new spheres of usefulness in the furtherance of the fruitful arts of peace. Three centuries ago Francis Bacon censured the universities of his own age as the homes of ignorant dogma and sterile disputation. The bad and narrow tradition which was then attacked has long since disappeared, and the circle of academic studies has been steadily enlarged by the pressure of scientific ideas and of practical needs without injury to the claims of a broad and humane education. When estate management, horticulture, and commerce are included in the curriculum, a university can no longer be described as a place in which nothing useful is taught. It is right and fitting that the new faculty of commerce should be linked to the London School of Economics, which has for many years enjoyed the reputation of being one of the principal centres of economic inquiry in my Empire, and I regard it as no less appropriate that a university situated at the very heart of our commercial system should now resolve to turn the dispassionate and illuminating eye of science upon the facts and principles of commercial life."

Societies and Academies.

LONDON.

Royal Society, May 20.—Sir J. J. Thomson, president, in the chair.—Prof. J. N. **Collie**: Some notes on krypton and xenon. In the paper the measurements of a considerable number of new spectroscopic lines at the red end of the spectrum are given; also a curious property of xenon has been noted. In tubes containing xenon, when a strong current from an induction coil is passed, much splashing of the electrodes occurs, and the xenon disappears as a gas. What becomes of the xenon is not clear, as it does not seem to be liberated again, either by strongly heating the metallic splash or by dissolving up the splash in suitable solvents.—Sih **Ling Ting**: Experiments on electron emission from hot bodies. Experiments on the electron currents from a platinum disc in a uniform field made by Prof. Richardson in 1907–9 showed that under the conditions of these experiments the distribution of velocity among the emitted electrons was very close to the requirements of Maxwell's law for a gas of equal molecular weight and temperature, but it was noted at the time that rough tests made on the liquid alloy of sodium and potassium, on platinum coated with lime, and on platinum saturated with hydrogen indicated an exceptional behaviour. The further investigation of these substances was postponed owing to technical difficulties and to the pressure of other problems. In 1914 Schottky investigated the electrons emitted from tungsten and carbon, and found a distribution of energy in close accordance with Maxwell's law, except that the mean energy varied between 2 per cent. and 25 per cent. in excess of that calculated from the filament temperatures. Errors in the estimation of these temperatures and in other directions might, however, have accounted for these discrepancies. The present experiments show that deviations from Maxwell's law, if not general, are at any rate quite common. With tungsten and platinum in a well-exhausted enclosure a common distribution is one which satisfies the requirements of Maxwell's law, except that the average electron energy is in excess of (frequently about twice as great as) that corresponding to the temperature of the source. Other cases have been recorded in which the velocity distribution has a different functional form.—L. **Silberstein**: The aspherical nucleus theory applied to the Balmer series of hydrogen. The general formulæ for spectrum emission by atomic systems containing an aspherical nucleus, given by the author in a previous paper (*Phil. Mag.*, vol. xxxix., p. 76), are now applied to hydrogen atoms the nuclei of which are treated as axially symmetrical charged distributions. The asphericity and the value of the Rydberg factor are determined from Mr. Curtis's observations of Hα up to Hγ. The series formula thus resulting (and containing but two constants) is shown to agree well with the six observations. The value of the asphericity coefficient is then used to determine the fine structure of the members or groups of the Balmer series, more especially of the groups Hα and Hβ, which are discussed in some detail.—T. E. **Stanton**, Miss D. **Marshall**, and Mrs. C. N. **Bryant**: The conditions at the boundary of a fluid in turbulent motion. Observations were made on air flowing through long pipes of circular cross-section at mean rates of flow covering as wide a range as possible below and above the critical speed. Dimensions of pipes used were 0·269, 0·714, and 12·7 cm. in diameter. Range in experimental conditions varied from $vd/\nu=460$ to $vd/\nu=325{,}000$, where v is mean speed of flow, d diameter of pipe, and ν kinematic viscosity of air. Estimation of velocity of fluid in neighbourhood of boundary was made from observations of difference in pressure existing in a small Pitot tube facing the direction of flow, and that in a hole in the wall of the pipe. The Pitot was of rectangular section, external dimensions at orifice being 0·1×0·8 mm. and internal dimensions 0·05×0·75 mm. By this means observations could be made up to a distance of 0·05 mm. from the wall. For distances less than this, by a special device the wall of the Pitot nearest the wall of the pipe was cut away and its place taken by the wall of the pipe. By this means observations could be taken at a distance of 0·01 mm. from the walls. From a comparison of the curves of velocity distribution near the boundary, obtained from observations with the Pitot and the composite tube, it was found that in the case of the former the interference with the flow near the orifice by side of tube adjacent to boundary was considerable. Velocity curves obtained from the composite tube, when further corrected for interference, were found to tend to a definite slope at boundary, which was identical with that which would exist in a layer of fluid in laminar motion and having the same surface friction as that actually measured.

