

favour of reform. Sir Ronald Ross urges that early education should be wide rather than deep, and suggests a long list of outdoor qualifications, arts, languages, and knowledges which should be the possession of an ideally trained young man of twenty. He refers to many amazing arguments which have been urged in favour of grammatical education (e.g. that to it is due the success of voluntary recruiting in Britain), and from the discussion draws the conclusions:—(1) That the first elements of Greek and Latin are necessary for every intellectual employment; (2) that a complete classical education is necessary for very few intellectual occupations; (3) that an exclusive classical education is insufficient for any such occupation; (4) that a knowledge of one or more modern languages is more useful than, and just as educative as, similar knowledge of a dead language; and (5) that a man who is entirely ignorant of science can scarcely be considered educated.

COMPULSORY Greek in university entrance examinations received little support at the meeting of the Hellenic Society on Tuesday, when the subject of "The Future of Hellenic Studies" was under discussion. Dr. Walter Leaf, who was in the chair, declared himself against this condition of entrance at Oxford and Cambridge, which are the only two Universities where Greek is made compulsory for all students; and this was also the view of most of the speakers who followed him. The discussion was intended to exhibit the claims of classical studies to continued attention as against the demands made by the advocates of the natural sciences at a meeting held last May, but the impression received from most of the speakers was that which Balak expressed after he had asked Balaam to assist him in stopping the advance of the Israelites: "I called thee to curse mine enemies, and behold thou hast altogether blessed them these three times." Prof. Conway stated that Greek need not be essential in preparatory schools or in the public schools, and could be studied very successfully by interested students after entering the university. He rightly pointed out that boys working for scholarships are not given time for science in preparatory schools or opportunity in public schools. Other speakers agreed that the knowledge of classical languages acquired by most pupils was insufficient to enable authors to be read with intelligence, and that from the point of view of influence upon life and character it would be better to devote time to the reading of translations. There was, indeed, little said at the meeting with which reasonable advocates of scientific studies would be disposed to differ, and nothing upon which a conflict between classics and science could be based. What is wanted most of all is joint action to change the attitude of the public in general towards all knowledge of which no direct commercial advantage can be seen. When this has been accomplished, and obscurantists of all kinds have been removed, it will be possible to contemplate courses of study apart from traditional or other interests, and to construct them with the sole aim of promoting the development of all that is best in the body and mind of the pupil.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 2.—Sir J. J. Thomson, president, in the chair.—Sir William Crookes: The photographic spectra of meteorites. Thirty rare earthy meteorites, mostly acquired through the courtesy of the British Museum Trustees, have been examined. The examination has revealed the presence of unexpectedly large traces of chromium in all the specimens, a condition quite different from that found in

the siderites or meteoritic irons, where chromium is practically absent. The proportion between chromium and nickel remains constant in twenty-six out of the thirty aerolites, and is clearly shown in the photographs. In three only nickel is almost absent. From the experience gained it has been possible to make a mixture containing known quantities of nickel and chromium, which, with the addition of iron, produces a spectrum in the neighbourhood of the chromium group that is practically identical with that produced by the aerolite Aubres.—Prof. H. Lamb: Waves in an elastic plate. The theory of waves in an infinitely long cylindrical rod was discussed by Pochhammer in 1876. The somewhat simpler problem of two-dimensional waves in a solid bounded by parallel planes was considered by Lord Rayleigh and by the author in 1889. The main object in these investigations was to verify, or to ascertain corrections to, the ordinary theory of the vibrations of *thin* rods or plates, and the wavelength was accordingly assumed to be great in comparison with the thickness. It occurred to the author some time ago that a further examination of the two-dimensional problem was desirable for more than one reason. The period-equation is, however, at first sight rather intractable, and it is only recently that a method of dealing with it has suggested itself. The result is to give a fairly complete view of the more important modes of vibration, together with indications as to the character of the higher modes which are of less interest.—Prof. W. H. Young: Multiple integrals. This note gives certain results and formulæ fundamental in the theory of multiple integration with respect to a function $g(x, y, \dots)$ of bounded variation (integrator). For simplicity the discussion is confined to two variables. The integrator may, without loss of generality, be taken to be a positive monotonely monotone ascending function—that is, one the monotone increase of which with respect to either of the variables has an increasing rate as the other variable increases.—Prof. W. H. Young: The order of magnitude of the coefficients of a Fourier series.—T. C. Sutton: A determination of the heat of vaporisation of water at 100° C. and one atmosphere pressure in terms of the mean calorie.—G. H. Livens: The mechanical relations of the energy of magnetisation. The usual mathematical formulation of the relations of the magnetic field leads to the same expression, viz. $\mu H^2/8\pi$, for the density of the energy associated with the field, whether this arises from rigid magnets or from steady currents; but as in the first case the energy is treated as potential energy, and in the second as kinetic energy, the apparently consistent result in the two cases really involves a discrepancy. In the present paper a new formulation of the relations is given which overcomes the difficulty of interpretation in the two cases. The fundamental change made in the work consists in the choice of the magnetic induction vector B , instead of the more usual magnetic force H , to denote the conditions in the æther.

