

realised, was, in fact, reborn, and existed in our present phase of civilisation in the splendid creations and the self-reliant, hopeful, and sober enthusiasm of the men of science of the nineteenth century. The Greeks, were they able to visit us now, would have nothing but contempt for our Greek compulsionists. At the conclusion of his address he proposed a possible and desirable course of school education when compulsory science had banished the usurper—compulsory Greek.

Sir William Tilden, in proposing a vote of thanks, pointed out the advances made in the schools during recent years, and mentioned that the boys who were compelled to learn Greek were fewer than those obliged to study science.

Sir J. J. Thomson was elected president for the coming year.

Mr. A. Vassall read a paper on the education of medical students, and explained the powers which the General Medical Council actually possess, and referred to further powers to which the General Medical Council appear to lay claim. He deprecated any attempt on the part of the Medical Council to dictate a syllabus of general, as distinct from technical, education. Prof. Osler, in the course of the discussion, supported the view that the early scientific training of medical students could be undertaken by public schools.

In his paper on the experimental determination of the equivalent of magnesium, Mr. W. M. Hooton explained the complex reactions which actually occur when magnesium is heated in a porcelain crucible. As usually performed, the products include, in addition to the oxide of the metal, magnesium nitride and silicide, carbon, and possibly silicon. We should like to see more papers of this type, for there are many text-book exercises in vogue, both in class and in examinations, which call for careful revision. Mr. Hooton did not only succeed in the analytical investigation—he further developed a revised and satisfactory manner of performing this quantitative exercise which is of considerable value in an elementary course.

A good discussion was evoked by Mr. Eggar's paper on teaching English in connection with science lessons. The opener and Mr. Lewis, who followed, dwelt mainly on the faults prevalent in boys' notes, but subsequent speakers offered constructive suggestions for improvement. Prof. R. A. Gregory asked that more prominence be given to the romance of science. Scientific work of the last ten years had been concentrated on the drudgery of the laboratory, and the inspiration of early days had been neglected. This neglect was detrimental to scientific progress, and he wished schools more effectually to cultivate interest in the higher aspects of science. Dr. Gow (Westminster) said that the difficulty in regard to accurate language was felt in every branch of school teaching. After a long and interesting debate, the chairman suggested the possibility of a correlation report, to be drawn up in association with teachers of English.

Another useful debate arose on the question of "Wave Theory versus Rays" in the teaching of light, the respective protagonists being Mr. J. Talbot and Mr. C. F. Mott. Dr. T. P. Nunn uttered a needed *caveat* against dogmatic exposition of ideas relating to the æther, and showed how simply some of the most useful formulæ of optics could be obtained by heuristic lessons without unverified assumptions. The outcome of the discussion appeared to us to be that it was possible to secure the presentation of useful concepts of the wave theory to a class of boys of age sixteen, and that the process was valuable educationally.

Mr. R. W. Sloley contributed a paper on teaching concepts of energy and potential.

The exhibition of scientific apparatus and books was of large extent and good quality. Twelve of the best known firms in the trade had arranged extensive exhibits, which included not a few novelties. There were also about forty pieces of apparatus contributed by the members of the association, in some instances the handiwork of pupils. Half a dozen leading publishers sent their latest books on science subjects, and it was satisfactory to note the large proportion of advanced books which were shown. Most of the members and guests devoted a considerable time to the examination of the exhibits, which were well

displayed, and suggested many practical aids to work in laboratory and lecture-room.

In promoting social intercourse among science and mathematical masters from various parts of the country, this year's congress was even more successful than its predecessors. Much of the credit for this must be given to Mr. D. J. P. Berridge, who is retiring from the office of honorary secretary after giving to the Public School Science Masters' Association several years of hard, successful work.

G. F. D.

#### GEOLOGY OF THE BRITISH ISLES.

AMONG the later memoirs of the Geological Survey of Great Britain, for which Mr. T. Fisher Unwin is wholesale agent, is that accompanying Sheet 142 of the 1-inch map, on "The Geology of the Melton Mowbray District and South-east Nottinghamshire," by Messrs. Lamplugh, Gibson, Wedd, Sherlock, and Smith (price 2s. 3d.). The map (price 1s. 6d.) is a good one for showing the irregular distribution of boulder-clay across the ridge of Middle Lias, and its cessation in the Vale of Belvoir. Rhætic beds are recognised above the "teal-green marls" of the Keuper in the north and west. In the memoir it is pointed out that the Vale of Belvoir must have lain in the glaciated region, but was an area of stripping rather than of accumulation. Melton Mowbray probably stands over a concealed coalfield, which has been proved by borings to the north-west, and which may extend far to the south-east.

