

that this alteration would make a much greater difference in the number of pupil-teachers working for sessional certificates than has been the case. They have been much gratified by the enthusiasm shown by the heads of pupil-teachers' centres with regard to University Extension teaching, in their efforts to keep in connection with the Society under the altered conditions. Pioneer courses of lectures, the expenses of which have been borne by the Technical Education Board of the London County Council, have been given at Bethnal Green, Poplar, Queen's Park, St. Pancras, Shoreditch (two courses), Walworth (two courses), and Wandsworth. These courses were attended by about 3500 people, almost exclusively of the artisan class. The average attendance at each lecture was 387. In two of the districts regular extension centres have been formed as the result of the lectures. In connection with these courses the illustrations of scientific principles are largely drawn from the industrial developments of the district with which the working men are particularly acquainted. Thus the course on "Electric Power and Lighting," given by Dr. Laurie at the Town Hall, Shoreditch, in the Lent Term, was fully illustrated by views of the Shoreditch electric installation, and created an intense interest in the subject among the working men, who attended in great numbers. A large proportion of the audience remained for class instruction after the lectures; many did regular weekly paper work, and forty obtained the certificates of the Society as the result of the terminal examination.

#### SCIENTIFIC SERIALS.

*American Journal of Science*, November. — Geology of Southern Patagonia, by J. B. Hatcher. This is an account of the results of an expedition into Argentine Patagonia made for the purpose of collecting vertebrate fossils for Princeton University. The oldest sedimentary deposits seen were a series of black, very hard, but much fractured slates, with Ammonites fairly abundant, but not sufficiently well-preserved to admit of identification. These beds are referred to the Jurassic, chiefly on account of their lithological characters and the great thickness of the overlying rocks, which, to judge from Dinosaurian remains, can hardly be more recent than the Cretaceous. The beds of basalt observed by Darwin on ascending the Santa Cruz River are not due to a flow from the distant Cordilleras, but to small local craters. — The former extension of the Appalachians across Mississippi, Louisiana, and Texas, by J. C. Branner. Gives additional facts in support of his thesis that the old Appalachian land area crossed what is now the lower Mississippi valley. The coal-measures drainage of the Illinois-Indiana-Kentucky basin flowed westward through the Arkansas valley into a carboniferous Mediterranean sea. The drainage of the coal-measures region south of the Ouachita anticline flowed westward and entered this sea north of the Texas pre-Cambrian area. The drainage of both the Arkansas and Texas carboniferous areas was reversed about the end of Jurassic times, when orographic movements over south-east Arkansas, eastern Texas, Louisiana, and Mississippi submerged the former extension of the Appalachian watershed, and admitted the early Cretaceous sea across the Palaeozoic land as far north as southern Illinois. — The combustion of organic substances in the wet way, by I. K. Phelps. Carbon dioxide may be estimated iodometrically with a fair degree of accuracy. It may, therefore, be applied to the determination of organic carbon oxidised by liquid reagents, such as potassium permanganate or chromic acid. The former was used for oxidising oxalates, formates, and tartar emetic; the latter for these and cane-sugar and paper. The method is very successful in the case of the less volatile organic compounds. — Some features of the pre-glacial drainage in Michigan. In all the glaciated area of North America no region is so extensively and deeply covered with drift as the lower peninsula of Michigan. The author works out the probable features by analogy with unglaciated areas, and constructs a map showing the probable carboniferous river system.

*Wiedemann's Annalen der Physik und Chemie*, No. 10. — Observation of Zeemann's phenomenon, by W. König. The author observes the dark sodium lines produced by an arc light traversing a sodium flame. The broadening in a magnetic field is detected by a differential method. A quarter-wave plate and a doubly-refracting prism are used to obtain two images of the slit joining across a narrow line. The extinction of the circularly-polarised right-hand edge in one image, and the left-hand

edge in the other, gives the appearance of a lateral displacement which is reversed by turning the prism. A total displacement of  $1/28$ th of the distance between the D lines is thus obtained in a field of 7300 units. — On the rate of depolarisation of electrodes and on dielectric constants at low temperatures, by R. Aebegg. This is a criticism of Dewar and Fleming's alleged enormous capacities of certain dielectrics at very low temperatures. The author maintains that these are only apparent, and are really due to the very slow depolarisation of electrodes in great cold, so that the current obtained from the condenser is a polarisation current instead of being a dielectric current. — On the depolarisation of mercury and platinum electrodes, by K. R. Klein. Large and small electrodes dipped into various acid and salt solutions, and the course of their polarisation by a known E.M.F. and their subsequent depolarisation, was investigated by means of a capillary electrometer of negligible capacity. It was found that the rate of depolarisation was nearly independent of the area of the electrode and of the nature of the solution, but was much accelerated by heat and by the presence of a salt composed of the electrode metal as a base, and the acid of the electrolyte. — An electro-chemical method of converting alternating into direct currents, by L. Graetz. Cells in which aluminium forms the anode do not transmit currents having a voltage below 22. Alternating currents may therefore be converted into intermittent currents by means of a battery of such aluminium cells. The author describes an arrangement for obtaining a direct pulsating current by the same means. The apparatus forms a convenient "rectifier." — Researches on lampblack, by J. Stark. The specific gravity of solid lampblack is forty-three times that of lampblack as deposited. One cc. contains 1,270,000 million particles of lamp black. The author obtained polished surfaces of lampblack, and proved that as regards elliptic polarisation they occupy a place intermediate between transparent substances and metals.

#### SOCIETIES AND ACADEMIES.

LONDON.

**Physical Society**, November 12. — Mr. G. Johnstone Stoney, Vice-President, in the chair. — Mr. J. Rose-Innes read a paper on the isothermals of ether. The well-known generalisations of Boyle and Gay-Lussac with regard to the pressure, volume, and temperature relations of gases, were examined by Ramsay and Young, who deduced the law  $p = bt - a$ , i.e. that pressure is a linear function of temperature, at constant volume, where  $b$  and  $a$  are functions of volume only. It yet remains to discover the form of these two functions  $b$  and  $a$ . The author finds  $b$  and  $a$  for a large number of volumes, and from them devises an empirical formula. As a preliminary step he examines whether any single algebraical expression can represent the case, so as to determine the probability of discontinuity. For this purpose a graphic method is applied. By plotting  $(av^2)^{-1}$ , against  $v^{-\frac{1}{2}}$ , a curve is obtained of "cusp" shape. The point of the cusp occurs very near critical volume, it suggests discontinuity in the slope of  $(av^2)^{-1}$ . The author concludes that there is extremely rapid change of behaviour of the gas at this point. Again, it is known that the temperature at which pressure is accurately given by the laws of a perfect gas at a particular volume, is constant for large volumes until critical volume is approached. The author observes that at the critical volume this temperature diminishes somewhat from its value for large volumes. These conclusions were embodied in a previous paper, and an algebraical expression for pressure in terms of temperature and volume were then given for isopentane. In the present paper the author investigates a similar formula for ether. Prof. Ramsay said that experimental errors might account for some of the lack of agreement between proposed formulæ and direct observation of the behaviour of gases. Isopentane was probably a better-investigated body than ether, for it was simpler. Ether tended to form complex molecular groupings, but isopentane was probably a mono-molecular liquid. Prof. Perry did not quite agree with the author's conclusions. It was necessary to distinguish between a formula founded on a physical hypothesis, and a mere empirical formula. The author had assumed that the Ramsay and Young formula was very exact, its originators did not put it forward as being infinitely exact. Probably the best test for such a formula as that under discussion would be derived from some thermo-dynamical conclusion deduced from it. The Rose-Innes formula, with five constants