at Detroit, and reproduced in a recent number of *Science* under the title "The Rehabilitation of the American College and the Place of Chemistry in It," is of more than local interest and importance. The author is strongly impressed with the difficulty of teaching his subject effectively to classes of students of widely varying mental capacities, and especially of teaching it in such a way as to be of service to those who do not expect to become professional chemists. He is a profound disbeliever in the method of imparting instruction which relies mainly upon lectures, and urges that the essential feature of all teaching should be "problem-solving" in some form or other. This method, he suggests, is fully developed in the teaching of languages, in which "the grammar furnishes the laws and general principles, together with all the known exceptions," "the dictionary supplies the isolated facts," and "the text provides the subject of study in constant and definite form." In the case of chemistry, he urges a closely interwoven scheme of laboratory work and classroom discussion, supplemented (if lectures are used) by briefly written answers to set questions and home study in varying amounts to suit the necessities of the individual student.

THE annual general meeting of the Association of Headmasters was held in London on January 12 and 13. Mr. Philip Wood, headmaster of Darlington Grammar School, the president for the year, in his presidential address referred to the question of the provision of free places in secondary schools receiving grants from the Board of Education. He said there are many grammar schools in towns with a population of less than 20,000 which educate the sons of the professional people and better-class tradesmen, but depend largely for their existence on being able to attract boarders. The position of such a school at the present time is very precarious. It has had always something of a struggle, and the grants of local education authorities and of the Board of Education are just what it requires to give it new life; but the grants are conditioned, and the conditions, at least of the Board of Education, would seem to contemplate a large day school in a large town rather than the kind of school in question. In a small market town, for instance, it is ridiculous that a school of, perhaps, seventy-five boys should be increased to 100 in order to provide for the education of twenty-five boys from the two or three elementary schools in the town. Boys capable of taking advantage of these opportunities are not to be found; and what is also a matter of common experience, their admission, whether they are capable or incapable, generally means the displacement of an equal number of boys whose parents do not like the new situation. Thus the 25 per cent. rule, which does not greatly embarrass a large day school, will, if rigorously applied, almost ruin many schools which we can ill afford to lose.

THE Department of Agriculture and Technical Instruction for Ireland has issued a pamphlet giving an account, by Mr. George Fletcher, assistant secretary for technical instruction, of the summer courses of instruction for teachers instituted by the Department in 1901. The courses are held in July and August, and extend over a period of about a month. They are held in Dublin and elsewhere. In selecting teachers to attend the courses, regard is had to the qualifications of the teachers and the needs of the school or district from which they come. After each year's course, teachers who pass the examinations are provisionally recognised as qualified to teach the subjects in which they have passed. Courses are held in experimental science, drawing, manual work in wood, and domestic economy. Besides preparing teachers to conduct classes in the Department's "Programme for Day Secondary Schools," the summer courses are year by year coming to serve a further purpose. Side by side with the development of the Department's scheme in day secondary schools there has grown up a system of specialised technical education all over Ireland. The rate of growth has been rapid, and a large and increasing number of Irish teachers are engaged in the schools and classes organised through urban and county councils. While it was necessary in the initial stages of such a system to employ teachers having experience of similar work, from whatever source they might be obtained, special efforts have since been made to train Irishmen when and where possible. Hence it is that year by year an increasing number of summer courses are organised to deal with subjects purely technical in character and having for their object the further education and training of teachers already engaged in Irish technical schools. It would be difficult to over-estimate the value of these courses as an element of educational progress. The typical courses described in the pamphlet by means of syllabuses, descriptions, and illustrations indicate what great pains have been taken by the authorities to make the lectures and practical work meet the needs of the teachers exactly.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society. January 13.—Sir Archibald Geikie, K.C.B., president, in the chair.—Sir Edward **Thorpe** and A. G. **Francis**: The atomic weight of strontium.—L. F. **Richardson**: The approximate arithmetical solution by finite differences of physical problems involving differential equations, with an application to the stresses in a masonry dam. In order to deal with irregular boundaries, analysis is replaced by arithmetic, continuous functions are represented by tables of numbers, differentials by central differences. Then problems fall into two classes. (A) The relation between the equation obtaining throughout the body and the boundary condition is such that the integral can be stepped out from a boundary. This class includes equations of all orders and degrees. It has been treated by arithmetical differences by Runge, W. F. Sheppard, Karl Heun, W. Kutta, and Richard Ganz. Examples of a specially simple method are given. (B) The integral must be determined with reference to the boundary as a whole, as in Dirichlet's problem. The method given has only been worked out for a limited group of linear equations, namely, for those in connection with which a function analogous to potential energy exists, which is a complete minimum when and only when the difference equations are satisfied. Under this condition the difference between the integral ϕ_u and a function ϕ_1 of the independents, having the correct boundary conditions but otherwise arbitrary, can be expanded in the form $\phi_1 - \phi_u = \Sigma A_k P_k$ where the $A_1 s \ldots A_n$ are constants and $P_1 \ldots P_n$ are "principal modes of oscillation" defined by $D'P_k = \lambda_k^2 P_k$ where $D'\phi_u = 0$ is the difference equation to be integrated and λ^2 is a constant. Now we start with the table of numbers ϕ_1 and calculate $D'\phi_1$. Then as $D'\phi_u = 0$ we have $D'\phi_1 = D'(\phi_1 - \phi_u) = \Sigma A_k \lambda_k^2 P_k$. Multiplying both sides by some number α_1^{-1} and subtracting from ϕ_1, and altering the boundary numbers so that the boundary condition is still satisfied, we have a new table which may be called ϕ_2; and $\phi_2 - \phi_u = \Sigma A_k(1 - \alpha_1^{-1}\lambda_k^2)P_k$. Repeating the process with $\sigma_2 \ldots \alpha_m$ we get:

