versity college, or of an educational body containing representatives of such places of higher education. The university or supervising body must be responsible for the framing of the syllabus, and the selection of a suitable tutor; and the instruction must aim at reaching, within the limits of the subject covered, the standard of university work in honours. The course must extend for each class over a period of not less than three years, and must occupy at least two hours a week for twenty-four weeks in each year, at least one-half of the time being devoted to class work.

IN the issue of *Science* for June 13 further large gifts to higher education in the United States are announced. Mr. Andrew Carnegie has undertaken to provide 200,000*l.* for the medical department of Vanderbilt University. Of this sum 40,000*l.* is to be given to the University immediately for the erection and equipment of laboratories. The income from the remaining 160,000*l.* is to be paid annually for the support of the department through the Carnegie Corporation. A condition of the donation provides that the direction of the educational and scientific work of the department shall be committed by the board of trustees to a small board of seven members, three of whom shall be eminent in medical and scientific work. Messrs. J. B. and B. N. Duke have given 160,000*l.* more to Trinity College in North Carolina. The college has thus secured the 30,000*l.* promised by the Rockefeller Foundation, and has added 200,000*l.* to its endowment. Governor Sulzer has signed a Bill granting 50,000*l.* for a building for the State College of Agriculture at Syracuse University.

THE report for 1913 of the council of the City and Guilds of London Institute has now been published. In it is passed in review the work of the City and Guilds (Engineering) College, the City and Guilds Technical College, Finsbury, the South London Technical Art School, the Department of Technology, and the Leather Trades School. The audited accounts and balance-sheet of the institute are given, and the reports of the heads of the various colleges and schools are included. During the past session the Department of Technology registered 4552 classes in the United Kingdom in 331 towns. These classes were attended by 53,999 students; this number represents, however, only a proportion of the total number of students in attendance at courses of technical instruction largely influenced by the work of the department. The examinations of the department were held in seventy-five technological subjects, for which 22,111 candidates were presented in the United Kingdom alone. While the total number of candidates shows a decrease on the number for 1911, the proportion of passes in the examinations has, on the contrary, risen by 4 per cent., which suggests that the fall in the number of candidates is largely due to the exclusion of a number of insufficiently prepared students from the examinations.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 19.—Sir Archibald Geikie, K.C.B., president, in the chair.—Sir James **Dewar**: Atomic specific heats between boiling points of liquid nitrogen and hydrogen.—I. The mean atomic specific heats at 50° absolute of the elements a periodic function of the atomic weights.—Hon. R. J. **Strutt**: An active modification of nitrogen produced by the electric discharge. V. (1) An improved practical method of preparing and storing nitrogen for the experiments is described. (2) It is shown, notwithstanding criticisms of certain other experimenters, that the presence of traces of oxygen in the nitrogen used is not essential, or even favourable, to the phenomena. The nitrogen used, purified by cold phosphorus, does not contain oxygen to the extent of one part in 100,000. Passing it over red-hot copper in addition makes no difference. The intentional addition of oxygen does harm; 2 per cent. obliterates the effects altogether. Hydrogen and carbon dioxide as impurities are much less harmful, but traces even of water vapour have a very bad effect. (3) Nitrides are formed by the admixture of active nitrogen with vapour of mercury, cadmium, zinc, arsenic, sodium, and sulphur. These are decomposable by water or potash solution, yielding ammonia. (4) Carbon disulphide yields a blue polymeric nitrogen sulphide, and polymeric carbon monosulphide. Chloride of sulphur gives ordinary yellow nitrogen sulphide. Stannic chloride and titanium tetrachloride also yield solid products. In the latter case nitrogen was proved to be present. (5) All organic compounds tried, except carbon tetrachloride, yield hydrocyanic acid freely, but not cyanogen, as was proved by chemical tests. When chlorine is present, cyanogen chloride is formed. Benzene yields (almost certainly) cyanobenzene. (6) The intensity of the cyanogen spectrum with organic compounds is no index of the quantity of hydrocyanic acid being formed. Preponderance of the red cyanogen bands is associated with cyanogen chloride or bromide. On a general view of the evidence, there does not appear to be any definite connection between the development of spectra by active nitrogen and the chemical actions in progress.—Dr. J. A. **Harker** and Dr. G. W. C. **Kaye**: The electrical emissivity and disintegration of hot metals. Preliminary experiments have been carried out on the volatilisation and electrical emissivity of a number of metals, mostly in nitrogen at reduced pressures. The metals were heated by alternating current and no applied potential was employed. (1) The emission of positive electricity occurs at temperatures from about 1000° to 1400° C. For metals which melt within this range, a sudden and marked increase in the positive current often occurred at the liquefying point—due, probably, to the sudden release of occluded gas. (2) Oxygen appears to augment the positive current. (3) At higher temperatures, negative electricity predominates and increases rapidly with the temperature. The negative current attained with iridium at the melting point was 80 milliamperes, with tantalum at 1670° C. 220 microamperes, with iron at the melting point 90 microamperes. In the case of carbon in air at atmospheric pressure, an ionisation current of $3\frac{1}{2}$ amperes was obtained. (4) The negative current at moderate pressures appears to be largely increased if the conditions are such that considerable sputtering of the metal occurs. (5) The negative currents are probably a consequence of chemical reaction between the metal and the surrounding gas. (6) Carbon becomes plastic in the neighbourhood of 2500° C. At such temperatures it also readily sublimes.—Dr. A. O. **Rankine**: A method of measuring the viscosity of the vapours of volatile liquids, with an application to bromine. In this method of determining viscosities the rate of transpiration of the vapour through a capillary tube is controlled by the vapour pressures of the liquid itself, a difference of pressure being established in the process of virtually distilling the liquid through the capillary. The pressures can be estimated without the use of mercury gauges—a state of affairs especially desirable in the case of the halogens. The viscosities of unsaturated bromine vapour over the approximate range 10° C. to 250° C. have been measured, and, except at the lowest temperatures, are found to agree well with Sutherland's formula, not-

