the more delicate of them disappear, in the transition from the calcareous ooze to the 'red clay;' and it is only by this light of later observations that we are now aware that this is by no means necessarily the case. On the 23rd of March, 1875, in the Pacific, in lat. 11° 24′ N., long. 143° 16′ E., between the Carolines and the Ladrones, we sounded in 4,574 fathoms. The bottom was what might naturally have been marked on the chart 'red clay;' it was a fine deposit, reddish brown in colour, and it contained scarcely a trace of lime. It was different, however, from the ordinary 'red clay,'—more gritty—and the lower part of the contents of the sounding tube seemed to have been compacted into a somewhat coherent cake, as if already a stage towards hardening into stone. When placed under the microscope, it was found to contain so large a proportion of the tests of Radiolarians, that Murray proposes for it the name 'Radiolarian ooze.' This observation led to the reconsideration of the deposits from the deepest soundings, and Murray thinks that he has every reason to believe (and in this I entirely agree with him) that, shortly after the 'red clay' has assumed its most characteristic form, by the removal of the calcareous matter of the shells of the Foraminifera, at a depth of say 3,000 fathoms, the deposit begins gradually to alter again by the increasing proportion of the tests of Radiolarians, until, at such extreme depths as that of the sounding of the 23rd of March, it has once more assumed the character of an almost purely organic formation, the shells of which it is mainly composed being however in this case siliceous, while in the former they were calcareous. The 'Radiolarian ooze,' although consisting chiefly of the tests of Radiolarians, contains, even in its present condition, a very considerable proportion of red clay. I believe that the explanation of this change, which was suggested by Murray, and was indeed almost a necessary sequence to his investigations, is the true one. We have every reason to believe, from a series of observations, as yet very incomplete, which have been made with the tow-net at different depths, that Radiolarians exist at all depths in the water of the ocean, while Foraminifera are confined to a comparatively superficial belt. At the surface and a little below it, the tow-net yields certain species; when sunk to greater depths, additional species are constantly found, and, in the deposits at the bottom, new forms occur, which are met with neither at the surface nor at intermediate depths. It would seem also that the species increase in number, and that the individuals are of larger size as the depth becomes greater; but many more observations are required before this can be stated with certainty. Now, if the belt of Foraminifera which, by their decomposition, according to our view, yield the 'red clay,' be restricted and constant in thickness, and if the Radiolaria live from the surface to the bottom, it is clear that, if the depth be enormously increased, the accumulation of the Radiolarian tests must gain upon that of the 'red clay,' and finally swamp and mask it."

Prof. Wyville Thomson further informs me that the best efforts of the *Challenger's* staff have failed to discover *Bathybius* in a fresh state, and that it is seriously suspected that the thing to which I gave that name is little more than sulphate of lime, precipitated in a flocculent state from the sea-water by the strong alcohol in which the specimens of the deep-sea soundings which I examined were preserved.

"The strange thing is, that this inorganic precipitated is scarcely to be distinguished from precipitated albumen, and it resembles, perhaps even more closely, the proligerous pellicle on the surface of a putrescent infusion (except in the absence of all moving particles), colouring irregularly but very fully with carmine, running into patches with defined edges, and in every way comporting itself like an organic thing."

Prof. Thomson speaks very guardedly, and does not consider the fate of *Bathybius* to be as yet absolutely decided. But since I am mainly responsible for the mistake, if it be one, of introducing this singular substance into the list of living things, I think I shall err on the right side in attaching even greater weight than he does to the view which he suggests.

T. H. HUXLEY

## *THE INTERNATIONAL CONGRESS AND EXHIBITION OF GEOGRAPHY*

AT the distribution of prizes the Ordnance Survey obtained a letter of distinction, although it was not an exhibitor. It is the only instance in which such an honour was awarded. M. Quatrefages, in the name of the governing body of the society, awarded two exceptional prizes, one to MM. Payer and Weyprecht for the discovery of Francis-Joseph Land, and the other to M. Delaporte for the foundation of the Cambodian Museum at Compiègne. Admiral la Roncière, le Nourry closed the meeting by a very impressive address reviewing the characteristics of the Congress.

