from an examination of the work of London Polytechnics. In the first place, the funds at the disposal of the Institutes are usually not sufficient to permit the educational needs to be properly supplied. In order to supplement the sum arising from endowment, grant-earning classes have to be held, which means that subjects come to be considered for what they will bring to the Institute's exchequer rather than for what they are worth. The Technical Education Board of the London County Council have taken steps to remedy this evil by contributing maintenance grants, and capital grants for equipment, apparatus, &c., the former being allotted according to a scale calculated to promote educational efficiency, and regularity of attendance. The Department of Science and Art, and other Examining Bodies, should consider the advisability of treating Polytechnic Institutes in a similar manner, instead of regarding them as mere collections of classes. The less an institute of this kind depends upon payment by results, the more likely is it to develop in the proper direction.

Very little provision is made in the institutes for really advanced work or research, but this will probably come, for in London, technical education is only in its experimental stage. Many years of work will have to be done before any London institute will be able to find students for instruction of such an advanced character as that given in continental Polytechnics. Mr. Ll. Smith recommended, in his report to the London County Council, that a grant should be made "towards the maintenance of an advanced department of applied science, bearing on some local industry, under the control of a well-qualified instructor who gives all his time to the work of the institute." The Technical Education Board have promised a contribution for this purpose when a Polytechnic desiring it shall have drawn up a detailed scheme of work, and the Board is satisfied that the proposed class will be of value to the industries of the district.

As to the recreative side of the institutes, little need be said. The desire for physical exercise is so much stronger than that for mental development, that there is a possibility of recreation swamping education in one or two cases. Generally, however, the two sides are very well balanced, and admirably assist one another in the development of men of thought as well as men of muscle.

For the rest, Polytechnic Institutes have aroused the interest of the working class, and men now realise the necessity of a scientific grounding for every trade. To have done this in so short a time promises well. In a few years, perhaps, London Polytechnics will be able to compare favourably with those in other European capitals, and when that day arrives a generation of workmen will have sprung up which, for aptitude and efficiency, should be able to hold its own against the world.

R. A. GREGORY.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Mr. V. H. Veley and Mr. G. C. Bourne have been appointed Examiners for the Burdett-Coutts Scholarship.

The sixth annual report of the Curators of the Botanic Garden shows a deficit of nearly £200 on the close of the financial year. This is due principally to the decrease of income derived from rents and profits of estates. The Curators report that the existing endowment is inadequate to maintain the Garden, and that it will be necessary to call on the University at no distant date, to consider whether a moderate annual subvention should not be made to place the Garden on a satisfactory basis. The deficit would have been greater but that the Professor of Botany has made, *proprio motu*, a contribution of £50 towards the funds of the Garden. The new range of glass-houses, including the palm house and the succulent house, has been completed and proves satisfactory.

Elections to Scholarships in Natural Science will be held at the following Colleges:—Balliol College, examination to begin on November 20, a scholarship in Natural Science worth £80 a year, on the foundation of Miss Hannah Brakenbury. Balliol, Christ Church and Trinity College. At Balliol two Scholarships of the value of £80 a year and one Exhibition of the value of £40 a year. Christ Church, one Scholarship of the value of £80 a year and one Exhibition of the value of £85 a year. Trinity College, one Scholarship of the value of £80 a year. The examinations for these Scholarships will begin on Tuesday, November 20.

CAMBRIDGE.—Dr. Bradbury, the Downing Professor of Medicine, has appointed as his assistant in Pharmacology Mr. C. R. Marshall, Research Fellow of Owens College, Manchester.

The Rede Lecture will be given in the Anatomy School by Mr. J. W. Clark, Registrary, on June 13 at noon. The subject is "Libraries during the Middle Ages and the Renaissance."

A considerable number of courses in scientific subjects, including Chemistry, Mineralogy, Geology, Anatomy, and Pathology are announced for the ensuing Long Vacation, which is more and more assuming the character of a regular term.

No less than twenty-three women are announced as having "deserved Mathematical Honours" in Part I. of the Mathematical Tripos.