Linnean Society, May 6.—Dr. A. Smith Woodward, president, in the chair.—Dr. G. P. **Bidder**: Sponges. (1) The fragrance of calcinean sponges. Clathrinidæ have a noticeable aromatic scent, probably due to the excretory granules which give their bright colours. These granules especially surround the pores. May this be to attract the spermatozoa? The author has not seen the fine-lashed spermatozoa of Poléjaeff, but in Sycon has observed a stiff-tailed organism—possibly the result of curious gregarine-like objects produced in cells resembling gonocytes. (2) *Syncrypta spongiarum* (wrongly assigned to Pandorina in his MS.) the author gives as a name to the "alga" abovementioned. He suggests that it is a dangerous parasite, against which *Grantia compressa* has a successful phagocytosis, but that certain other sponges are hosts for its Palmella stage. (3) Notes on the physiology of sponges. (*a*) Cercids, proposed as a name for the "minute wandering cells." (*b*) Cessation of the current in sponges. (*c*) Differences between Calcinea and Calcaronea in their porocytal granules and odour. (*d*) The excreta of collar-cells are gelatinous globules containing dark particles. Probably Dendy is right in comparing these to the "spermatozoon-heads" of Poléjaeff, which may be the ultimate residue of victorious

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phagocytosis. (*e*) Origin of sponges. Archæocytes may have been differentiated into external excretory cells and internal reproductive cells; the former engulfed cercids, but only to pass them on to the latter. By abbreviation of this process the excretory cells may have become self-perforating porocytes, which were then adapted to supply water to flagellate cells in the centre of a Protospongia-like colony, thus converting it into an elementary Olynthus.

Royal Meteorological Society, May 19.—Mr. R. H. Hooker, president, in the chair.—Dr. Griffith **Taylor**: Agricultural climatology of Australia. The author, after indicating briefly the diversity of climates in Australia, pointed out the extreme importance of the rainfall, more so than in most other countries, as the controlling factor in the settlement of the country; also that the season at which rain falls and the certainty of its occurrence (its "reliability") were as important as the total amount. The greater proportion of the wheat-lands lay in regions receiving less than 20 in. of rain per annum, while the crop can be grown with as little as 7 in. if it falls at the right time. Sugar-cane is confined to the eastern coast, where the rainfall exceeds 40 in. and the temperature 68° F. The hay crop is also important, and in dry seasons when the grain fails includes a large bulk of cereals. Ninety per cent. of the sheep are in the south-eastern third of the continent; a rainfall of at least 10 in. and a temperature below 77° are required for them. Cattle are reared more in the north-east. The great variability of the rainfall frequency results in serious droughts and consequent failure of the cereal crops and reduction of flocks and herds; but it is hoped that these recurrent losses will become less serious in time with the progress of irrigation, though Dr. Taylor is not sanguine that irrigation will open up to settlement the enormous areas that seem to be anticipated by some writers.—J. E. **Clark** and H. B. **Adames**: Report on the phenological observations for the year 1919. The dominant factors in 1919 were the excessive wetness until April and drought in May and early June, lasting or reappearing until October or later. The abnormally warm December of 1918 was followed by four months universally cold, closing with heavy snow in the last week of April. Then hot summer weather in May and early June preceded a detrimental six weeks or more of abnormal cold. Cold recurred after August, culminating in a November deficiency beyond most records. In consequence, summer-growing garden crops (such as celery and cauliflower) were poor and most field crops short, though fairly good, especially potatoes. Of tree-fruits only plums and apples cropped heavily, the latter ripening and colouring to a degree rarely known, and excelled only by the wonderful autumn tints—both, no doubt, due to the dry and sunny autumn. As to the tables, the four earliest flowers were nine days late, but the effect of May was to make the last four decidedly early. The early migrants were late, especially the nightingale. The 1919 isophenes were seven days further south than in 1918. The number of observers has been further reduced from war effects, barely exceeding 100, but 1920 prospects are such that at least a 100 per cent. increase is probable. The areas worst represented are Wales, the south-west of Ireland, and the north-west of Scotland. Observers from these parts will be most welcome.