$$\phi_{m+1} - \phi_u = \Sigma A_k(1 - \alpha_2^{-1}\lambda_k^2)(1 - \alpha_2^{-1}\lambda_k^2) \ldots (1 - \alpha_m^{-1}\lambda_k^2)P_k.$$

Now a function I exists such that $SIP_k^2 = 1$, $SIP_iP_k = 0$ where S denotes a summation throughout the region. Therefore:

$$SI(\phi_{m+1} - \phi_u)^2 = \Sigma[A_k(1 - \alpha_1^{-1}\lambda_k^2) \ldots (1 - \alpha_m^{-1}\lambda_k^2)]^2.$$

Now by a sufficient number of suitably chosen αs the polynomial in λ^2 on the right can be made small throughout the range from λ_1^2 to λ_n^2. Therefore the error of ϕ_{m+1} can be made small; for, since I is one signed it is measured by the L.H.S. The process is arithmetical. The error due to finite central differences is of the form

$$e_2h^2 + e_4h^4 + e_6h^6 + \text{ \&c.},$$

where h is the coordinate difference and the es are functions of position independent of h. If the integral has been found for two or more sizes of h, more exact values of it can be extrapolated by this formula. These methods have been applied in the paper to calculate the stress-function in a masonry dam.—A. O. **Rankine**: A method of determining the viscosity of gases, especially those available only in small quantities.—Dr. P. **Phillips**: Recombination of ions at different temperatures.—Dr. G. C. **Simpson**: The electricity of rain and snow. This paper relates to measurements of the electricity of rain made in continuation of those described at the beginning of last

year (Phil. Trans., Series A, vol. ccix., pp. 379–413, 1909), and, in addition, to a series of measurements of the electricity of snow made during the winter 1908–9. All the main conclusions drawn from the previous work have been confirmed, and it may now be stated with confidence that in Simla (*a*) more than three times as much positive as negative electricity is brought down by the rain; (*b*) the heavier the rainfall, the more likely is it to be positively charged; (*c*) light rain is, as a rule, more highly charged than heavy rain, irrespective of whether the charge is positive or negative. With regard to the electrification of snow, the measurements indicate that in Simla (*d*) the positive charge carried down by the snow is between three and four times as great as the negative charge; (*e*) snow is generally more highly charged than rain.—L. **Vegard**: The polarisation of X-rays compared with their power of exciting high-velocity kathode rays.