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withstanding the fact that all the temperatures are below the critical.—E. E. Fournier **d'Albe**: The efficiency of selenium as a detector of light. The efficiency of a selenium preparation used as a detector of light is defined as the amount of additional conductivity imparted to it by the unit of incident light. Since many factors affect the efficiency of a given selenium bridge, standard conditions are chosen, chief among them being an illumination of one lux. The law of light action is studied, and the total effect is shown to be proportional to the square root of the incident energy, while the instantaneous effect is proportional to the energy. This is verified down to an illumination of 0·00001 metre-candle. It is shown that selenium is the most efficient light detector known, that it is capable of discriminating minute differences of luminous intensity far beyond the capacity of the eye, and that, with suitable means of detecting minute currents, it should offer a means of testing the quanta theory of light by direct experiment.—A. E. **Oxley**: The Hall effect in liquid electrolytes. Experiments have been made on aqueous solutions of copper sulphate, silver nitrate, cadmium sulphate, and on copper sulphate gel. Each substance was placed in a small cell of glass or mica, and was subjected to a uniform magnetic field. A Paschen galvanometer was used to measure the transverse potential difference. In a uniform magnetic field this transverse potential difference is due partly to a true Hall effect (depending on the difference of the ionic mobilities), and partly to a concentration Hall effect (depending on the sum of the ionic mobilities). The latter effect is primarily the one which has been measured in this research, and the former, which is smaller, is included. Eight experiments have been made, and the transverse potential differences, which changed sign on reversal of the magnetic field, have been found to agree with the calculated values. The relation between the transverse potential difference and the intensity of the magnetic field, for an aqueous solution of copper sulphate, is linear.—Prof. W. B. **Morton**: The displacements of the particles and their paths in some cases of two-dimensional motion of a frictionless liquid.—S. **Chapman**: The diurnal variations of the earth's magnetism produced by the moon and sun.—Prof. H. A. **Wilson** and Marjorie **Wilson**: The electric effect of rotating a magnetic insulator in a magnetic field.—A. **Hopwood**: The magnetic materials in claywares. The author has found that white, cream, grey, yellow, buff, red, or brown claywares are feebly or moderately magnetic owing to the presence of unfused grains of unchanged ferruginous minerals and fused globules of complex ferruginous silicates; while flashed, brindled, or blue claywares are always strongly magnetic owing to the presence of complex ferruginous silicates and finely disseminated magnetic oxide of iron. The origin of the complex ferruginous silicates in claywares is quite different from that of the magnetic oxide of iron. While the latter is produced either by the orientation of the magnetite, originally present in the clays, or by the reducing action of the kiln gases on the precipitated or colloid oxides, hydroxides, or carbonates of iron disseminated throughout the clays, the former are produced by the fusion of the granular or concretionary ferruginous minerals, *i.e.* iron pyrites, siderite, hæmatite, magnetite, biotite, &c., occurring in the clays with the surrounding matrix.—A. **Hopwood** and C. **Weizmann**: Synthesis of the anhydrides of α-aminoacyl glucosamines.—H. S. **Jones**: The flexure of telescope mirror-discs arising from their weight, and its influence upon resolving power.—Prof. W. H. **Young**: Fourier series and functi of bounded variation. In the present communication it is shown that in a number of fundamental theorems the derived series of the Fourier series of a function of bounded variation may take the place of the Fourier series of a summable function, and this even when the function of bounded variation is not continuous, or still less an integral. In particular, the coefficients of such a series may be used as convergence factors, with results which approximate to, or are even identical with, those obtained when the convergence factors are the coefficients of a Fourier series. The use of these convergence factors transforms, in fact, when the function of bounded variation is odd, a Fourier series into a Fourier series, and an allied series into a Fourier series when the function of bounded variation is even.—Prof. W. H. **Young**: A condition that a trigonometrical series should have a certain form. In the present communication a necessary and sufficient condition that a trigonometrical series should have a form in which its coefficients are expressible in terms of Stieltjes integrals with respect to a function of bounded variation is obtained.—Prof. W. H. **Young**: Trigonometrical series the Cesaro partial summations of which oscillate finitely.