Zoological Society, October 24.—Dr. A. Smith Woodward, vice-president, in the chair.—S. Maulik: Cryptostome beetles in the collection of the Cambridge University Museum. The collection is a representative one, containing species from all parts of the world. Three new genera, one new subgenus, and two new species are described.—H. G. Newth: Investigations into the early development of the Echinoderm Cucumaria. The larval life is very short as compared with that of the Auricularia. It takes place at the expense of the yolk, and is complete in about five days. Formation of the coelomic vesicles occurs by the bending and constriction of the archenteron. No separate anterior coelom appears. The hydrocele ring closes in the left dorsal interradius, and the radial canals and five

primary oral tentacles arise directly from it, alternating with one another. The internal madreporite arises as a secondary differentiation of the walls of the stone-canal.—**R. E. Turner**: Wasps of the genus *Pison*. One hundred and nine species are dealt with, of which fifteen are described as new. Reasons, drawn from the numerical distribution of the species in different areas, are given for supposing the genus to be in a declining state—fifty of the total number of species being from the continent of Australia. In addition to *Pison*, the small allied genera, *Aulacophilus* and *Pisonopsis*, are dealt with, one new species of the former being described.

Physical Society, October 27.—**Mr. F. E. Smith**, vice-president, in the chair.—**Dr. S. G. Barker**: The application of the Kerr effect to the determination of the saturation values for magnetism of ferro-magnetic metals, compounds, and alloys. The paper describes work carried out in the laboratory of Prof. Du Bois on the relation between the intensity of magnetisation of various ferro-magnetic materials and the rotation of the plane of polarisation of plane polarised light reflected from a polished surface of the material. The specimens, in the form of circular discs 5 mm. in diameter and 0.5 mm. thick, were soldered to one of the pole pieces of a large electromagnet. Through an aperture in the other pole monochromatic light, polarised in two nearly coincident planes by means of a Lippich polariser, was incident almost normally on the polished surface of the specimen. The reflected beam passed through an analyser, the rotation of which could be measured, by means of an auxiliary optical system, to a high degree of accuracy. In the first part of the paper results are given for a number of materials of known magnetic properties in order to establish the validity of the method, due to Du Bois, of obtaining the value of the saturation intensity from the curve connecting field strength with rotation. The method is then applied to materials of unknown properties. The variation of the Kerr constant with the wave-length of the light was also determined for a number of substances.—**D. Owen**: The influence of the time element on the resistance of a solid rectifying contact. The resistance at a solid rectifying contact, and consequently the exact shape of the resistance characteristic, depend upon the time for which the testing current is allowed to flow. A series of characteristics is given corresponding to durations of contact extending over the range one forty-thousandth of a second to thirty seconds. The following conclusions are drawn:—(1) That the variation of resistance with voltage may be attributed entirely to thermal effects. (2) That the characteristic obtained by applying the testing voltage for one hundredth of a second is, at moderate voltages, materially the same as that which would be found at the expiry of a period of the order of a millionth of a second. (3) That the sensibility of a wireless receiving circuit (in which the rectifying contact is used) does not differ very appreciably from that deduced from a slow period characteristic. (4) That an important fraction of the contact-resistance resides in a stratum of molecular thickness at the interface of the two elements of the contact; and that it is in this region alone that rectifying action at very high frequencies is effected.