Mathematical Society, January 13.—Sir W. D. Niven, president, in the chair.—Dr. H. F. **Baker**: (1) The theory of the cubic surface; (2) an example of the expansion of a function in a series of polynomials.—G. N. **Watson**: The harmonic functions associated with the parabolic cylinder.—Dr. H. de S. **Pittard**: Note on the theory of sets in probabilities.—H. **Bateman**: The transformations of coordinates which can be used to transform one physical problem into another.—G. H. **Hardy**: Note on a former paper on the theory of divergent series.—Dr. W. H. **Young**: Homogeneous oscillation of successions of functions.—Dr. W. H. **Young** and Mrs. G. C. **Young**: The determination of a semi-continuous function from a countable set of values.—J. E. **Campbell**: Cyclic congruences.

Royal Astronomical Society, January 14.—Sir David Gill, K.C.B., president, in the chair.—J. **Evershed**: Radial movement in sun-spots: second paper. The paper contained further investigations on the spectra of sun-spots, made at the Kodaikánal Observatory, India. The spectra of every considerable spot had been photographed, and it was invariably found that, except when the spot was near the centre of the disc, the lines crossing the spot were inclined towards the red on the side nearest the limb, and towards the violet on the side nearest the centre of the disc. Assuming this inclination to be due to motion in the line of sight, the conclusion seemed inevitable that spots are centres of a force directed outwards in a horizontal plane. This would explain the motion of recession on the side nearest the limb, and of approach on the side nearest the centre of the disc. The effect would not be observed in the case of a spot near the central meridian, where there would be no motion in the line of sight. A study of the calcium lines showed a motion in the opposite direction (towards the centre of the spot), indicating an in-draught of calcium vapour in the higher chromosphere. No evidence was obtained of an upward current over spots, but there were some indications of downward movements. There are also indications of cyclonic motion, but in the opposite direction to that shown in some of Prof. Hale's spectroheliographs.—A. C. D. **Crommelin**: Diagram illustrating a method of charting the geocentric places of a comet referred to a fixed radius vector.—R. W. **Wood**: The moon in ultra-violet light; spectro-selenography. The author recommended a spectroscopic method of investigating the nature of the surface of the moon.

Institute of Metals, January 18.—Sir William H. White, K.C.B., F.R.S., president, in the chair.—G. D. **Bengough** and B. P. **Hill**: The properties and constitution of copper-arsenic alloys. One of the principal objects of the paper was to bring forward data for an authoritative pronouncement upon the best proportion of arsenic to be used to secure copper alloys having greater strength and rigidity, and greater resistance to the corrosive action of gases at high temperatures, than commercially pure copper. The first portion of the paper dealt with the mechanical properties of the alloys of industrial importance, and the second with their chemical composition. In the latter section the authors denied the existence of the compound Cu^2As, proposed by Hiorns, and confirmed the existence of the compounds Cu_3As and Cu_5As_2, already proposed by Friedrich.—E. A. **Smith**: The assay of industrial gold alloys. The author gave a brief comparative description of the methods in general use for the assay of industrial gold alloys, based on experimental work carried out at the Royal School of Mines and in the University of Sheffield. It was shown that the results for gold assay were invariably higher when determined by direct cupellation with parting silver than when determined indirectly by double cupellation.—Dr. R. **Seligman** and F. J. **Willott**: The analysis of aluminium and its alloys. A detailed description was given of the technical methods of estimating the various foreign elements (copper, zinc, nickel, magnesium, tin, lead, manganese, titanium) and impurities (silicon, iron, and sodium) to be found in commercial aluminium and aluminium alloys. It was pointed out that the effect of these elements, particularly in minute proportions, upon aluminium was but little understood, and that it was desirable that research be directed along those lines.

EDINBURGH.

