

to the abolition of by-laws which permit a child to leave school so early as twelve, and in the rural districts even earlier, to work as a half-timer. In view of the factious opposition the Bill has evoked, it is clear that only a Government measure will meet the necessities of the case and provide for the raising of the whole-time school age until the age of fourteen, and for the continued effective education of the pupil on leaving school, and within the normal working hours, until at least the completion of his seventeenth year. Only by measures of this kind can the great expenditure on elementary education be justified and its fruits assured. Nothing short of this will enable the country to maintain its position amongst civilised nations. The remarkable industrial and commercial advance of Germany has been secured under conditions of an extended whole-time school age far beyond those prevailing in this country, together with provisions for continued compulsory education within the normal hours of employment on leaving school up to the age of eighteen, of the most effective character. The measures proposed in the Bill have had the strong support of the Manchester Chamber of Commerce and of the Manchester and Salford Trades and Labour Council, and of experienced educationists and social reformers. No so-called industrial exigencies ought to stand in the way of the welfare of the children.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 18.—Sir William Crookes, president, in the chair.—Sir D. Bruce, Major A. E. Hamerton, Captain D. P. Watson, and Lady Bruce: (1) Trypanosome diseases of domestic animals in Nyasaland. *Trypanosoma caprae*, Kleine. Part III.—Development in *Glossina morsitans*; (2) trypanosomes found in wild *G. morsitans* and wild game in the "fly-belt" of the Upper Shiré Valley; (3) the food of *G. morsitans*; (4) infectivity of *G. morsitans* in Nyasaland during 1912 and 1913.—Dr. C. W. Andrews: A description of the skull and skeleton of a peculiarly modified rupicaprine antelope, *Myotragus balearicus*, Bate. *M. balearicus*, Bate, is a peculiarly modified rupicaprine antelope, remains of which were discovered by Miss D. M. A. Bate in cavern deposits in Majorca and Minorca. The dentition is very remarkable. Instead of having three incisors and a canine on each side of the mandibular symphysis, as is usual in the Bovidae, the canines and the two outer pairs of incisors are wanting, while the median incisors are enormously enlarged rodent-like teeth, growing from persistent pulps. The premolars are reduced in number and the molars have very high crowns. The feet are remarkable for the shortness and stoutness of the metacarpals and metatarsals, which are quite similar to those of the Takin (Budorcas). The animal seems to have been adapted for climbing on steep crags and cliffs, and probably lived on very hard vegetation.—E. T. Halnan and F. H. A. Marshall: The relation between the thymus and the generative organs, and the influence of these organs upon growth. With a note by G. U. Yule.—H. E. Roaf: The vapour pressure hypothesis of contraction of striated muscle. Two objections have been urged against muscular contraction being due to movements of water from one portion of the muscle fibre to another. These are: (1) that an osmotic model of muscle cannot cause a sufficient degree of shortening; and (2) that the movement of water would require a longer time than the muscle takes in contracting. The extent of contraction possible for an osmotic model and the time required for this contraction has been calculated for structures of the

