THE authorities of the University College of Wales, Aberystwyth, at the request of several county education committees, have organised a series of short courses for teachers and others at the college during the month of August next. Classes in the following, among other, subjects have been arranged: geography and nature study, rural science, and hygiene and temperance. A special course in geographical survey, nature survey, and allied subjects will be held under the joint auspices of the Provisional Committee for the Development of Regional Survey and the Department of Geography in the Aberystwyth University College. Prof. H. J. Fleure will give a course of lectures on the geography of western civilisation, and Mr. W. E. Whitehouse courses on map-reading, and local climatic surveys. The course in rural science is intended primarily for teachers in rural schools, and will include lectures on agriculture and land surveying by Mr. A. E. Jones, on agricultural chemistry by Mr. J. J. Griffith, and on school horticulture by Mr. J. L. Pickard. All inquiries with regard to the summer school should be directed to the registrar at the college.

COMMEMORATION day at Livingstone College was celebrated on June 3. The former principal and founder of the college, Dr. C. F. Harford, who is at present an officer in the Royal Army Medical Corps, presided. The secretary of the London Missionary Society, in the course of an address, said the training given at the college enables men to look after their own health, and that is an important point. In the first ten years of the history of the London Missionary Society's mission in Central Africa, eleven of the missionaries died and six were invalided home, and with one exception were never able to return to their work. In the last twelve years there has not been a single death in the mission, nor a single case of a man being invalided home. The average term of service of the first ten men who were sent to Central Africa was well under three years; for the last ten men sent to Central Africa, already their average term of service is more than fourteen years, and their average age about forty. The men have learned what Livingstone College teaches, the care of their own health, hygienic conditions, the need for building their houses in a healthy position and not on the side of a lake because it is a beautiful spot, the need for trying to drain the land round their houses, to avoid mosquitoes, the need for taking care of their heads when they are out in the sun.

THE pamphlet entitled "Suggestions for the Teaching of Elementary Science, including Nature Study," just issued by the Board of Education (Circular 904, price 1*d.*), is intended to supersede earlier suggestions on the same subject. It is a clear and practical guide, which embodies the experience of the most enlightened teachers of elementary science, and particularly of nature study. The needs of both teachers and scholars are considered sympathetically, and no more gratifying recognition of the value of nature study has, so far as we know, ever been printed in this country. Experimental science is, of course, treated slightly in the earliest stages of school life, but the beginnings of all kinds of science are here discussed with knowledge and insight. Hints to those who are called upon to prepare lessons in nature study are much more abundant than in the earlier editions, and being both practical and engaging, may be expected to kindle enthusiasm for the work. Of the many distinct merits which we find in the suggestions before us, none is more salutary than the spirit in which they are conceived and expressed. The Board of Education does much to encourage those who, during the last five-and-twenty years, have striven to improve school methods in elementary science, and we warmly recommend its counsels, not only to teachers in public elementary schools, but to all who teach children. Had the suggestions been locked up in a big report, we should have quoted some of the more remarkable passages, but the whole document can be bought for a penny and read in an hour; to enthusiastic teachers the task will be a pleasant one.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, May 25.—Prof. E. W. MacBride, vice-president, in the chair.—S. **Hirst**: A minute blood-sucking mite belonging to the family Gamasidæ. The mite was found on Couper's snake in the Society's Gardens, and is described as a new species of the genus Ichoronyssus.—H. R. **Hogg**: The spiders of the family Salticidæ, collected in Dutch New Guinea by the British Ornithologists' Union and Wollaston expeditions. One new genus and eleven new species were described.—G. A. **Boulenger**: The snakes of Madagascar, Comoro, Mascarenes, and Seychelles. The fauna of these islands is remarkable for the absence of snakes dangerously poisonous to man, with the exception of two sea-snakes known from the western part of the Indian Ocean. The paper contained a complete list of the species known to inhabit these islands, with keys to the identification of the genera and species.—Dr. F. E. **Beddard**: *Toenia tauricollis* of Chapman and on the genus Chapmannia. Dr. P. **Chalmers Mitchell**: The anatomy of the Gruiform birds, *Aramus giganteus*, Bonap., and *Rhinochetus kagu*. It was shown that *A. giganteus* resembled *A. scolopaceus* very closely in the details of its muscular and bony anatomy, and that the genus Aramus, in these respects, was very close to the true cranes.