Royal Society, December 20, 1909.—Sir William Turner, K.C.B., president, in the chair.—Sir William **Turner**: The aborigines of Tasmania, part ii., the skeleton. The paper gave further particulars as to the specimens of Tasmanian skulls and skeletons now extant, and described in detail the bone anatomy of the specimen in the museum at Brussels. The discussion emphasised the fact that the Tasmanian had differed in important particulars from the ordinary black races, but resembled them in other respects. As regards the flattened femurs, the Tasmanian suggested affinity with the cave-dwellers and the Maoris, whereas in the form of the pelvis there was greater resemblance to the European races.—W. T. **Gordon**: The structure and affinities of *Zygopteris Römeri* (Solms). The petiole of this form was described by Solms Laubach from the Culm of Falkenberg. A few years later a similar petiole was obtained by Renault from rocks in Autun, and called *Diplolabis Esnostensis*. The present specimens of stems, petioles, and roots were found last year by the author in rocks of Calciferous Sandstone age at Pettycur, in Fife. The stem is protostelic, and is circular in transverse section. The wood consists of an inner zone with short elements, and an outer zone with longer tracheides. All the wood elements, whether long or short, have reticulate thickenings in their walls. The stem branches dichotomously. Appendages are given off from the stem at long intervals. These are either petioles or roots. At successive levels in the petiole the trace is indistinguishable from the characteristic trace in several different genera. *Zygopteris Römeri* is thus a synthetic type so far as the stages in the development of its petiole are concerned, and in the possession of a protostele the plant is the most primitive zygopterid yet discovered. In its organisation it has an important bearing on the origin of the Botryopteridæ and the Osmundaceæ.—Prof. Gwynne **Vaughan** and Dr. R. **Kidston**, F.R.S.: The fossil Osmundaceæ, part iv., and conclusion. Two new species are described, *Osmundite Kolbei* and *O. Schemniciensis*. The latter is closely similar to the modern Osmunda, but the anatomy of the former is described for the first time. It is very interesting owing to the position it takes up between the Osmundaceæ that have a solid xylemed stele and those with a broken ring of xylem surrounding a pith. The xylem is broken up into separate strands, but its pith contains scattered groups of tracheal elements. The general results of the whole paper are summed up, and the relationships between the Osmundaceæ and the Zygopterideæ are discussed in some detail, especially with reference to the peculiarities of the structure of the zygopterid leaf-trace.—Prof. J. C. **Ewart**, F.R.S.: The restoration of an ancient race of horse. About the middle of last century Owen received two upper molar teeth of a small member of the Equidæ family from a cavernous fissure at Oreston, near Plymouth. Similar teeth were obtained from the drift lying over the London at Chatham and from Kesingland, in Suffolk. Owen realised that these molars could not belong to a small variety of *Equus fossilis*—the species now represented by the wild horse (*E. przewalskii*) of Mongolia—but he had some difficulty in deciding whether they were the teeth of a small race of horses or the teeth of an ass or a zebra. Eventually he concluded that the Oreston teeth belonged to a "wild ass or quagga," which, with a wild horse and a wild boar, entered "into the series of British Pliocene hoofed mammals." To this

