with that of other animals or plants. By this means the Library Commissioners are making the collection of real service in elementary education.

THE Scottish Education Department has formulated a scheme whereby an agricultural college is to be instituted, to take over the functions of the agricultural department of the Glasgow and West of Scotland Technical College and the Kilmarnock Dairy School. The special grant of 2000*l.* voted for agricultural education in Scotland, and now administered by the Scotch Education Department, has been distributed in various amounts to four institutions, two being those mentioned and the two others the Edinburgh School of Rural Economy and the Agricultural Department of Aberdeen University. It has, however, long been felt that the grants to these institutions ought to be reinforced by contributions from local authorities in order to place the institutions in a position to exercise a more decided influence upon the progress of agriculture in Scotland than has yet been possible. Several County Councils having recently promised support, in some cases of a very substantial kind, to an independent agricultural college in the West of Scotland, the Scotch Education Department prepared a scheme for such an institution, and it has been accepted by the various bodies concerned. The college will give facilities for the most thorough and highly developed instruction in agriculture to those students who are able to devote a considerable time to this study, and should at the same time be a means of bringing home to the agricultural population of the districts concerned the latest results of agricultural research.

THE degree of Doctor of Philosophy was conferred in 1898 upon 224 candidates by twenty-three universities in the United States. An analysis of the statistics referring to these doctorates is given in *Science*, together with the names of those who received the degree in science, and the titles of their theses. Of the 224 degrees, 72 were in the humanities (under which are included philology, grammar, literature and philosophy), 37 were in history and economics, and 115 in the sciences. Six universities, Johns Hopkins, Columbia, Yale, Chicago, Harvard and Pennsylvania, conferred 169 degrees—more than three times as many as all the other United States universities combined. Columbia gave this year decidedly the largest number of degrees in the sciences, while Harvard is the only one of these universities in which the degrees in the humanities were more numerous than in the sciences. The distribution of students among the different sciences was as follows:—Chemistry, 32; psychology, 15; mathematics, 13; botany, 11; zoology, 11; physics, 7; education, 5; geology, 5; sociology, 5; palæontology, 4; astronomy, 2; mineralogy, 2; physiology, 1; bacteriology, 1; meteorology, 1. It will be noticed that chemistry leads very decidedly. While no definite conclusion can be drawn from the results, it may be noted that at Johns Hopkins more than half the scientific degrees are given in chemistry. This science also leads at Yale and Harvard. Psychology and education are especially strong at Columbia. Chicago stands first in zoology and in physiology.

THE Technical Instruction Committee of the Oxfordshire County Council have presented their annual report on the work of the schools and institutions aided by them during the past year. The Committee has been recognised by the Department of Science and Art as the organisation responsible for science and art instruction within its area. No grants will therefore be made by the Department to the managers of new schools and classes unless they are acting in unison with the Committee. The managers of all the schools and classes in the county which are receiving Science and Art grants have agreed to come within the new organisation. With regard to rural agricultural instruction, the Committee report that at the Chipping Norton Agriculture Class, under Mr. W. Warne, there were seventy-six students, of an average age of 39·5. They were factory hands, labourers, mechanics and small tradesmen, who all cultivated allotments. One thousand and twenty attendances were made at twenty-four meetings. The subject of the course was "Insects as friends and foes to agriculture." To illustrate how agriculture is being gradually developed by the work of the science lecturers, the Committee report that from advice given by Mr. Stewart, at Minster Lovell, in his lectures, an acre of strawberries was planted. This year a much larger area was laid down there. It is hoped that an industry in soft fruit is now started in that locality. At the same place a fruit farm of three acres was laid out two years ago on Mr. Stewart's advice. It was so successful that now twelve acres are laid out. At Stoke Row, eight tons of filberts last year were saved by the treatment given to the nut weevil, and last year the currant bushes were afflicted by the currant mite, but spraying the bushes enabled four tons to be marketed. Codlin moth and apple-blossom weevil attacked the apple trees, but Mr. Stewart's treatment saved the trees. When agriculturists are brought in this way to see the practical side of scientific knowledge they begin to understand the value of the science of agriculture.

SCIENTIFIC SERIALS.

