at present possessed by the universities, and place them in a position of dependence on the Government. Although it is intended that the new regulations shall only come into operation gradually as new appointments are made, and shall not be applicable to the professors who already occupy chairs, the effect has been to cause so much uneasiness in university circles that the Government may possibly abandon the proposal.

THE annual general meeting of the Association of Technical Institutions was held on Friday last. Mr. Hobhouse, M.P., in the course of his presidential address remarked that he hoped the rising generation of agriculturists, as of other classes, would listen to the wise advice given them by such men as the Duke of Devonshire, Lord Rosebery, and Sir Henry Roscoe, and would avail themselves of every opportunity to acquire skill and apply knowledge in adapting their industry to the altered conditions of the times. As to how far this kind of instruction was to be carried, he urged that they should extend and advance their instruction as far as ever their funds would permit. It was somewhat extraordinary to see the same men who were willing to pour money out like water on new ironclads and regiments for meeting the remote contingency of an invasion by foreign troops grudge a few thousands a year for checking, and, if possible, defeating, the immediate and actual invasion of our country by foreign products and foreign workmen. As to the conditions under which technical instruction should be given, he pleaded that specialised training should not begin too early in life, but should as far as possible be based on a solid foundation of literary and general culture; and they should bear in mind the importance of a well-balanced and truly educational curriculum. They would, further, all agree that in a properly-managed institute there should be no cramming for examinations; that neither children nor adult pupils should be treated as grant-earning machines; and that they ought to aim at securing that continuous "low-pressure" system of work that was induced by enlightened and helpful inspection rather than an intermittent "high-pressure" system resulting from mechanically-conducted paper examinations.

THE Technical Education Committee of the Derbyshire County Council have already provided definite systems of applied technical instruction for agriculture and mining—the two great industries of the county, but they have found a difficulty in doing anything for the smaller and more scattered industries. For these it is often not possible to do more than provide general secondary education and instruction in scientific principles. From a report just issued by the Committee, it appears that in the north-west of the county there is, in a comparatively small area, a large development of the calico-printing industry, involving a capital expenditure of over half-a-million, and giving employment to 2000 hands. Recent inquiry has shown a definite want of technical instruction in this industry. At a meeting of manufacturers, attended by Mr. Percy Hawkridge, the Organising Secretary, it was shown that they obtain their colours from Germany, and that their composition is not known in this country by the people engaged in their use. They are bought and used in accordance with instructions supplied by the German colourist. Most of these colours are, however, definite chemical compounds derived from coal-tar. They are understood thoroughly by English chemists, and there is no valid reason why they should not be produced in this country, in association with the industries employing them. Indeed, the Committee reports that, even with the ordinary chemical appliances in use at New Mills, valuable results have been achieved. As a result of the meeting referred to, it has been resolved to ask the Derbyshire County Council to construct a laboratory to be specially devoted to this work. The scheme commends itself to the Committee on account of its decidedly practical nature, and also on account of the unique development of the calico-printing industry in the neighbourhood of New Mills.

