not take place; also that some means should be found, either by the establishment of an independent department or faculty of technology or otherwise, by which students of the Imperial College who satisfactorily complete the associateship courses of the college, and students duly qualified by research, advanced study, or in other approved ways, may obtain degrees without further examination. To maintain the departments of applied science in the college, so that they may be of the greatest possible usefulness to their related industries, small committees of experts are being formed with the express object of keeping the college specially informed as to the needs of that industry. Throughout the report there are many instances of the strenuous endeavours of the governing body to equip and maintain the college in a manner worthy of its name.

IN a paper read before the Royal Colonial Institute on April 23, Mr. A. E. Shipley, Master of Christ's College, Cambridge, dealt with the problem of fitting men for their practical post-academic life. The Americans, he pointed out, set great store by the practical nature of education. Not infrequently boys who in the ordinary course of events would leave school at fourteen or so, go up to the high school, where they maintain themselves, altogether or partly. The path from the school to the university is a straight one. But the system in America is beset by many grave disadvantages. The teaching staffs of some of the great universities are far from adequate, and the priceless feature of individual instruction and attention is neglected. College degrees may, he said, be "crammed" for, and the system stifles originality. Several Americans have told Mr. Shipley that comparatively few things are actually invented in America—that most inventions come from abroad, but are eagerly taken up and exploited in the States. Where the American really shines is not as an inventor, but as a manufacturer. Originality is rare in America, and this must be accounted for by the educational system. The remedy is either a gigantic increase in the teaching staffs of the universities or else a rigorous elimination of the first-year students. At present, he continued, the older English universities are producing the best men, but the field from which they draw is small. By making slight reforms, America could be on the same footing as the English universities, with the added advantage of a universal field from which to select the raw material.

THE completion of another important addition to the many departments housed under the roof of the Battersea Polytechnic was inaugurated on Monday, April 22, when his Honour Judge Benson (Master of the Worshipful Company of Drapers) attended for the purpose of opening the new hygiene and physiology laboratories, presented by that body as a further step towards the thorough equipment of the polytechnic. The new laboratories with their classrooms are equipped and arranged on the latest principles for the study of hygiene, physiology, bacteriology, and geology. Dr. Rawson, principal of the polytechnic, presented an interesting report on the work of the past year, in the course of which he pointed out that the number of both day and evening students showed a gratifying increase. In the matter of examination results, thirty-eight scholarships and exhibitions (to the value of 211*l.*) had been gained during the year, together with nine medals and sixteen prizes, and other awards. The number of university students and their successes at the university examinations also showed a great increase over previous years. In conclusion, Dr. Rawson referred to the great help the new laboratories given to the polytechnic by the Drapers' Company would prove. In the past, so far as the study of hygiene and physiology was concerned, the work had been seriously hampered for want of accommodation, but that has now been remedied. Judge Benson then distributed the prizes and formally opened the new laboratories. Later he delivered an address, in which he contrasted the present educational system with the opportunities which existed in his youth, and urged the students in their efforts to perfect themselves in technical arts and crafts, not to neglect that general culture which is necessary to the proper development of the human intellect.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 25.—Sir Archibald Geikie, K.C.B., president, in the chair.—J. S. **Townsend**: The diffusion and mobility of ions in a magnetic field. The mobility and diffusion of ions in a magnetic field is investigated on the same principles as those employed in the ordinary kinetic theory by considering the motion of an ion along its free paths between collisions with molecules. If U and K be the mobility and coefficient of diffusion when the magnetic force is zero, U_h and K_h the corresponding quantities in directions at right angles to a magnetic force H, then

