University for the county of London, although the County Council itself has not assumed any such ambitious denomination for its work. On the contrary, continued the Duke, the Technical Education Board is fully aware of the need of our great metropolis for a teaching University, and it has promised to that new University a contribution of £10,000 a year, contingent upon the organisation of that body being such as will secure the advantages of a new University to all classes of the inhabitants of London, including the artisan and the labouring classes. The Council has thus shown the most practical proof that in its opinion the great work which it has already undertaken still requires to be supplemented by something more thoroughly and more completely deserving the name of University education for the county of London.

WE learn from the *Times* that Mr. T. H. Ismay has written to the President of the Liverpool Engineering Society, offering on behalf of the White Star Line Company the sum of £2000, to be used in founding and maintaining in connection with University College a scholarship intended to perpetuate the memory of the late Sir Edward Harland and his association with the shipping life and engineering profession of Liverpool. It is proposed that the scholarship shall be awarded for nautical engineering and marine architecture, and called the "Sir Edward Harland Memorial Scholarship."

THE following new announcements of gifts to educational institutions in America are noted in *Science*. Mr. J. H. Armstrong, of Plattsburg, deeded a considerable property to Union College, but retained a life interest in it. On January 2 of this year he died, and by his will added to the gift, which now amounts to 100,000 dols. The Legislature of Massachusetts has passed the Bill granting 25,000 dols. to the Massachusetts Institute of Technology. Mrs. Josiah N. Fiske has given Barnard College 5000 dols. for the foundation of a scholarship which will be open to competition.

SCIENTIFIC SERIALS.

THE *Quarterly Journal of Microscopical Science* for January 1896, contains but one article—on the development of *Asterina gibbosa*, by E. W. MacBride, Fellow of St. John's College, with plates 18–29. The investigations forming the subject of this memoir were commenced some years ago; the author at first intended to work out the development of the so-called heart, with its accompanying sinuses, in the Asterids, as he had previously done in the case of the Ophiurids. Coming to the conclusion, however, that our knowledge of the development of most of the organs in the Asterid body was very defective, he determined to thoroughly revise their whole history, embryonic and larval. This work has occupied his attention for the last two years, and as a result we have this carefully written memoir, which the author hopes may be found to place our knowledge of Asterid development on the same level as that to which our acquaintance with Crinoid ontogeny has been raised by the researches, among others, of Bury and Seeliger. The material was chiefly collected at the Naples Station. The memoir is prefixed by a statement of the methods of research adopted, and concludes with a chapter entitled "General Considerations," in which two questions are asked: (1) What light does this history throw on the affinities of the Asterids with the other Echinoderms? and (2) Does it suggest any direction in which we may look to find the origin of the group Echinodermata? The answer given to the former is that the Asterids have an affinity with the Crinoids, and that they had a fixed ancestor; and to the latter, that assuming a free-swimming ancestor of Echinoderms (provisionally called Dipleurula), it and the Tornaria ancestor of Balanoglossus must have been closely allied. This further involves the assumption that the Asterids were thus allied to the Protochordata.

THE number of the *Nuovo Giornale Botanico Italiano* for January contains, among others, the following papers:—Botanical results of a journey to the Lower Obi, by S. Sommier.—A paper by A. Pizzigoni on the dry and moist cancer of the potato, which he regards as two distinct diseases; the former due to the attacks of *Fusisporium solani* alone, the latter to this fungus, together with bacteria.—Sig. G. Del Guercio describes the changes produced in the cortex of the oak by the attacks of the larva of *Gracilaria simploniella*.—Prof. A. Borzì has a paper on the hydrophorous apparatus of xerophilous plants belonging to the Mediterranean flora; those specially described are the nodal sheath and cushion of many Caryophyllaceæ, the leaf-sheath of Gramineæ and Umbelliferæ, and the ochrea of Polygonaceæ.—Sig. A. Lenticchia contributes a useful list of the flowering plants of Italian Switzerland.

IN the *Bullettino* of the Italian Botanical Society for December 1895 and January 1896, are papers on the dimorphism in the flowers of *Convolvulus arvensis*, caused by the attacks of *Thecaphora hyalina*.—On the meteorology of the year 1895, and its effects on the plants in the Botanic Garden at Florence. The lowest temperature recorded during the severe winter 1894-95 was -7° C.—On the biology of the flowers of *Oxalis cernua*, with especial reference to the occurrence of fertile flowers intermediate between the normal and the true cleistogamous flowers.

SOCIETIES AND ACADEMIES

LONDON.