SCIENTIFIC SERIALS

American Journal of Mathematics, vol. xix. 1 (Baltimore, January, 1897).—Theorie der periodischen cubischen Transformationen im Raume R_3, by S. Kantor, contains a full account (in 59 pages) of the theory on the lines of the same author's Theorie der endlichen Gruppen von eindeutigen Transformationen in der Ebene (1895).—Mr. Basset, in theories of the action of magnetism on light, discusses the theories of Maxwell, Fitzgerald, and Larmor. His object is twofold. First, he subjects Mr. Larmor's theory to a searching examination, and maintains that instead of being an improvement on its predecessors, it is open to a variety of additional objections and defects. In the next place, by means of a modification of the fundamental hypothesis, he proposes to show that the theory of Rowland and himself may be placed on a perfectly satisfactory basis, and that the difficulty with regard to the discontinuity of the tangential component of the electro-motive force at an interface may be removed.—In the article on the roots of Bessel- and P-functions, Mr. Van Vleck confines his attention to those functions which are symmetrical in their properties with respect to the real axis of the complex variable. The first part of his work aims at proving that between two successive positive or negative roots of $J_n = 0$ there lies one, and only one root of $J_{n+1} = 0$. He gives an extract from Gray and Mathews' treatise on Bessel Functions, but in so quoting he spells each author's name incorrectly. He proves, in the second part of his article, a similar theorem for contiguous Riemann P-functions.—Herr Kantor contributes a short note, Ueber Collineations gruppen an Kummer'schen Flächen.—Two more notelets are: note on linear differential equations with constant coefficients, by F. Franklin; and on certain partial differential equations connected with the theory of surfaces, by T. Craig, the editor.—An excellent portrait of Prof. L. Fuchs faces the title-page.

American Journal of Science, January.—The worship of meteorites, by H. A. Newton. (This lecture, delivered by the late Prof. Newton in 1889, has not hitherto been published. We hope to be able to refer to it fully in a later number.)—The spectra of argon, by J. Trowbridge and T. W. Richards. The two characteristic spectra of argon were studied by means of a high-tension accumulator of 5000 cells, which gives a more uniform discharge than either the induction coil or the influence machine. A tube 15 cm. long was filled with the gas. The red glow of argon was readily obtained with a voltage of about 2000. At higher pressures a higher voltage is required; but when the discharge has once set in, it may be continued with lower voltages. The introduction of a capacity in the circuit made no difference as long as the condenser was quiet; but as soon as the condenser began to emit its peculiar humming sound, the beautiful blue glow so characteristic of argon immediately appeared. Examined by a revolving mirror, this glow was seen to consist of intermittent discharges. The blue glow was changed to red by introducing a small coil of about 8 ohms resistance and a self-induction of ·015 henry. The same conversion may be brought about by introducing a simple resistance or self-induction, or by increasing the pressure of the gas, and consequently its resistance. The blue glow may also be produced by sending an exceedingly strong current through the tube for very short intervals. In this case it is probably the capacity of the battery itself which produces the necessary oscillations. A tube containing argon at suitable pressure shows the blue colour at once on being brought near a Hertz oscillator giving 115 million oscillations per second. The tube may be used as a sensitive detector of electric waves, and the author proposes to give it the special name of talantoscope. —Some queries on rock differentiation, by G. F. Becker. The homogeneity of vast subterranean masses, called for by the hypothesis of differentiation, is unproved and improbable. The difference between well-defined rock types are more probably due to original and persistent heterogeneity in the composition of the globe. Hypogeal fusion and eruption tend rather to mingling than to segregation, and transitional rocks may be accidental mixtures of the diverse primitive masses composing the earth's crust.—Igneous rocks from Smyrna and Pergamon, by H. S. Washington. Describes an augite-andesite rock from Mount Pagos, near Smyrna, and a biotite-dacite from Pergamon. —Revision of the genera of the Ledidæ and Nuculidæ of the Atlantic coast of the United States, by A. E. Verrill and K. J. Bush. Describes five new genera, chiefly belonging to the family of Ledidæ, from the U.S. Fish Commission dredgings. The paper is accompanied by twenty-two diagrams.—An experiment with gold, by M. Carey Lea. Of a 10 per cent. sodium hypophosphite solution, 15 cc. are placed in a beaker, and 1 cc. of a gold chloride solution containing 1 gr. of gold to 10 cc. of solution is added, and then one drop of H_2SO_4. As soon as the solution begins to darken, 30 cc. of water are added. The solution then assumes a deep green colour, due to very

finely divided blue gold suspended in the yellow solution.—Note on a new meteorite from Sacramento Mountains, Eddy County, New Mexico, by W. M. Foote. This was seen to fall in 1876. It weighs 237 kgr., and measures about 80 × 60 × 20 cm. It contains 91·39 per cent. of iron, and shows splendid etching figures.