$$U_h=\frac{U}{1+\omega^2T^2} \text{ and } K_h=\frac{K}{1+\omega^2T^2},$$

where $\omega=He/m$ and T the mean interval between collisions. The magnetic deflection θ of a stream of ions moving with a constant velocity in an electric field is also investigated, and a method is indicated of determining the velocity U due to an electric force X. When θ is small, $\tan\theta=HU/X$, and when θ is large, $\tan\theta X/=HU_h$.—J. J. **Manley**: The observed variations in the temperature coefficients of a precision balance. In this paper is given an account of experiments which supplement and extend an earlier research (Phil. Trans., A, ccx., p. 387) dealing with changes which may be observed in the resting points of precision balances. Attention is directed to the following:—(*a*) the possibility of the change from a positive to a negative value for the temperature coefficient of a balance; (*b*) the *critical temperature range* of a balance; (*c*) the various causes tending to give rise to a temperature coefficient; (*d*) the necessity for the "ageing" of a beam either naturally or artificially. In addition to the above, certain minute and temporary lateral displacements of the whole beam are investigated. A method for measuring these movements is given, and their origin disclosed. —Dr. Guy **Barlow**: The torque produced by a beam of light in oblique refraction through a glass plate. In accordance with the principle that light carries with it a stream of momentum, the passage of a beam of light through a refracting plate should give rise to a torque on the plate, it being supposed that the reaction is on the matter through which the beam is passing. In 1905 Prof. Poynting and the author made experiments which confirmed this result, but as disturbances, due to gas action, were not eliminated, more exact measurements appeared desirable. In the present experiment the original double-prism arrangement was abandoned in favour of a single cube. A glass cube, of 1 cm. edge, was suspended axially by a fine quartz fibre. A strong beam of light was sent obliquely through the cube, the angle of incidence having been so adjusted that the beam entered through one half of one face, and emerged through the half-face diagonally opposite. The torque was

determined from the observed angular deflection of the cube. Observations were made in hydrogen and air with pressures ranging from 0·1 to 76 cm. Hg. The disturbance due to radiometer action was found to be inversely proportional to the gas pressure, and could be eliminated. After allowing for the reflected beams, the observed torque (of the order 2×10^{-6} dyne cm.) was within 2 per cent. of that calculated from the energy of the beam.—Dr. T. C. **Porter**: Contributions to the study of flicker. Paper III. This paper is a continuation of two former papers: Proc. Roy. Soc., vol. lxiii., p. 347, and vol. lxx., p. 313. If n be the number of revolutions per second for a disc with white sector "w" and the rest black, just to appear flickerless under illumination "I," then

$$n = -27{\cdot}83 + (8{\cdot}57 + 2{\cdot}79 \log \mathrm{I}) \log w\,(360 - w);$$

this holds when I is greater than 3·98. If I be less than 3·98, then

$$n = -38{\cdot}6 + (12{\cdot}4 + 0{\cdot}77 \log \mathrm{I}) \log w\,(360 - w).$$

The existence of the remarkable break in the line connecting n and log I for $w = 180$ has been confirmed. The relation of n and I for perfectly symmetrical discs of four or more sectors is established, and application made to the measurement of high illuminations. Asymmetrical discs are considered, and it is proved that n is independent of the direction of their rotation. With the aid of a reasonable assumption there is deduced a curve expressing numerically the rise and fall of retinal excitation with time when the eye has presented to it suddenly a white surface, which is afterwards suddenly withdrawn. This curve is drawn to scale for a given illumination of the white surface.