Linnean Society, November 2.—**Sir David Prain**, president, in the chair.—**Prof. G. S. Boulger**: Early chapters in plant distribution. The author sketched the first glimpses in the works of Cardinal Bembo, M. de l'Obel, Sir Hans Sloane, Dr. Christian Mentzel, and J. Pitton de Tournefort. The second chapter was devoted to Carl von Linné, whose "*Flora lapponica*" and several theses in the "*Amœnitates academicæ*" were brought forward in support. Next followed

Haller, J. G. Gmelin, Buffon and Forsk., C. L. Willdenow, with a brief allusion to P. A. Broussonet.—**L. A. Borradaile**: The Pontoniinae and Carides from the western Indian Ocean.

Aristotelian Society, November 6.—**Dr. H. Wildon Carr**, president, in the chair.—**Dr. H. Wildon Carr**: Presidential address: The problem of recognition. In the experience of recognition there is an element which may be named "againness." The problem of recognition is the nature and genesis of this element. There are two forms of recognition, in each of which we meet with this element of "againness"—an intelligent form and an instinctive form. These appear to be quite separate, but the cognitive fact is the same in each. In intelligent recognition we seem able to account for the "againness" by repetition, memory, and the judgment or perception of identity or similarity—the mental process being an external act of comparison between a present sense-datum and a past. This, however, is an illusion, because in reality the essential factor, repetition, is absent. Recognition implies prior cognition, but does not depend on the presence of a memory-image of the prior cognition. Recognition is the conditionate, and not the condition, of learning by experience; learning by experience is a primary, not a dependent, fact. In instinctive recognition there can be no memory-image of the prior cognition, because this prior cognition lies beyond the individual in the racial experience. Yet in instinctive recognition we have sentience, familiarity, and pre-awareness—all of which are mental characteristics. We have, therefore, to conceive the mental process, or the mind, as a continuous organisation of experience. Past experience has not only contributed its quota to this organisation, but is incorporated within it, giving to it, and receiving from it, its character and individuality. New sentient experience in entering this organisation receives the impression of its stamp or mould, and this is the mark of the past on the present cognition which constitutes it recognition.

Mineralogical Society, November 7.—Anniversary meeting.—**Mr. W. Barlow**, president, in the chair.—**Dr. J. W. Evans**: The combination of twin operations. The question of complex twin-crystals in which two distinct laws of twinning are represented was dealt with. A distinction was made between cases in which the twin-axes are parallel or at right angles, and those in which they are inclined to one another obliquely. In the former the result of the combination is itself a twin operation, while in the latter it is a rotation, the direction of which depends on the order in which the operations are applied; it is in some cases combined with an inversion.—**Dr. J. W. Evans**: A modification of the Köhler method of determining refractive indices. The observing instrument is a microscope placed vertically and fitted with a Bertrand lens. An immersion theodolite stage of the Klein type is used so that the substance under investigation may be rotated beneath a liquid of higher refractive index about two axes, the first at right angles to the optical axis of the instrument, and the second at right angles to the first and to the plane surface of the object. This is observed through the natural surface of the liquid, and rotated in either direction until the position of total reflection is reached. By rotation of the object about the second axis the refractive indices in all directions parallel to its plane surface may be determined, and the values of the principal refractive indices thus obtained.—**A. Holmes** and **Dr. H. F. Harwood**: The basalts of the Brito-Arctic Province. The basalts from Hare Island, which were collected by Thomas Reid in 1855, include six varieties, of which four are free from olivine and carry silica among the amygdale minerals, and the remaining two contain olivine and are with-

out free silica. All the rocks are rich in titaniferous magnetite, and analyses indicate that their most noteworthy feature is the unusual abundance of titania. The analyses cannot be closely matched except by those of basalts from Scoresby Sound, Iceland, the Farøe Islands, and the west of Scotland. This paper is the first of a series in which the authors hope to describe rocks from all the important localities within the province.—Miss N. **Hosali** exhibited models of crystals constructed by herself.

