acquainted with the needs of the agricultural classes and the conditions of country life, and that the inspectors should be instructed to see that the curricula of rural schools are differentiated from those of urban schools. It was also recommended that in rural elementary schools there should be a continuous course of rural instruction, beginning in the lower standards with object lessons and continued in the upper standards with lessons in natural history and elementary science bearing on agriculture and rural life. With regard to training, it was suggested that provision should be made at certain of the teachers' training colleges for giving practical as well as theoretical instruction in agriculture and horticulture to those students who desired it. With regard to higher agricultural instruction and evening continuation schools it was recommended that the Board of Education should encourage those county authorities which have not yet done so to provide or to contribute to school and experimental farms and should inspect and report annually on such farms; that in rural evening schools instruction should be given in such subjects as natural history, botany, and other sciences bearing on agriculture, horticulture, bee and poultry keeping, land measuring, farm accounts, and so on, rather than in such subjects as typewriting, commercial arithmetic, and shorthand. The Duke of Devonshire expressed himself in sympathy with the desire of the Committee to give a more useful and practical character to elementary education in rural districts, and mentioned certain steps which the Education Department has taken in furtherance of this object. Full consideration was promised to the various suggestions put forward by the Agricultural Education Committee. The subject is dealt with in an article on p. 332.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, January 26.—Prof. Lodge, F.R.S., President, in the chair.—A paper by Prof. Ayrton and Mr. Mather, on some developments in the use of Price's guard wire in insulator tests, was read by Prof. Ayrton. For insulation tests made by the direct deflection method the guard wire properly applied affords complete protection against surface leakage when the ends of the cable tested are near the galvanometer, so that it is possible to have the wire connecting the conductor of the cable with the galvanometer terminal "air insulated." A difficulty, however, arises when the ends of the cable are at a considerable distance from the testing instrument; this may render air insulation impossible. The authors have overcome this difficulty by applying a guard wire along the entire length of the lead. This is done by using a concentric wire to connect the cable and galvanometer, the inner of the concentric being used as the lead and the outer as the guard wire. The principle can also be applied to determine whether a defective piece of cable is bad throughout or bad owing to one or more isolated faults. In this case the cable is placed in two water tanks, one of which is earthed, and the other fairly well insulated. By a suitable arrangement of the guard wire it is then easy to determine the resistance of the wire in the earthed tank, so that by altering the length of this wire the character of the insulation can be determined throughout the whole length of the cable. In referring to some of the earliest experiments with the guard wire made by Mr. Appleyard in 1895, Prof. Ayrton pointed out that the principle had not been applied completely, and that at one point there was a chance of leakage. Mr. Campbell said that the necessity of having a concentric could be obviated by simply hanging the lead from the guard wire by short lengths of material of fair insulation. Mr. Appleyard said that he quite agreed with Prof. Ayrton that the guard wire ought in general to be applied at both ends of all leads, provided that both ends could be got at. The reason it was used at one end only in the experiments on dielectrics made in 1895 was that the far end of the lead was carried into the condenser box, which was submerged in water in the temperature tank. Special precautions were taken to ensure good insulation of the submerged end of the lead, and tests showed that the leakage there was nil. As the end of the wire could not be got at, no guard wire could be applied. Mr. Appleyard congratulated the authors upon the use of a concentric cable for a lead, and pointed out that such a lead was sufficient for all the routine tests on core; the inner and outer conductors could be used for the purpose of taking the "copper" resistance. Mr. Price expressed his interest in the developments of his principle which had been made by the authors.—Mr. Appleyard then read a paper on a fault-test for braided and other cable-core. This method enables the fault to be found without the removal of braiding or tape. The core is wound on two insulated drums or tanks, the intermediate piece of cable being about ten feet long. One end of the core is left free, the other is connected to earth through a galvanometer and a battery. A guard wire is connected from some point between the galvanometer and the battery to some point of the braiding on the wire between the drums. A wet cloth, connected to an earth wire, is laid on one or other of the drums, over the braiding. The galvanometer deflection is noted. The earth-wire is then changed over to the second drum, and the corresponding deflection is observed. A comparison of these deflections at once indicates upon which drum the fault lies. With the galvanometer still deflected, the core may be run through a suitable contact brush or sponge attached to the guard wire. The instant the fault passes under the guard wire contact, the deflection falls and the fault is located. The paper gives the theory of the method, and indicates how to apply it (1) to localising "distributed" faults; (2) to several faults in a single cable; and (3) to the case of a single fault. One advantage of the method is that at the critical moment, when the fault passes under the guard wire, the galvanometer is short circuited through the fault, and thus completely protected.—A paper on reflection and transmission of electric waves along wires, by Dr. E. Barton and Mr. L. Lownds, was read by Dr. Barton. The waves used were produced by means of an induction coil and an oscillator, and travelled along wires ·15 cm. diameter, 8 cms. apart, and 166 metres long. The ends of the wires were connected by graphite markings on ground glass, so that any wave trains which reached the ends were at once absorbed. Three circular parallel-plate condensers were used, of 15, 9 and 5 cms. radius respectively. The plates were in all cases separated by air, and were placed 1 cm. apart. The needle of the electrometer connecting the wires was uncharged, so that it was always attracted by the charged plates. The positions of the condenser and electrometer could be varied so as to study either the reflected or the transmitted waves. The electrometer produced a negligible disturbance, as it reflected only 0·04 per cent. of the energy incident upon it. The authors have attacked the problem mathematically, using the relations of Heaviside, and have obtained expressions for the reflected and transmitted systems. These expressions consist of two terms, one of which is comparatively unimportant. From the other term certain values have been calculated. A superior limit has then been given to the other term, and the values already obtained have been subjected to a correction on this account. By a suitable arrangement of the condenser and electrometer these calculated values have been experimentally determined, and are in close agreement with the theoretical numbers, falling in many cases between the results derived from the approximate and the corrected theories. The authors have also investigated the stationary wave system produced by interference when the electrometer is placed close to the condenser, and between the condenser and the oscillator. The chairman said that the experiments afforded a satisfactory verification of Heaviside's theory.—A paper on the frequency of transverse vibrations of a stretched india-rubber cord, by Mr. T. J. Baker, was taken as read. In this paper Mr. Baker has investigated the frequency of the note given out by an india-rubber cord of square section when subjected to different tensions. The relation between length and tension is linear over a considerable range. The curve connecting length with frequency shows that while the cord was doubling its length the pitch was rising rapidly, but that further extension was practically without effect. Since the relation between length and tension is linear, while the sectional area is decreasing, it follows that the value of Young's modulus must be changing. The author has shown that the value of Young's modulus is proportional to the square of the stretched length of the cord. Using this fact, the frequency of the note given out by a stretched india-rubber cord is shown to be proportional to a quantity which varies very slightly with increase in length of the cord, and hence the variation in elasticity is given as the cause of the constancy of the note.—Mr. Appleyard exhibited some mirrors produced inside incandescent lamps by the application of voltages much above those for which the lamps were designed, and the consequent deflagration of the filaments.—The meeting then adjourned until February 9.