Royal Microscopical Society, April 17.—Mr. H. G. Plimmer, F.R.S., president, in the chair.—J. D. **Siddall**: The life-history of some marine diatoms from Bournemouth. Living and mounted examples, drawings, photographs, and lantern slides were exhibited in illustration of the author's observations, the chief interest of which centred in a Coscinodiscus, about 1/400 in. in diameter, furnished with very numerous radiating pseudopodial filaments. The specimens shown demonstrated the certainty of this beyond any possibility of doubt, and thereby set at rest the old and much-debated controversy as to the possession and utilisation of pseudopodial appendages, at any rate in this particular diatom, which, for the sake of convenience, he proposed should receive the specific name *heliozoides*. The presence of pseudopodial appendages, much smaller, fewer, and still more difficult to discern, was also notified in Nelosira, Surirella, Biddulphia, and Triceratium. The cause of the peculiar movement of *Bacillaria paradoxa* was also briefly discussed in the paper, which concluded with the suggestion that further study of living diatoms with modern microscopical appliances would explain much of the meaning and purpose of the exquisite minutiæ of their siliceous skeletons.—E. B. **Stringer**: A modified form of the lever fine-adjustment, and a simple turn-out device for the substage condenser. The essential feature of the fine-adjustment was that the movement of the lever was carried to the top of the limb by means of a strong steel pin working through a guide, the opposing spring being at the bottom, and friction between the lever and the pin eliminated by means of a ball-bearing. Freedom from lateral movement and greater sensitiveness was thus secured. A simple two-speed movement was also provided. The turn-out device acted on the top lens of the condenser alone, thus affording illumination adapted to the power of the objective in use. A note was added on the value of the Bertrand lens in ordinary microscopical work.

Institution of Mining and Metallurgy, April 18.—Bedford McNeill, vice-president, in the chair.—E. **Hatschek** and A. L. **Simon**: Gels in relation to ore deposition. Actuated by the already known fact that dissolved substances will diffuse into and out of "gels," such as gelatine and silicic acid gels, the authors have made a series of experiments, from which it appears probable that many features of the occurrences of gold in quartz can be explained by the assumption that such occurrences originated in the reduction of gold salts in a medium of gelatinous silicic acid. In these experiments the agents employed for the reduction of gold chloride in the gels were various, and comprised two groups: in aqueous solution—oxalic acid, ferrous sulphate, formic acid with ammonia, and sodium sulphite; gaseous—sulphur dioxide, carbon monoxide, illuminating gas, and hydrogen. The reverse process of adding the reducing agent to the "gels," and afterwards pouring in the gold chloride solution, was also tried. The results of these experiments, as demonstrated in test-tubes, throw, in the authors' opinion, a new light on certain gold deposits, and afford a more satisfactory explanation of their genesis than has been hitherto suggested. This is a matter of some importance, as the finding of alluvial gold has frequently led to the expenditure of vast sums of money in the endeavour to locate the primary rock source, which is possibly non-existent if these experiments are interpreted aright. The authors are making further and more exhaustive investigations on the same lines which may lead to even more conclusive results.—J. I. **Hoffmann**: Recent practice in diamond drilling and borehole surveying. This paper may be regarded as supplementary to others on the same subject read previously before the institution, and described more recent practice, including a detailed account of the surveying instrument now exclusively employed on the Rand, the invention of Mr. Oehman, with improvements by Mr. A. Payne-Gallwey. In this instrument the survey is photographically recorded, two discs of sensitised paper being placed so that at a given moment they receive impressions from a small electric lamp, and the variation in the image transmitted to each enables a ready estimation to be made of both the dip and direction of the borehole at the point where the record is made. The paper contains folding plates giving diagrammatic views of two typical Rand boreholes surveyed by means of this instrument. A description of a deflecting wedge invented by Mr. Wm. Gallagher, used for the purpose of correcting the deviation of a borehole while in process of being drilled, or of making an offset from one already drilled, added interest to the paper and assisted in bringing it up to date.—Two other papers were on the agenda, but had to be taken as read; these were:—G. T. **Holloway**: Notes on the valuation of ores and minerals and on metallurgical calculations; and T. A. **Rickard**: The domes of Nova Scotia.