fossil wild ass or zebra Owen gave the name of *Asinus fossilis*. In addition to the last two upper molars there is preserved in the British Museum a first upper molar from Oreston which probably belonged to an animal between ten and eleven hands at the withers. In this small first molar the grinding surface of the "internal pillar"—a fold of enamel on the inner surface of the tooth—is only one-third the length of the grinding surface of the crown. In having a small internal pillar or protocone in this first upper molar, the Oreston type differs profoundly from the wild horse of Mongolia, but resembles (1) the small horses which at the beginning of the Pliocene period lived in Nebraska, *i.e.* horses of the Pliohippus group; (2) a small race which towards the close of the Pliocene frequented the valley of the Arno—a race hitherto included in the *E. stenosis* group; (3) a small variety which in Pliocene times lived in Auvergne and other parts of France, sometimes known as *E. ligeris*; and (4) a small equine which in Pleistocene times occurred in Algiers, to which M. Thomas gave the name *E. asinus atlanticus*. M. Boule regarded the last two as closely related, and as probably the direct ancestors of the zebras now living in South Africa. The Italian, French, and English deposits have also yielded cannon bones—metacarpals and metatarsals—as slender as those of the fine-boned desert Arabs, but not so slender as the cannon bones of the Onager and other wild asses of Asia. From inquiries extending over some years, Prof. Ewart had ascertained that there were small horses in the Roman Fort at Newstead, near Melrose, with molars of the same type as those from Oreston, and with cannon bones as slender as the fossil ones from the Valley of the Arno, Auvergne, and Kent's Cave, Torquay. Further, in a six-year-old Shetland pony of the Celtic type he had recently noticed that the first upper molars, in size as well as in the enamel foldings, were practically identical with the small first Oreston molar in the British Museum. He was of the opinion that the teeth said by Owen to belong to a fossil ass or zebra really belonged to a small race of horse, from which have in part descended the modern Exmoor, Welsh, Shetland, and other ponies of the Celtic type. To this small, true horse, which in Pleistocene times probably ranged from Algiers to the south of England, he had given the name *Equus agilis*—the more appropriate name *gracilis* not being available. Bearing in mind that several of the zebra hybrids which he had bred some years ago seemed, at least in their markings, to reproduce ancestral types, he decided to try to restore the small race which lived in the south of England along with the mammoth. By blending all the available Occidental and Oriental breeds, Prof. Ewart had now obtained several ponies which probably in make, disposition, and colour, as well as in limbs and teeth, fairly accurately reproduced the small, slender-limbed species hunted and sketched or sculptured by our Palæolithic ancestors. The pony which probably restores most accurately the small, fine-boned prehistoric race has a fine head, slender limbs and small hoofs, a mane which instead of clinging to the neck arches to one side, a well set-on tail, and only two of the eight callosities usually found in horses, *i.e.* the four ergots and the hind chestnuts are absent. This pony, like the other forty crosses bred, cannot be described as "more or less striped"—there is only a narrow dorsal band and a faint shoulder stripe—and hence lends no support to the view that in prehistoric times all the wild horses were at least as richly decorated as the recently extinguished quagga, or to M. Boule's view that the small horse which in Pleistocene times inhabited the south of France and North Africa is the direct ancestor of the zebras now living in South Africa. Though this hybrid pony is, like the wild horse of Mongolia, of a yellow dun colour, and is a mixture of seven more or less well-marked breeds, namely, Connemara, Welsh, Hackney, Iceland, Hebridean, Shetland, and Arab, it excels in make, action, and intelligence all the other ponies of a like age—an indication perhaps that, notwithstanding its mixed origin, it possesses the traits of an ancient wild race.

PARIS.