MANCHESTER.

Literary and Philosophical Society, April 20.—Sir Henry A. Miers, president, in the chair.—W. J. **Perry**: The origin of warlike States. In previous papers the author has put forward the theory that, speaking generally, warlike States are those with an hereditary military aristocracy. In an examination of the ruling groups of the chief historical peoples, Teutonic, Turko-Tartar, Semitic, the facts suggest their beginning as small groups claiming divine descent. These groups seem to be of "matriarchal" origin, and the chief religious feature was the cult of the Great Mother. Just after the new groups of rulers had been formed, the institutions became patrilineal, and the Great Mother was replaced by gods. Study of the practice of heraldry verifies the author's theory. This law of "dynastic continuity," if true, leads to the conclusion that all ruling classes in the world are derived from one original group; and this result harmonises with Prof. Elliot Smith's claim that all civilisation originated in the Ægypto-Sumerian region.

PARIS.

Academy of Sciences, May 10.—M. Henri Deslandres in the chair.—C. **Guichard**: Networks and congruences conjugated with respect to a linear complex.—Prof. W. H. Perkin was elected a correspondant for the section of chemistry in succession to M. Ciamician, elected foreign associate.—P. **Boutroux**: A family of multiform functions defined by differential equations of the first order.—M. **Janet**: Systems of equations of derived partials.—G. **Cerf**: The analysis of anti-symmetrical tensors and the symbolic forms of differentials.—C. **Camichel**: Application of the principle of images to water-vessels.—Th. **De Donder** and H. **Vanderlinden**: New fundamental equations in generalised co-ordinates.—J. **Carvallo**: A new universal method of measuring and compensating instrumental astigmatism.—A. **Kling** and A. **Lassieur**: The separation of tin and antimony. The estimation of tin by cupferron. The antimony is separated as sulphide in hydrofluoric acid solution, boric acid added to the filtrate to convert the hydrofluoric acid into fluoboric acid, and the tin precipitated by cupferron.—F. **Bourion** and Ch. **Courtois**: A method of modified enrichment in the analysis of commercial chlorobenzenes. Some refinements on a method described in an earlier communication.—G. **Tanret**: Pelletierine and methyl-pelletierine. Hess and Eichel were unable to isolate the optically active alkaloid pelletierine, and could only obtain the inactive isomer *iso*pelletierine; hence they propose that the name *iso*pelletierine should be dropped. In the present paper experimental confirmation of the work of Ch. Tanret on the optically active alkaloid is given.—A. **Mailhe**: A new preparation of amines by catalysis. The hydrazines obtained from acetaldehyde, *iso*butyraldehyde, and from valeraldehyde heated with hydrogen in presence of nickel give mixtures of primary, secondary, and tertiary amines.—A. **Guébhard**: The planet Mars and "igneous sedimentation."—R. **Souèges**: The embryogeny of the Solanaceæ. Development of the embryo in Nicotiana. Nine diagrams are given showing the principal steps in the development of the embryo. The statement of Hanstein, that the embryo of Nicotiana develops according to laws comparable with those observed in Capsella, is shown to be inexact.—A. **Chevalier**: Researches on the Amygdalaceæ and the apple-trees of the cooler parts of Indo-China and of the south of China.—A. **Piedallu**, P. **Malvezin**, and L. **Grandchamp**: The treatment of the blue *casse* of wines. Oxygen gas in very minute bubbles, produced by forcing the gas under pressure through the walls of a porous porcelain filter, can rapidly convert the ferrous salts into ferric salts. The wines clarify readily, and are reduced to a normal state.—L. **Bertin**: Remarks on the buccal and feeding apparatus in some Coleoptera.—P. **Courmont** and A. **Rochaix**: The action of the microbial flora of sewage effluents purified by the activated-sludge method on carbohydrates.