PARIS.

Academy of Sciences, June 25.—M. F. Guyon in the chair.—M. **d'Arsonval**: Some remarks on the papers read at the meeting at Toulouse of the Congrès national du Froid.—J. **Guillaume**: The present sun-spot minimum. During the seventy-three days from April 12 to June 23 no spot has been noted on the sun's disc.—A. **Tian**: An experimental determination of the light energy absorbed in a photochemical reaction. A description of a null method based on the use of a thermopile. In the photochemical decomposition of hydrogen peroxide there is no proportionality between chemical action and the energy absorbed, even when the light used contains no infra-red rays.—Jacques **Carvallo**: A photo-electric phenomenon presented by liquid sulphur dioxide. In a preceding communication it has been shown that liquid sulphur dioxide submitted to a constant potential difference between two platinum electrodes is traversed by a current which tends to a constant limit. This phenomenon is sensitive to the action of light: each exposure causes a sudden decrease in the current. The effects have been proved to be due to ultra-violet rays.—Thaddée **Peczalski**: A relation between the law of compressibility of gases and the coefficients of expansion.—André **Léauté**: The high-frequency oscillations in very short electric arcs. From the experiments described a new position is proposed for safety fuses in connection with high-tension circuits.—P. Th. **Muller** and R. **Romann**: The electrolytic dissociation of a salt, governed by the mass law. A study of the conductivity of solutions of piperidine cyanacetate. For this salt the ionisation, measured by the conductivity of the solution, is governed by the law of mass action.—Marcel **Boll**: The photochemical decomposition of solutions of oxalic acid in presence of uranyl nitrate. The electrical conductivity measurements showed that the reaction was unimolecular, the solution being illuminated with monochromatic light. The energy absorbed during the reaction is much lower than the quantum of Einstein.—Marc **Landau**: The phenomenon of photocatalysis. All compounds of uranium possess marked photocatalytic properties; there is no relation between the values for the photocatalytic power and the radioactive power of these compounds. Catalysis takes place even when the uranium compounds used as catalysers are insoluble.—E. **Rengade**: The melting points, specific heats, and heats of fusion of the alkali metals. Measurements of these three constants are given for sodium, potassium, rubidium, and

