THE following announcements are made in the *Johns Hopkins University Circular* (No. 121):—Sir Archibald Geikie has accepted the invitation of the President and Board of Trustees of the Johns Hopkins University to inaugurate the George Huntington Williams Memorial Lectureship, and has selected October, 1896, as the time for delivering his lectures.—Prof. Cleveland Abbe, of the United States Weather Bureau, will, during January next, give four lectures upon Climatology in its relations to Physiography.—Mr. G. K. Gilbert, of the U.S. Geological Survey, will begin a course of lectures upon Physiographic Geology the second week in January, and will lecture four times weekly until about the end of February.—Mr. Bailey Willis, of the U.S. Geological Survey, will commence his lectures upon Stratigraphic and Structural Geology, as soon as Mr. Gilbert has completed his course, and will lecture twice weekly until the middle of May.—Dr. R. M. Bagg has been appointed assistant in Geology.

SIR JOHN GORST, in a speech delivered last Thursday at the annual meeting of the London Society for the Extension of University Teaching, remarked that "though they were all anxious that the scientific education of the country should be fully developed, it would be a great mistake if that development were to take place at the expense of the literary side of education. A proper liberal education is fairly balanced on all sides, and no system which extends one branch of education at the expense of others can be productive of anything in the long run but mischief." Just so. We have always urged that science should receive as large a share of attention as literature in our colleges and universities; but no one can say that it does. Some of Sir John Gorst's hearers took his remarks to indicate a reaction against the increased facilities now being offered for instruction in science; but if the remarks are taken literally, they mean that scientific education should be fostered, and placed upon the same footing as the humanities.

SCIENTIFIC SERIALS.

American Meteorological Journal, November.—Relations of the Weather Bureau to the science and industry of the country, by Prof. W. L. Moore, Chief of the Weather Bureau. It is satisfactory to find that the change of Chief will not affect the scientific activity of the U.S. Weather Office, as many people supposed. Prof. Moore quotes the Act of Congress of October 1, 1890, which prescribes the duties of the Chief, from which it is seen that the main object of the Bureau is to give warning of the approach of storms, and therefore that the proper line of investigation should be relative to their mechanism. Systematic exploration of the upper air, with a continuation of the studies of terrestrial magnetic forces, begun by Prof. Bigelow, will be the line of investigation prosecuted during the next two years. With regard to estimating the probability or severity of frost, Prof. Moore thinks that sufficient weight has not yet been given to the dryness or wetness of the soil, and he calls for special attention to this point.—The meteorological observatory on Monte Cimone, Italy, by A. L. Rotch. Monte Cimone is the culminating point of the Northern Apennines, attaining a height of 7100 feet above the sea, and it is the only summit station in Italy, the observatories of Vesuvius and Etna being both situated on the flanks of these volcanoes. Both the summit and base stations are provided with self-recording instruments, and are dependent upon the Central Meteorological Office at Rome, with which there is telegraphic communication.—Physiological effects of high altitudes, by A. L. Rotch. The author points out the importance of the effect of the rarefaction of the air on the human system, which is, as yet, but imperfectly understood, and refers to his own experiences at great heights in the Alps and Andes.

Wiedemann's Annalen der Physik und Chemie, No. 10.—The practical use of Wheatstone's bridge, by F. Kohlrausch. The meter bridge is greatly improved and made more sensitive by introducing two resistances, 4·5 times the resistance of the wire, at one or both ends of it. The wire may also be rolled on a roller of marble or wood boiled in paraffin, with a flat spiral groove. With an enlarged scale reading to thousandths the author claims to have attained a limit of error of 1 in 25,000.—Density measurements of extremely dilute solutions, by the same author. These were made, as before, by weighing a glass sphere immersed in the liquid. But as the sphere used was heavier in this case, the cocoon fibre suspending it had to be replaced by a fine wire of dull platinum. The accuracy was then carried to the seventh decimal place, the only limit being the accuracy of temperature measurements.—Luminescence of solids and solid solutions, by E. Wiedemann and G. C. Schmidt. This is a continuation of previous researches on photo-luminescence and cathodo-luminescence, or the phosphorescence produced by the impact of light and cathode rays respectively on certain bodies, such as sulphates. A list of the most brilliantly luminescent substances is given, including "solid solutions," in van 't Hoff's sense, of $MnSO_4$ in other sulphates. The kind of luminescence of the latter depends only little upon the concentration, but much upon the kind of solvent. The lower the temperature the brighter the light. But the sulphates of copper, iron, and nickel extinguish it altogether, even in small quantities. The spectrum of the rays emitted is in every case a continuous spectrum consisting of one band.—On the absorption of cathode rays, by P. Lenard. The ratio between the absorptive power and the density is the same for all media, whatever their state of aggregation, provided the cathode rays are of the same kind.—Cathode rays and continuous discharges in gases, by O. Lehmann. This paper deals with the question of the actual nature of gas discharges.—The cooling effects of air currents, by A. Oberbeck. These are measured by finding what velocity of air is required to prevent the glowing of a platinum wire conveying a current. It is proposed to use this as a sensitive anemometer.—Anomalous dispersion curves, by A. Pflüger. Cyanine and Hofmann's violet have refractive indices below 1 for rays between F and G, and fuchsine, magdala red, and malachite green all show an increase of refrangibility with increase of wave-length in certain portions of the spectrum.