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May 17.—M. Henri Deslandres in the chair.—G. **Bigourdan**: Lechevalier at the Observatory of Saint-Geneviève. The co-ordinates of this observatory.—M. **Hamy**: A particular case of diffraction of the images of circular stars of large diameter.—L. E. Dickson was elected a correspondant for the section of geometry in succession to M. Cosserat, elected non-resident member.—P. **Humbert**: The general solution of the system which satisfies the function W (x, y).—N. **Pipping**: A criterion for real algebraical numbers, based on a direct generalisation of Euclid's algorithm.—J. **Drach**: The spiral compensator and new problems of the mechanics of regulation. The spiral compensator of M. Guillaume, obtained by addition of a third or a fourth metal to an iron-nickel alloy, is the first example of a solid the elasticity of which increases with the temperature. The application of this to the control of chronometer balance-springs is discussed, and reasons are given for supposing that the chronometer will equal the astronomical clock in accuracy.—Ch. **Frémont**: The genesis of cracks in certain axles.—P. **Morin**: The study of flow over a weir with the aid of chronophotography.—M. **Battestini**: The optimum magnification of a telescope. The magnification of a reading telescope should be reduced proportionally to the square root of the illumination of the field.—L. **Thielemans**: Calculations and diagrams of lines carrying energy to great distances.—G. **Bruhat**: The properties of fluids in the neighbourhood of the critical point and the characteristic equations.—J. **Villey**: The discussion of Michelson's experiment.—C. **Zenghelis** and B. **Papaconstantinos**: The acceleration of the decomposition of hydrogen peroxide by colloidal rhodium. From measurements of the velocity constants the reaction is shown to be unimolecular. If the solution of colloidal rhodium is treated with a current of hydrogen or carbon monoxide the reaction is accelerated.—F. **Bourion**: The impurities of the benzene extracted from commercial chlorobenzenes. Normal hexane and heptane have been isolated, and also chloroform, from benzene extracted from commercial chlorobenzene.—C. **Matignon** and Mlle. **Marchal**: The prolonged action of carbon dioxide on silicates and quartz. Six minerals and glass were submitted to the action of a solution of carbon dioxide in water under a pressure of 10 atmospheres for a period of ten years and three months. The quantities of silica in solution were estimated, and the minerals after this exposure examined microscopically for evidence of attack. Quartz, wollastonite, mica, talc, dioptase, and asbestos showed signs of corrosion. With glass the corrosion was scarcely perceptible.—J. **Bougault** and J. **Perrier**: The action of hydrocyanic acid on glucose: Kiliani's reaction. In solutions faintly acid, even as weak as hundredth normal, the combination between hydrocyanic acid and glucose does not take place, and this would also appear to be the case in neutral solution. A slight alkalinity, even as small as that derived from the glass containing vessel, determines the reaction, which is therefore probably between glucose and alkaline cyanide. The reaction between potassium cyanide and glucose was quantitatively studied, and proved to be bimolecular.—L. **Cayeux**: The Hettangian iron minerals of Burgundy. The iron mineral at Beauregard is not oolitic, but the whole of the oxide of iron is a substitution product for calcium carbonate.—Ph. **Négris**: The alternatives of the Glacial and inter-Glacial epochs during the Quaternary period.—G. **Ferronnière**: An Eifel laver of the Basse-Loire synclinal.—A. **Boutaric**: The intensity of nocturnal radiation at high altitudes.—E. **Rothé**: A new electrical anemometer. For observations of wind velocities at high altitudes the anemometer is carried in a small captive balloon, and the anemometer vane serves as an interrupter, which at each contact puts in action a small electrical oscillator. At the base of the cable holding the balloon is a small receiving apparatus for detecting wireless signals. The indications of several instruments fixed at different heights up the cable can be received simultaneously.—G. **André**: The exosmosis of the acid principles and sugars of the orange.—P. **Bugnon**: The structure of certain fibro-vascular bundles in the stems of the Graminaceæ.—H. **Piéron**: The variation of the energy as a function of the time of stimulation for peripheral vision.—A. **Mayer**, H. **Magne**, and L. **Plantefol**: The reflexes provoked by irritation of the respiratory passages. Action of the general exchanges of the organism. The irritation of the terminations of the trigeminal nerve in certain mammals has the effect of causing, for more than half an hour, a reflex diminution of the general exchanges of the organism. These may be lowered to a value very small compared with the normal.—A. **Desgrez** and H. **Bierry**: Nitrogen equilibrium and lack of vitamines.—R. **Hovasse**: The number of chromosomes in parthenogenetic tadpoles.—M. **Delage**: Remarks on the preceding communication.—J. **Legendre**: The food *régime* of *Carassius auratus* in Madagascar.