Chemical Society, January 18.—Prof. Thorpe, President, in the chair.—The following papers were read:—Note on nitrogen halogen compounds, by J. Stieglitz and E. E. Slosson.—On the electrolysis of the nitrogen hydrides and of hydroxylamine, by E. C. Szarvasy. The author has made series of experiments on the electrolysis of solutions of ammonia, hydrazine, azoimide, hydroxylamine, and of their salts; attempts to prepare polymeric nitrogen by electrolysing solutions of azoimide and its salts at high current densities are still in progress.—On the relationship between the constitution of some substances and the fluorescence which they exhibit, by J. T. Hewitt.—Action of fuming nitric acid on α-dibromocamphor, by A. Lapworth and E. M. Chapman. The oxidation of α-dibromocamphor yields camphoronic and homocamphoronic acids, nitrobromocamphor, dibromocampholidid, a substance of the composition $C_{10}H_{16}N_2O_6$ and a lactone which yields a crystalline acid, $C_{10}H_{16}O_4$, on hydrolysis with potash.—Note on Volhard's method for the assay of silver bullion, by T. K. Rose. The precautions to be observed in using Volhard's method are described, and the limit of accuracy is put at 0·1 per 1000.—*c*-Substituted hydroxytriazoles, by G. Young and E. Witham. The authors have prepared a number of hydroxytriazoles, using the reactions represented by the following equations:—