American Journal of Science, July.—Velocity of electric waves in air, by G. V. Maclean. The author describes an elementary type of coherer suitable for the Hertzian experiment of determining wave-lengths from nodes produced by metallic reflection. It consists of two globules of platinum, 1 mm. in diameter, attached to the ends of two platinum wires forming spirals about two iron terminals which run through the centre of the two brass caps of a glass tube 8·5 cm. long. The globules can be adjusted to any small distance from each other. The velocity of propagation, determined from the wave-length and the period of oscillation, is $2{\cdot}991 \times 10^{10}$ cm. per second, or practically the same as along wires.—Spiral fulgurite from Wisconsin, by W. H. Hobbs. A lightning tube forming a perfect dextrorotary helix has recently been presented to the geological collection of the University of Wisconsin. It was found embedded in a sand knoll about ten feet high, at a distance of five feet below the surface. The tube is as thick as a man's thumb, and five inches long. The fulgurite from Waterville, Maine, described by Bayley in 1892, also shows a dextrorotary structure. The author suggests that this twist is somehow connected with the electrical conditions under which the tubes were produced, and guesses at an influence of the earth's magnetic field upon the path of the lightning.—The mouth of Grand River, by E. H. Mudge. The mouth dealt with is not the present Grand Haven, but another point seventy miles inland from the shores of Lake Michigan, which was the termination of the old river valley. At one time a great glacial stream, three-fourths of a mile in width, flowed across the peninsula from Lake Saginaw to Lake Chicago. This stream has been called the Pewamo outlet. The author describes its course and the river-mouth deposits about the old mouth.—Electrical measurements, by H. A. Rowland and T. D. Penniman. The authors have tested six out of the thirty different methods of measuring self-induction and capacity indicated by Rowland. The methods for the comparison of the two self-inductions, or a self-induction and a capacity, are independent of the period of the alternating current used, and an accuracy of 1 in 10,000 can be attained.—Reflection of Hertzian waves at the ends of parallel wires, by L. de Forest. The author uses a compromise between the Lecher and the Blondlot wire systems, and investigates the relation between the change of phase in reflection from bare ends of various shapes, and the frequency.

Wiedemann's Annalen der Physik und Chemie, No. 6.—Observation of fringes in the development of Daguerre plates with wedge-shaped silver iodide layers, by O. Wiener. A silver plate was iodised in two wedge-shaped layers by laying it on a glass tube during exposure to the iodine vapour, the layer thus being made to increase in thickness from the line of contact outwards. A spectrum with the slit normal to the lines of equal thickness was then photographed on the plate, and it was found that the sensitiveness varied periodically with the thickness, maxima occurring whenever the surface coincided with a ventral segment of the electrical force, produced by reflection at the boundary dividing the iodide from the metallic silver.—Experiments on certain flow formations, by K. Mack. Deals with the deformations of fungoid flow structures by gravitation, and the deformation of horizontal layers of liquid by ascending fungoid structures.—Influence of gaseous pressure upon electric currents due to Röntgen rays, by W. Hillers. Near the pressure at which the gaseous resistance reaches a maximum, the current intensity varies as the square root of the pressure.—An electrolytic current interrupter, by A. Wehnelt. This is a reprint of the author's original paper from the *Elektrotechnische Zeitschrift*.—Action of the Wehnelt interrupter, by H. T. Simon. The author formulates what he claims to be a complete mathematical

theory of the Wehnelt interrupter. Between the period T and the E.M.F. E he obtains the relation