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cæsium. The value of L/T was about 1·68 for all four metals.—Léon **Guillet** and Victor **Bernard**: Variations of the resilience of copper and of some of its alloys as a function of the temperature. Curves are given for copper, six brasses, cupro-nickel, German silver, and two aluminium bronzes.—René **Dubrisay**: The neutralisation of chromic acid.—Paul **Pascal**: Remarks on the additivity of the physical properties in the organometallic series.—A. **Colani**: Study of the chloro-oxalate of thorium.—J. B. **Senderens**: Oxidation of the alcohols under the influence of heat alone. Ethyl, *iso*butyl, and *iso*amyl alcohols are rapidly oxidised by air at temperatures between 380° C. and 450° C. Ignorance of this fact has led to catalytic properties being erroneously assigned to certain substances.—G. **Favrel**: A new series of *iso*pyrazolones.—G. **André**: The relation of the mineral acids and bases in plant tissues.—C. **Gerber**: The latex of *Ficus coronata*, an incomplete plant pancreatic juice, without amylase, and with proteolytic diastase predominating. Comparison with *Ficus carica*.—De **Gironcourt**: The Gironcourt Expedition, 1908–9. The botanical results. Specimens were collected in Dahomey, Nigeria, Togo, and the Gold Coast.—Paul **Dop**: The cytology of the micropylar suckers of the albumen of *Veronica persica*.—M. **Guilliermond**: The formation of anthocyan in the middle of the mitochondria.—E. **Michel-Durand**: Variations in the carbohydrates of leaves in the course of development.—L. **Bordas**: Anatomical and histological considerations on the Malpighian tubes of some Orthoptera.—L. **Léger** and O. **Duboscq**: The evolutive cycle of *Porospora portunidarum*.—J. **Bridré** and A. **Boquet**: Anticlavelous vaccination with sensitised virus. Duration of the immunity: applications to vaccination.—A. **Trillat** and M. **Fouassier**: The contamination of milk by the typhoid bacillus through water. Milk is an extremely favourable medium for the development of the typhoid bacillus.—R. **Fosse**: The detection of urea in plants. Urea can be precipitated by xanthydrol in plant extracts, heating or concentration of the solution being unnecessary.—L. **Lagane**: The action of hydrogen peroxide on the amylase of human milk.—H. **Guilleminot**: The law of the biological action of filtered and non-filtered X-rays.—Carl **Renz**: The discovery of the Trias and the Jurassic in the Kopais Mountains (Central Greece).—J. **Vallot**: The velocity of glaciers in winter. The velocity of a glacier is the same in winter and summer.

BOOKS RECEIVED.

Das Radium und die Radioaktivität. By Dr. M. Centnerszwer. Pp. 96. (Leipzig and Berlin: B. G. Teubner.) 1.25 marks.

Protective Inoculation against Cholera. By W. M. Haffkine. Pp. 98. (Calcutta: Thacker, Spink and Co.; London: W. Thacker and Co.) 3 rupees, or 4*s*. 6*d*. net.

L'Aviation. By Prof. P. Painlevé, Prof. E. Borel, and C. Maurain. Sixième édition. Pp. viii+298. (Paris: F. Alcan.) 3.50 francs.

Geologischer Führer in die Umgegend von Halle a.d.S. By Prof. H. Scupin. Pp. viii+142. (Berlin: Gebrüder Borntraeger.) 2.60 marks.

Text-Book of Zoology. By H. G. Wells and Dr. A. M. Davies. Seventh Impression (sixth edition). Revised by J. T. Cunningham. Pp. viii+487. (London: W. B. Clive.) 6*s*. 6*d*.

Geological Survey of Alabama. Monograph 8: Economic Botany of Alabama. Part i., Geographical Report on Forests. By R. M. Harper. Pp. 228. (Alabama: The University.)

Elementary Tropical Agriculture. By W. H. Johnson. Pp. xi+150. (London: Crosby Lockwood and Son.) 3*s*. 6*d*. net.

The British Bird Book. Edited by F. B. Kirkman. Section XI. Pp. 189–404+plates. (London and Edinburgh: T. C. and E. C. Jack.) 10*s*. 6*d*. net.

A Laboratory Guide to the Study of Parasitology. By W. B. Herms. Pp. xv+72. (London: Macmillan and Co., Ltd.) 3*s*. 6*d*. net.

The Chemistry of Rubber. By B. D. Porritt. Pp. vii+96. (London: Gurney and Jackson.) 1*s*. 6*d*. net.

Orthopædics in Medical Practice. By Prof. A. Lorenz and Dr. A. Saxl. Translated by Dr. L. C. P. Ritchie. Pp. xvi+288. (London: J. Bale, Ltd.) 7*s*. 6*d*. net.

DIARY OF SOCIETIES.

FRIDAY, JULY 4.

GEOLOGISTS' ASSOCIATION, at 8.—A Geological Reconnaissance on the East Coast of the Victoria Nyanza: Dr. Felix Oswald.

MONDAY, JULY 7.

ARISTOTELIAN SOCIETY, at 8.—Annual Meeting.—The Philosophy of Probability: Dr. A. Wolf.

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