Physical Society, May 28.—Dr. A. Russell, vice-president, in the chair.—Dr. H. S. **Allen**: Numerical relationships between electronic and atomic constants. Jeans has pointed out that hc, where h is Planck's constant and c is the velocity of light, has the same physical dimensions as the square of an electric charge. Lewis and Adams have suggested a relation between these quantities of the form

$$ch = \sqrt[3]{\frac{8\pi^5}{15}}(4\pi e)^2,$$

which may be written

$$\frac{2\pi e^2}{hc} = \frac{(15/\pi^2)^{\frac{1}{3}}}{(4\pi)^2} = q,$$

where q is $7{\cdot}28077 \times 10^{-3}$. The square of this numerical constant is $p = 5{\cdot}30096 \times 10^{-5}$. The charge e on an electron in E.S.U. is found to be, within 0·1 per cent., $9p \times 10^{-6}$. The ratio e/m of the charge to the mass is found to be $p \times 10^{22}$, with the same order of accuracy.—H. **Moore**: A method of calculating the absorption coefficients of homogeneous X-radiation. The action of X-radiation when passing through a gas is to liberate electrons from the gas. The number of electrons emitted by any atom in a beam of X-rays is proportional to the fourth-power of its atomic weight (or possibly its atomic number). Thus, equal numbers of atoms of different elements, when subjected to similar X-ray beams, will liberate amounts of electronic radiation proportional to the fourth powers of the atomic weights of the elements.

The absorption coefficients are proportional to the amounts of electronic radiation liberated, and, therefore, the absorptions of two elements, when equal numbers of atoms are present, will be proportional to the fourth powers of their atomic weights. The corpuscular radiation liberated in the vapour of an element if it could be obtained as a monatomic vapour at 76 cm. can be expressed as $1{\cdot}05 \times 10^5 \times (\text{atomic weight})^4$, taking the corpuscular radiation in air as unity. The absorption coefficient of such a vapour would, therefore, be this number of times the coefficient of absorption of air for the same type of X-radiation. The absorption of any element is proportional to the number of atoms present, and having calculated the absorption in a hypothetical vapour of this type, the absorption in the same element in any condition can be calculated by a simple density law. This is done for several elements (metals), and also, assuming an additive law, it has been calculated for some compounds. The agreement between the calculated values and the values obtained by different observers by direct experiment is close over a considerable range of radiations and absorbers.—Prof. O. W. **Richardson**: Two experiments illustrating novel properties of the electron currents from hot metals. The first demonstrates the cooling of a tungsten filament when an electron current is allowed to flow from its surface. This effect is analogous to the cooling due to latent heat when a liquid evaporates. An experimental lamp containing a fine filament of double tungsten is placed in one arm of a balanced Wheatstone bridge actuated by the current which heats the wire. When the electron current is allowed to flow, by completing a side circuit from an electrode inside the lamp to a point in the adjacent arm of the bridge, the galvanometer is deflected in a direction which corresponds to a reduction of the resistance (and temperature) of the hot filament. The second, in which a similar experimental lamp is used, demonstrates the flow of electron currents from a hot filament to a surrounding cylinder *against* various opposing P.D.'s up to about 1 volt. On account of the large currents from tungsten this effect can easily be shown on a galvanometer. The data can be used to find the velocities of the emitted electrons.—Prof. Ernest **Wilson**: Experiments on high permeability in iron. 1. When iron is subjected to a strong magnetic force it has the effect of reducing the permeability and increasing the hysteresis loss for given values of the magnetic induction. The effect can be largely removed by careful demagnetisation. It was thought that the earth's magnetic force might also have a polarising influence upon exposed iron, and an effort has been made to remove it by placing the specimen in a magnetic shield, and carefully demagnetising it. The permeability corresponding to small values of the magnetic induction is thereby considerably increased, and the hysteresis loss diminished. After a long period of rest in the shield the permeability has diminished, and on taking the specimen out of the shield it maintains its high value. 2. As regards higher forces, the specimen in this case is not shielded, but is subjected to a magnetising force during the time that it is allowed to cool through the temperature of recalescence. Either with an alternating or steady magnetic force a maximum value of the permeability of more than 10,000 is obtained. The material has been tested in the form of laminated squares or rings. With straight strips 8 cm. long, 1·5 cm. wide, and 0·053 cm. thick, built into the form of test pieces, the effect, though produced, could not be maintained, and the specimen with ordinary handling was reduced to the normal state.—T. R. **Merton**: An experiment showing the difference in width of the spectrum lines of neon and hydrogen. By "crossing" a Fabry and Perot étalon with a single prism spectroscope it is possible to discriminate between lines arising from different elements, by the "visibility of the fringes." In the experiment a vacuum tube containing neon and hydrogen is examined in this way. The neon lines, being narrow, show sharp interference fringes, but for the hydrogen lines, which are broader, the limiting order at which interference can be seen is too low for fringes to be visible.

CAMBRIDGE.