dimensions of frog's sartorius. It is found that the extent of contraction can be explained by the osmotic model, and that the time required is less than 0.03 sec., and frog's sartorius requires at least 0.04 sec. for complete contraction.—A. N. Drury: The validity of the microchemical test for the oxygen place in tissues. Experiments were made to show that the microchemical test with rongalit white, used by Unna to fix the position of the oxygen place in tissues, could be obtained on a surface entirely free from oxygen. A further extension of the work showed that the condensation of a solute on to a surface is markedly influenced by the previous treatment of, or by the gas condensed on, that surface.—Prof. J. S. MacDonald: Man's mechanical efficiency. The rate of heat-production, Q , associated with cycling at a uniform rate but with varied performances of mechanical work, is expressed in the following form, $x + Ey = Q$, where x represents the heat-production associated with the uniform rate of movement, y the rate of work-performance. It is shown that E varies inversely with $W^{2/3}$. It follows that, putting on one side x , the energy-transformation entailed by the movements *per se*, the additional energy-transformation required for any definite rate of work-performance is less the greater the weight, W , of the worker; and the mechanical efficiency measured in this fashion varies directly with $W^{2/3}$. It is also shown, however, that x varies approximately with $W^{3/2}$, and thus that the energy-transformation associated with the mere production of movement is much greater the greater the weight.—Dr. A. Holt: The colouring matters in the compound Ascidian, *Diazona violacea*, Savigny.—Prof. W. B. Bottomley: Some accessory factors in plant growth and nutrition. Plant growth-stimulating substances are formed in sphagnum peat when it is incubated with a liquid culture of certain aerobic soil bacteria for a fortnight at 24° C. These substances are soluble in water and in alcohol, and are active in very small amounts, two applications of water-extract of 0.18 gram treated peat doubling the size of *Primula malacoides* seedlings over untreated plants in six weeks' time. They appear to be similar to so-called accessory food substances essential for nutrition of growing animals, first studied in connection with the deficiency diseases beri-beri and scurvy. The production of these substances appears to be associated with formation of soluble humates in peat by bacterial action. They are not formed when peat is treated with alkalis. Cultures of *Azotobacter chroococcum* grown with extract of "bacterised" peat gave an increase of 18 milligrams of nitrogen in eight days, whilst extract of chemically-treated peat gave no increased fixation. The active substance is precipitated from aqueous solution of alcoholic extract of "bacterised" peat by phosphotungstic acid, and can be further separated by decomposing with baryta, reprecipitating with silver nitrate and decomposing with hydrogen sulphide. Wheat seedlings in sand culture with Detmer's complete food solution gave an increase of 22.7 per cent. with the phosphotungstic fraction, and 17.7 per cent. with the silver fraction. Water-culture experiments with wheat seedlings in Detmer's solution prepared from pure salts in physiologically pure distilled water showed that these substances are essential for assimilation of inorganic food constituents.—Prof. H. B. Dixon, C. Campbell, and W. E. Slater: A photographic analysis of explosion-flames traversing a magnetic field. The authors have carried out a suggestion made by Sir J. J. Thomson that the explosion-wave in gases should be photographed on a rapidly moving film while it traverses a strong magnetic field, to determine whether the emission of electrons in front of the wave "prepares the way" by ionising the gases. Using a very powerful magnet lent them by Sir E. Rutherford,

the authors have photographically analysed the explosion-wave in different mixtures of gases before it enters, while traversing, and as it leaves, the magnetic field. In no case did the magnetic field alter the character or velocity of the flames.

Geological Society, June 10.—Dr. A. Smith Woodward, president, in the chair.—E. B. Bailey: The Ballachulish fold near the head of Loch Creran (Argyllshire). The purpose of the present paper is to direct attention to two phenomena strikingly illustrated by the local evidence:—(1) The complexity of the slides affecting the Ballachulish Core, and the correlated (quite exceptional) occurrence of more groups towards the close of the fold, south-east of the River Creran, than towards the gape, north-west of the same; (2) the intense secondary refolding of the Ballachulish Fold, and the resultant sinuous outcrop of the Ballachulish Core.—Dr. Douglas Mawson: Geology and glaciation of the Antarctic regions.

Mathematical Society, June 11.—Prof. A. E. H. Love, president, in the chair.—R. H. Fowler: A problem of diophantine approximation.—G. H. Hardy: Some theorems by Mr. S. Ramanujan.—G. H. Hardy and J. E. Littlewood: Proof of the general Borel-Tauber theorem.—Prof. E. W. Hobson: Theorems relating to functions defined implicitly, with applications to the calculus of variations.—J. G. Leatham: The differentiation of a surface-integral at a point of infinity.—R. E. Powers: Mersenne's numbers.—J. Proudman: Free and forced longitudinal tidal motion in a lake.

DUBLIN.