Linnean Society, April 18.—Dr. D. H. Scott, F.R.S., president, in the chair.—Dr. D. H. **Scott**: *Botrychioxylon paradoxum*, a Palæozoic fern with secondary wood. The plant is from the Lower Coal-measures, and is a member of the family Zygopterideæ, belonging to the Primofilices of Arber. The stele has a "mixed pith," consisting of internal tracheides and parenchyma; the surrounding zone of wood is entirely secondary, diminishing in thickness upwards. The branching of the stem, as in *Ankyropteris corrugata* and some other Zygopterideæ, is dichotomous. The leaf-trace, like the stele, shows a considerable development of secondary xylem, but in the petiole the tissues of the bundle are

entirely primary. The structure differs from that of Ankyropteris in the apparent absence of "peripheral loops." "Aphlebiæ," forming branched, spine-like organs, are borne both on stem and petiole.—Dr. E. A. Newell **Arber**: *Psygmophyllum majus*, sp. nova, from the Lower Carboniferous rocks of Newfoundland, together with a revision of the genus, and remarks on its affinities. This paper deals with a rare and little-known genus of Palæozoic plants. A new species of Psygmophyllum (*P. majus*, sp. nov.) from the Lower Carboniferous rocks of Newfoundland is first described, and a full account of *P. flabellatum*, Lindl. and Hutt., the British representative, is added. The genus is revised and the affinities of the genus discussed.

PARIS.

Academy of Sciences, April 22.—M. Lippmann in the chair.—J. Violle, M. Bassot, H. Deslandres, G. Bigourdan, B. Baillaud, MM. Fournier and Bourgeois, Joseph Eysséric, Louis Fabry, M. Stéphanik, Fr. Iñiguez, D. Eginitis, A. Lebeuf, E. Cosserat, Charles André, Alfred Angot, Henry Bourget, E. Carvallo, and Maurice Hamy contributed papers dealing with the eclipse of the sun of April 17 (see p. 221).—Paul **Appell**: Remarks on the possible use of the energy of acceleration in the equations of electrodynamics.—A. **Lacroix**: The radio-active uraniferous niobotantalotitanates of the Madagascar pegmatites and their frequent association with minerals containing bismuth. Analyses are given of four of these minerals. Details of the radio-active properties of these substances are reserved for a later communication.—A. **Chauveau**: The stereoscopic inversions caused by the association of two systems of retinal impressions in opposition and of unequal power. The influence of the preponderating impression. It is shown that in the stereoscope, in the case of two retinal impressions in the same visual field and of unequal strength, the feebler retinal impressions are subordinated to the stronger ones. The latter can cause the inversion of the retinal impressions produced by the former.—Pierre **Termier** and Robert **Douvillé**: The rocks and fossils of the region of the high plateaux between Bou-Denib and the Mlouya, on the southern Algero-Morocco border.—Arnaud **Denjoy**: Calculation of the primitive of the most general derived function.—Harald **Bohr**: The $\zeta(s)$ function in the half-plane $\sigma>1$.—Ch. **Fremont**: The distribution of the deformations in metals submitted to forces. Case of the folding of tubes.—G. **Kœnigs**: Joule's cycle. A comparison of the efficiency of an internal-combustion motor working on a Carnot cycle and a Joule cycle.—Samuel **Lifchitz**: The path of particles in Brownian motion. The formation of vortices.—E. E. **Blaise**: Syntheses by means of mixed organo-metallic derivatives of zinc. Formyl-lactyl chloride with the zinc compound R—Zn—I gives lactic acid and the aldehyde R—CHO. The method is general, and in some cases furnishes a serviceable process for the preparation of aldehydes.—Mme. **Ramart-Lucas**: The dehydration of pseudo-diphenyl-carbinol.—Maurice **Lanfry**: The action of hydrogen peroxide upon the bromothiophens. Monobromothiophen is partially converted into the dibromo-derivative; tribromo- and tetrabromo-thiophens are not attacked by the reagent.—Edouard **Bauer**: Reduction of the β-diketones. Acetylacetone can be reduced to the corresponding diglycol by reduction with sodium in boiling alcohol.—A. **Wahl**: Researches on coal. A study of the substance extracted by boiling pyridine from various classes of coal.—R. **de Litardière**: The phenomena of somatic kinesis in the radicular meristem of some Polypodiaceæ.—M. **Ravin**: The carbon nutrition of Phanerogams with the aid of some organic acids and their potassium salts.—G. **André**: The displacement of the food substances contained in seeds by water.—Em. **Bourquelot** and Mlle. A. **Fichtenholz**: The presence of arbutin in the leaves of *Grevillea robusta*.—Albert **Robin**: Delay in the consolidation of a broken limb in a tuberculous case. Treatment based on the disturbances in the exchanges caused by tuberculosis.—MM. **Desgrez** and **Dorléans**: The hypotensive action of guanine. Experiments with dogs and rabbits proved that guanine lowers the arterial pressure, and is opposed in this respect to the action of adrenaline.—Jean **Effront**: The action of light and hydrogen peroxide upon albumenoids and amido-acids.—A. **Zimmern** and P. **Cottenot**: The effects of irradiation of the suprarenal glands in physiology and therapeutics. A. **Trillat**: The favourable influence exercised on the development of certain cultures by association with *Proteus vulgaris*.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* (physico-mathematical section), parts i. and ii., for 1912, contain the following memoirs communicated to the society:—