Royal Society, December 5, 1895.—"The Measurement of High Potential Difference." By H. C. Leake, R. Leventhorpe, and C. S. Whitehead.

This paper describes firstly the method adopted by Prof. Ayrton and Mr. Mather for the accurate calibration of electrostatic voltmeters in electro-magnetic units. For this purpose a high alternating potential difference is employed, which can be measured by the apparatus in several ways, each of which is a check on the others. By means of a divided resistance and a new type of low-reading idiostatic electrometer, the high alternating potential difference can be measured without involving determinations of either current or resistance. It is probable that the measurements of 2000 volts are correct to about $\frac{1}{10}$ per cent. in terms of the Clark cell.

With the aid of this apparatus, and the most probable value of "v," the authors determined the accuracy with which measurements of steady potential differences of about 2000 volts could be made in terms of the absolute electrostatic unit by means of the Kelvin absolute electrometer, when used in the ordinary way, and they found that measurements made with this instrument were always too large by, on the average, $1\frac{1}{2}$ per cent.

They traced this error to imperfection in the action of the coach-springs, the greater part of which could be eliminated by keeping the springs constantly loaded.

The remaining error, which was due to change of temperature of the coach-springs, was reduced by very carefully shielding the instrument from heat when in use, and was finally eliminated by the use of a simple correction formula. This method of correction had the great advantage of not depending on thermometer readings, as the coach-springs themselves were virtually used as a metallic thermometer to indicate their own temperature.

With these precautions it was found possible on some occasions to make measurements with the absolute electrometer accurate in absolute electrostatic units to about $\frac{1}{10}$ per cent., in so far as the authors were able to judge; but it was found that on many days there was an error of about $\frac{1}{2}$ per cent. in the constant of the instrument, due to some inherent defect, intermittent in its action, which could not be satisfactorily explained.

A theoretical investigation is given to determine the most suitable values of the mass to be used for the initial adjustment of the coach-springs, and of the potential difference to which the electrometer should be charged, for the heterostatic measurement of a given potential difference, with the result that the former should be proportional to the $\frac{2}{3}$ power, and the latter to the first power of the potential difference to be measured. It is also shown that, in addition to the well-known advantages of the heterostatic over the idiostatic method, there is the additional advantage that the error in the ordinary assumption as to the value of the effective area of the attracted disk is of far less importance in the former than in the latter method.

Finally an investigation is given in which Schwarz's method is applied to determine the error in the ordinary assumption as to the value of the effective area, for the case when the disk and guard-ring are not quite in the same plane.

Geological Society, January 8.—Dr. Henry Woodward, F.R.S., President, in the chair.—A delimitation of the Cenomanian, being a comparison of the corresponding beds in Southern England and Western France, by A. J. Jukes-Browne and William Hill. The object of the authors has been to compare the beds which form the lower part of the Upper Cre-

taceous series in those parts of Southern England and Western France which are nearest to one another. They claim to have defined the limits of the Cenomanian stage in Western France, and to have shown that this group of beds is simply a southern extension of our Lower Chalk, formed in a shallower part of the Cretaceous Sea and nearer to a coast-line.—The Llandovery and associated rocks of Conway, by G. L. Elles and E. M. R. Wood, Newnham College. In the paper a full description of the representatives of the Birkhill, Gala (Tarannon), and Wenlock beds was given, and the distribution of the fossils (chiefly graptolites) in the various subdivisions was recorded. Many of the graptolites are forms which had been described from Swedish deposits, but had hitherto been unrecorded in this country.—The gypsum deposits of Nottinghamshire and Derbyshire, by A. T. Metcalfe. The gypsum deposits of these counties occur in the Upper Marls of the Keuper division of the Triassic system. The author described their occurrence in thick nodular irregular beds, large spheroidal masses, and lenticular intercalations, and their association with satin-spar, alabaster, selenite, and anhydrite.

EDINBURGH.