Bulletin of the American Mathematical Society (December 1896).—Dr. W. J. A. Young reviews the "Introduction à l'étude de la Théorie des Nombres et de l'Algèbre supérieure," by Messrs. Borel and Drach. This is an interesting work founded on lectures by M. Jules Tannery. These lectures were delivered during the scholastic year 1891–2, before the students of the third year, in the École Normale Supérieure. Dr. Young characterises it as a book to be read and not to be used as a book of reference. The scanty table of contents offers but little assistance to one, who, without having read the book, or at least having familiarised himself with the details as to its contents, wishes to consult its pages on a specific question. It gives clear and concise outlines of general principles stripped of illustrations and amplification. One great blemish appears on the surface, for hardly any references are said to be given either to the original sources of the material used, or as guides to those who wish to study the subject further. Some of the references which are given are not as clear as could be wished: thus the proof of the proposition that every integer can be expressed as the sum of four or fewer squares, which is based on the properties of continued fractions, and which makes use of determinants, is assigned to Mr. Smith. To those who know this is, of course, the proof by Prof. Henry Smith. To add to the unsatisfactoriness, no indication is given of the way in which "Mr. Smith" expressed his proof. Many such blemishes (apparently) are to be met with, which mar a book of considerable value.—"Quaternions" is a highly commendatory notice of Prof. Hathaway's "Primary Quaternions," by Prof. J. B. Shaw.—Prof. Hathaway briefly discusses three recent text-books: viz. "Elements of Geometry," by G. C. Edwards; "Plane and Solid Geometry," by W. W. Beman and D. E. Smith; and "Plane and Solid Geometry" (suggestive method), by C. A. Van Velzer. Each book appears to embody some new and distinctive features.—Dr. G. A. Miller, in an article on several theorems of operation groups, continues his work on the lines of his recent contributions to the *Quarterly Journal of Mathematics* (vol. xxviii.).—"Numerically regular Reticulations upon Surfaces of Deficiency higher than 1" is a short note on a generalisation of Euler's relation for convex polyhedra, by Prof. H. S. White.—The usual interesting news, under notes and publications, closes the number.

Wiedemann's Annalen der Physik und Chemie, No. 1.—On the theory of stationary electric waves along wires, by P. Drude. Electric waves are not totally reflected by a bridge laid across the wire system. They undergo a displacement of phase and a diminution of amplitude, which depends essentially upon the ratio of the length of the bridge to that of the wave. Short waves, like those in water, are greatly damped by reflection. The absorptive power of a substance for electric waves may be measured by noting the number of nodes observable along the wire.—Treatment of high-tension accumulators, by L. Zehnder. The accumulators described by the author several years ago must not be charged by stronger currents than 0·1 ampere per cell. The creeping up of acid along the lead may be prevented by spreading the plates with vaseline while hot. The copper wires may be similarly protected from mercury by burning off the latter and covering with vaseline. An important precaution against the deterioration of the battery is never to leave the cells coupled in series or single. They should be connected in parallel when not in use.—Dielectric constants at low temperatures, by R. Abegg. The specific inductive capacities of all substances increase as the temperature falls, and it is possible to approach the high dielectric constant of water by cooling other dielectrics to low temperatures.—Magnetic induction of horizontal discs rotating in the earth's field, by F. F. Martens. Describes a new method of measuring magnetic hysteresis and viscosity, the disc being a limiting case of the ellipsoid of revolution.—Absolute thermal conductivity of air, by E. Müller. Investigates all the sources of error in the vacuum-thermometer method, and tests the variations used by Winkelmann and by Kundt, Warburg and Graetz. The former method was found unsatisfactory, and the latter, which eliminates radiation by determining it absolutely *in vacuo* and deducting it, gave values which are too small. Taking into account the residual mercury vapour and the newly-determined specific heat of the glass employed, the author finds the conductivity of air to be 0·000056 in C.G.S. units.—An attempt to separate the two constituents of cleveite gas by diffusion, by A. Hagenbach. Diaphragms of gypsum having been found unsatisfactory owing to contraction, compressed powdered graphite was used instead. The original density of the gaseous mixture being 2·315 (H = 1), that of the diffused gas was 2·032, and of the undiffused gas 2·576. The author believes that he has succeeded in a partial separation of the constituents of cleveite gas by this means.—Diffusion coefficients of some gases for water, by G. Hüfner.—Corresponding temperatures, by J. A. Groshans.—Elasticity and light, by P. Glan.