The success of the Exhibition is so great that it will be kept open up to the 19th of September. The number of visitors is greater than ever now that the Congress is over, and many fresh attractions have been added to several sections. M. Buys Ballot, the director of the Utrecht Meteorological Institution, has sent a board used by him for better indicating the direction of winds and distribution of pressure. Small holes are perforated in a map at the places occupied by the several stations. In these holes are placed small needles whose height indicates the barometrical height, and whose head is an arrow showing the actual direction of the wind.

In the French annexe has been exhibited a drawing of a machine for manufacturing relief maps out of a block of plaster. The knife is movable by a kind of pantograph, and can be conducted alongside the several *lines of level* (lignes de niveau) of a map which is seen by reflection in a plate of glass placed in a suitable position.

Peter the Great having been appointed a member of the Academy of Paris in 1717, ordered a map of the Caspian Sea to be drawn, which he sent to his fellow-members of the Academy as a proof of his zeal for the progress of science, and to justify the honour which had been conferred upon him. This map was lodged in the archives of the Academy, engraved and published in the volume of 1721, with a report written by Delisle the astronomer. It happens that the same map is exhibited at the Russian annexe, and the circumstances connected with it having become generally known, it has given rise to the report that the Grand Duke Constantine will be elected a member of the Academy, like his ancestor and the Emperor of Brazil. It is something more than an idle rumour.

A banquet was given by the Section of Commercial Geography, and some resolutions were adopted *inter poculas*. The most notable is in reference to the establishment of a *fonda* in the centre of the Sahara for the use of all civilised nations. But although adopted unanimously, the motion is not likely to be carried into execution very speedily.

## *SCIENCE IN GERMANY*

(*From German Correspondents.*)

IT was the phenomenon of the motion of glaciers which caused most of the scientific men, that studied its details, to make experiments on the behaviour of snow and ice under pressure. The brothers Von Schlagintweit and Prof. Tyndall were the first who made such experiments with regard to glacial phenomena. Later on Helmholtz described a series of investigations, which proved amongst other things that snow is changed into ice by high pressure, that ice broken into little pieces can again be pressed into a homogeneous ice cylinder, that

such a cylinder can be pressed through openings of smaller diameter, &c. It was thus shown that under a strong pressure ice can be formed into any desired shape, that it behaves plastically even on a small scale, in the same way as the gigantic ice-rivers of glaciers do on a large one, adapting themselves to the narrower or wider parts of the valleys through which they flow. The phenomenon discovered by Faraday in the year 1850, which was afterwards widely discussed, and which was called regelation, formed the key for the explanation of this behaviour. Not one, however, of the men of science mentioned has tried to determine the exact pressure under which ice changes its form; all of them have worked with very high pressure, which in fact is necessary to obtain results that are visible in a short time. Only Moseley has made several series of experiments, to ascertain at what pressure or draught ice tears, is crushed, or when its plasticity becomes perceptible, *i.e.* at what pressure a dislocation of the ice-particles takes place. He found, that to tear an ice-cylinder apart, for each square inch of its base a weight of from 70 to 116 lbs. was necessary according to the higher or lower temperature (representing a pressure of 5½ to 9 atmospheres). To break an ice cylinder by pressure, 101·8 lbs. were necessary for each square inch; and to cause a dislocation of the ice-particles, from 97·89 lbs. to 118 lbs. were required (7½ to 9 atmospheres).

Herr Pfaff, of Erlangen, has lately made a series of experiments in order to obtain some more exact numerical values for the degrees of pressure which change the form of ice to any apparent extent; it is particularly interesting to know with reference to the glacier motion, what is the *minimum* of pressure at which ice still remains plastic, *i.e.* yields to pressure. It was found that even the *smallest* pressure was sufficient to dislocate ice-particles *if it acted continuously, and if the temperature of the ice and its surroundings was near the melting-point.* At a pressure of two atmospheres ice showed itself so yielding, that for instance a hollow iron cylinder of 11·5 mm. diameter and 1·7 mm. thickness of side entered 3 mm. deep into the ice within two hours, and at a temperature of between − 1° and + 0·5°. The following will show the influence of temperature. The same iron cylinder under the same pressure entered 1·25 mm. deep into the ice in twelve hours at a temperature of between − 1° and − 4°; while at a temperature varying between − 6° and − 12° it only entered 1 mm. deep in five days, at a pressure of five atmospheres, or only 0·1 mm. in twelve hours. If the temperature of the surroundings rises beyond the melting-point the ice becomes so soft that in one hour the same iron cylinder under the same low pressure entered 3 cm. deep into the ice, although it was completely surrounded by snow in order to prevent the temperature of the cylinder itself rising beyond 0°. In all these experiments a one-armed lever was used to regulate the pressure; it consisted of a steel rod of 86 cm. length, which had a boring at its end and was fastened to a steel plug round which it could easily be turned. By this simple contrivance any desired pressure could be maintained for any length of time. These and other experiments (which were made with a pressure of only ⅓ atmosphere) show that the plasticity of ice at a temperature near its melting-point is very great even at the lowest degrees of pressure. Herr Pfaff is of opinion that at this temperature the plasticity of the ice only becomes *nil* when the pressure itself is *nil*, but that it decreases very quickly as the temperature gets lower.