Royal Society, January 6.—The Hon. Lord M'Laren in the chair.—Dr. Buchan submitted a paper on the high temperatures of September, and the Ben Nevis observatories. He described briefly the weather of September generally, which was markedly anticyclonic, and selected for consideration the 28th, 29th, and 30th of the month, as being characteristic in an intensified degree. On these days, the state of the atmosphere at Fort William, and low levels in Scotland generally, was one of great humidity. On the top of the mountain, on the other hand, there was great dryness. It was the opinion of Prof. Tait, and other physicists whom he had asked, that when the vapour in the atmosphere existed as pure vapour, it was practically diatherminous to the sun's rays. Between the (reduced) barometer at the top of the mountain, and the barometer at Fort William with a temperature difference of four degrees, there was only a difference of half a tenth, while the calculated difference for such a difference in temperature should have been a hundredth. He considered this inquiry to be of value in the prediction of storms.—Dr. Knott read a paper on the strain produced in iron and nickel tubes in the magnetic field. He described the apparatus used, and the numerous difficulties to be overcome, and exhibited graphs of the volume-changes of the tubes. He had found the behaviour of steel tubes so extraordinary that he reserved it for further treatment.—Prof. Tait described some further work he had done in the study of the path of a rotating spherical projectile. From the equations involved he had deduced the paths which such a moving body should follow, and, though some of these looked extraordinary, being concave *upwards*, and even looped, he was not without hopes of reaching them in practice. He had already succeeded in the case of some of them, with a teetotum.

DUBLIN.

Royal Dublin Society, December 18, 1895.—Prof. A. C. Haddon in the chair.—Mr. A. Francis Dixon read a paper on the development of the branches of the fifth cranial nerve in man. The paper was illustrated by models of the fifth cranial nerve in five different stages of the human embryo.—Prof. Grenville A. J. Cole read a paper on the rhyolites of County Antrim, with a note on bauxite. These rocks, often spoken of as "trachytes," occur as isolated exposures among basalts. At Templepatrick, rhyolite is seen to be intrusive in the Lower Basalts; but elsewhere the junctions are quite obscure. The author believes that there is not justification for the construction of sections showing the supposed relations of the rocks; but he urges that the mass at Tardree Mountain is very complex, and he calls special attention to the extensive flows of fluidal, perlitic, and spherulitic lavas at Sandy Braes. The various rocks are described in detail, and a survey of this area suggests that the pale bauxites of Co. Antrim have been derived from the decomposition of the rhyolites. Soluble salts of aluminium may have been formed throughout the lavas by the action of solfataras, &c.; waters containing alkali-carbonates may have acted on these, causing the precipitation of the basic aluminium carbonate studied by MM. Urbain and Renoul; and the extreme instability of this compound may have given rise to aluminium hydrate, which would be washed down into lakes during the interval between the outpouring of the Lower and Upper Basalts, together with the iron oxide also found in bauxite. At Ballycloughan, north of Ballymena, a distinctly biotitic rhyolite occurs as an intrusive neck; and at Cloughwater there is a patch of most delicately fluidal character; both these have vertical flow-planes. The rhyolites of Co. Antrim are often poor in ferro-magnesian minerals, but soda-pyroxene is common at Carnearny and on Sandy Braes.—Prof. James Lyon described a system of hot-water supply for domestic purposes. In the case of hot-water supply by means of domestic boiler and circulating cylinder, in order to obviate the necessity for drawing off a quantity of cold water from the rising pipe before the hot water can be obtained, the rising pipe is often returned near the bottom of cylinder to produce circulation. When this is done a flap valve of special construction should be placed at the latter point, to prevent cold water supply from flowing from bottom of cylinder, and thus mingling with the hot water which is being drawn.

PARIS.

Academy of Sciences, January 27.—M. Cornu in the chair.—On the equilibrium of an elastic body, by M. H. Poincaré.—Of the utility of photography by the X-rays in human pathology, by MM. Lannelongue, Barthélemy, and Oudin. In diseases in which there is an actual loss of substance of the bone, or an abnormal growth of bony tissue, the photographs taken by the Röntgen method confirm the previous diagnosis.—On a non-linear differential equation of the second order with doubly periodic coefficients, by M. Hugo-Gyldén. A particular solution of an equation of importance in astronomy. Application is made of the solution to the planet Hilda (153) with a satisfactory result.—Biological studies on some Hirudinia, by M. A. Kowalevsky.—On the linear equations and the method of Laplace, by M. E. Goursat.—On the addition of the arguments in the periodic functions of the second order, by M. G. Fontené.—On the complete solutions of the equation

$$x_1 \tan^{-1}\frac{1}{\kappa} + x_2 \tan^{-1}\frac{1}{\kappa_2} + \ldots + x_n \tan^{-1}\frac{1}{\kappa_n} = k \cdot \frac{\pi}{4},$$