By the election of Dr. Hickson to the Professorship of Zoology at Owens College, Manchester, a vacancy is created for a University Lecturer in Invertebrate Morphology.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 5.—On the measurement of surface tension of water and mercury in capillary tubes, by G. Quincke. In accurate measurements of the surface tension of water by elevation in capillary tubes the marginal angle must be taken into account. It is different from zero, and generally increases with the age of the tubes. For the same kind of glass the surface tension of water at 18° is generally found to increase with the diameter of the capillary tube. For wide tubes of normal Jena glass or English flint glass the surface tension at 18° was 7·846 and 7·776 mgr.—On the magnetic deflection of cathode rays, by Philipp Lenard. The magnetic deflection is not affected by the medium in which the rays are observed, but remains the same for a given species of cathode rays, whatever may be the gas, the intensity, and the pressure. But at different pressures within the generating apparatus different cathode rays are produced, showing varying amounts of deflection.—On a sodium-nitrogen compound, by L. Zehnder. Sodium mirrors deposited electrolytically in vacuum tubes gave rise to strong absorption and rapid fall of pressure, accompanied by the formation of a brown mirror during the glow discharge. A detailed investigation showed that this action takes place as soon as metallic sodium has been transferred to the cathode. The compound formed, probably NNa_3, is not deposited on the cathode, but on the glass walls near the anode.—On the elliptic polarisation of reflected light, by K. E. F. Schmidt. In the case of glasses of equal refractive indices and different dispersive powers the glass with the higher dispersion shows the wider range of angle at which ellipticity is observed.—On the spectra of tin, lead, arsenic, antimony and bismuth, by H. Kayser and C. Runge. The authors have continued their efforts to find uniformities in the structure of the metallic line spectra through the periodic series of the elements. The above metals were taken as convenient representatives of the fourth and fifth rows. The spectrum of tin may be reconstructed by superimposing three equal spectra differing by a constant oscillation frequency. The same law applies to the spectra of lead and arsenic. In the case of antimony, six such spectra are superposed, and in bismuth four.—Line spectra, by J. R. Rydberg. This is a comparison of the spectra of calcium and strontium.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society. May 10.—"Preliminary Report on the Results obtained with the Prismatic Camera during the Total Eclipse of the Sun, April 16, 1893." By J. Norman Lockyer, C.B., F.R.S.

During the total eclipse of 1871 observations were made by Respighi and the author with a spectroscope deprived of its collimator, and a series of rings was seen corresponding to the different rays emitted by the corona and prominences. A similar instrument, arranged for photography, was employed during several succeeding eclipses, but the photographs were on so small a scale that none of the results came up to the expectations raised by the observations of 1871. As the Solar Physics Committee is now in possession of a prismatic camera of 6 inches aperture, the prism having a refracting angle of 45°, it was determined to employ it during the eclipse of 1893. The instrument was placed at the disposal of the Eclipse

Committee by the Solar Physics Committee, and was entrusted to Mr. Fowler, who took the photographs at the African station.

It also seemed desirable that a series of similar photographs should be taken at another point on the line of totality, even though an equally efficient instrument were not available. A spectroscope with two 3-inch prisms of 60°, used in conjunction with a siderostat, accordingly formed part of the equipment of the expedition to Brazil, and was placed in charge of Mr. Shackleton.

The present preliminary report is intended to indicate the kind of results obtained, and some of the photographs are reproduced for the information of those specially interested, as it will be some time before the complete reductions are ready for publication.

The most conspicuous lines, or rather portions of circles, seen in the photographs taken during totality, are the H and K lines of calcium, and in these rays the images of the various prominences are very clearly outlined.

The lines of hydrogen, extending far into the ultra violet, are also very prominent, and numerous other lines are seen in addition.

Isochromatic plates were used for some of the exposures, and on some of these the ring formed by the characteristic line of the coronal spectrum (1474 K) is clearly depicted, especially in the Brazilian photographs. A comparison with the photographic records of the corona shows that the prismatic camera has picked out the brightest parts of the corona in this way. All the photographs show a bright continuous spectrum from the inner corona.

"On the Leicester Earthquake of August 4, 1893." By C. Davison, M.A., King Edward's High School, Birmingham.