$$CHR:N.NH.CO.NH_2 + O = CR\begin{matrix}N.NH\\ \diagdown\\ \diagup\\ N\end{matrix}C.OH + H_2O$$

and

$$R.CHO + NH_2.CO.N:N.CO.NH_2 = CR\begin{matrix}NH.N\\ \diagdown\\ \diagup\\ N\end{matrix}C.OH + NH_3 + CO_2.$$

—Note on the use of a mixture of dry silver oxide and alkyl halides as an alkylating agent, by G. D. Lander. Alkylic derivatives of menthol, benzoin, benzamide and ethylic acetoacetate are obtained by the action of dry silver oxide and alkyl iodides.

Entomological Society, January 17.—Annual meeting.—Mr. G. H. Verrall, President, in the chair.—It was announced that the following had been elected as officers and council for 1900-1901: President, Mr. G. H. Verrall; treasurer, Mr. R. McLachlan, F.R.S.; secretary, Mr. C. J. Gahan; librarian, Mr. G. C. Champion; and as other members of the council: Mr. C. G. Barrett, Dr. T. A. Chapman, Messrs. W. L. Distant, H. St. J. K. Donisthorpe, F. D. Godman, D.C.L., F.R.S., A. H. Jones, R. W. Lloyd, the Hon. Walter Rothschild, and Messrs. E. Saunders and C. O. Waterhouse. The election to fill a vacancy on the council and one in the office of secretary, caused by the resignation of Mr. J. J. Walker, R.N., was adjourned to March 7.—The President delivered an address in which he reviewed the advantages and disadvantages under which entomologists and other men of science now labour as compared with the conditions existing at the beginning of the century. He called attention to certain abuses prevalent, instancing, among others, the hasty and ill-digested nature of much of the work now published, the result, as he believed, of the facilities that are given for publication. Having referred also to the vast increase in the number and variety of the publications which a student must consult in order to be fully acquainted with the work being done in his special branch of study, Mr. Verrall proceeded to suggest that there should be an international agreement for the purpose not only of restricting the number of the publications to be recognised, but of exercising some control over their contents, in order that worthless papers might be excluded. In conclusion, he briefly summarised the reforms which he considered most essential to be effected at the beginning of the new century.

Zoological Society, January 23.—Dr. Albert Günther, F.R.S., Vice-President, in the chair.—Mr. Sclater exhibited a photograph of a young example of the Rocky Mountain goat (*Haploceros montanus*). It was stated that the animal had been captured near Field, British Columbia, in June last, and had lived in captivity ever since. Mr. Sclater also exhibited a collection of birds formed by Mr. Alfred Sharpe, C.B., during an excursion to Fort Jameson in Northern Rhodesia. The collection consisted of 135 specimens, which had been referred to 66 species.—Mr. A. Smith Woodward gave an account of a series of remains of *Grypotherium* and associated mammals from a cavern near Last Hope Inlet, Patagonia, exhibited by Dr. F. P. Moreno. The specimens had been collected for the La Plata Museum by Dr. R. Hauthal, and had already been described in a memoir by Drs. Hauthal, Santiago Roth, and Lehmann-Nitsche. Mr. Woodward recorded some additional observations. He confirmed the reference of the so called *Neomylodon* to *Grypotherium*, and agreed with the previous authors that the fragments of bones and skin had been left in their present state by man. The associated mammalian remains were in the same condition of preservation, and were referable to *Arctotherium*, a large species of *Felis*, *Onohippidium*, and a large rodent, all of the extinct Pampean fauna. Remains of existing mammals were also found in the same cave, but apparently in another stratum.—Prof. E. B. Poulton, F.R.S., communicated a report, drawn up by various specialists, on the Insects and Arachnids collected in 1895 and 1897 by Mr. C. V. A. Peel in Somaliland. It contained annotated lists of the specimens contained in the collection and descriptions of several new species.—Mr. W. E. de Winton read a paper on an interesting collection of mammals made by Lord Lovat in Southern Abyssinia while accompanying Mr. Weld-Blundell's expedition from Berbera to Khartoum in the beginning of last year. Several of the antelopes were of particular interest: the "Beira" (*Dorcotragus megalotis*), hitherto only known from a few isolated hills in Somaliland, was found to be very plentiful on the banks of the Blue Nile above Roseires.