Optical Society, November 9.—Mr. F. J. Cheshire, president, in the chair.—J. W. **French**: The grinding and polishing of optical surfaces. The polished surface of metals consists of a layer which covers over small scratches and pits in the underlying material. When the surface layer is removed by etching, the scratches and pits are exposed. When the polished surface of glass is etched, numerous fine scratches reappear, and it has been wrongly assumed that glass behaves like metals. For purposes of description, the original material is referred to as α glass and the modified material constituting the surface layer as β glass. Clean scratches comparable with those on metal cannot be formed on the α glass. The material splinters in the characteristic conchoidal fashion. Perfectly clean scratches can be formed in the β layer; they can be filled in by further polishing, and it is these scratches that reappear after etching. The cohesion of the silicates constituting the surface layer is too small to permit of the bridging over of pits, such as minute airbells, that are just exposed, and no evidence of any inclusion of foreign matter in the β layer scratches has been obtained. An optical glass surface is produced as follows:—The action of the pitch polisher loosens or liquefies, as it were, the surface layer of molecules, which rearrange themselves uniformly under surface tension. The polishing medium subdivides, breaks up, and removes the surface layer, thus exposing the underlying material. This process then repeats itself, and a perfect surface is obtained only by the removal of material beyond the bottom of the hollows produced in the glass during the earlier abrasion process.

PARIS.

Academy of Sciences, October 23.—M. Camille Jordan in the chair.—The President announced the death of M. E. F. Maupas, correspondent in the section of anatomy and zoology.—A. **Lacroix**: The volcanic glasses of the Cantal massif.—G. **Humbert**: Some remarkable numerical functions.—C. de la Vallée **Poussin**: The zeros of $\zeta(s)$ of Riemann.—A. **Verschaffel**: Advantages of circles both mobile and with multiple origin.—W. H. **Young**: Trigonometrical series and the means of Cesàro.—D. **Pompeiu**: Series with positive terms and the derived functions.—D. **Menchoff**: The unicity of the trigonometrical development.—J. **Guillaume**: Observations of the sun made at the Observatory of Lyons during the third quarter of 1916. Details of observations made on seventy-nine days during the quarter.—C. **Camichel**: The determination of the velocity of propagation a in high-pressure water mains.—C. **Zengheli** and S. **Horsch**: The chemical action of sodium peroxide upon hydrogen sulphide. The main product of the reaction is sulphide; polysulphides, sulphate, and thiosulphate are formed in smaller quantities.—Ph. **Flajolet**: Perturbations of the magnetic declination at Lyons (Saint-Genis-Laval) during the second quarter of 1916.—L. **Vegard** and O. **Krogness**: The results of observations of the aurora borealis carried out at the Observatory of Halde. The discussion of determinations of heights measured by photographs taken simultaneously from two points. The lower

limit of height always exceeds 85 kilometres, the upper limit from 100 to 330 kilometres.—G. **Bourguignon** and J. **Lucas**: Classification of the muscles of the superior member in man following their radial systematisation, by the velocity index of excitability.—M. **Weinberg** and P. **Séguin**: Contribution to the etiology of gaseous gangrene. A description of a new bacillus (*B. histolyticus*) which, while incapable of itself producing a gaseous infection, appears to play an important part in the etiology of certain cases of gaseous gangrene.