Royal Irish Academy, May 8.—Dr. R. F. Scharff, vice-president, in the chair.—R. Southern: Free-living Nematelmia, Kinorhyncha, and Chætognatha (in connection with the Clare Island Survey). A large number of new free-living nematoda were described, belonging to the families Anguillulidæ, Desmoscolecidæ, and Chætosomatidæ. One species of Gordius was found on Clare Island. Of the Kinorhyncha (Echinoderes) five species were described, two being new species. Two species of the Chætognatha were found in the plankton of Clew Bay.—J. N. Halbert: Acarina (in connection with the Clare Island Survey). In this paper are recorded certain of the terrestrial and marine Acarina collected during the Clare Island Survey. The following families are represented:—Gamasidæ, Oribatidæ, Halaconidæ, and the Trombididæ. Some new species are described, including interesting forms found between tide-marks on the seashore.—G. P. Farren: Notes on marine plankton (in connection with Clare Island Survey). The plankton of the Clare Island district is boreal neritic, and may be subdivided into three groups: open-sea plankton, plankton of the intermediate offshore region, and plankton of the bays and harbours. The open-sea is characterised by the comparatively small number of species, a few of which, notably *Calanus helgolandicus*, occur at times in very great abundance. The number of species in the bays and harbours is large, many of them being only temporarily planktonic forms derived from the bottom. The intermediate region contains elements derived from both the other groups, but a few species, e.g. *Aurelia aurita*, find optimum conditions in it.

PARIS.

Academy of Sciences, June 13.—M. P. Appell in the chair.—A. Haller and R. Cornubert: Syntheses by means of sodium amide. The alkylcyclopentanones obtained by the addition of hydrogen to unsaturated derivatives. Details of the reduction in presence of nickel as catalyst of dibenzylidene- β -methylcyclopentanone and $\beta\alpha$ -dimethyl- $\alpha\alpha\alpha$ -triallylcyclopentanone. The paper concludes with a summary of the results

obtained on the substituted cyclopentanones and published in this and preceding communications.—J. Boussinesq: The calculation by successive approximation of the continuous velocities in a uniform state by polynomials, in a prismatic tube of square section.—Charles Richet: The non-hereditary accommodation of micro-organisms in slightly nutritive media. The lactic bacillus can be grown accustomed to poisons, but becomes weakened by generations of growth in media deficient in food. Such weakened strains supplied with a normal amount of food are still less vigorous than the ordinary strain of bacillus.—M. Considère: Measurement of the contraction, strains, the elasticity, and the resistance of the concrete in reinforced concrete constructions.—R. de Forcrand: The preparation of the hydrates of manganese sulphate.—V. Grignard and Ch. Courtot: Derivatives of cyclopentadiene and its dimer. Cyclopentadiene in toluene or petroleum ether solution reacts with magnesium methyl iodide, giving methane and a magnesium compound. The latter compound is very reactive, but the substances obtained are mostly derivatives of the dimeric $C_{10}H_{12}$.—J. Renaut: The isochromaticity of the hard segregation grains of rhagiocrine connective cells and the figured collagen formations of the conjunctive tissue.—M. Angelesco: A generalisation of Hermite's polynomials.—P. Appell: Observations on the preceding communication.—Charles N. Moore: The relation between certain methods for the summation of a divergent series.—Leonida Tonelli: A direct method in the calculus of variations.—Paul Renard: The mode of construction of flexible airships.—Jules Baillaud: A simple arrangement for recording rhythmic time signals. A heavy pendulum is arranged to make an electrical circuit, arranged to produce taps in the telephone receiving the wireless signals, and these are brought into exact coincidence by displacing the contact-maker.—M. Mالدینی: A colour reaction exhibited by solid hydroquinone. Solid hydroquinone and potassium carbonate, rubbed together, give a characteristic blue coloration.—Paul Jégou: An arrangement for studying the strength of the oscillations received in wireless telegraphy. An electrolytic detector without any external electromotive force is used in conjunction with a transformer with movable coil. The detector is of low sensibility but high constancy in its indications, and hence is not easily affected by parasitic waves. A series of twelve measurements taken every two hours throughout the day clearly shows the favourable action of darkness on the wave propagation.—Maurice de Broglie: Direct spectrum analysis by the secondary Röntgen rays.—R. Ladenburg and F. Reiche: The distribution of energy in the D lines of sodium.—Daniel Berthelot: The various modes of photolysis of oxalic acid by the ultra-violet rays of different wave-length. Solid oxalic acid with ultra-violet rays of middle and very short wave-length gives carbon dioxide and formic acid as the primary products of decomposition, some carbon monoxide and hydrogen being present as secondary products, probably arising from the action of the rays on the formic acid. In aqueous solution the secondary products appear in larger proportion.—F. Leprince Ringuet: The limits of inflammability of marsh gas. A study of the influence of moisture, pressure, diameter of the explosion tube, and direction of the explosion (from above or below) on the explosive properties of mixtures of methane and air.—O. Honigsmid and Mlle. St. Horovitz: The atomic weight of lead from pitchblende. According to recent theories the final disintegration product in the uranium radium series, known as Radium-G, and isotopic with lead, should possess a different atomic weight. The average result of a series of atomic weight determinations carried out on a sample of lead