PARIS.

Academy of Sciences, January 22.—M. Maurice Levy in the chair.—M. Grandidier announced to the Academy the loss it had sustained by the death of M. Alexis de Tillo, correspondant for the section of geography and navigation.—Presentation of the first publications of the Observatories of Potsdam and Paris relating to the photographic chart of the sky, by M. Lœwy. Two sets of negatives have been taken, one with a long exposure, sufficient to take in stars of the 14th magnitude; the other with shorter exposure, so as to exclude stars of a higher magnitude than the 11th.—M. Zeuthen was elected a correspondant for the section of geometry in the place of the late M. Sophus Lie; and M. Peron, a correspondant for the section of mineralogy, in the place of the late M. Matheron.—Note on the works of Lavoisier, by M. de Vincenzi. A reproduction of a letter of Lavoisier, not previously published, dated January 6, 1793, to Mr. Robert Kerr, the English translator of his *Traité élémentaire de Chimie*.—Observations on the subject of the preceding note, by M. Berthelot. No trace can be found in the archives of the Academy of the new and enlarged edition of the *Traité élémentaire* referred to by Lavoisier in the above letter as being in preparation.—On isothermal surfaces, by M. C. Guichard.—On the degree of generality of any differential system whatever, by M. Riquier.—On the measurement of capacity in a heterogeneous medium, by M. A. A. Petrovsky. An analysis of the method suggested by Borgmann and Petrovsky, in which alternating currents are used. It is shown that a complete compensation can only be obtained in the cases where the compensated system is either a conductor or an insulator. In general, the magnitude of the capacity as measured will be a function of the number of oscillations of the alternating current.—On the liquefaction of gaseous mixtures, by M. F. Caubet. A pressure-temperature diagram is given showing the results of experiments on ten mixtures of carbon dioxide and methyl chloride. The results complete those already published by Prof. Kuenen.—On a phenomenon arising from the use of triphase currents in radiography, by M. Delézinier. The author shows that by the use of the method suggested by him in a previous paper, using triphase currents, the Crookes' tubes will work equally well when the anode of the tube is connected to either pole of the induction coil. The destructive effects upon the bulbs of a changing over of polarity, which occur with direct currents, are avoided if triphase currents are employed.—Transformation of the photographic image of a negative into a lamellar state, and colour phenomena derived from this, by M. A. Frillat. A negative is carefully cleaned and dried and then exposed to the vapours of nitric acid, which dissolves the precipitated silver, and causes the disappearance of the image. The plate is now placed in an atmosphere of moist sulphuretted hydrogen, when the silver is reprecipitated in a lamellar condition, and the image which reappears is vividly coloured. There is, however, no relation between the true colours of the objects and the colours so produced, although by varying the time of exposure to the sulphuretted hydrogen some control is obtainable over the colours.—On