Academy of Sciences, January 10.—M. Émile Picard in the chair.—H. **Deslandres**: The magnetic storm of September 25, 1909, and the connected solar phenomena. A verification of some theories proposed. A discussion of the various theories of the influence of the sun on the earth. The author regards the theory of kathode radiation put forward by himself and by Birkeland as offering a sufficient explanation of the observed facts. It explains the delay of forty-five hours of the magnetic storm with respect to the passage of the active spot across the central meridian, and is connected with the author's theory of nebulæ.—J. **Carpentier**: Remarks on a frequency meter constructed from the designs of Commandant Ferrié, and also on a small precision balance constructed by M. Collot. The weights, from 50 grams to a decigram, are introduced on the pans by pressing buttons external to the balance case; the smaller weights are read by a microscope as deviations of the pointer. The balance works at constant load—100 grams—and by substitution, and is very rapid in its indications.—C. **Guichard**: The surfaces of total constant curvature which correspond to singular systems of any order.—C. **Russyan**: The theorem of W. Stekloff (the generalised theorem of Jacobi) and generalised formulæ of contact transformation.—Henri **Lebesgue**: The integral of Stieltjes and linear functional operations.—J. **Le Roux**: Definite quadratic forms with an infinity of variables.—E. **Jouguet**: The impossibility of certain waves of shock and combustion.—E. **Estanave**: Images changing from two or three points of view on the autostereoscopic plate.—Edm. **van Aubel**: The production of ozone under the influence of ultra-violet light. The production of ozone by the action of ultra-violet light, first observed by Lenard, has been confirmed by other observers. On the other hand, H. Bordier and T. Nogier have recently described experiments leading to the contrary conclusion. The experiments detailed in the present paper confirm Lenard's experiments.—F. **Ducelliez**: The study of some alloys of cobalt from the point of view of their electromotive forces. Curves are given for the experimental measurements with alloys of cobalt with tin, antimony, bismuth, lead, and copper.—A. **Besson** and L. **Fournier**: A new chloride of phosphorus. No chloride of phosphorus corresponding to the hydride P_2H_4 and the iodide P_2I_4 has hitherto been described. This chloride, P_2Cl_4, is produced by the action of the silent electric discharge on a mixture of hydrogen with the vapour of phosphorus trichloride. The new chloride forms a colourless, oily liquid, solidifying at $-28°$ C., and distilling with slight decomposition at 95° C. under a pressure of 20 mm. It absorbs oxygen rapidly from the air, and sometimes catches fire spontaneously. Attempts to isolate the corresponding bromide were unsuccessful.—Marcel **Delépine**: The solution of platinum in sulphuric acid, and on the products of this reaction. The presence of oxygen is not necessary to the reaction between platinum and sulphuric acid, as has been assumed by M. Quennessen, since solution takes place in a stream of carbon dioxide, air, oxygen, or carbon dioxide mixed with sulphur dioxide.—Pierre **Jolibois**: Two new phosphides of nickel. These compounds were obtained by heating a nickel-tin alloy in sealed tubes with phosphorus. The composition of the phosphides agreed with the formulæ NiP_2 and NiP_3.—E. **Cornec**: The formula of hypophosphoric acid. A cryoscopic study of aqueous solutions of the acid and the potassium salt. The double formula $H_4P_2O_6$ agrees best with the facts observed.—J. B. **Senderens**: The catalytic preparation of the aromatic ketones. The catalytic action of thoria at 460° C. upon a mixture of benzoic and a fatty acid gives a mixture of the symmetrical fatty ketone and the mixed fatty aromatic ketone, no benzophenone, apparently, being formed. The method has been successfully applied to the preparation of ketones of the general formula C_6H_5—CO—R, in which R was methyl, ethyl, normal and isopropyl, and isobutyl.—M. **Lespieau**: Methylacetenylcarbinol.—Em. **Bourquelot** and M. **Bridel**: The presence of gentiopicrin in *Chlora perfoliata*. Details are given of the methods employed for isolating this glucoside in the pure state.—H. **Bierry**: Researches on the digestion of inulin. It is found that various animals are capable of digesting inulin, but they employ for this digestion different physiological agents. In the higher animals, the transformation of the inulin takes place in the stomach, and is due to the hydrochloric acid of the gastric juice; in molluscs a ferment is secreted which is capable of hydro-

lysing the inulin to levulose.—J. **Sarthou**: The presence in cow's milk of a catalase and an anæroxydase. The statement of MM. Bordas and Touplain that the insoluble casein of milk is capable of decomposing hydrogen peroxide is denied, and experiments detailed which tend to show that this action is due to a mixture of a physiological catalase and a bacterial catalase.—Louis **Roule**: The structure of the epidermal protuberances of certain Amphibia and their morphological affinities with the nails.—J. **Nageotte**: A new formation of the myeline layer.—J. **Mawas**: The structure of the ganglion nerve cells of the amyelinic cord of the Cyclostomes.—A. **Contamin**: The immunisation against cancer of mice inoculated with tumours modified by the X-rays.—L. **Bull**: The mechanics of insect flight.—C. **Levaditi** and K. **Landsteiner**: Researches on experimental infantile paralysis. The preventive inoculation of animals by means of the dried spinal cord is possible.—A. **Thiroux** and W. **Dufougeré**: A new spirilla from *Cercopithecus patas*. This organism resembles in its morphological characters the *Spirillum duttoni* of tick fever, from which, however, it is distinct. The name *Spirillum pitheci* is proposed.—L. **Cayeux**: The prolongation of the Silurian oolitic iron deposits under the Paris basin.—E. **de Martonne**: The mechanical theory of glacial erosion.—Alfred **Angot**: The value of the magnetic elements at the Val-Joyeux Observatory on January 1, 1910.—E. **Esclangon**: The intensity of gravity and its anomalies at Bordeaux and neighbourhood.—E. **Péroux**: The mineral contents and chemical analysis of the water from the artesian wells of Maisons-Laffitte.—André **Brochet**: New determinations of the radio-activity of the thermal springs of Plombières. These springs are strongly radio-active, this effect being due to the radium emanation.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 20.