Bulletin de la Société des Naturalistes de Moscou, 1894, Nos. 3 and 4.—On the Ostracodes fauna of the neighbourhoods of Moscow, by A. Croneberg (in German). Twenty-three species are described, of which *Cyclocypris pygmæa* and *Erpetocypris peregrina* are new (with plates).—On the slates of Megalo-Aialo, near Balaklava, by D. P. Stremoukhoff (Russian, summed up in French). The presence of a number of Amonites, characteristic of the Bath and Kelloway strata, settles their age.—The birds of the government of Moscow, by Th. Lorenz. A list (in French) continued from a previous number.—The development of the tarsus in *Pelobatus fuscus*, by M. Chomiakoff (in German).—Two new Aphides from South Russia (*Stomaphis Graffii* and *St. macrohyncha*), by N. Cholodkovsky (in German) The microscopical structure of the electrical organ of the torpedo, by N. Iwanzoff, a large detailed work (in German), with plates in both numbers.—Yearly report of the Society.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 22.—Special meeting.—Captain W. de W. Abney, President, in the chair.—The following resolution, with reference to the articles of association, was passed. In Article 33, to strike out the words "by the payment of £10 in one sum," and in place of this to insert the words "the composition fee shall be, for every member who shall not have paid ten annual subscriptions, fifteen times the amount of the annual subscription payable by such member, and for any member who shall have already paid ten or more annual subscriptions, ten times the amount of the annual subscription payable by such member."—The ordinary meeting then took place.—Dr. G. Johnstone Stoney exhibited a print of Profs. Runge and Paschen's photograph of the spectrum of the gas obtained from clevite, together with a diagram illustrating the manner in which these observers have arranged *all* the lines obtained in two sets, each set containing three series of lines. Dr. Stoney also drew attention to the resemblance between each of these sets of three series of lines and the similar triple series obtained in the case of the metals of Mendelejeff's first group. The lines of the different series in the case of the gas obtained from cleveite have certain definite peculiarities which permit of their identification and selection. The two gases, to the presence of which the two sets of lines are presumably due, can be partly separated by diffusion through a plug of asbestos. Prof. Ramsay's observation that by suitably altering the pressure of the gas the predominance of the lines in either of the two sets can be increased is, however, against the