the metallic borates, by M. L. Ouvrard. Since the only definite borate of the composition $B(OR)_3$ is the magnesium borate of Ebelmann, attempts were made to prepare other borates of a similar constitution. Cadmium borate, $Cd_3(BO_3)_2$, can be prepared in a pure state by heating together in a platinum crucible potassium and hydrogen fluoride, KHF_2, with boric anhydride, and then adding cadmium oxide.—On a new method for determining aluminium, by M. Alfred Stock. The method proposed depends upon the setting free of iodine and precipitation of alumina from its salts by a mixture of potassium iodide and iodate. The reaction is not complete unless some sodium thiosulphate is added, and the solution heated. The aluminium hydrate thus thrown out is in a much denser form than when precipitated by ammonia, and is easily washed and dried.—On the fauna of the Auvergne, by MM. C. Bruyant and A. Eusébio.—On the seminal teguments of some species of the genus *Impatiens*, by M. Camille Brunotte.—On the geology of Southern China, by M. Leclère. The geological expedition to Southern China occupied from December 1897 to July 1899, and resulted in filling up the gap in the geology of the country between Indo-China and Central Asia.—On some fossil plants of Southern China, by M. R. Zeiller. A study of the carboniferous fossils collected by M. Leclère in the expedition mentioned in the previous paper.—On the structure of the southern portion of the zone of the Briançonnais, by M. W. Kilian. On a new Miocene rodent, by M. Cl. Goillard. The new rodent, which was found in the Miocene strata of Grive-Saint-Alban, on account of its peculiar dentition cannot be regarded as belonging to any known genus. The molars have some resemblance to those *Brachyuromys Betsileonensis*, now existing in Madagascar, and recall also the dentition of the living species *Tachyoryctes annectens* and *Rhizomys vestitus*. The name proposed for the fossil is *Anomalomys Gaudryi*.—On a crystallised fibrin, by M. L. Maillard. Although admitting the accuracy of the observations of M. Dzerzgowski as to the existence of crystals of calcium palmitate in the deposit from sterile serum, the author still is of opinion that there is also a quasi-crystalline albuminoid material present.—The increase of yeasts, without fermentation, in the presence of a limited quantity of air, by M. A. Rosenstiehl. In the experiments described, the reproduction of the yeast without fermentation would appear to be caused by the presence of tannin, or of some similar substance capable of being coagulated by gelatine.—On the nature of the propagation of a nervous influx, by M. G. Weiss. The experiments made by the author upon the effect of temperature upon the velocity of a nerve impulse are not in agreement with those of Helmholtz, since the velocity would appear to be independent of the temperature, and hence is not so intimately related to a chemical change as is muscular contraction.—New method for measuring the thermal sensibility, by MM. Ed. Toulouse and W. Vaschide. To eliminate the disturbing effects of contact sensations the authors use drops of water heated to known temperatures, and weighing only 0·1 gram, which are allowed to fall on to the skin from a height of 1 cm.—Action of a continuous current upon the respiration of muscle, by M. Th. Guilloz. On the solar halo of January 11, 1900, by M. l'Abbé Maze.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 1.

ROYAL SOCIETY, at 4.30.—A Case of Monochromatic Vision: Sir W. Abney, F.R.S.—Thermal Radiation in Absolute Measure: Dr. Bottomley, F.R.S., and Dr. Beattie.—Electrical Conductivity in Gases traversed by Cathode Rays: Dr. McLennan.—Researches on Modern Explosives: W. Macnab and A. Ristori.—On the Influence of the Temperature of Liquid Air on Bacteria: Dr. A. Macfadyen.

ROYAL INSTITUTION, at 3.—The Senses of Primitive Man: Dr. W. H. R. Rivers.

LINNEAN SOCIETY, at 8.—On Botanic Nomenclature: C. B. Clarke, F.R.S.—On the Zoological Results of an Expedition to Mount Roraima, in British Guiana, undertaken by Messrs. F. V. McConnell and J. J. Quelch: Prof. E. Ray Lankester, F.R.S.

CHEMICAL SOCIETY, at 8.—The Chlorine Derivatives of Pyridine. Part V. Synthesis of $\alpha\alpha'$-Dichloropyridine. Constitution of Citrazinic Acid: W. J. Sell and F. W. Dootson.—The Formation of Heterocyclic Compounds: S. Ruhemann and H. E. Stapleton.—The Space Configuration of Quadrivalent Sulphur Derivatives: Methyl Ethyl Thetine Dextrocamphorsulphonate, and Dextrobromocamphorsulphonate: W. J. Pope and S. J. Peachey.—Nitrocamphane: M. O. Forster.

