iron rod had absorbed its maximum of hydrogen (a few minutes after being short-circuited), it became a constant cell, giving but small traces of polarisation when or after being short-circuited for hours at a time. There occurs, however, a slight diminution of electromotive force after a few days' hard work, being then ·52, due to the acidulated water becoming more neutral by the formation of sulphate of zinc and iron. If, however, we wish to restore its full electromotive force, we have only to short-circuit the cell for a few seconds, torrents of hydrogen will be given off, and its electromotive force becomes, on testing of its highest value, ·56.

If we short-circuit the hydrogenised iron cell for one minute, and at once test its electromotive force, we shall find at the first instant a certain amount of polarisation, about 10 per cent., but it rapidly recovers, being at its full initial force in ten seconds' repose; whilst carbon, platinum, and all other negatives yet tried, did not recover their polarisation in several minutes' repose.

Taking the Smee battery as the best example of depolarisation in a single liquid, and comparing the constancy of this cell with that of the hydrogenised iron, I find that according to Mr. Latimer Clark's experiments, in his work on electrical measurements, that the electromotive force of a Smee cell is 1·017, but when in action only ·446. Thus its electromotive force in action is less than that of the iron cell, and its polarisation some five times greater than that of iron.

I have submitted these results (rather hastily obtained) to our president, Mr. W. H. Preece, and he has kindly consented to have some exact measurements made of the electromotive force of hydrogenised iron, and its comparative freedom from polarisation with all other metals employed as negative elements in a single liquid cell, the results of which quite agree with those obtained by myself.

A practical application of iron as a negative may be mentioned. If we wish to purify mercury from any zinc, or any metal less negative than iron, we have only to place the mercury in dilute sulphuric acid, and then introduce an iron rod so that its lower portion shall make contact with the mercury, hydrogen is now freely and constantly given off by the iron, and this continues until all traces of zinc have disappeared; and as a proof of this, if after a certain time, when no hydrogen is given off, we simply touch the mercury with zinc for an instant, the hydrogen at once reappears, and continues until this small portion of dissolved zinc has been separated from the mercury.

In order to render evident the remarkable depolarising power of iron, we use in the same cell several negatives, such as carbon, platinum, silver, copper, and iron; and if we test these negatives separately for its initial electromotive force, we shall find them all superior to iron. But if we join all the negatives together, and short-circuit the whole with the zinc, iron alone will freely give off its hydrogen, whilst carbon will appear to be entirely inert, and if after this short-circuiting we insultate or separate the different negatives, we shall find on testing them that they are all polarised, carbon being the most so, and iron comparatively quite free, and at its initial giving the highest electromotive force.

In conclusion I may add, that if hydrogen seems to be an enemy of iron and steel, rendering it brittle, on the other hand it is perhaps its best friend in rendering it more negative, and whilst under its entire influence completely preserving it from oxidation or rust.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The debated question of a Natural Science Degree will again come before Congregation on April 27. It is proposed to create a new faculty and to allow students in the Science Faculty to pass a modified form of Responsions and Moderations, in which a modern language may be substituted for Greek, but in which the mathematics required will be more advanced than at present. The following is the proposed form of statute:—

"*Of the Faculty of Natural Science.*—1. There shall be a Faculty of Natural Science, in which two degrees shall be granted, viz., the Degree of Bachelor of Natural Science and the Degree of Master of Natural Science.

"2. Any person duly matriculated wishing to proceed to a Degree in Natural Science shall be deemed to be a Scholar in the Faculty of Natural Science as well as in the Faculty of Arts."

In the Natural Science "Responsions" candidates shall offer two books, either (1) one Greek and one Latin, or (2) one Greek and one German, or (3) one Greek and one French, or (4) one Latin and one German, or (5) one Latin and one French. A special knowledge of the grammar of the languages of the books selected will be required. The candidates will also be examined in arithmetic, in plane geometry, including doctrine of similar triangles, and in algebra, including quadratics and ratio and variation.

In the Natural Science "Moderations" candidates shall offer *three* books, one being some portion of a Greek or Latin historical or philosophical work. The mathematical part of the examination will include theory and use of logarithms, trigonometry as far as the solution of plane triangles, the rudiments of plane co-ordinate geometry, and the mechanics of solid and fluid bodies treated by elementary methods.

After passing "Moderations" the student will be at liberty to enter the Natural Science School or the Mathematical School in honours.

A GRANT of 75*l.* has been made from the Worts Travelling Scholars' fund to Mr. J. E. Marr, B.A., of St. John's College, Cambridge, to enable him to travel in Norway, Sweden, and the islands of the Baltic, and collect evidence and specimens bearing upon the classification of the Cambrian and Silurian rocks, with the understanding that specimens be sent by him to the University, accompanied by reports which may hereafter be published.