On August 4, 1893, at 6.41 P.M., an earthquake of intensity nearly equal to 6 (according to the Rossi-Forel scale) was felt over the whole of Leicestershire and Rutland and in parts of all the adjoining counties. The disturbed area was 58 miles long, 46 miles broad, and contained an area of about 2066 square miles. The direction of the longer axis (about W. 40° N. and E. 40° S.) and the relative position of the isoseismal lines show that the originating fault, if the earthquake were due to fault-slipping, must run in about the direction indicated, passing between Woodhouse Eaves and Markfield, and hading towards the north-east. The anticlinal fault of Charnwood Forest, so far as known, satisfies these conditions, and it is highly probable that the earthquake was caused by a slip of this fault; greatest in the neighbourhood of Woodhouse Eaves, and gradually diminishing in amount in either direction, rather rapidly towards the north-west and much more slowly towards the south-east. The total length of the fault-slip may have been as much as twelve miles or even more, and there can be little doubt that it was continued for some distance under the Triassic rocks on which Leicester is built.

Royal Society, May 10.—"The Stresses and Strains in Isotropic Elastic Solid Ellipsoids in Equilibrium under Bodily Forces derivable from a Potential of the Second Degree." By C. Chree, Superintendent of Kew Observatory.

The problem solved in the present memoir, viz. that of an isotropic elastic solid ellipsoid under the action of bodily forces derived from a potential

$$\tfrac{1}{2}(Px^2+Qy^2+Rz^2),$$

is the most general case of equilibrium under forces derived from a potential of the second degree. The above potential covers forces arising from mutual gravitation or from rotation about a principal axis in an ellipsoid of any shape.

The solution obtained satisfies without limitation or assumption of any kind all the elastic solid equations. It enables the variation in the effects of gravitation and rotation with the change of shape of the ellipsoid to be completely traced.

The results obtained for the very oblate and very oblong forms seem to show that in many cases of bodily forces the assumptions usually made in the treatment of thin plates and long rods would not be justified.

By comparison with the author's previous researches, a close similarity is shown to exist between the phenomena in rotating flat ellipsoids and thin elliptic discs on the one hand, and rotating elongated ellipsoids and long elliptic cylinders on the other.

Royal Society, May 24.—"On certain Functions connected with Tesseral Harmonics, with Applications." By A. H. Leahy, late Fellow of Pembroke College, Cambridge, Professor of Mathematics at Firth College, Sheffield.

Royal Society.—*Correction.*—In the abstract of the paper "On the Specific Heats of Gases" (Part III.), by J. Joly, F.R.S., read (in place of the formula given):—

$$Cv = a + 2b(100-t) + 3c(100-t)^2.$$

Royal Microscopical Society, May 16.—Mr. A. D. Michael, President, in the chair.—Mr. C. Lees Curties exhibited and described a microscope which had been specially made for photographic purposes. The leading feature of the instrument is that the nose-piece is removable, so that an ordinary photographic lens can be substituted for the objective if required. He also exhibited a new form of apparatus for obtaining instantaneous photographs of objects under the microscope; as examples of what could be done with this apparatus, he showed photo-micrographs of blood-corpuscles taken with powers × 306 and 600 diameters, and also some low-power photos of living specimens of *Lophopus* with tentacles extended. Dr. W. H. Dallinger thought the photomicrographs were extremely good. He noted in the immediate vicinity of the *Lophopus*, there were some vorticellæ, and this suggested that it might be possible to take them in the act of closing, so as to get an idea how the movement was performed.—Mr. Shrubsole said he had brought to the meeting a few living specimens of *Gromia*, which were shown under the microscopes on the table. One peculiarity of these specimens was that instead of possessing but one aperture, there was a zone of small apertures round a central one. This he thought was a good reason why this object should be removed from the Monostomia. After describing a naked rhizopod closely allied to *Lieberkuhnia*, and an organism resembling *Shepheardella*, Mr. Shrubsole said he had on the previous day obtained from the water off Sheerness some masses of a dirty-looking substance containing all sorts of forms of gelatinous objects, in which were imbedded a number of granules; they were the cause of what the fishermen called "foul water," or "May water." They were only seen for certain seasons and for a short time, and it would be an interesting inquiry to find out what became of them.—Prof. Jeffrey Bell said that he had just been present at the annual inspection of the Marine Biological Laboratory at Plymouth, and he found that one of the greatest troubles there had been the condition of the water. Only two fish had died during the last twelve months, but the Director was desirous of obtaining information as to the diatomaceous and desmidaceous condition of the water in the tanks. Inquiries naturally suggesting themselves would be what the organisms really were which caused this "foul water"; was the "foul water" due to their presence, and were they a great number of larva undergoing transformation?—Prof. Bell called attention to the three frames of photo-micrographs which formed the Society's exhibit at the Chicago Exhibition, and which had just been returned. The Fellows would have now the opportunity of seeing them and determining whether they were worthy of the medal which they were told had been awarded the Society.