Books Received.

The Story of a Cuckoo's Egg. By H. Terras. Pp. 95. (London: The Swarthmore Press, Ltd.) 6*s*. net.

A Primer of Air Navigation. By H. E. Wimperis. Pp. xiv+128. (London: Constable and Co., Ltd.) 8*s*. 6*d*. net

The Identification of Organic Compounds. By the late Dr. G. B. Neave and Prof. I. M. Heilbron. Second edition. Pp. viii+88. (London: Constable and Co., Ltd.) 4*s*. 6*d*. net.

The Blind: Their Condition and the Work being done for them in the United States. By Dr. H. Best. Pp. xxviii+763. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 21*s*. net.

Australian Meteorology: A Text-book, including Sections on Aviation and Climatology. By Dr. Griffith Taylor. Pp. xi+312. (Oxford: At the Clarendon Press.) 12*s*. 6*d*. net.

Keys to the Orders of Insects. By F. Balfour-Browne. Pp. vii+58. (Cambridge: At the University Press.) 7*s*. 6*d*. net.

Beauty and the Beast: An Essay in Evolutionary Æsthetic. By S. A. McDowall. Pp. vii+93. (Cambridge: At the University Press.) 7*s*. 6*d*. net.

Thermodynamics for Engineers. By Sir J. A. Ewing. Pp. xiii+383. (Cambridge: At the University Press.) 30*s*. net.

A Text-book of Physiology. By Prof. R. Burton-Opitz. Pp. 1185. (Philadelphia and London: W. B. Saunders Co.) 32*s*. 6*d*. net.

Intermediate Text-book of Chemistry. By A. Smith. Pp. vi+520. (London: G. Bell and Sons, Ltd.) 8*s*. 6*d*. net.

An Elementary Treatise on Differential Equations and their Applications. By Prof. H. T. H. Piaggio. Pp. xvi+216+xxv. (London: G. Bell and Sons, Ltd.) 12*s*. net.

Problems in Physical Chemistry: With Practical Applications. By Dr. E. B. R. Prideaux. Second edition. Pp. xii+294. (London: Constable and Co., Ltd.) 18*s*. net.

La mort et son mystère: Avant la Mort. By C. Flammarion. Pp. 401. (Paris: E. Flammarion.) 6.50 francs net.

An Introduction to Entomology. By Prof. J. H.

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