Philosophical Society, May 10.—Prof. Newall, president, in the chair.—W. H. **Mills**: 1. The ketodilactone of benzophenone-2 : 4 : 2′ : 4′-tetracarboxylic acid. 2. The synthesis of 1 : 5-dibromo-3-*iso*propylpentane.—Dr. H. B. **Fantham** and Dr. Annie **Porter**: Further experimental researches on insect flagellates introduced into vertebrates. Herpetomoniasis can be induced in various warm- and cold-blooded vertebrates when the latter are inoculated or fed with herpetomonads occurring in the digestive tracts of various insects. The infection produced and the protozoal parasites found in the vertebrates resemble those of human and canine leishmaniases. An infection can also be induced in certain vertebrates when they are fed or inoculated with *Crithidia gerridis*, and both flagellate and non-flagellate stages occur therein, but no transition to a trypanosome was found. The following Flagellata have proved pathogenic to warm-blooded mammals when the latter have been fed, or inoculated subcutaneously or intraperitoneally with them: *Herpetomonas jaculum*, *H. stratiomyiae*, *H. pediculi*, and *Crithidia gerridis*. The hosts used were mice of various ages. That *H. ctenocephali* can infect dogs has already been shown by the authors. *Herpetomonas jaculum* and *Crithidia gerridis* have also been successfully fed or inoculated into cold-blooded hosts, namely, fishes (*Gasterosteus aculeatus*), frogs, toads, lizards (*Lacerta vivipara*), and grass snakes (*Tropidonotus natrix*). The authors believe that leishmaniases are arthropod-borne herpetomoniases, and that these maladies have been evolved from flagellates of invertebrates (especially herpetomonads of insects) which have been able to adapt themselves to life in vertebrates.—Sir G. **Greenhill**: Note on Dr. Searle's experiment on the harmonic motion of a rigid body.—W. A. D. **Rudge**: The electrification given to the air by a steam jet.

DUBLIN.

Royal Dublin Society, May 18.—Prof. Wm. Brown in the chair.—Prof. G. T. **Morgan** and G. E. **Scharff**: Certain preliminary experiments in the utilisation of peat tar. Specimens of peat tar obtained from the hydraulic scrubbers of a producer plant burning peat were distilled fractionally and subjected to a preliminary chemical examination. The distillates consisted in the main of neutral (non-acidic) oils, containing a notable proportion of unsaturated compounds. The presence of these unsaturated substances was manifested by the following properties: absorption of bromine or of atmospheric oxygen, decolorisation of permanganate and interaction with chromic or nitric acid. The fraction boiling at about 300° deposited, on cooling, crystals of wax melting at 35–42°; this material, when thoroughly drained from oil, was almost colourless. On washing the crude oils distilled from peat tar with dilute mineral acid a small proportion of ammonia was removed, together with pyridine and other organic bases. Extraction of the crude oils with aqueous alkali hydroxides and subsequent treatment of the alkaline liquor with dilute mineral acid led to the separation

of a considerable proportion of acidic (phenolic) oil. This material was redistilled and divided into three main fractions. The first fraction (b. p. 100–200°), when emulsified with gum acacia and compared with carbolic acid in regard to its germicidal action on *Bacillus typhosus*, gave a carbolic acid coefficient of 7. The second fraction (b. p. 200–250°), under similar conditions, gave a carbolic acid coefficient of 17, whereas the third fraction (b. p. 250–360°) gave a coefficient of 31. The phenolic substances present in these fractions couple readily with *p*-nitrodiazonium salts, forming dark red azo-derivatives, and they also give distinctive colorations with a 4-triazo-3:5-dimethylpyrazole, a reagent which has been found to furnish characteristic colours with aromatic hydroxy-derivatives (Morgan and Reilly, *Trans. Chem. Soc.*, 1914, vol. cv., 442). These tests indicate that phenol oils' immediate homologues, the cresols, are concentrated in the fraction of lowest germicidal power, and that the active substances present in the two higher fractions are evidently more complex substituted compounds of phenolic character.—Prof. Wm. **Brown**: The subsidence of torsional oscillations and fatigue of nickel wires when they are subjected to the influence of alternating magnetic fields of frequencies up to 250 per second. The fatigue of nickel wire is increased as the rigidity is increased, and for a wire of given rigidity the maximum fatigue is not increased beyond a certain value when the frequency of the applied alternating magnetic field is increased nearly three times, but the fatigue takes place in a shorter period of time. In soft nickel wire there is a great difference in the subsidence of torsional oscillations due to the application of a longitudinal magnetic field and an equivalent alternating magnetic field, but the difference is small when alternating magnetic fields of frequencies 50 and 250 per second are applied.—Louis B. **Smyth**: On the faunal zones of the Rush-Skerries Carboniferous Section, Co. Dublin. This coast section was described and zoned by Matley and Vaughan in two papers (*Quart. Journ. Geol. Soc.*, 1906 and 1908). Owing to the scanty and poor material collected, certain parts of the exposure were only tentatively assigned to zones. Further collection has now cleared up their position as follows:—Rush slates (lower) Z_2, Rush slates (upper) and Rush conglomerate (lower) C_1, Rush conglomerate (upper) C_2, Carlyan and Kate limestones CS (a confirmation, in the main, of the former correlation). Lane limestone C_1, Lane conglomerate C_2, Holmpatrick limestone CS (all three previously placed in "? D of unknown position"). The Holmpatrick limestone is found to have a fauna closely resembling that of CS beds at Arnside, Westmorland.