ROYAL SOCIETY, at 4.30.—Further Observations on the Pathology of Gastric Ulcer (Progress Report): Dr. C. Bolton.—(1) The Velocity of Reaction in the "Absorption" of Specific Agglutinins by Bacteria, and in the "Adsorption" of Agglutinins, Trypsins, and Sulphuric Acid by Animal Charcoal; (2) On the Absorption of Agglutinin by Bacteria, and the Application of Physico-chemical Laws thereto: Dr. Georges Dreyer and J. Sholto Douglas.—Observations on the Rate of Action of Drugs (Alcohol, Chloroform, Quinine, Aconitine) upon Muscle as a Function of Temperature: Dr. V. H. Veley, F.R.S., and Dr. A. D. Waller, F.R.S.—An Examination of the Physical and Physiological Properties of Tetrachlorethane and Trichlorethylene: Dr. V. H. Veley, F.R.S.—The Action of Antimony Compounds in Trypanosomiasis in Rats: J. D. Thomson and Prof. A. R. Cushny, F.R.S.—"Amakebe" (a Disease of Calves in Uganda): Colonel Sir David Bruce, F.R.S., Captains A. E. Hamerton and H. R. Bateman, R.A.M.C., and Capt. F. P. Mackie, I.M.S.—On Scandium: Sir William Crookes, For.Sec.R.S.

ROYAL INSTITUTION, at 3.—Assyriology: Rev. C. H. W. Johns.

LINNEAN SOCIETY, at 8.—Discussion on the Origin of Vertebrates: Dr. Gaskell, Dr. Gadow, Mr. Goodrich, Prof. Starling, Prof. MacBride, Dr. Smith Woodward, Prof. Dendy.

INSTITUTION OF MINING AND METALLURGY, at 8.—Copper Leaching Plant in the Ural Mountains: A. L. Simon (*Adjourned discussion.*)—Some Analyses of Copper Blast Furnace Slags and Determination of their Melting Points: A. T. French.—The Detection of Minute Traces of Gold in Country Rock: A. R. Andrew.—Errors due to the Presence of Potassium Iodide in testing Cyanide Solutions for Protective Alkalinity: B. Collingridge.

FRIDAY, JANUARY 21.

ROYAL INSTITUTION, at 9.—Light Reactions at Low Temperatures: Sir James Dewar, F.R.S.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Ninth Report to the Alloys Research Committee: On the Properties of some Alloys of Copper, Aluminium, and Manganese (with an Appendix on the Corrosion of Alloys of Copper and Aluminium when exposed to the Sea): Dr. W. Rosenhain and F. C. A. H. Lantsberry.

PHYSICAL SOCIETY, at 5.—Saturation Specific Heats, &c., with van der Waals' and Clausius' Characteristics: R. E. Baynes.—The Polarisation of Dielectrics in a Steady Field of Force: Prof. W. M. Thornton.—On the Use of Mutual Inductometers: Albert Campbell.

MONDAY, JANUARY 24.

ROYAL SOCIETY OF ARTS, at 8.—Textile Ornamentation: A. S. Cole.

VICTORIA INSTITUTE, at 4.30.—The Attitude of Science towards Miracles (being the Gunning Prize Essay, 1909): Prof. H. Langhorne Orchard.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Travels in Northern Arabia: D. Carruthers.

TUESDAY, JANUARY 25.

ROYAL INSTITUTION, at 3.—The Cultivation of the Sea: Prof. W. A. Herdman, F.R.S.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.30.—Annual General Meeting.—Presidential Address: The Influence of Environment on Man: Prof. W. Ridgeway.