Quekett Microscopical Club, May 18.—Mr. A. D. Michael, Vice-President, in the chair.—Mr. C. L. Curties exhibited a new instantaneous photo-micrographic apparatus, and explained the method of using it. Some excellent pictures of pond-life, and fresh human blood corpuscles, &c., taken by this apparatus, were handed round for inspection, and one group of *Lophopus*, fully extended, surrounded by vorticellæ, was particularly admirable and life-like. The Chairman thought this apparatus would be especially valuable for obtaining representations of quickly-moving organisms, which were almost impossible to draw in a natural way because of their rapid volutions, and they might get composite pictures which would throw some light on this difficult subject of locomotion in minute animals, such as had been done by Muybridge and others with the horse, for instance.—Mr. G. Western read some interesting notes of foreign rotifers which had since been found in Britain, amongst them being *Notholca heptodon*, *Bipalpus vesiculosus*, *Chromogaster testudo*, *Æcistes mucicola*, and *Æ. Socialis*, *Brachionus dorcas*, and others, which were accompanied by beautifully executed drawings by Mr. Dixon-Nuttall. Mr. Western pointed out the uncertainty and variability of many of the characters relied upon for specific, and in some cases for generic, value, such as the presence or absence of setæ, antennal appendages, or even of the eyes. Mr. Michael said with regard to the eye he had frequently found the same peculiarity among the Hydrachnea or water-mites; in

the same gathering would perhaps be met with specimens otherwise identical, some with and some without eyes, or the eye present on one side only. The pigment greatly varied in amount, or was entirely wanting, but without sections it was difficult to say whether that was the case with the true nervous part of the visual organ, which, from its transparency, was easily overlooked in merely surface views.

PARIS.

Academy of Sciences, May 21.—M. Lœwy in the chair.—Researches on trimethylene and propylene, and on a new class of hydrocarbons; dynamical isomerism, by M. Berthelot. Trimethylene and propylene have, respectively, − 17·1 Cal. and − 9·4 Cal. for heats of formation from their elements. The corresponding dibromides, sulphates, and alcohols have nearly the same heats of formation; just as trimethylene and propylene differ by − 7·7 Cal. in heat of formation, so the formation of bromides, sulphates, and alcohols from these substances liberates more heat in the case of trimethylene, the excess being +9·4, + 8·8, and +10·2 Cal. in the respective cases. The dibromides liberate heat on the further addition of bromine as follows:—

	$+Br_2$	$+Br_2$	$+2Br_2$	$+3Br_2$
Propylene dibromide	+0·522,	+0·872,	+1·397,	+1·661 cal.
Trimethylene dibromide	+0·592,	+1·010,	+1·567,	+2·052 ,,

The heat of formation of terebenthene is +4·2 Cal., of citrene is + 21·7 cal., and of liquid camphene is about 24 Cal. The corresponding hydrochlorides have nearly the same heats of formation. From these data it is argued that trimethylene and terebenthene belong to a new class of hydrocarbons, and are dynamical isomerides of propylene and camphene respectively.—A note by M. Lœwy accompanying the presentation of a volume of the "Annales de l'Observatoire de Bordeaux."—On the formation of urea in the liver after death, by M. Charles Richet. The formation of urea is analogous to the production of sugar. Urea continues to be formed in the liver after removal from the body and cleansing from blood, &c., by washing, probably by hydrolysis due to the action of a soluble diastase.—The insects of the carboniferous period, by M. Charles Brongniart.—On the superficial tension of saline solutions, by M. H. Sentis. If F be the superficial tension of the saline solution, f that of water at the same temperature, n the volume of 100 molecules of water, and v that of a mixture of n molecules of the salt with 100 − n molecules of water, we have