THE Queen has signed the charter of the new Royal Irish University, the successor of the Queen's University. The Senate is large and fairly representative.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, April 15.—The Rev. G. Henslow in the chair.—The Secretary read a paper for the Rev. R. Boog Watson, on the Mollusca of the *Challenger* Expedition (Part 5). Some thirty-five species are described and compared, whereof the greater part are new forms and belonging to the families Solenoconchia, Trochida, Rissoellidæ, Litorinida, and Cerithiidæ. The author observes that temperature even more than mere depth seems an important condition in molluscan life, while both prove barriers to distribution, though great length of time naturally helps escape from these barriers. Where barriers of depth and temperature do not check distribution there is no limit to universality of distribution, and such is the case with certain existing species; still there is no trace of especial, lasting, and progressive change.—A communication was read by Mr. N. E. Brown on some new Aroideæ, with observations on other known forms (Part 1). Of the former the specimens are contained in the Kew Herbarium, and the latter are annotations, chiefly supplementary to Prof. Engler's recent monograph of the order. While following Engler, the author has given preference to the classification of Schott. Among others several interesting new Bornean forms are described.—Prof. F. Jeffrey Bell next read a note on an abnormal (quadriradiate) specimen of *Amblypneustes formosus*, and afterwards Mr. Chas. Stewart exhibited and made remarks on another but differently abnormal specimen of the same species.—Prof. Bell, after a full description of his specimen, observes: that with more or less reason some naturalists have looked on the possession of other than five rays as a character of some specific value among the Asteridæ and Ophiurida, and have considered that, on account of its greater rarity among the latter, it is of greater value as a mark of distinction; but such a view must be taken with considerable limitation. The pentamerous arrangement of parts in the regular Echinida is, then, only disturbed in one example; information and specimens are, however, at hand to show how this may have happened. The rarity of any divergence from this five-part division, in face of the numerous variations which occur in the Echinodermata, will doubtless become more and more important as a factor in determining the genealogical history of the group.—A series of microscopic sections of pearls exhibiting many irregularities in structural detail were shown by Dr. J. Murie, and their several peculiarities explained.—Messrs. S. H. Wintle and George Bay (of Tasmania) were elected Fellows of the Society.

Chemical Society, April 1.—H. E. Roscoe, president, in the chair.—The following papers were read:—On betorcinol and some of its derivatives, by J. Stenhouse and C. E. Groves. The authors have extracted from *Usnea barbata* an acid provisionally named barbatic acid, which is probably dimethyl-

evernic acid; by distillation it furnishes carbonic acid and betorcinol (or Borcin). Betorcinol melts at 163° C., giving a bright crimson colour with hypochlorites: its ammoniacal solution is rapidly coloured by exposure to air. Chlorine, bromine, and nitroso compounds were prepared and examined.—Note on chemical equilibrium, by M. M. P. Muir. The object of this paper is to describe a few measurements of the variations caused in chemical changes by modifications in the conditions of these changes, and to attempt to generalise some of the conditions of chemical equilibrium, looking at the phenomena from a dynamical point of view.—Preliminary note on the action of the new diastase Eurotin on starch, by R. W. Atkinson, Professor of Chemistry at Tôkiô. The author has studied in detail the interesting manufacture of "saki," the fermented liquor from rice; he comes to the conclusion that the ferment solution "koji" converts the starch of rice not into maltose and dextrin, but into glucose and dextrin. Analyses of the "mash" are given at various stages from the first to the twenty-eighth day.—Note on the products of the combustion of coal-gas, by L. T. Wright. In opposition to the paper recently read before the Society by Mr. Ridout, the author concludes that ozone is not formed by the combustion of coal-gas, and that the substance which gives the blue colour with iodide of potassium and starch is probably nitrous acid, as when the coal-gas and air are carefully freed from ammonia no blue colour is produced.—On polysulphides of sodium, by H. C. Jones. The author establishes the existence of the pentasulphide, which is probably a tetrathiosulphate; this is probably the highest sulphide. On heating it is converted into a tetrasulphide. The precipitate produced by the addition of the pentasulphide to cadmium salts contains cadmium sulphide and sulphur.—On the reflection from copper and on the calorimetric estimation of copper by means of the reflection cuprimeter, by T. Bayley. The author has shown that the light reflected from metallic copper contains all the elements of white light, but that the region of the spectrum to the red side of the D line is more intense than in the spectrum of the reflection from a white surface of equal illumination; the light transmitted by dilute solutions of cupric salts is deficient in those rays which the spectrum of reflection has in excess. It follows that if we look at a copper surface through a sufficient thickness of cupric sulphate solution the metal appears silver white. Upon these facts the construction of the reflection cuprimeter is based.—On pyrene, by Watson Smith and G. W. Davies. Crude material from Dr. Schuchardt was purified by crystallisation from petroleum spirit. Light yellow monoclinic crystals were obtained melting at 149°, having a vapour density of 6·912, calculated 6·999.—Analyses of the ash of the wood of *Eucalyptus rostrata* and *E. globulus*, by Watson Smith.—On the action of organo-zinc compounds on quinones (second notice), by F. R. Japp. The author has succeeded in isolating the substance $C_{16}H_{14}O_8$, and has studied its more important reactions. From various considerations he concludes that Graebe's views, giving to phenanthrene quinone the formula of a peroxide, are correct.