The opinion is still widely spread, based upon some experiments of Tyndall, that ice is not in the least flexible or ductile, although lately several observations have been made which force us to ascribe some flexibility to that substance. Kane observed, for instance, that a large slab of ice resting with its edges on two other blocks, bent itself under its own weight after a lapse of several months. Herr Pfaff experimented with a parallelopiped of ice of 52 cm. length, 2·5 cm. breadth, and 1·3 cm. thickness. It was placed with its two ends on wooden supports, so that on each side 5 mm. were resting on wood. From Feb. 8th to Feb. 15th, when the temperature remained between − 12° and − 3·5°, the middle sunk very little, on the average 2 or 3 mm. in twenty-four hours, so that on Feb. 15th the total bend amounted to 11·5 mm. Then the temperature rose but still remained under 0°; yet this rise caused a great increase in the bending, as it reached the value of 9 mm. in twenty-four hours (therefore 20·5 in all). Nowhere could any crack or tear in the ice be seen; the lower surface was examined with particular care, and did not show the trace of a crack!

Herr Pfaff has also succeeded in proving the expansion of ice by draught. It appears therefore that near its melting-point ice, like other bodies, yields to pressure and to draught, and must be looked upon, particularly with reference to the former, as an eminently plastic substance. This behaviour of ice towards pressure at different temperatures throws a new light upon the fact that the velocity in the motion of glaciers increases with temperature. As the glacier ice and the air over it possess a temperature, in the summer months at least, which lies very near the freezing point, it is evident that a very small pressure suffices to cause the glaciers to move. S. W.

At present a question is being discussed by morphologists, which seriously affects in more than one direction some traditional maxims of experience which were apparently confirmed long ago. It treats of the way and means by which cells, the foundation-stones as it were of the animal organism, are formed during the first process of the development of the ovum, viz., during its continually progressing division. The views of Remak, Kölliker, and others were generally adopted and often repeated until lately, namely, that the ripe and fertilised ovum, when it lost its former nucleus, the "germ bubble," received a new one, and that the division of this new nucleus caused that of the ovum itself; the further divisions were represented by the simple idea of a division of cells. Although Goette already, in the year 1870 ("Centralblatt für die medicinischen Wissenschaften," No. 38), and later, Bütschli ("Beiträge zur Kenntniss der freilebenden Nematoden," in "Nova acta der Leop. Carol. Deutschen Akademie der Naturforscher," 1873), and Fol ("Die erste Entwickelung des Geryonidencies; Jenaische Zeitschrift für Medicin und Naturwissenschaft," 1873) had opposed these views on the basis of new observations, yet general attention was only obtained by Auerbach in his work, "Organologische Studien" (1874), as the question at stake was treated in a more detailed manner. Auerbach examined the same animals which Bütschli had observed, viz., that order of Entozoa known as Nematoidea; he found that in their fertilised ovum, after the germ bubble has disappeared, two new nuclei are formed at two opposite poles of the ovum, which then approach each other towards the middle of the ovum and unite into *one*; this, however, soon disappears again, and a less sharply defined clear substance takes its place; this then extends longitudinally and takes a star-shaped form at each end, so that the two stars are connected by a thin stem. Now the division of the ovum begins to take place through the middle of that stem, while in each half of the same, by the confluence of little bubbles, a nucleus forms, which initiates the same phenomena for the further divisions as those which precede and accompany the first one. The result, therefore, would be as follows:—1. In the division of the ova of Nematoidea the nuclei disappear before each stage of the division, and form anew after each stage. 2. This formation takes place through the confluence of two or more bubble-shaped or nucleus-like