$$\Phi = F - \frac{100 - n}{100} \cdot \frac{f}{\sqrt[3]{\frac{v}{n}}},$$

where Φ is the action per unit of length between the molecules of the salt and the molecules of water. With regard to Φ—(1) This action is independent of the temperature between 0° and 25°; (2) it is proportional to n up to the most concentrated solutions; (3) it is independent of the nature of the salt and approximately equal to 0·78 dyne per centimetre for each radical equivalent (*e.g.* $\frac{\Phi}{n}$ for NaBr, KCy, $MgSO_4$, $CaCl_2$, and K_2CrO_4 is respectively 1·6; 1·5; 1·6; 2·3; and 2·4).—Properties of magnetic substances at various temperatures, by M. P. Curie. Oxygen, manganese chloride, ferrous sulphate, and palladium follow the law expressed by $k = \frac{A}{T}$ where k is the specific coefficient of magnetisation, A is a constant, and T is the absolute temperature. The temperature of magnetic transformation of nickel is near 340° Its coefficient k between 373° and 806° is independent of the intensity of the field, and decreases regularly and very rapidly as the temperature rises. The temperature of magnetic transformation of magnetite is about 535°. From 550° to 850° it behaves like nickel, from 850° to 1370° it obeys the same law as oxygen. Iron exhibits very complex phenomena. Between 860° and 1280° there appears to be another modification of iron formed; before 860° and beyond 1280°, iron behaves like nickel.—On a system of new scales, by M. Alexandre de Bertha.—Apparent death produced by alternating currents. Restoration to life by means of artificial respiration, by M. A. d'Arsonval. In the cases where death has apparently been caused by direct action of the current on the nerve centres, without lesion or destruction of the tissues, it is found possible to revive the patient by the treatment adopted with apparently drowned persons.—On a method permitting the measurement of the mental intensity of vision and the longitudinal aberration of the eye, by M. Charles Henry.—Absorption spectra of hydrobromic solutions of cupric bromide, by M. Paul Sabatier. The absorption between $\lambda = 660\,\mu\mu$ and $\lambda = 440\,\mu\mu$ is far more intense than in the cases of the alcoholic solution of the anhydrous salt or the aqueous solutions of the green and blue hydrates.—On the molecular transformations of some chromic compounds, by M. A. Recoura.—On some combinations of ammonia with various silver salts, by MM. Joannis and Croizier. The compounds $AgBr.3NH_3$, $AgBr.1\frac{1}{2}NH_3$, $AgBr.NH_3$, $AgI.NH_3$, $AgI.\frac{1}{2}NH_3$, $AgCy.NH_3$, $AgNO_3.3NH_3$, $AgNO_3.2NH_3$, $AgNO_3.NH_3$ have been studied, and their temperatures of dissociation, as also their characteristic formulæ for the pressures of dissociation at any temperature, are given.—On the detection of hydrochloric acid, by MM. A. Villiers and M. Fayolle.—On geraniol from the essence of *Andropogon Schœnanthus*.—Does digestion of proteid matters without digestive ferments exist? by M. A. Béchamp.—Essay on a theory of the temporal (bone), by M. S. Jourdain.—On the increase of temperature of earth-layers with the depth in the low Algerian Sahara, by M. Georges Rolland. In many parts of the low Algerian Sahara, between 30° and 35° Lat., the temperature increases with the depth at least 1° for 20 metres, and often much more rapidly.—Agronomic map of the canton of Ferté-sous-Jouarre, by M. Gatellier.

BOOKS and PAMPHLETS RECEIVED.

BOOKS.—Studies in Forestry: Dr. J. Nisbet (Oxford, Clarendon Press).—Systematic Survey of the Organic Colouring Matters: Drs. G. Schultz and P. Julius, translated and edited by A. G. Green (Macmillan).—Discourses, Biological and Geological: T. H. Huxley (Macmillan). Geology: C. Bird (Longmans).—Primitive Civilizations, 2 Vols.: E. J. Simcox (Sonnenschein).—Lehrbuch der Zoologie: Dr J. E. V. Boas (Jena, Fischer).—Blackie's Chemistry Demonstration Sheets; eight Sheets (Blackie)—Micro-Organisms in Water: Prof. P. Frankland and Mrs. P. Frankland (Longmans).—Climbing and Exploration in the Karakoram Himalayas: W. M Conway (Unwin).—Étude Industrielle des Gites Métallifères: G. Moureau (Paris, Baudry).

PAMPHLETS.—The Marine Biological Laboratory 6th Annual Report, 1893 (Boston).—A Description of Two Large Spinel Rubies: Dr. V. Ball (Dublin).

CONTENTS.