$$T = A + \frac{B}{E^2}$$

which is closely borne out by experiment.—Magnetic properties of the elements, by S. Meyer. The author attempts to connect the permeabilities of the elements in the pure state with their atomic weight. When arranged in periodic series, the paramagnetic elements are seen to group themselves in the centre, and the diamagnetic elements at the ends. The scheme is at present very rough, owing to the difficulty of determining the permeabilities of the rare elements.—Transverse tones of caoutchouc threads, by V. von Lang. When caoutchouc threads are stretched, the pitch of the note emitted by them remains constant between certain lengths, owing to the fact that the ratio of length to tension is constant. The author investigates how far Taylor's formula applies to such threads.—Accurate control of the frequency of an alternating current, by J. Zenneck. The alternate current is made to produce a rotary field, to which the kathode beam in a Braun tube is exposed. The end of the beam describes a circle on the screen, which is interrupted by a tuning-fork twice during every revolution. As long as the dots thus produced are on the same diameter the frequency is constant.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 7.—M. Maurice Lévy in the chair.—On rolling motion; equations of motion analogous to those of Lagrange, by M. Appell. The Lagrange equations cannot be applied without modification to those dynamical problems in which the relations between the solid bodies are such that they are allowed to roll or are pivoted on each other. In a system of three independent parameters q_1, q_2, q_3, the equations of motion are reduced to the form $\frac{\partial S}{\partial \dot{q}_1} = Q_1$, where Q_1 is a function of the forces to which the bodies are submitted, and $S = \frac{1}{2}\Sigma m J^2$, J being the acceleration of the point m.—Thermochemical determinations: ethylenediamine, by M. Berthelot. Measurements are given for the heats of combustion and formation of cholalic acid, amygdalin, conicine, and ethylenediamine.—On ammoniacal silver nitrate, by MM. Berthelot and Delépine. A thermochemical study of the action of ammonia solution upon a solution of silver nitrate. The oxide of silver-ammonium is shown to be an alkali, with a heat of neutralisation comparable with those of the most energetic mineral alkalis.—On the expansion of iron and steel at high temperatures, by M. H. Le Chatelier. The table of expansions given for soft iron and six specimens of steel, at temperatures ranging between 0° and 700°, shows that the differences in the expansions of the various specimens are within the limits of experimental error; up to about 750°, iron and steel expand similarly. But above the temperature of molecular transformation the expansion of the different specimens of steel varies very rapidly with the amount of carbon present, an increase of carbon from 0·05 to 1·2 per cent. doubling the coefficient of expansion.—Action of chlorine on a mixture of silicon, silica, and aluminium, by M. Émile Vigouroux. A good yield of pure silicon tetrachloride may be obtained by first heating together a mixture of silica (200 gr.) and aluminium (100 gr.) to a dull red heat, cooling the mass and extracting with acids. The residue, thus freed from aluminium, contains from 14 to 22 per cent. of silicon, and readily gives the pure tetrachloride on treating with chlorine in the usual way.—Action of hydrogen phosphide upon copper oxide, hydrate and carbonate, by M. E. Rubénovitch. The reaction with the oxide is energetic, and takes place according to the equation

$$5PH_3 + 10CuO = 2P_2Cu_5 + H_3PO_4 + 6H_2O.$$

Copper hydrate behaves similarly, if the gas is admitted in such small quantities that the temperature of the reaction cannot rise to incandescence. With basic copper carbonate the reaction is

$$5PH_3 + 5CuCO_3.Cu(OH)_2 = 2Cu_5P_2 + H_3PO_4 + 5CO_2 + 11H_2O.$$

—On the estimation of mannose in admixture with other sugars, by MM. Em. Bourquelot and H. Hérissey. The authors apply the property possessed by mannose of giving an insoluble hydrazone in the cold to the estimation of this sugar. The numerous test analyses, some on pure mannose, others on mixtures of the same with galactose and maltose, are very satisfactory.—On some properties of dioxyacetone in respect to its molecular aggregation, by M. Gabriel Bertrand. Dioxyacetone appears to exist in two forms, one in crystals, having a molecular weight $2(C_3H_6O_3)$, which is practically insoluble in cold alcohol, ether, or acetone; the other, formed by simply melting the crystals, has the simple formula $C_3H_6O_3$, and is very soluble in these solvents. Water slowly dissociates the bimolecular form, but not so rapidly as to prevent cryoscopic measurements being made in confirmation of the above views.—On the variations in the production of glycerol during the alcoholic fermentation of sugar, by M. J. Laborde. In the numerous experimental results quoted, the glycerol found varied from 2·5 to 2·75 grams of glycerine per 100 grams of sugar decomposed. The same yeast, living in saccharine media of the same concentration of sugar, may give very varying amounts of glycerol, the production being in inverse proportion to the activity of the yeast. A rise of temperature favours an increase in the amount of glycerol.—On the anatomical structure of *Vanilla aphylla*, by M. Édouard Heckel. A comparison of the anatomical characters of the stems of *V. aphylla* and *V. phalaenopsis* shows such great differences that it is impossible to class them together in the same genus. The author also points out that the theory adopted by Herbert Spencer, in his "Principles of Biology," to explain the formation of monocotyledonous stems, is strongly supported by the fact of the simultaneous presence in the stem of *V. aphylla* and the leaves of *V. phalaenopsis* of the same cellular elements constituting the skin.—The *Piralahy*, the india-rubber weed of Madagascar, by M. Henri Jumelle.—On the external border of the Briançonnais between Freyssinières and Vars, by MM. W. Kilian and E. Haug.—On the pot-holes of the granitic islets of the cataract of Assouan, by M. Jean Brunhes.

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