extracted from pitchblende was 206.74, or 0.4 less than the atomic weight of ordinary lead. This figure confirms the theoretical indications.—E. **Berger**: The reduction by hydrogen of the oxides of copper and nickel in presence of a dehydrating agent. The reduction of these oxides is strongly accelerated when the water vapour is removed as fast as it is formed. The reduction of copper oxide is continuous, but there are indications of the existence of a nickelous oxide, Ni_2O .—Jacques **Joannis**: The oxidation and reduction of copper.—L. **Gay**, F. **Ducellier**, and A. **Raynaud**: The predominance of benzene and its homologues. The catalytic action of manganese. Metallic manganese exerts a marked accelerating action in the bromination of benzene and toluene. If the reagents are dry the metal is unchanged.—Marcel **Godchot**: Thujone and thujamenthene. The direct passage from one to the other. Thujone and hydrogen in the presence of nickel give a good yield of thujamenthene.—Léo **Vignon**: The synthetic preparation of a coal gas. A scheme for the conversion of a mixture of coal gas and water gas, or water gas alone, into a gas possessing approximately the heating value of ordinary coal gas and free from carbon monoxide. It is based on the use of lime, nickel, and other catalytic agents.—Georges **Friedel**: A layer of iodargyrite in France. This rare mineral has been found in cavities in a vein of campylite at Les Montmans, near Echassières. G. **André**: The velocity of hydrolysis and of displacement by water of the nitrogenous and mineral materials contained in leaves.—Charles **Nicolle** and Georges **Blanc**: Are the spirillæ of recurrent fever virulent during the successive stages of their evolution in the flea? Demonstration of their virulence at an invisible stage.—J. E. **Abelous** and C. **Soula**: Modifications of the cerebral action in anaphylaxy. An experimental study in the changes in the cerebral metabolism resulting from the injection of a non-fatal dose of urohypotensine.—Auguste **Lumière** and Jean **Chevrotier**: The vitality of cultures of gonococcus. It would appear from the experiments described that the poisonous substance to which the rapid sterilisation of gonococcus cultures is due is an oxidation product of the exotoxines secreted by the organism. Consequently by working under anaerobic conditions the vitality of gonococcus cultures can be increased.—Louis **Roule**: The deep-water fishes belonging to the family of the Eurypharyngideæ.—Gabriel **Bertrand** and M. **Rosenblatt**: The thermo-regeneration of the various diastases of yeast.—S. **Sécerov**: The influence of ultra-violet light on the coloration of the fur of rabbits and guinea-pigs. The white fur of these animals becomes yellow or reddish under the action of ultra-violet light.—H. **Bierry** and Mlle. Z. **Gruzewska**: The estimation of sugar materials in the liver.—M. de **Lamothe**: The ancient alluvial sheets and terraces of the Rhône and Isère, near Valence.—G. **Gardet**: New fossiliferous horizons in the upper Muschelkalk in the neighbourhood of Bourbonne-les-Bains.—M. de Montessus de **Ballore**: The probable epirogenic origin of earthquakes in New Zealand.

BOOKS RECEIVED.

Canada. Department of Mines. Geological Survey Branch. Memoir 31: Wheaton District, Yukon Territory. By D. D. Cairnes. Pp. x+153. Memoir 43, No. 36, Geological Series: St. Hilaire (Beloeil) and Rougemont Mountains, Quebec. By J. J. O'Neill. Pp. vi+108. Memoir 52, No. 42, Geological Series: Geological Notes to accompany Map of Sheep River Gas and Oil Field, Alberta. By D. B. Dowling. Pp. ii+26. (Ottawa: Government Printing Bureau.)