by M. Carl Stormer.—On certain invariants relating to a group of Hesse, by M. Boulanger.—On groups of operations, by M. Levasseur.—Theory of pitching on a rolling sea, by M. A. Kriloff.—Some properties of the Röntgen rays, by M. Jean Perrin. The conclusion is drawn that these rays are not identical with the kathodic rays, since the latter cannot pass out through vacuum tube walls of 1 mm. in thickness. The propagation of the Röntgen rays is shown experimentally to be linear; they are not reflected either by a mirror of polished steel or of glass, neither are they refracted by prisms of paraffin or wax. Unsuccessful attempts to form diffraction fringes showed that if the phenomenon is periodic, the period is much below that of green light.—Observations on the preceding communication by M. Poincaré, pointing out that Prof. Röntgen has already shown that the X-rays are not refracted.—Dark light, by M. Gustave Le Bon. An ordinary photographic dry plate, placed under a negative in a printing-frame, and the negative closely covered with a thin plate of iron, was exposed to the light of a paraffin lamp for three hours. Vigorous and prolonged development brought out a faint but well-defined image. If a plate of lead was wrapped round the back of the frame, and bent over the edges of the iron plate so as to enclose the printing-frame in a metallic box, after three hours' exposure to the same source of light an image was obtained "which was nearly as vigorous as if no obstacle had been interposed between the light and the plate." M. Le Bon proposes to continue the study of the properties of light after its passage through opaque bodies.—Action of heat on mercurous iodide, by M. Maurice François. To avoid the complications introduced by the presence of air, the mercurous iodide was heated *in vacuo*. The reaction is a limited one, equilibrium resulting when a fixed amount (depending on the temperature) of mercurous iodide has been broken up into mercury and mercuric iodide. Hence the reaction is reversible, and the same state of equilibrium results if mercury and mercuric iodide are taken and heated together.—The absorption of light by solutions of indophenols, by MM. Bayrac and Ch. Camichel. A quantitative study of the absorption spectra of homologous indophenols in various solvents. Relations are indicated between the positions of the absorption bands, concentrations, and molecular weights. One compound, obtained by the general method of preparation of indophenols from mono-methyl-resorcinol and *p*-nitroso-dimethyl-aniline hydrochloride, gives quite anomalous results, and hence the conclusion is drawn that this body is not an indophenol.—Combinations of aluminium chloride with phenols and

their derivatives, by M. G. Perrier.—On Russian essence of aniseed, by MM. G. Bouchardat and Tardy.—On the production of pure gaseous formic aldehyde, by M. A. Brochet. For the purposes of disinfection by gaseous formic aldehyde, free from water vapour, a current of a warm indifferent gas (nitrogen or carbon dioxide) is passed through a tube containing fragments of trioxymethylene. The quantity can be regulated by altering the temperature.—On antivenomous serum, by MM. Calmette, Hankin, and Lépinay. An account of some experiments with a serum, the injection of which protects the animal from snake venom.—On some points in the anatomy of *Tetraclita porosa*, by M. A. Gruvel.—New form of negative reaction on the retina, by M. Aug. Charpentier.—Proofs of the submarine extension to the south of Marseilles of the Maures and Esterel group, by MM. Vasseur and Fournier.

BERLIN.

Physical Society, December 13, 1895.—Prof. Warburg, President, in the chair.—The President referred to the deaths of Prof. Knoblauch, of Halle, and Prof. Spörer, of Potsdam.—Prof. Des Coudres spoke on kathodic radiation, and demonstrated its sensitiveness to magnetic lines of force.—Prof. Neesen described two interesting strokes of lightning, of which one pierced the roof of a church-tower unprovided with a conductor, and stopped short at the organ. Its effects were characterised by the rents it made in the inside of the church above the organ, similar to those observed in a tree when struck. The second struck a petroleum store, whose four tanks were each protected by five-pointed conductors adequately put to earth. Two of the tanks were completely shattered by a violent explosion, the other two burnt out by fire. The speaker was of opinion that the petroleum vapours above the tanks had been ignited by small sparks during the discharge, and he had verified this view by experiment; he therefore proposed that for the purpose of adequate protection all openings, more particularly manholes, should be guarded by wire netting, on the principle of the Davy lamp.—A small instrument was exhibited by Mr. von Hefner-Alteneck for demonstrating minute variations of atmospheric pressure. It consists of a flask, whose neck communicates with a horizontal glass tube, whose central portion is bent slightly downwards; in this tube there is an extremely mobile index of coloured petroleum, which follows the least change of external pressure. The apparatus is one hundred and fifty times more sensitive than a mercurial barometer.—Prof. Neesen criticised a recently published method of measuring the velocity of projectiles. It consists in making the projectile close and open a current which passes spirally round a tube containing carbon bisulphide; the plane of polarisation of this fluid is rotated during the time of flight, and hence a beam of light previously extinguished by crossed Nicols can now pass through, and make a record on photographic paper.

