The programme has now been extended and completed, and was prepared for submission to the International Meteorological Congress which was to have met at Rome in September, but which has been adjourned to next year. I have just received from my friend Weyprecht a copy, and may summarise its contents as follows :—

The enterprise proposed by Count Wilczek and Capt. Weyprecht has for its aim strictly scientific exploration, purely geographical discovery being a secondary matter. It will be the first step towards a systematic scientific investigation of the regions around the poles of the earth and the minute observation of phenomena peculiar to these regions—phenomena the earnest investigation of which is of the highest importance in connection with a great number of problems with regard to the physics of the globe. The international expedition will have for its aim to make in the Arctic and Antarctic regions, or in the neighbourhood of these regions, and at as many stations as it is possible to establish, synchronous observations according to a programme mutually agreed upon ; for the purpose, on the one hand, of deducing by comparison from observations collected at different points, independently of the peculiarities which characterise the years of different observations, the general laws of the phenomena investigated ; and, on the other hand, of arriving by probable inductions at a knowledge of the chances of penetrating further into the interior of the unknown regions. For this purpose each of the states participating in the work will undertake to equip at its own expense, and send out an expedition to one of the points designated. Each state will of course be at liberty to authorise its expedition to carry on work outside of that mutually agreed on.

The investigations to be made in common bear only on meteorological phenomena, those of terrestrial magnetism, aurora borealis, and on ice phenomena. At each station the observations must be continued one year, from September 1 to August 31. The meteorological observations will be made in conformity with the resolutions of the permanent International Committee, and will relate to atmospheric pressure, the temperature and humidity of the air, the direction and force of the wind, the state of the sky and its degree of clearness, and also to phenomena of condensation. The programme then gives detailed instructions as to methods and instruments of observation, all being arranged to secure accuracy, fulness, and uniformity.

It is probable that each station will be near a coast, and one of the chief objects of the expedition will be to observe the connection between the movements of the ice and the winds and currents, and if these are observed regularly, important results will no doubt be obtained as to the movements of the ice in the Arctic regions, and therefore as to the routes most favourable for reaching the pole. The best ice-observations will of course be at those stations where local conditions have the least influence.

The magnetic observations are divided into absolute determinations and determinations of the three elements. Minute directions are given in the programme as to the method to be followed in taking these observations, the fixing of the positions of the various instruments, the kinds of instruments to be used, the methods of verification and testing, the construction of observatories, &c. These directions, if faithfully carried out, would give the observer plenty of work to do, but the result would be of unprecedented value. In consequence of the persistent perturbations which prevail in these regions, isolated readings made only from hour to hour, even when carried on for long periods, are not sufficient to give with precision the hourly, daily, and monthly magnetic character of the place of observation. It is necessary, consequently, to multiply these observations. Ten observations per hour for each of the three elements will be sufficient, and to insure a rigorous synchronism it is stipulated that the three instruments of variation be read during ten minutes, from minute to minute, viz., at the full minute (– h. 56m. 0s.) the declination, ten seconds after (– h. 56m. 10s.) the horizontal intensity, and ten seconds after that (– h. 56m. 20s.) the inclination. Before and after each observation, viz., – h. 52m. 0s., and at – h. 69m. 0s. the form and position of the auroræ should be noted. Immediately after the meteorological observations should be proceeded with in the following order :—Temperature, humidity, winds, clouds, atmospheric pressure. (For magnetic observations it is proposed to use Göttingen mean time.) Besides observations of the regular magnetic variations, it will be of great importance to have made, by three observers, rigidly synchronous readings of the three elements in order to obtain precise data of the total intensity. For this purpose there will be made, during one hour each day, by these observers, from minute to minute, from – h – m. 0s., readings of the three instruments. The hours of these observations should be advanced an hour each day, so as to return to the point of departure at the end of every twenty-four days.

The auroræ should be observed as to their form, their intensity, and their position. The programme then names and describes the various forms assumed by auroræ—arches, streamers, beams, corona borealis, haze, waves, flashes—for the adequate and scientific observation of which the programme gives directions.

The most favourable time for this joint expedition will be October and November, when the temperature is not so low as to necessitate special preparations.

As the absolute simultaneity of the observations is of the utmost importance, each station must be furnished with the means of obtaining the exact longitude ; good chronometers will also be necessary. To carry out the above observations to their fullest extent, four observers will suffice for each station, if among the subordinates there are men who can perform the purely mechanical duty of reading the instruments.

The programme concludes with three propositions, the purpose of which is to insure the possibility of the exact comparison of the magnetic observations.

The following are the points proposed as most favourable for the various observations referred to above :— In the northern hemisphere—The north coast of Spitzbergen ; north coast of Novaya Zemlya ; Finmark, near the North Cape ; the mouth of the Lena, on the north coast of Siberia ; New Siberia ; Point Barrow, on the north-east of Behring Strait ; the west coast of Greenland ; the east coast of Greenland, about 75° N. lat. In the southern hemisphere—The neighbourhood of Cape Horn ; the Kerguelen or Macdonald Islands ; one of the groups south of the Auckland Islands.

I wish that in the influential pages of NATURE this great international scientific subject could be again urged. I cannot help thinking that in the present Hydrographer of the Navy we have an officer who would be at once most able and willing to take part in giving, in the way suggested, true scientific direction and scope to future Arctic research. My confidence in the great value of simultaneous observations in comparison with the meagre results of isolated expeditions must be my apology for thus writing.