theory that the two gases are really separated by diffusion. Three of the original negatives taken by Prof. Rowland when preparing his map of the solar spectrum were also exhibited. Dr. Gladstone said he had examined the spectrum of the gas in two tubes, one of which had been filled by diffusion through an asbestos plug, and the helium line (D_3) was certainly brighter in one tube than in the other, though the brightness of the remaining lines appeared about the same in both tubes. As to the difficulty of allocating the new gases in Mendelejeff's table, it appeared to him (Dr. Gladstone) that they would have to be put in the first group between hydrogen and lithium. An examination of the successive differences between the atomic weights of adjacent members of the metals in the first group showed that these differences increased as we go downwards. If then the new gases have atomic weights of, say, 2 and 4, we should have for these differences 2, 2, 3, 16, 16, 26, &c., instead of 6, 16, 16, &c., as at present. The important point which required investigation was whether these two gases were really simple bodies or not. Prof. Silvanus Thompson asked if Runge and Paschen had performed a similar analysis of the lines in the spectra of other elements besides the members of the first group. He would also like to know if in the case of any element besides hydrogen the lines could be arranged in a single series. Dr. Stoney, in reply, said that the spectra of most of the metals had been analysed, the chief exceptions being iron, nickel, cobalt, and manganese. There was no other element besides hydrogen which gave a single series of lines. Prof. Herschel gave an account of a line of reasoning which had led him many years ago to a formula resembling that expressing Balmer's law for the hydrogen lines, namely, $\frac{1}{\lambda} = 1 - \frac{4}{n_2}$. The Chairman (Captain Abney) drew attention to the fact that Runge expressed his result to 1/1000th of an Angström unit, although Dr. Stoney had said the measurements could only be made to within 1/50th of a unit. There was great lack of uniformity in the method of drawing spectra in general use; he strongly recommended the placing of the red end of the spectrum to the right, so that the wave-lengths increased from left to right. As to the three series of lines obtained in the case of most elements, it was not conclusively proved that they were not due in each case to three distinct kinds of molecules, and it will probably be found that there are more than two simple gases present in the gas evolved from cleveite.—Mr. R. Appleyard read a note on the action of sulphur vapour on copper. When a copper wire is exposed for some time to the action of sulphur vapour, it becomes entirely converted into sulphide of copper, and it is found that there is a fine axial hole running down the rod of sulphide formed. Rods of copper of square section cut from a block of copper after exposure to the action of sulphur vapour also exhibited the axial hole, the rod of sulphide formed being of circular cross-section. In every case the diameter of the rod of sulphide is about twice that of the original rod of copper. Delta metal was found to be unacted upon by the sulphur vapour.—Mr. Appleyard then read a paper on a "direct-reading" platinum thermometer. This form of platinum thermometer has been devised with the view of determining the temperature of the dielectrics employed in some experiments on the variation of the electrical resistance of dielectrics with temperature. The thermometers consist of six platinum coils, each of about seven ohms resistance, attached to thick copper leads. A slide-wire Wheatstone's bridge is employed to measure the resistance. The stretched wire is three metres long, and the moving contact so arranged that it is impossible to damage the wire. The auxiliary coils used in connection with the bridge are immersed in a bath of paraffin oil, the temperature of which is maintained constant, and a little above that of the air, by means of a glow-lamp immersed in the oil. Mr. Appleyard also read a historical note on resistance and its change with temperature, in which he showed that the earliest measurements of the variation of resistance with temperature were made by Lentz in 1833. Some experiments on this subject made by Davy were also referred to, and some of these experiments repeated before the Society. Mr. Trotter said he agreed with the author, that the "reserve of precision" at our disposal, on account of the delicacy of some of the modern instruments, ought to be made use of to facilitate the rapid performance of many measurements where the utmost accuracy is not necessary. He had the impression that platinum silver was not now considered the best material for use as the bridge wire. Mr. H. F. Burstall explained the differences between the temperature as measured on the mercury, air and platinum thermometers. At a temperature of about 40° the platinum thermometer read about 0°·4, and the mercury thermometer about 0°·1 below the air thermometer. Prof. Callendar had obtained measurements of temperature correct to within 0°·1 by using a Weston voltmeter and an ordinary Wheatstone bridge the variations of resistance, and hence the temperature being read directly from the deflections on the voltmeter. Mr. Rhodes thought that, except where extreme accuracy was necessary, the mercury thermometer was very much more convenient than the platinum thermometer. Mr. Burstall said the great convenience of the platinum thermometer lay in the fact that the scale could be read at a distance of many yards from the point where the temperature was being measured, and hence could be used in many places where it would be impossible to read a mercury thermometer. Mr. Blakesley considered that the author was somewhat bold to state that for general purposes it was never necessary to measure temperature to nearer than one-tenth of a degree. The author having replied, the Society adjourned till December 13.

Mathematical Society, November 14.—Major MacMahon, R.A., F.R.S., President, in the chair.—The President announced the death of Mr. E. H. Rhodes (elected June 10, 1875), which took place on the 1st inst.—The gentlemen, whose names were published in NATURE of October 31, were, after the ballot had been taken, declared duly elected on the Council for the ensuing session.—The President stated the reasons which had led Mr. M. Jenkins, after thirty years' tenure of the office, to resign his position of Secretary, and moved a vote of thanks to that gentleman for his "devoted services of thirty years" to the Society, and coupled with the vote the hope that his health might be improved by his retirement to the country. The vote was seconded by Mr. Kempe, F.R.S., and supported by Mr. S. Roberts, F.R.S., who had been connected with the Society almost from its inception. After the vote had been unanimously carried, Mr. Jenkins suitably thanked the Society and the speakers for their good wishes and appreciation of his services. The following papers were read or communicated: On the stability and instability of certain fluid motions (iii.), and on the propagation of waves upon the plane surface separating two portions of fluid of different vorticities, by Lord Rayleigh, Sec. R.S. The two earlier papers upon the subject of these communications are to be found in the Society's *Proceedings* (vol. xi., 1880, and vol. xix., 1887).—Determination of the volumes of certain species of tetrahedron without employment of the method of limits, by Prof. M. J. M. Hill, F.R.S. Proofs are first given of the propositions: (A) that it can be shown without dissection that symmetrically equal tetrahedra are equal in volume. (B) That two tetrahedra having a common base, and being the images of one another with regard to that base, are equal. (C) That a tetrahedron, in which the line joining the middle points of two opposite edges is perpendicular to those edges, can be bisected into two superposable tetrahedra by a plane through either of these edges and the middle point of the other. By means of (B) a tetrahedron of special form is constructed, such that a prism can be built up of this tetrahedron and two of its successive images. The volume of this species of tetrahedron is then known without employment of the method of limits. Calling it ABCD, its sides are expressible in terms of two parameters a, r as follows:

$$AC = a\sqrt{9 - 3r^2}, \quad AD = BC = 2a,$$
$$AB = BD = DC = a\sqrt{1 + r^2}.$$

By means of (C) two other types of tetrahedra, whose sides are expressible in terms of two parameters, are deduced from the tetrahedron ABCD. Also by a consideration of a special case of the tetrahedron ABCD, the volumes of two tetrahedra of definite shape, not included in the above-mentioned types, are determined.—An extension of Sylvester's constructive theory of partitions, by the President. In connection with this paper the President communicated a paper by Prof. Forsyth, F.R.S., entitled, "Some algebraic theorems connected with the theory of partitions.' The paper is concerned with a general method leading to the proof of some theorems required in Major MacMahon's investigations in the partitions of numbers. They depend upon the summation of terms selected from the series, which is the expansion of particular fractions, and the summation is effected algebraically.—On the evaluation of a certain dialytic determinant, by Mr. W. W. Taylor. In a paper read before the Society in March 1894, Prof. Elliott (the author) remarked: "It

is unfortunate for the simplicity of the argument of this paper that the property of such a determinant as Δ, that after division by its obvious factors $F(\rho, 1)$, $F(\rho, -1)$, it leaves a perfect square, is one which, as far as I know, direct algebraical methods have not yet supplied." This *lacuna* Mr. Taylor supplies.—Lieut.-Colonel Cunningham, R.E., communicated a criterion of 2 as a 16^{ic} residue, and added some remarks upon certain of Mersenne's numbers.—The following papers were taken as read: Notes on matrices, by Mr. J. Brill; certain general series, by Mr. F. H. Jackson; note on the representation of a conic by a linear equation, by Mr. J. Griffiths; on the representation of a number as a sum of two squares, by Prof. G. B. Mathews; researches in the calculus of variations: part vii., limiting conditions in multiple integrals; part viii., reduction of the problem of the discrimination of maxima and minima values in double integrals with variable limits to a new problem in single integrals, by Mr. E. P. Culverwell; a note on certain forms of the equation of normals to conic sections, by Mr. J. L. S. Hatton.

PARIS.

