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 new forms. 3. The disappearance of the nuclei is accompanied by a peculiar star-shaped formation, which Auerbach deduces from the flowing apart of the nucleus matter. Bütschli has lately published new observations on the same subject ("Siebold's und Kölliker's Zeitschrift für wissenschaftliche Zoologie," 1875), from which it must be specially pointed out that even the first nucleus of the fertilished ovum of some Nematoidea, and of the fresh-water mollusc, Limnæus, results from the confluence of several little bubbles. Flemming has found Auerbach's observations confirmed with the fresh-water shell, Anodonta ("Archiv für mikroskopische Anatomie," band x., and "Sitzungsberichte der Akademie der Wissenschaften zu Wien III. Abtheilung," 1875"); he only differs so far from Auerbach in the interpretation of what he saw, that he does not deduce the "carpolytical figures" of the latter from the nucleus matter which radiates from the centre of the nucleus, but from a peculiar structure in the surrounding yolk-protoplasm, which he considers to be in connection with each division of the yolk and the new formation of the nuclei. But he does not interpret the process of this new formation. Flemming, in his second paper, describes the observations on a radiated arrangement of the yolk, which had previously been made occasionally with several other animals, without the observers being able to explain these phenomena or trying to investigate them further. We must, however, remark here that Goette, in the work we mentioned in our last report, has not only completely described the interior process of the division of the ovum of *Reptilia*, but has also attempted a uniform explanation of the same. According to his experience no nuclei at all are formed for some time in the division parts of the yolk, but only nuclei-shaped interior transformation products of the yolk, which are only apparently separated from their surroundings, but are in reality in continuous connection with them. These interior formations originate as collecting points of a radiated and universal protoplasm current in the yolk, which in turn results from the reciprocal action of the ovum and the surrounding medium. The difference in the currents is said to cause (in a manner described in detail) the division of these interior formations, and, as a consequence, the division of the surrounding yolk material. The radiated arrangement of the latter round the brighter centres is only imperfectly visible in *Batrachia*; but Goette has observed it in the ova of *Ascidia*, and interpreted it in the way just described. The definite nuclei of embryo cells, which result immediately from the division of the yolk, Goette supposes to be formed within those centres from a number of grains, which are at first greatly augmented, and then finally unite completely. But these origins of the nuclei do not disappear during the divisions of the yolk. If now we compare all the observations mentioned, we first of all find them all agreeing *that the division of the yolk is no simple cell division*, such as is elsewhere found in the tissues of developed organisms; for the remainder, the observations do not agree. While Goette supposes a gradual and continual progress of the formation of cells beginning from the first division, the other observers incline to the belief that at each division an interruption and a consequent re-beginning of the formation of cells takes place, as the once formed nuclei are said to disappear continually and new ones are said to form.

NOTES

THE U.S. Government have just shown in a handsome manner their appreciation of the services rendered by Dr. Henry Draper in connection with the U.S. observation of the recent Transit of Venus, by presenting him with a gold medal made at the U.S. Mint at Philadelphia. On the obverse is the motto, from Virgil, "Famam extendere factis hoc virtutis opus est," and in the centre a figure of the heliostat which was used by Dr. Draper in training the photographers. On the reverse is the inscription, "Veneris in sole spectandæ curatores, R. P. F. S. Henrico Draper, M.D., Dec. viii. MDCCCLXXIV." The phrase around the edge of the reverse, "Decori decus addit avito," conveys a tribute of praise to the literary and scientific attainments of Dr. Draper, sen. The Transit Commission have also sent Dr. Draper a handsomely bound set of resolutions illuminated in mediæval style, with a telescope, camera, &c. We are sure all scientific men will join in congratulating Dr. Draper on his well-deserved honour, and at the same time the U.S. Government on their enlightenment in thus acknowledging the glory which the triumphs of pure science have shed upon a nation; they have set a striking example to our own and other European Governments.

THE fifth session of the French Association for the Advancement of Science, as we intimated in our last number, will be opened to-day at Nantes. The principal attraction will be the excursions; one of them will last for more than three days, a war-steamer having been placed at the service of the Association by the Minister of Marine. The excursionists will visit Vannes and its prehistorical museums, the megalithic monuments of Locmariaques, the celebrated remains at Carnac, the sland of Belle-ile, and Lorient. No doubt there will be a great rush for the excursion. The list of papers to be read is a very long one. In the Mathematical Section a large number of the papers are on engineering subjects, and in the Natural Science Section a large proportion are on medical subjects, besides a good many on prehistoric archæology. Among the latter class are the following:—Dr. Broca, On the anthropology of Brittany; The Dolmens of the Lozère, by Dr. Prunières; On the funeral rites of prehistoric times in Scandinavia, by M. Waldemar-Schmidt. Other papers in this section are: On a new elementary theory of botany, by Dr. Ecorchard; On the meaning which it is proper to attach to the word "Mollusc" as a taxonomic term, and On the organisation of Rhizomes, by Dr. Gulland; On the Fauna of the Lake of Tiberias, by Dr. Lortet; On the pressure and rate of the blood in the arteries, by M. Marey. In the Section of Physical and Chemical Sciences we note the following:—On Microzymes in their relation to fermentation and physiology, On two new principles of wine, and On the origin of Bacteria, by Prof. Béchamp; Experiments on the rate of light between the Paris Observatory and Montlhéry, by M. A. Cornu; On the use of the spectroscope in the manufacture of Bessemer steel, by M. V. Deshayes; The meteorology and physics of the Polar Regions, by the Abbé Durand; On molecular combinations, by M. C. Friedel; On the limits of permanent snow and ice on the surface of the globe, On a magneto-dynamic galvanoscope, and On the chemical constitution of albuminoid matters, by M. P. Schützenberger; On a polymer of the oxide of ethylene, and on the dissociation of the salts of aniline, by M. A. Wurtz. There will be two public lectures—one by Prof. Bureau, of the Paris Museum, On the Natural Sciences at Nantes, and the other, On Acoustics—the *timbre* of sounds, by Dr. Gavarret.

THE above Association is not the only French institution which was created after the model of the British Association. M. de Caumont, who died four years ago, instituted another annual scientific congress, which will hold its forty-first session at Perigueux, in the department of Dordogne. Every year this association meets in a provincial town during summer, and at Paris during the recess of Easter. The members are mostly Legitimists and Roman Catholics.

THE forty-eighth meeting of the German Scientific and Medical Association will commence this year on the 17th of September at Graz (Austria). The two branches will be