October 30.—M. Camille Jordan in the chair.—G. **Bigourdan**: Astronomical observations at Paris from 1632 to the foundation of the Observatory. From 1632 to 1637 work was done by Gassendi, Beaugrand, Boulliau, and Descartes. About this period there commenced scientific gatherings which later resulted in the formation of the Academy of Sciences. The solar eclipse of June 1, 1639, was observed by three different groups. The paper concludes with a tabular statement showing the more important observations made between 1653 and 1667.—H. **Le Chatelier** and F. **Bogitch**: The determination of the density of solid bodies. A discussion of the chief causes of error in density measurements of solids. The method suggested is based on the direct measurement in a narrow graduated tube of a liquid by the powdered solid. It is shown that either benzene, carbon tetrachloride, or petroleum spirit may serve as the displaced liquid, but that water is quite unsuitable.—M. **Hamy**: A reduction formula for prismatic spectra.—MM. **Costantin** and **Bois**: The varieties of vanilla.—C. de la Vallée **Poussin**: The Riemann zeros of $\zeta(s)$.—W. **Kilian**: The exact age of the "Plaine des Rocailles," near the Roche-sur-Foron (Haute-Savoie), and fluvioglacial stages of Genevois-Faucigny.—L. **Bouchet**: The variations of thickness of a caoutchouc sheet under the influence of an electrostatic field. It is proved experimentally that under the action of an electrostatic field vulcanised india-rubber contracts in the direction of the lines of force.—J. **Bougault**: The semicarbazones of the α -ketonic acids. α -Di-iodo- and α -dibromophenylbutyric acids. α -Iodo- and α -bromo-phenylcrotonic acids.—L. **Daniel**: Experimental cultures at the seashore. In the course of fifteen years plants of various kinds, transferred from Rennes to Erquy, near the sea, have acquired none of the characteristics of halophytic plants.—P. **Lesage**: Trials of the seeds of *Lepidium sativum* under varying conditions. The effects of germination in dilute potash solutions, in alcoholic solutions, in solutions of chlorides, nitrates and sulphates of potassium, sodium, and ammonium were studied. The effects of time of immersion, soaking in petrol or ether, of moist air, and of solutions of hydrogen peroxide are also given.—F. **Vincens**: A Vorticellaceæ of doubtful affinities.—M. **Baudouin**: Results of the examination of the mandible of a young infant of the polished Stone age.—W. T. **Porter**: Low arterial pressures and their treatment. Experiments on animals have proved that when the diastolic pressure is as low as 45 mm. to 50 mm., unless appropriate treatment is applied the animal dies. Observations on wounded at the front show that there is no essential difference between the effects of a low pressure in man and in animals, and the same mode of treatment can be applied with success in both cases. The means adopted are:—(1) Mechanical; (2) adrenaline; (3) injection of isotonic serum.—Ch. **Richet**: Remarks on the preceding paper.—J. **Beauverie**: Researches on the influence of the osmotic pressure on bacteria. The case of the cholera vibron.—L. C. **Bailleul** and P. **Girard**: The polarisation of the cicatricial tissue and the electrical treatment of deep cicatricial adhesions.

NEW SOUTH WALES.

Linnean Society, July 26.—Mr. A. G. Hamilton, president, in the chair.—R. J. Tillyard: Studies in Australian Neuroptera. No. 4. Descriptions of new genera and species of the families Ithonidæ, Hemero- biidæ, Sisyridæ, Berthidæ, and the new family Trichomatidæ. An attempt is made, by a critical study of the venation, to clear up the difficult question of the relationships of a mass of forms usually relegated to the Hemero- biidæ. Reasons are given for restricting this family to forms combining a number of characters, among which the principal are the number and structure of the radial sectors.—Dr. A. J. Turner: Studies in Australian Microlepidoptera. Five genera and sixty-five species of Meyrick's two groups, *Œco-* phorides and *Eulechriades*, are described as new, and a number of known species are recorded from additional localities.—Rev. W. W. Watts: Some crypto- gamic notes from the Botanic Gardens, Sydney.

BOOKS RECEIVED.

Elementary Practical Chemistry. By Profs. F. Clowes and J. B. Coleman. Part ii. Eighth edition. Pp. xvi+255. (London: J. and A. Churchill.) 3s. 6d. net.

A Text-Book of Physics. Edited by A. W. Duff. Fourth edition. Pp. xiv+692. (London: J. and A. Churchill.) 10s. 6d. net.

Om Ole Rømers Opdagelse af Lysets Tøven. By K. Meyer. (København: Høst und Søn.) 2 kronen.

Chemistry for Rural Schools. By E. Jones and J. J. Griffith. Pp. 184. (London: Blackie and Son, Ltd.) 2s. 6d. net.

Typographical Printing Surfaces. By L. A. Legros and J. C. Grant. Pp. xxiv+732. (London: Longmans and Co.) 2l. 2s. net.

Oil-Field Development and Petroleum Mining. By A. B. Thomson. Pp. xix+626+maps viii. (London: Crosby Lockwood and Son.) 25s. net.

A Concordance to the Works of Horace. Compiled and edited by L. Cooper. Pp. ix+593. (Washington: Carnegie Institution.)