MINERALOGICAL SOCIETY, at 5.30.—On a Group of Minerals formed by the Combustion of Pyritous Shales: S. J. Shand.—A Crystal-holder for Measuring Large Specimens: W. J. Lewis.—Some Observations on Pleochroism: T. Crook.—Notes on the Weight of the "Cullinan" Diamond and on the Value of the Carat-weight: L. J. Spencer.—On a Basalt from Rathjordan, Co. Limerick: G. T. Prior.—On a Fluo-arsenate from the Indian Manganese Deposits: G. F. H. Smith and G. T. Prior.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Reconstruction of the Tyne North Pier (*Discussion*): I. Collingwood Barling.

WEDNESDAY, JANUARY 26.

ROYAL SOCIETY OF ARTS, at 8.—Goldsmiths' and Silversmiths' Work: O. Ramsden.

GEOLOGICAL SOCIETY, at 8.—On a Skull of Megalosaurus from the Great Oolite of Minchinhampton: Dr. A. S. Woodward.—Problems of Ore-deposition in the Lead- and Zinc-veins of Great Britain: A. M. Finlayson.—On the Vertebrate Fauna found in the Cave-earth at Dog Holes, Warton Crag (Lancashire): J. W. Jackson.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

THURSDAY, JANUARY 27.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Note on Carbon Monosulphide: Sir James Dewar, F.R.S., and Dr. H. O. Jones.—Long-period Determination of the Rate of Production of Helium from Radium: Sir James Dewar, F.R.S.—On the Extinction of Colour by Reduction of Luminosity: Sir William de W. Abney, K.C.B., F.R.S.—The Initial Accelerated Motion of Electrified Systems of Finite Extent, and the Reaction produced by the Resulting Radiation: George W. Walker.—On the Nature of the Magnetokathodic Rays: H. Thirkill.

ROYAL INSTITUTION, at 3.—Assyriology: Rev. C. H. W. Johns.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Equitable Charges for Tramway Supply: H. E. Yerbury.

FRIDAY, JANUARY 28.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Some Uses of Mechanical Power in Engineering Construction: H. F. Donaldson.

SATURDAY, JANUARY 29.

ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford), at 6.—Trawl Fishing in the North Sea: S. H. Goodchild.

CONTENTS.

PAGE

Lord Kelvin's Early Life. By **W. J.** 331
Protoplasm in Harness 333
Electricity on the Farm 334
The Phenomena of the Earth's Surface. By **G. A. J. C.** 335
Our Book Shelf:—
Mees: "An Atlas of Absorption Spectra" 336
Moore: "Physiology of Man and Other Animals" . 336
"Deutsche Südpolar-Expedition, 1901–1903" . . . 336
Stroobant: "Les Progrès récents de l'Astronomie (1908)."—**W. E. R.** 336
Letters to the Editor:—
Cross-fertilisation of Sweet-peas.—π 337
The Village Institute and its Educational Possibilities.—**John B. Coppock** 337
Avogadro's Hypothesis (or Law).—**S. H. Woolhouse** 338
"A Japanese Priest in Tibet."—**Dr. C. G. Knott** 338
Standard Measurement in Wave-lengths of Light. (*Illustrated.*) By **Dr. A. E. H. Tutton, F.R.S.** . . 338
Some New Nature Books. (*Illustrated.*) 341
The Boston Meeting of the American Association 342
The Mean Height of the Antarctic Continent . . 343
The Natural History Museum 343
Notes 343
Our Astronomical Column:—
Discovery of a New Comet 348
Halley's Comet 348
The Spectra of Comets' Tails 349
Two Curiously Similar Spectroscopic Binaries 349
The "Annuaire Astronomique," Belgium 349
The Evolution of the Brain. By **Prof. G. Elliot Smith, F.R.S.** 349
Conferences on Science and Mathematics in Schools. By **G. F. D.** 350
North of England Education Conference 351
The Ethnology of California 352
Some Applications of Microscopy to Modern Science and Practical Knowledge. By **Prof. E. A. Minchin** 353
University and Educational Intelligence 356
Societies and Academies 357
Diary of Societies 360