The tenth part of "The Geology of the South Wales Coalfield" has also been issued by the Survey, and is written by Messrs. Strahan, Cantrill, Dixon, and Thomas (price 2s.). It accompanies Sheet 229 of the map, which appears both in "solid" and drift editions. Part of the area was surveyed by Mr. B. S. N. Wilkinson, now senior geologist on the Irish Survey. The features of economic importance are dealt with in the description of the coalfield, which appears in the south-east of the map, and in chapter xv., on metallic ores, building stones, &c. The subdivisions of the Ordovician strata, including the Llanvirn series, are now shown in considerable detail on the colour-printed map, and Upper Tremadoc beds are also recognised in a band south of Carmarthen town. The Old Red Sandstone makes distinctly hilly country along the coast, and is cut across its strike by the main streams. The journey westward from Kidwelly thus involves two picturesque but sometimes breezy ferries, while the railway runs in milder Ordovician country to the north. The drift map shows patchy remnants of a sheet of boulder-clay, deposited by ice moving westward and southward down the Towy Valley, but disregarding its local windings. In the extreme west of the area ice probably came in from the north-west. It is suggested (p. 147) that the chalk-flints which are fairly common in the glacial gravels were derived from Cainozoic deposits which have been swept away.

Messrs. Lamplugh and Gibson have described "The Geology of the Country around Nottingham" (1910, price 2s.), with an accompanying map, specially composed of parts of four sheets (price 1s. 6d.). Attention is directed to points where local research is still required, a feature of the memoir that will be welcomed in a district famous for its amateur geologists. This official work has, indeed, been undertaken in an educational spirit, and is certain to meet with a gratifying response.

Mr. H. J. Osborne White writes on "The Geology of the Country around Alresford" (1910, price 2s.), and a colour-printed reproduction (price 1s. 6d.) is now issued of the drift-sheet No. 300, first published in 1898. The district lies on the edge of the chalk of Salisbury Plain, which is followed so picturesquely on the east by the high commons of the Lower Greensand beyond Lyss and Kingsley. A memoir describing the country that includes the village of Selborne, nestling in its vale at the foot of the Lower Chalk escarpment, will appeal to many naturalists. Mr. O. White pays special attention to the zoning of the Chalk. Types of soil and questions of water supply are dealt with in the concluding pages, and there are some interesting notes on river-capture (pp. 74 and 75).

The valuable series of memoirs on water supply is continued by one on Oxfordshire, by Mr. R. H. Tiddeman (1910, price 2s. 3d.), and one on Hampshire and the Isle of Wight, by Mr. W. Whitaker (1910, price 5s.). Dr. H. R. Mill contributes the chapters on the rainfall of the areas.

The Survey's "Summary of Progress" for 1909 (1910, price 1s.) contains, as usual, a record of new observations, of which further details may be expected later. A number of Devonian inliers have been found in the Culm-measure area west of Dartmoor. Mr. Clement Reid is prepared to correlate the well-known Bovey beds, with which even Playfair was acquainted, with the lignites of the Rhine, and to assign them to the Upper Oligocene. They thus fill a gap in British geology above the Hamstead beds of the Hampshire basin. "The Bovey flora . . . seems to be essentially the flora of the granite-ravines, with the admixture of a very few aquatic forms. . . . Marsh-plants are exceedingly rare" (p. 18). The additions to our knowledge of the Isle of Mull are conspicuous (pp. 26-38). Upper Lias and Middle Jurassic beds have now been discovered on Loch Don, thus filling part of the gap that occurs at Carsaig between the representatives of the Jurassic and the Cretaceous (see also p. 57). "Cornstones" in the Trias of Morvern (p. 35) indicate arid conditions; and Mr. Maufe's tropical experiences are here used to advantage. Detailed analyses of Devonshire clays, derived from granite, are given on p. 59. The titanium dioxide is usually more than 1 per cent., while zirconia and vanadium sesquioxide are each about 0.03 per cent.