Academy of Sciences, November 18.—M. Marey in the chair.—Truffles (*Terfezia hanotauxii*) from Teheran, by M. Ad. Chatin. The characteristics of Persian truffles and their spores are described. The name *Terfezia hanotauxii* is given to these truffles as forming a new species. The most important characters are given for comparison of the other known species of Terfezia: *T. claveryi*, *T. boudieri*, *T. hafizi*, and *T. leonis*.—On a probably new element existing in the terbium earths, by M. Lecoq de Boisbaudran. The evidence relied upon is that of an absorption band at λ 487·7, which the author fails to connect with known elements.—A memoir, by M. A. Sarrat, on a demonstration of Fermat's theorem. Impossibility of the equation $a^n + b^n = c^n$ in whole numbers, was submitted to a committee.—A note of M. J. Laborde on the causes of the formation of hail was similarly disposed of.—Observations of the sun, made at Lyons Observatory (with the Brunner equatorial) during the second quarter of 1895, by M. J. Guillaume.—On the employment of punching and shearing as methods of testing metals, by MM. L. Bacte and Ch. Fremont. A machine, called by the authors an *elasticimètre*, is described by means of which indicator diagrams are obtained which show the actual character of the instantaneous stresses developed in the operations of punching and shearing. Special test-samples are not required, the machine is applied while the material is being worked up in the ordinary way.—On a power dynamometer specially applicable to physiological studies, by M. Charles Henry.—On the origin of atmospheric oxygen, by M. T. L. Phipson. The author recalls the results of his researches on this subject, and summarises them as follows: (1) In the most distant geological periods nitrogen formed, as now, the principal part of the earth's atmosphere. (2) The presence of free oxygen in this atmosphere is entirely due to vegetation. Primitive plants were the means by which oxygen was naturally supplied to the air. (3) Plants now living are, like those of geological times, essentially anærobic. (4) As the quantity of free oxygen in the atmosphere has gradually augmented, the anærobic cell has become modified into more or less ærobic forms (fungi, bacteria), and finally has become completely ærobic (in animal life). (5) The lowest unicellular algæ give, weight for weight, much more oxygen to the atmosphere than to the superior plants. (6) In proportion with the slow increase of the relative quantity of oxygen in the air, the cerebro-spinal nervous system, the highest characteristic of animal life, has become more and more complex.—Synthesis of methyleugenol. Constitution of eugenol, by M. Ch. Moureu. Allyl veratrol is synthetically formed and shown to be methyleugenol. It follows that eugenol is an allylguaiacol.—On the cholesterines of the cryptogams, by M. E. Gérard.—On the distribution of pectase in the vegetable kingdom and on the preparation of this diastaste, by MM. G. Bertrand and A Mallèvre. Pectase may be regarded as of universal occurrence in the green plants. It is especially abundant in leaves, and probably spreads from the leaves to the other organs. The richness of certain leaves in pectase has permitted the preparation of this ferment.—Researches on the Tapidæ, by M. Piéri.—Study on the reproduction of wasps, by M. Paul Marchal.—On a morphological modification of species and on the heredity of acquired characters, by M. Rémy Saint-Loup.—On a disease of the sloe-tree contracted spontaneously by a maple, by M. Paul Vuillemin.—On the structure and optical properties of divers compact or earthy silicates, by M. A. Lacroix. The minerals studied, though apparently compact and earthy, are formed wholly or in part of a crystallised substance having many of the properties of mica.—On the optical isomorphism of felspars, by M. Fr. Wallerant.—Triassic ammonites from New Caledonia, by M. Edmond de Mojsisovics.—On the retting of flax and the microbe concerned, by M. S. Winogradsky.—On the use of viper's and adder's blood as antivenomous substances, by MM. C. Phisalix and G. Bertrand.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—A Manual of Physics: Dr. W. Peddie, 2nd edition (Baillière).—Thirteenth Annual Report of the Fishery Board for Scotland. Part 3. Scientific Investigations (Edinburgh, Neill).—Mechanics, Hydrostatics: R. T. Glazebrook (Cambridge University Press).—Cambridge Natural History. Vol. v. Peripatus, Myriapods, Insects: A. Sedgwick, F. G. Sinclair, and D. Sharp (Macmillan).—Molecules and the Molecular Theory of Matter: A. D. Risteen (Ginn, Boston).—On the Densities of Oxygen and Hydrogen, and on the Ratio of their Atomic Weights: Dr. E. W. Morley (Washington).—Elementary Inorganic Chemistry: Prof. A. H. Sexton, 4th edition (Blackie).—Earth-Knowledge: W. J. Harrison and H. R. Wakefield, Part 1, 9th edition (Blackie).—Food and its Functions: F. Knight (Blackie).—Minerals and how to Study them: E. S. Dana (Chapman).—Grundgesetze der Molekularphysik: T. H. Schwartze (Leipzig, Weber).—Sur l'Origine du Monde: H. Faye, troisième édition (Paris, Gauthier-Villars).—Essais sur la Philosophie des Sciences. Analyse-Mécanique: C. de Freycinet (Paris, Gauthier-Villars).—First Stage Mechanics: F. Rosenberg (Clive).—Observaciones de Precision con el Sextante, Conde de Cañete del Pinar (Madrid, R. Alvarez).—The Wild Fowl and Sea Fowl of Great Britain: A Son of the Marshes (Chapman).

PAMPHLETS.—Cantor Lectures on Commercial Fibres: Dr. D. Morris (Trounce).—An Account of the Smithsonian Institution (Washington).—The Exhibit of the Smithsonian Institution at the Cotton States Exposition, Atalanta, 1895 (Washington).—Christian Huygens: J. Bosscha (Leipzig, Engelmann).—The Common Crow of the United States: W. B. Barrows and E. A. Schwarz (Washington).

SERIALS.—Natural Science, December (Rait).—Longman's Magazine December (Longmans).

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