IN the *Journal of Botany* for December 1896, Mr. W. A. Clarke completes his "First Records of British Flowering Plants"; and two new species (?) of *Rubus* from Ireland are described by the Rev. W. Moyle Rogers. In the number for January 1897, Mr. W. P. Hiern gives a list of plants (flowering plants, Vascular Cryptogams, Muscineæ, and Fungi) gathered in the Isle of Man; Miss A. L. Smith describes some microscopic fungi new to or rare in Britain; Mr. J. Ll. Williams has an interesting note on the intoxicating effect produced on certain kinds of humble-bee by the honey of flowers belonging to the Compositæ and Dipsacaceæ.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, January 22.—Prof. Ayrton, Vice-President, in the chair.—Mr. Croft gave an exhibition of some simple apparatus. The exhibition included an ingenious form of clip to fit on an upright retort stand; a Nicol used for projecting the rings and brushes in crystals, with which it is sufficient to use the ordinary condenser of the lantern, the source of light having been moved further away from the lens than is usual; some photographs showing caustics, conical refraction, and diffraction; a stand for magnets, &c., when demonstrating the attraction and repulsion of poles; a stand for the suspension of objects for experiments on diamagnetism; a holder for X-ray tubes consisting of a spiral of wire fitting round the exhaustion tube of the bulb; an X-ray photograph taken by means of a Wimshurst machine; a model of Michelson's interference experiment; an arrangement to show subjective colours, in which a double lantern is arranged to give two partly over-lapping discs. A sheet of green glass is placed before one lantern, and the light of the other decreased till the illumination of the two discs is the same. The over-lap then appears white, while the remainder of the uncoloured disc appears red. Prof. Silvanus Thompson said he was surprised that "patent plate" was sufficiently good for Michelson's experiment. Had the author tried illuminating the discs, in his subjective effect experiment, for a very short interval, so that the eye should not have time to wander from one disc to the other? Mr. Griffith said that if you looked through a tube at one disc at a time, one appeared green and the other white. The Chairman said the point seemed to be, could you fatigue the eye simultaneously, or must it be successive? Prof. Silvanus Thompson said two common 1-inch microscope objectives were very suitable for projecting rings and brushes.—Mr. E. C. Baly read a paper on the passage of electricity through gases. In this paper, which is of a purely controversial nature, the author brings forward as arguments that electrical conduction in gases is not of an electrolytic nature the following: (1) That the sign of the change on the supposed gaseous ion is variable; (2) the initial resistance of a gas; (3) the invalidity of Ohm's law; (4) the permanence of the supposed gaseous electrolyte; (5) that every mixture of gases must equally be an electrolyte; (6) that the potential gradient in a vacuum-tube, when the current is passing, has been shown to be very uneven. It is very steep in the kathode glow, and is by no means a regular decline between the electrodes. Prof. Armstrong said it was difficult to know from what point of view the author had treated the question. The first part of the paper consisted almost entirely of a criticism of Prof. J. J. Thomson's theory and experiments. Prof. Thomson, however, is not the only observer who has dealt with this subject. The author's arguments seemed vitiated by the fact that he has looked upon the subject from one very narrow standpoint only, viz. the ionic hypothesis, and Lord Kelvin, for instance, does not believe in the truth of the ionic