Mr. L. Richardson contributes an elaborate and well-illustrated paper on "The Inferior Oolite and contiguous Deposits of the South Cotteswolds" to the Proceedings of the Cotteswold Naturalists' Field Club, vol. xvii., 1910, p. 63. He also discusses some of the hollows on the Cotteswold scarp in a paper on glacial features (*ibid.*, p. 40), and shows how the Ice age has probably left its traces in the land-forms here, as in North Wales. Mr. Richardson read his paper in 1909, and about the same time Prof. W. M. Davis, to whose work on Snowdon he refers, contributed a short paper on "The Valleys of the Cotswold Hills" to the Proceedings of the Geologists' Association (vol. xxi., p. 150). He points out that "when the curves of a stream are too small for the curves of its valley, a diminution of stream volume is to be inferred." The Evenlode and other valleys on the back of the Cotteswolds are too large for their present streams, and this may be due to their beheading by the recession of the escarpment. But the author suggests that they may formerly have been occupied by water escaping from small lakes between an ice-front in the Liassic lowland and the face of the Cotteswold cuesta. Such water would select the pre-glacial valleys, and would enlarge them.

In the same journal (vol. xxi., p. 333) Messrs. C. R. Bower and J. R. Farmery add to our knowledge of "The Zones of the Lower Chalk of Lincolnshire," working upwards from the top of the Red Chalk or Hunstanton Limestone. They see cause to differ as to the selection of zone-fossils made by previous writers, and choose, going upwards, *Holaster subglobosus*, *Terebratulina ornata*, and *Holaster trecensis*. Forty-three species are added to the records from these beds, and a plate is given to show the range of form in *Discoidea cylindrica*, from a pentagonal type in the lower zone to a flattened one, with a circular base, in the upper zone. Messrs. J. G. Hamling and T. Rogers (*ibid.*, 1910, p. 451) furnish a new coloured geological map of North Devon, on the scale of three-quarters of an inch to one mile.

In the same volume of the Proceedings of the Geologists' Association, p. 489, Mr. M. A. C. Hinton summarises his work on the British fossil voles and lemmings, and makes some very interesting remarks on the climatic conditions accompanying the maximum extension of ice in our islands. He regards the "Great Ice Age" in Britain as due to "glaciers formed in the mountainous districts," though it is not clear why Britain in this respect should differ so widely from Ireland or Scandinavia. His views are in happy agreement with those of Dr. Scharff as to the survival of Lusitanian members of our fauna through the alleged destructive epoch of maximum glaciation.

Dr. R. F. Scharff (Proc. Royal Irish Academy, vol. xxviii., sect. B, No. 1, price 1s.) writes on "The

Evidences of a Former Land-bridge between Northern Europe and North America." His paper has a special bearing on the origin of the present flora and fauna of Ireland. The author holds that land-bridges afford the only means by which terrestrial species are permanently transferred to a new habitat. He makes out a good case for the existence of a connection between our islands and America in late Pliocene times, and for the pre-Glacial origin of our flora and fauna. Incidentally, there is much that will interest workers on glacial climate, though the view (p. 5) that "the Glacial period was primarily due to the diversion of oceanic currents" will not explain the simultaneous glaciation of Europe, North America, and the central Andes. The only way out of this difficulty, if we rely on ocean-currents, is to accept, with M. Stanislas Meunier (*Revue des Idées*, September 15, 1910, p. 219), the still more difficult proposition that post-Pliocene glacial phenomena were separated, in various regions, by intervals of several thousands of years.

The Transactions of the Hull Geological Society for 1906-9 (1910, price 2s. 6d.) show how local observation may be aptly stimulated. Mr. Sheppard most usefully summarises, with numerous illustrations, recent publications bearing on the district. Mr. F. M. Burton has issued a paper on "The Witham and the Ancaster 'Gap'" as a separate publication (London and Hull: Brown and Sons, price 1s.). Surely this would have found better circulation through one of the northern scientific journals. Something seems omitted in a critical passage on p. 12, where the "clays of the Upper Lias and beds of Marlstone" are said to have extended eastwards, "cutting through the Lower Oolite at Ancaster, and forming the 'Gap' there."

In the Quarterly Journal of the Geological Society of London, vol. lxvi., part iii., issued in August, 1910, Mr. L. Moysey discusses (p. 329) Brongniart's genus *Palæoxyris*, as abundantly revealed in the Derbyshire and Nottinghamshire coalfield. The similarly problematic organisms *Vetacapsula* and *Fayolia* are also found, the former being known only from England. All three genera are believed by the author to be egg-cases of fishes. The society, as is well known, publishes abstracts of the discussions on its papers, a practice that should be universally followed under careful editing. We gather that the types of fish that would produce such egg-cases are practically absent from the beds where the three genera are found, and that botanists may still rise up to claim these quaint elongated bodies.