Physiological Society, December 6, 1895.—Prof. H. Munk, President, in the chair.—Prof. I. Munk reported on further experiments as to the minimal proteid requirements of a dog during nitrogenous equilibrium.

December 20.—Prof. H. Munk, President, in the chair.—Dr. Cohnstein reviewed the laws of osmotic pressure from the existing point of view of physical chemistry.—Dr. Rosenberg spoke on reported cases of presumed regeneration of the bile duct some twenty days after its extirpation. He reported a case of a lateral branch from the duct recently observed in a dog and leading into the intestine, and urged that the possible existence of such a branch should have been in every case disproved before concluding that a regeneration of the duct had taken place.—The President exhibited a section of an elephant's tooth, which showed a circular green streak round the outer border of the pulp cavity.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Eclipses du Soleil et Occultations: L. Cruls (Rio de Janeiro).—Le Climat de Rio de Janeiro: Ditto (Ditto).—Posições Geographicas: Ditto (Ditto).—Iowa Geological Survey, Vol. 4 (Des Moines).—Ex-Meridian Altitude Tables: Brent, Walter, and Williams (Philip).—A Naturalist in Mid-Africa: J. F. Scott Elliot (Innes).—Domesticated Animals: N. S. Shaler (Smith, Elder).—Practical Studies in Fermentation: Dr. E. C. Hansen, translated by Dr. A. K. Miller (Spon).—Petroleum: B. Redwood, 2 vols. (Griffin).—Computation Rules and Logarithms: Prof. S. W. Holman (Macmillan).—Catalogue of the Mesozoic Plants in the Department of Geology, British Museum (Natural History): The Wealden Flora: A. C. Seward, Part 2 (London).—Catalogue of the Fossil Fishes in the British Museum (Natural History): A. S. Woodward, Part 3 (London).—Roads and Pavements in France: A. P. Rockwell (Chapman).—Cyanide Processes: E. B. Wilson (Chapman).—Heating and Ventilating Buildings: Prof. R. C. Carpenter (Chapman).—Manual of Lithology: Prof. E. H. Williams, jun. (Chapman).—Vegetable Culture: A. Dean (Macmillan).—Lessons in Elementary Botany: T. H. MacBride (Boston, Mass., Allyn).—University Correspondence College Calendar, 1895-96 (Red Lion Square).—Catalogue of Scientific Papers (1874-1883), compiled by the Royal Society of London, Vol. xi. (C. J. Clay).

PAMPHLETS.—The Authentic Letters of Columbus: W. E. Curtis (Chicago).—Contribution to the Flora of Yucatan: C. F. Millspaugh (Chicago).—Variation of Latitude at New York City. Part 1: Declinations and Proper Motions of Fifty-six Stars: Dr. H. S. Davis (New York).—Shanghai Meteorological Society. Third Annual Report: Essay on the Winter Storms of the Coast of China: Rev. S. Chevalier (Shanghai).—Laboratory Tables for Qualitative Analysis (Manchester, Cornish).—Handbook and Catalogue of the Meteorite Collection: Dr. O. C. Farrington (Chicago).—The Honey-Bee: F. Benton (Washington).—Proceedings of the Seventh Annual Meeting of the Association of Economic Entomologists (Washington).

SERIALS.—Proceedings of the Academy of Natural Sciences of Philadelphia, 1895, Part 2 (Philadelphia).—Proceedings of the Rochester Academy of Science, Vol. 2, Parts 2 and 4 (Rochester, N.Y.).—Proceedings and Transactions of the Nova Scotian Institute of Science, Session 1893-94 (Halifax, Nova Scotia).—Zeitschrift für Physikalische Chemie. xix. Band, 1 Heft (Leipzig, Engelmann).—History of Mankind: F. Ratzel, translated (Macmillan).—Cassell's History of England, Part 1 (Cassell).—Humanitarian, February (Hutchinson).—Royal Gardens, Kew. Bulletin of Miscellaneous Information, 1895 (Eyre).—Proceedings of the Physical Society of London, Vol. 13, Part 13; Vol. 14, Part 1 (Taylor).—Contemporary Review, February (Isbister).—Terrestrial Magnetism, No. 1 (Chicago).—National Review, February (Arnold).—Fortnightly Review, February (Chapman).—American Journal of Mathematics, January (Baltimore).—Centralblatt für Anthropologie, &c., 1 Jahrg., Heft 1 (Williams).—Journal of the Chemical Society. December (Gurney).—Century Magazine, February (Macmillan).—Geographical Journal, February (Stanford).—Science Progress. February (Scientific Press).

CONTENTS.