RÖNTGEN SOCIETY, at 8.—Röntgen Rays in Diseases of the Chest: Dr. Hugh Walsham.—Mr. A. Hastings Stewart will show a small Egyptian Mummy and Skiagrams of the same.

FRIDAY, FEBRUARY 2.

ROYAL INSTITUTION, at 9.—Wireless Telegraphy: G. Marconi.

GEOLOGISTS' ASSOCIATION, at 7.30.—The President, J. J. H. Teall, F.R.S., will deliver an Address on the Natural History of Phosphatic Deposits.

MONDAY, FEBRUARY 5.

SOCIETY OF ARTS, at 8.—The Nature and Yield of Metalliferous Deposits: Bennett H. Brough.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Fragment of the Geography of England: South-West Sussex: Dr. H. R. Mill.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—On Recent Objections urged against the Adoption of the Metric System: Dr. W. S. Squire.—Oil of Carthamus Tinctorius (Safflower Oil): H. R. Le Sueur.

TUESDAY, FEBRUARY 6.

ROYAL INSTITUTION, at 3.—Structure and Classification of Fishes: Prof. E. Ray Lankester, F.R.S.

ZOOLOGICAL SOCIETY, at 8.30.—Notes on the Transformations of some South African Lepidoptera: Colonel J. M. Fawcett.—On Mammals obtained in South-Western Arabia by Messrs. Percival and Dodson: Oldfield Thomas.—On a Small Collection of Decapod Crustaceans from Freshwaters in North Borneo: L. A. Borradaile.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Moving Loads on Railway Underbridges: W. B. Farr.—Note on the Floor System of Girder Bridges: C. F. Findlay.

WEDNESDAY, FEBRUARY 7.

GEOLOGICAL SOCIETY, at 8.—Bala Lake and the River System of North Wales: Philip Lake.—Foraminifera from an Upper Cambrian Horizon in the Malverns: Frederick Chapman.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Note on the Separation of Oleic Acid from other Fatty Acids: Dr. J. Lewkowitsch.—Analysis of a Sample of "Treacle" and of a Sample of So-called "Golden Syrup": C. G. Matthews and A. Hyde Parker.—The Determination of Carbon and Sulphur in Steel: Bertram Blount.—Note on Sour Milk: H. Droop Richmond and J. B. P. Harrison.—Butters from various Countries compared: C. Estcourt.

THURSDAY, FEBRUARY 8.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* The Spectrum of α-Aquilæ: Sir N. Lockyer, K.C.B., F.R.S., and A. Fowler. On Electrical Effects due to Evaporation of Sodium in Air and other Gases: W. C. Henderson.

ROYAL INSTITUTION, at 3.—Modern Astronomy: Prof. H. H. Turner, F.R.S.

CHEMICAL SOCIETY, at 8.30.—Victor Meyer Memorial Lecture: Prof. T. E. Thorpe, F.R.S.

SOCIETY OF ARTS (Imperial Institute), at 4.30.—The Projects of Railway Communication with India: J. M. Maclean.

MATHEMATICAL SOCIETY, at 8.—A Formula in the Theory of the Theta-Functions: Prof. A. C. Dixon.—Some Elementary Distributions of Stress in Three Dimensions: J. H. Michell.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Standardi-ation of Electrical Engineering Plant: R. P. Sellon.

FRIDAY, FEBRUARY 9.

ROYAL INSTITUTION, at 9.—Symbiosis and Symbiotic Fermentation: Prof. J. Reynolds Green.

ROYAL ASTRONOMICAL SOCIETY, at 3.—Anniversary Meeting.

PHYSICAL SOCIETY, at 5.—Annual General Meeting.—Address by the President, Prof. O. J. Lodge, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Underground Sources of Water-Supply: D. E. Lloyd-Davies.

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