Miss H. Drew and Miss T. Slater (*ibid.*, p. 402) describe the "Geology of the District around Llansawel (Carmarthenshire)," where little has been done since Sedgwick wrote in 1854. The beds described are Gotlandian, and include the whole Birkhill series, followed by Lower Gala beds.

Mr. T. O. Bosworth's work on the metamorphism round the Ross of Mull granite is referred to in the Summary of Progress of the Geological Survey for 1909. He now (*Quart. Journ. Geol. Soc.*, 1910, p. 376) describes the beautiful phenomena of injection of granite along the foliation-flexures and other planes of weakness in the surrounding garnetiferous mica-schists. The latter belong to the Moine series of the Highlands. Groups of well-bounded prisms of sillimanite occur as contact-products in the schists, in addition to the ordinary fibrolitic type. There are some indications in the long and interesting discussion that the views of many Continental observers as to the potency of metamorphism by injection are spreading among workers in the British Isles.

Mr. G. W. Tyrrell, of Glasgow University, has published several papers on the characters of igneous rocks in southern Scotland. Writing on the "Intrusions of the Kilsyth-Croy District, Dumbartonshire" (*Geological Magazine*, 1909, pp. 299 and 359), he points out that the feeders of the laccolite of diabase in this district "appear to cut" the Linlithgowshire intrusive rocks, which have been regarded as of Cainozoic age. Since there is much evidence that the Kilsyth Croy rocks are of post-Carboniferous, but still Palæozoic, date, the Linlithgowshire series to the south must also be late Palæozoic. Micropegmatite veins occur through the diabases, and give cause for an interesting discussion (p. 362) as to their origin in

this and other cases, based on the suggestion of Daly that igneous magmas are essentially basic at the outset. In a paper on "The Classification of the Post-Carboniferous Intrusive Igneous Rocks of the West of Scotland" (Transactions of the Geol. Soc. of Glasgow, vol. xiii., p. 298), Mr. Tyrrell gives a useful account of the distribution of the various types. In cooperation with Mr. N. Martin, he describes the geology of the Auchineden district in the Kilpatrick Hills (*ibid.*, p. 322), and continues (p. 337) with an account of the igneous rocks of the vents and lava-flows. These prove to be olivine-basalts, though the sills were previously thought to be trachytic, on account of their fluidal structure and pale crusts. They belong to the late Palæozoic series. In a notice of rocks near Ballantrae (*ibid.*, p. 283), Mr. Tyrrell points to a granulitic diorite as a dolerite or gabbro metamorphosed by a later intrusion of serpentine. There is a pleasing sense of original outlook in these papers.

The Geological Survey of Ireland has issued a memoir by Messrs. Kilroe, Hallissy, and Seymour on the soils of the agricultural station at Ballyhaise (price 1s. 6d.), accompanied by a map showing types of soil and the underlying rocks, on the scale of eight inches to one mile. The methods adopted by this Survey for the examination of soils are fully stated. Another memoir, by Messrs. G. A. J. Cole and T. Crook (price 1s. 6d.), describes the submarine geology of the west coast of Ireland, so far as it can be known from the numerous rock-specimens dredged up by the official Fishery Survey. The amount of mingling of material by glacial drift-action appears to be very small on the west coast. Areas of Upper Cretaceous and Cainozoic limestone are indicated off the Kerry coast. As in the Ballyhaise memoir, a coloured map is included in the publication.

Prof. Cole describes (Proc. R. Irish Acad., vol. xxviii., sect. B, 1910, p. 113, price 6d.) the phenomena of weathering on the surface of a sheet of fine-grained diorite near Rathmullan, in Donegal, which is known as the "picture rock" or "scribed rock." The residual spheroids lie in box-like enclosures, the walls of which result from the toughening of the rock by the development of amphibole inard from its joint-planes.

In the *Irish Naturalist* for September, 1910, the Rosapenna area in northern Donegal is systematically described. Among the papers on its natural history is an excellent one on the geological structure, by Mr. J. de W. Hinch.  
G. A. J. C.