March 7, 1908, and July 29, 1911.—The late K. **Zoeppritz**, L. **Geiger**, and B. **Gutenberg**: Seismic waves, part v.

December 10, 1910.—**Angenheister** and **Ansel**: The Iceland expedition of 1910, part i. (observations on terrestrial magnetism) and part ii. (observations on atmospheric electricity and meteorology from May 10 to June 2, with reference to the passage of Halley's comet).

BOOKS RECEIVED.

Text-book of Hygiene for Teachers. By Dr. R. A. Lyster. Pp. viii+496. (London: W. B. Clive.) 4*s*. 6*d*.

Grandeur et Figure de la Terre. By J. B. J. Delambre. Ouvrage augmenté de notes, &c., by G. Bigourdan. Pp. viii+402. (Paris: Gauthier-Villars.) 15 francs.

Volumetric Analysis for Students of Pharmaceutical and General Chemistry. By C. H. Hampshire. Pp. vii+104. (London: J. and A. Churchill.) 3*s*. 6*d*. net.

Scottish National Antarctic Expedition. Report on the Scientific Results of the Voyage of S.Y. *Scotia* during the Years 1902, 1903, and 1904 under the Leadership of Dr. W. S. Bruce. Vol. iii.—Botany. Parts i.–xi. Pp. ix+153+12 plates+chart. (Edinburgh: Scottish Oceanographical Laboratory; Edinburgh and London: Oliver and Boyd.) 23*s*. 6*d*.

The Life of the Plant. By Prof. C. A. Timiriazeff. Translated by Miss A. Chérémeteff. Pp. xvi+355. (London: Longmans and Co.) 7*s*. 6*d*. net.

A Geography of Europe. By T. Alford Smith. Pp. xi+272. (London: Macmillan and Co., Ltd.) 2*s*. 6*d*.

Wild Flowers as they Grow. Photographed in Colour Direct from Nature. By H. E. Corke. With descriptive text by G. C. Nuttall. Third series. Pp. viii+199. (London: Cassell and Co., Ltd.) 5*s*. net.

The Horse and its Relations. By R. Lydekker. Pp. xii+286. (London: G. Allen and Co., Ltd.) 10*s*. 6*d*. net.

Lectures on the Differential Geometry of Curves and Surfaces. By Dr. A. R. Forsyth. Pp. xxiii+525. (Cambridge: University Press.) 21*s*. net.

The Doctor and the People. By H. de C. Woodcock. Pp. xii+312. (London: Methuen and Co., Ltd.) 6*s*. net.

Handbuch der vergleichenden Physiologie. Edited by H. Winterstein. 21 Lief., Band iv. (Jena: G. Fischer.) 8 marks.