided with laboratories, vessels, and a sea-fish hatchery, and much good scientific work has been done in the past by Dr. Fulton and his able staff; but it is said that nearly all the available funds (without which practical work cannot be carried on), and the energies of the scientific men, of the Fishery Board for Scotland have now been diverted for several years into the service of the international North Sea investigation scheme.

In Ireland matters seem to be managed better. Competent scientific men are carrying on important investigations having for the most part a direct bearing on the local fisheries, and there seem to be sufficient funds not only to meet the necessary expenses of the work, but also to publish the results in suitable form—with coloured plates and other good illustrations. Across the Irish Sea there is a "fisheries branch" in the Department of Agriculture and Technical Instruction, and the two names that appear prominently in connection with the work—Win. Spotswood Green and E. W. L. Holt—are ones that command respect from marine biologists and from fisheries experts alike. Mr. Green is Chief Inspector of Fisheries, and Mr. Holt is his scientific adviser, and from what we know of the work accomplished the combination seems a good one. The department in question has now issued the "Report on the Sea and Inland Fisheries of Ireland for 1901," in which, for the first time, as the report of the scientific adviser states, a part ii. on scientific investigations appears as a separate volume. It contains a couple of hundred pages and more than twenty plates, and Mr. Holt—for it is evidently very largely his work—and the department, and all others concerned, are to be congratulated on its appearance. The volume is entitled the report for 1901, but we notice occasional references to work done in 1902, and it contains the translation of a Norwegian paper said to be published in 1902. There is no harm in this, but we may be allowed to hope that the volumes for 1902 and 1903 will follow soon.

After a brief report from the scientific adviser to the chief inspector dealing with sea fisheries, inland fisheries, and the Cork Exhibition (1902), there follows an appendix, which is the main part of the book and contains a number of memoirs by Mr. Holt and his colleagues which are of both scientific and economic value. Amongst these we may note a brief account of a fishing survey of the Porcupine Bank, which is supplemented by a paper on the rock specimens trawled from the floor of the Atlantic and examined by Prof. Grenville Cole and Mr. T. Crook; a paper on Copepoda and one on Nudibranchiata by Mr. G. P. Farran; a useful paper on the British and Irish gobies, by Mr. Holt and Mr. Byrne, which is illustrated by two beautiful coloured plates and a number of figures in the text; an account of an investigation of the oyster beds of Wicklow and Wexford; and a translation of A. Wollbeck's three papers on oyster culture from "Norsk Fiskeritidende." The section on inland fisheries has papers and reports on salmon, pollen, and trout.

It is interesting to notice that Mr. Holt speaks of his oyster investigation as "part of the systematic examination of all our eastern fishing grounds, which is an item in the work of the scientific section of the fisheries branch." That is a programme such as we should expect from Mr. W. S. Green, and we have no doubt it will be ably carried out by Mr. Holt.

W. A. H.



(From the Geographical Journal.)

interrupted by isolated Tertiary deposits, and, with the exception of a considerable late or post-Glacial submergence, terrestrial conditions may have been since then generally persistent.

T. G. BONNEY.

FISHERIES INVESTIGATION IN IRELAND.

IRELAND seems to be happier for the moment than either England or Scotland in the organisation and in the results of its official fisheries research. In England the official Fisheries Department has been for some years under the Board of Trade, and is soon, we believe, to be transferred to the Board of Agriculture. It has had no laboratories, no boats, and no scientific assistants, and it is no reflection upon