Beiträge zur Naturdenkmalpflege. Band iv., Heft 2.

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Ueber den Schutz der Natur Spitzbergens. By H. Conwentz. Pp. 65-138. (Berlin: Gebrüder Borntraeger.)

Odontologische Studien II. Die Morphogenie der Primatenzähne. By Prof. L. Bolk. Pp. viii+181. (Jena: G. Fischer.) 7 marks.

Philosophical Transactions of the Royal Society of London. Series B., Vol. 205: Some Notes on Soil Protozoa. By C. H. Martin and K. R. Lewin. Pp. 77-94. (London: Royal Society.)

The Leather Trades' Year Book. Edited by M. C. Lamb and J. G. Parker. Pp. 210. (London: Anglo-American Technical Co., Ltd.) 3s.

Storied Windows. By A. J. de H. Bushnell. Pp. xi+338+plates. (Edinburgh and London: W. Blackwood and Sons.) 15s. net.

Morocco the Piquant. By G. E. Holt. Pp. xi+242. (London: W. Heinemann.) 6s. net.

A Natural History of Bournemouth and District. By the Members of the Bournemouth Natural History Society. Edited by Sir D. Morris. Pp. xiv+400. (Bournemouth: The Natural Science Society.) 2s. 6d. net.

The Fauna of British India, including Ceylon and Burma: Orthoptera (Acridiidae). By W. F. Kirby. Pp. ix+276. (London: Taylor and Francis.) 10s.

Simplification Studies. I.: Stellar Aberration. Part i. By M. Niles. Pp. 100. (Brunswick, Maine: Brunswick Publishing Co.)

The Theory of Relativity. By Dr. L. Silberstein. Pp. viii+295. (London: Macmillan and Co., Ltd.) 10s. net.

A First School Calculus. By R. Wyke Bayliss. Pp. xii+288. (London: E. Arnold.) 4s. 6d.

Berichte der Naturforschenden Gesellschaft zu Freiburg i Br. Zwanzigster Band 1913 u. 1914. Heft 2. Edited by Prof. W. Schleich. Pp. v+182. (Naumburg.)

Livingstone College Year Book, 1914. Pp. 136. (Leyton: Livingstone College.)

Board of Agriculture and Fisheries. Fishery Investigations. Series II. Sea Fisheries. Vol. i., Part i., Report on Market Measurements in relation to the English Haddock Fishery during the years 1909-1911. Pp. iv+133. (London: H.M.S.O., Wyman and Son, Ltd.) 4s. 6d.

The Romanes Lecture, 1914. The Atomic Theory. By Sir J. J. Thomson. Pp. 39. (Oxford: Clarendon Press.) 1s. 6d. net.

Roger Bacon: Essays contributed by various writers on the occasion of the Commemoration of the Seventh Centenary of his Birth, collected and edited by A. G. Little. Pp. viii+426. (Oxford: Clarendon Press.) 16s. net.

Der Säugetierorganismus und seine Leistungen. By Prof. E. T. v. Brucke. Erster Teil. Pp. 192+plates. Zweiter Teil. Pp. 173. (Leipzig: P. Reclam, jun.) Two parts in one volume. 1.75 marks.

The Unconscious. By Prof. M. Prince. Pp. xii+549. (London: Macmillan and Co., Ltd.) 8s. 6d. net.

The Essence of Astronomy. By E. W. Price. Pp. xiv+207. (New York and London: G. P. Putnam's Sons.) 10s. 6d. net.

Studies in Economic and Political Science. Edited by Hon. W. Pember Reeves. Kinship and Social Organisation. By Dr. W. H. R. Rivers. Pp. vii+96. (London: Constable and Co., Ltd.) 2s. 6d. net.

Studien in der Geophysik und der Kosmischen Physik. By O. Pettersson. Pp. 31. (Berlin: E. S. Mittler und Sohn.)

Ancient Egypt. By Prof. E. J. Rapson. Pp. viii+199. (Cambridge: University Press.) 3s. net.

Smithsonian Institution. U.S. National Museum. Bulletin of the U.S. National Museum. No. 50, The Birds of North and Middle America. Part vi. By