PARIS.

Academy of Sciences, May 31.—M. Ed. Perrier in the chair.—J. **Boussinesq**: The problem of the cooling of the earth's crust considered according to the method and ideas of Fourier.—Maurice **Hamy**: A reduction formula for prismatic spectra. Starting with the result of M. Salet that any wave-length λ can be expressed with a high degree of approximation by the formula $\lambda-\lambda_0=h\tan k(l-l_0)$, in which λ_0, l_0, h, k are constants and l is the reading of the micrometer screw of the dividing engine used in measuring the photograph of the spectrum. A simplified expression for λ as a function of l is given, as precise as that of M. Salet, but much less laborious.—J. **Guillaume**: Observations of the sun made at the observatory of Lyons during the first quarter of 1915. Observations were made on fifty-eight days, and tables are given of the results, showing the number of spots, their distribution in latitude, and the distribution of the faculæ in latitude.—Arnaud **Denjoy**: The descriptive theory of numbers derived from a continuous function.—M. **Glagolev**: The spectrum of the homogeneous secondary X-rays.—A. **Leduc**: Remarks on the proportion of oxygen in the atmosphere, according to MM. Guye and Germann. The author considers that 20·8 per cent. of oxygen found at Geneva is too low.—A. **Boutaric**: The velocity of reduction of potassium permanganate by oxalic acid. The reaction has been studied by a spectrophotometric method based on the absorption by the permanganate. Under the conditions of these experiments the logarithmic law does not hold true; the velocity of the reaction is not proportional to the quantity of permanganate existing in the solution.—Ph. **Flajolet**: Perturbations of the magnetic declination at Lyons (Saint Genis Laval) during the first quarter of 1915.—M. **Salet**: The law of dispersion of prismatic spectra. The measurement l of the distance of a line is related to the wave-length λ by the relation $\lambda=a\tan(bl+c)+d$. The differences between the calculated and measured values of l are of the same order as the experimental error (0·002 mm.).—J. **Wolff** and Mlle. Nadia **Rouchelmann**: Oxidation and reduction phenomena in the chromogens of plants.—Ch. J. **Gravier**: Phenomena of replacement after mutilation of corals from great submarine depths.

BOOKS RECEIVED.

With the Flowers and Trees in California. By C. F. Saunders. Pp. x+286. (London: Grant Richards, Ltd.) 7*s*. 6*d*. net.

Electricity for the Farm. By F. I. Anderson. Pp. xxiii+265. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 5*s*. 6*d*. net.

Mechanical Drawing, with Special Reference to the Needs of Mining Students. By J. Husband. Pp. 79. (London: E. Arnold.) 3*s*. net.

The Electric Dry Pile. By C. E. Benham. Pp. 37. (London P. Marshall and Co.) 1*s*. net.

Amœbiasis and the Dissenteries. By Dr. L. P. Phillips. Pp. xi+147. (London: H. K. Lewis.) 6*s*. 6*d*. net.

Volumetric Analysis. By A. J. Berry. Pp. 137. (Cambridge: At the University Press.) 6*s*. 6*d*. net.

Domestic Science. By C. W. Hale. Part I. Pp. xi+327. (Cambridge: At the University Press.) 3*s*. 6*d*. net.

The Ferns of South Africa: Containing Descriptions and Figures of the Ferns and Fern Allies of South Africa. By T. R. Sim. Second edition. Pp. ix+384 and plates. (Cambridge: At the University Press.) 25*s*. net.

Report for 1914 on the Lancashire Sea-Fisheries Laboratory at the University and the Sea-Fish Hatchery at Piel. Edited by Prof. W. A. Herdman. Pp. 240. (Liverpool: C. Tinling and Co., Ltd.)

Emma Darwin: a Century of Family Letters, 1792–1896. Edited by her daughter, Henrietta Litchfield. 2 vols. Vol. i., pp. xxxi+289; Vol. ii., pp. xxv+326. (London: John Murray.) 21*s*. net.

Canada. Department of Mines. Mines Branch. Report on the Non-metallic Minerals used in the Canadian Manufacturing Industries. by H. Fréchette. Pp. viii+197. Peat, Lignite, and Coal. By B. F. Haanel. Pp. xv+261. (Ottawa: Government Printing Bureau.)

Aeroplanes and Dirigibles of War. By F. A. Talbot. Pp. xi+283. (London: W. Heinemann.) 3*s*. 6*d*. net.