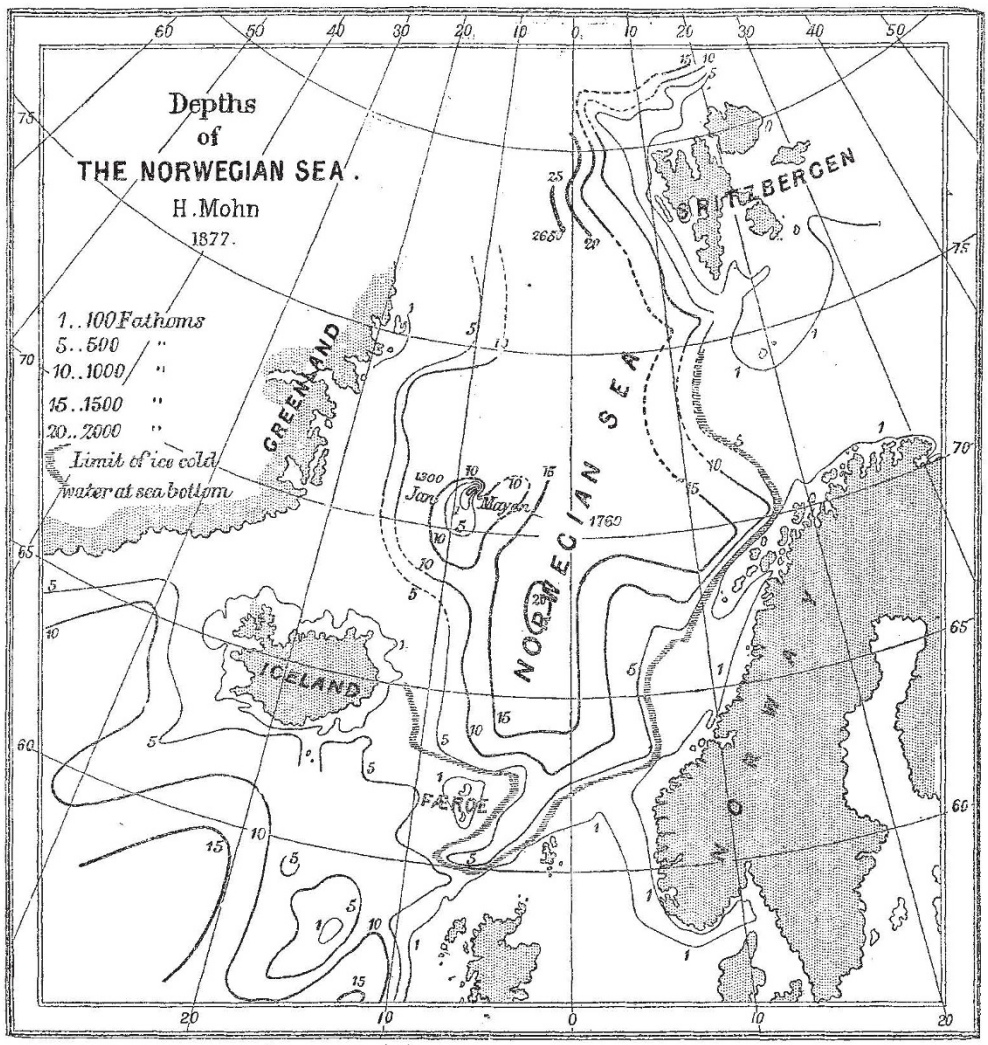
E. J. REED

THE NORWEGIAN DEEP-SEA EXPEDITION

FROM soundings taken by the second German Polar Expedition, and kindly communicated by Capt. Koldewey, of Hamburgh, I have been induced to alter

my views about the configuration of the sea-bottom around Jan Mayen. The figure of the bottom which I at present find the most probable I have given in the chart which I send herewith. It will be observed that it is the part of the sea between Jan Mayen and Iceland which is to be corrected on the small chart which was published in NATURE, vol. xvi. p. 527.

Christiania, October 23 H. MOHN



ON THE DIFFUSION OF MATTER IN RELATION TO THE SECOND LAW OF THERMODYNAMICS

1. THE purpose of this paper is to call attention to a natural process that appears to constitute an exception to the second law of thermodynamics, and which, if noticed by others, would at least appear from its importance to merit a more general recognition. The subject may be best dealt with by means of a simple illustration, the principles involved in the action of which are already perfectly well known.

2. Let the annexed figure represent a cylinder, containing a piston, P; a suitable (plumbago) porous diaphragm (as used for diffusion experiments) being fitted into the piston. The piston can be connected conveniently with any outer arrangement for doing work. Suppose the one half of the cylinder to be filled with oxygen, the other half with hydrogen. Then, as is known, according to the kinetic theory, the molecules of O and H are impinging continually against the porous partition or diaphragm, P, and the molecules in their impacts thus occasionally encounter vacant spaces or pores, and so continue their motion on across the diaphragm into the opposite compartment. Owing, however, to the fact that the molecules of hydrogen are moving four times as fast as the molecules of oxygen, they strike the diaphragm correspondingly more frequently, and thus four times as many hydrogen molecules pass through into division O, as oxygen molecules pass through into division H. [The piston is supposed fixed at present, so that no work being done, there is consequently no heating or cooling of the gas.] But on account of the excess of molecules passing into division O, the pressure there will rise. If, then, after the pressure has risen to a certain degree, the piston be