#### RUSSIAN MAGNETIC OBSERVATIONS.

UNDER the title "Die Variationen des Erdmagnetismus" Prof. Ernst Leyst has written a paper, occupying 250 pages and four plates, in the *Bulletin de la Société Impériale des Naturalistes de Moscou* for 1909. It deals with magnetic data from the Russian observatories at Pavlovsk (St. Petersburg), Irkutsk, and Katharinenburg, and with some corresponding data from Potsdam and Greenwich. The paper contains valuable statistical data for Pavlovsk, such as the secular changes of all the magnetic elements from 1873 to 1906, and diurnal inequalities derived from a 33-year period. Its main object, however, is to investigate the relations borne to terrestrial magnetism by sun-spot frequency and barometric pressure. A number of the data bearing on the sun-spot connection should be useful, such as diurnal inequalities in years of sun-spot maximum and minimum at the several stations. But their utility would have been greater if the numerical relationships between magnetic and solar phenomena had been gone into more critically. A good deal has been already done on these lines, even for some of the stations considered by Dr. Leyst, of which he seems unaware.

The parts of the memoir having a chief claim to novelty relate to the influence of sun-spot frequency on secular change and on the annual inequality, and to the relation between barometric pressure and the diurnal variations. Dr. Leyst finds secular change of declination to be more rapid near sun-spot maximum than near sun-spot minimum at all the stations included in his research except Katharinenburg. For the ratio borne by the rate of secular change at sun-spot maximum to that at sun-spot

minimum he finds nearly 2 : 1 at Greenwich and more than 3 : 1 at Irkutsk. In the case of the annual inequality—i.e. the variation shown in the mean monthly values after elimination of the secular change—he concludes in pp. 206-7 that the range is increased at sun-spot maximum for declination and inclination, but diminished for total force. As regards barometric pressure, Dr. Leyst finds the range of the magnetic daily oscillations, both regular and irregular, at Pavlovsk to be larger on days of highest barometric pressure than on those of lowest pressure, the phenomenon being specially conspicuous near sun-spot maximum.

The author's zeal, as evidenced by the great amount of labour expended in his investigations, merits warm appreciation. One's confidence, however, in his conclusions would have been greater if the work had shown more distinct evidence of critical insight.

Lines of no secular change seem to traverse continents with continuous velocity. Their passage must occur at some stations in sun-spot maximum, and at others in sun-spot minimum, and must mark in either case a time when secular change numerically considered is a minimum. In short, secular change, while seldom varying rapidly with the geographical coordinates, is essentially a local phenomenon, whereas sun-spot frequency is not. The secular change results assigned by Dr. Leyst to Greenwich are certainly not fairly representative of sun-spot maximum and minimum there. They show not the least resemblance to some which the present writer has deduced for Kew from the longer period 1860-1909. If a difference of the kind supposed by Dr. Leyst does exist, it is in England, at least, of a comparatively trifling character. As to the annual inequality, that of declination—the element which ought to possess least uncertainty—presents the suspicious features that the ranges obtained have usually diminished as the number of years included was lengthened, while the types obtained at comparatively near stations have differed. In Dr. Leyst's case the results are derived from only two or three groups of three-year periods at either sun-spot maximum or sun-spot minimum, so that more than usual uncertainty attaches to the elimination of the secular change. Of all Dr. Leyst's conclusions, that as to the relations between the diurnal variations and the barometric pressure is undoubtedly the most remarkable. The figures which he gives for declination and horizontal force show during summer, not a small, but a large difference between the ranges of the diurnal inequality and the absolute ranges (absolute maximum less absolute minimum) on days of highest and on days of lowest barometer at Pavlovsk. In winter the phenomenon is much less apparent, which leads the author to regard the case as one of association and not of direct cause and effect.

If confirmed, the result, it need hardly be said, would be of great theoretical importance. A matured opinion on the question could be attained only by a minute study of observational data. Thus an independent investigation of data from some second observatory by a competent critic is to be desired. Several theoretical considerations naturally present themselves. Large absolute magnetic ranges are intimately associated with highly disturbed conditions, and such conditions are normally, at least, not local. High or low barometric pressure, on the other hand, is an essentially local phenomenon. A high at St. Petersburg means a low somewhere else, often even within the confines of Europe. If there is any such general association as Dr. Leyst supposes, a high barometer at Pavlovsk must be a symptom of a special set of conditions affecting an area much larger than that the barometric pressure of which is above the average.  
C. CHREE.

#### THE MICHAEL SARS NORTH ATLANTIC DEEP-SEA EXPEDITION, 1910.<sup>1</sup>

IN August, 1910, Sir John Murray offered to defray the expenses of an expedition to the North Atlantic with the Norwegian research steamer *Michael Sars*. The Norwegian Government, too, showed itself very indulgent towards the enterprise, and placed the vessel entirely at our disposition; and my colleagues, who have so long

<sup>1</sup> From a paper read before the Royal Geographical Society on January 16 by Dr. Johan Hjort.