PARIS

Academy of Sciences, April 12.—M. Edm. Becquerel in the chair.—The following papers were read:—Nebulæ discovered and observed at Marseilles observatory, by M. Stephan.—On the explanation of MM. Lontin and de Fonvielle's experiment, by M. Jamin. He traces the effect to the magnetisation of the direct current being greater than that by the inverse.—On some compounds of halogen substances, by M. Berthelot. A thermo-chemical study.—The plague in modern times: its prophylaxy defective or *nil*: its limitation spontaneous, by M. Tholozan. Like other evils whose secret is unknown, it appears at one or several points, extends, reaches its acme, then diminishes, and ceases; and this independently, to a great extent, of sanitary measures.—Disinfection of vehicles by means of anhydrous sulphurous acid, by M. Fatio. This relates to the effects of a spray of the acid in waggons containing phylloxerised roots and plants.—On cyclotomic functions, by M. Lucas.—Reply to a note of M. Boussinesq, by M. Bresse.—Studies on chronometry; compensation, by M. Rozé.—On a new dynamometric indicator, by M. Deprez. He sought a mechanism giving a diagram from motion of the pencil only, the paper being at rest; the problem was to impart to a point C a motion proportional and parallel each instant to the resultant of the motions of two other points A and B. The pantograph meets this want (where the three points are in a line). Point A is attached to the piston of the indicator, point B (which must be guided in a straight line) to the cord commanded by the piston of the engine, and the crayon is at C. The arrangement has several advantages.—On the deformation of glass tubes under strong pressures, by M. Amagat. He shows by an experiment (with mercury) that the glass or crystal tubes, nearly 1 mm. internal diameter, and 10 to 12 mm. external, which he has used in experiments on the compressibility of gases, do not sensibly increase in volume under pressures up to 400 atm.—On some new experiments of magnetic attractions, by M. Ader. Of various substances tried (wood, paper, &c.), elder-pith was most attracted by a magnet. With a Jamin magnet capable of holding 100 kg., and having two small polar armatures 0·002 m. apart, he attracted at 0·03 m. distance a suspended pith ball 0·005 m. diameter. He could raise it at a distance of 0·004 m., and, once attracted, it was held, spite of shocks given to the magnet.—On the freezing-point of alcoholic liquors, by M. Raoult. For solutions containing 0 gr. to 10 gr. alcohol in 100 gr. water, the retardation of the freezing-point resulting from addition of 1 gr. of alcohol is constant and equal to 0·377°. The lowering of the freezing-point below zero is proportional to the total weight of alcohol dissolved in a constant weight of water (whence, probably, the alcohol here exists in the anhydrous state). For solutions with 24 to 51 gr. alcohol in 100 gr. water, the retardation of the freezing-point, on adding each gramme of alcohol, is constant and equal to 0·528°. The total lowering below zero is not proportional to the total weight of alcohol (so that the dissolved body is probably a hydrate of alcohol, at least between −10° and −24°). M. Raoult gives a table of freezing-points of various fermented liquors; these are always lower than for equivalent mixtures of alcohol and water. The freezing-point descends as the freezing progresses.—On two new silico-titanites of soda, by M. Hautefeuille.—On the examination of pyrites by the gravivolumetric method, by M. Houzeau. The sulphur in pyrites can be determined much more quickly by this method.—On the formation of tetramethylammonium, by MM. Duvillier and Buisine.—On the natural and mydriatic alkaloids of Belladonna, Datura, Hyoscyamus, and Duboisia, by M. Ladenburg.—On the existence of ammonia in plants, by M. Pellet. Operating with the normal plant, he found in beet-leaves (dry) 0·155 gr. ammonia per cent.; beet-seed, 0·168 and 0·216 gr.; beet-root (dry), 0·196 and 0·147 gr.; corn, 0·16 gr.; ordinary linseed meal, 0·188 gr. The regular existence of ammonia in plants is important, suggesting that magnesia and phosphoric acid penetrate them in the form of ammoniaco-magnesian phosphate.—On some facts relative to the gastric digestion of fishes, by MM. Richet and Mourrut. Experiments with fishes of the genus *Scyllum* and with *Lophia piscatorius* seem to show that there are very great differences in the stomachic mucus as to richness in pepsine. The acidity of liquids in the stomach is extreme. (The authors give results of a number of comparative artificial digestions.)—Analyses of chlorophyll, by M. Rogalski. His results agree with those of M. Gautier and M. Hoppe-Seyler.—On the formation of the shell in Helix, by MM. Longe and Mer.

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