The Coal Measures Amphibia of North America. By R. L. Moodie. Pp. x+222+plates 26. (Washington: Carnegie Institution.)

Gonadectomy in relation to the Secondary Sexual Characters of some Domestic Birds. By H. D. Goodale. Pp. 52+plates vii. (Washington: Carnegie Institution.)

A Sylow Factor Table of the First Twelve Thousand Numbers. By H. W. Stager. Pp. xii+120. (Washington: Carnegie Institution.)

The Elements of Reconstruction. Pp. 120. (London: Nisbet and Co., Ltd.) 1s. net.

Australasian Antarctic Expedition, 1911—1914. Scientific Reports. Series C, Zoology and Botany. Vol. iii., part i. Fishes. By E. R. Waite. Pp. 92+ plates 5, etc. (Adelaide: R. E. E. Rogers.) 8s. 6d.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 16.

INSTITUTION OF MINING AND METALLURGY, at 5.30.—*Informal Discussion*: Standardisation, so far as it affects the Mining and Metallurgical Industries: including the Question of the Adoption of the Metric System.

CHILD STUDY SOCIETY, at 6.—Experiments in Hand-writing in Schools: Speed Tests in Manuscript Writing: Dr. C. W. Kimmins.—The Artistic Aspect of Manuscript Writing: W. Scutt.—Manuscript Writing in a Central School: J. W. Samuel.—Manuscript Writing in a Boys' Elementary School: A. Sinclair.

LINNEAN SOCIETY, at 5.—(1) Pedanios Dioscorides of Anazarba; his Writings and his Commentators; (2) The New Cabinets for the Linnean Herbarium: The General Secretary.—A New Australian Genus of Hydrocharidaceæ: Dr. A. B. Rendle.—Some Collections of the Littoral Marine Fauna of the Cape Verde Islands, made by Cyril Crossland in the Summer of 1904: A. W. Waters.

CHEMICAL SOCIETY, at 8.—A Simple Method of Estimating Arsenic in Organic Derivatives: A. J. Ewins.—A New Method for the Preparation

of Nitrosyl Tribromide: R. L. Datta and N. R. Chatterjee.—Neutral Potassium Persulphate as a Reagent in Organic Chemistry: R. L. Datta and J. N. Sen.—The Hydrolysis of Iron Ammonium Alum: W. N. Rae.

FRIDAY, NOVEMBER 17.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Report of the Hardness Tests Research Committee.

MONDAY, NOVEMBER 20.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Easter Island: Mr. and Mrs. W. Scoresby Routledge.

TUESDAY, NOVEMBER 21.

ZOOLOGICAL SOCIETY, at 5.30.—The Pectoral and Pelvic Arches of the London Specimen of *Archæopteryx*: Prof. B. Petronievics and Dr. A. Smith Woodward.—Studies on the Anoplura and Mallophaga, being a Report upon a Collection from the Mammals and Birds in the Society's Gardens. II.: E. F. Cummings.—Notes on a Collection of Heterocera made by Mr. W. Feather in British East Africa, 1911-13: Lieut.-Col. J. M. Fawcett.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—Keadby Bridge: J. B. Ball.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—The Pyrogenesis of Hydrocarbons: E. L. Lomax, Dr. A. E. Dunstan, and Dr. F. B. Thole.

ROYAL STATISTICAL SOCIETY, at 5.15.—Presidential Address: The Organisation of Registration in its Bearing on Vital Statistics: Sir Bernard Mallet.

WEDNESDAY, NOVEMBER 22.

ROYAL SOCIETY OF ARTS, at 4.30.—The Economic Development of Russia and Britain's Share Therein: I. Urquhart.

GEOLOGICAL SOCIETY, at 5.30.

THURSDAY, NOVEMBER 23.

ROYAL SOCIETY, at 4.—Annual Report of Council.—At 4.30. *Probable Papers*: The Scattering of Plane Electric Waves by Spheres: Dr. T. J. Ia Bromwich.—Numerical Results of the Theory of the Diffraction of a Plane Electromagnetic Wave by a Perfectly Conducting Sphere: J. Proudman, A. T. Doodson, and G. Kennedy.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Parallel Operation of Electric Power Stations: J. S. Peck.

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