the best years of their youth and manhood to acquiring a competent knowledge of the science of their subject, unless they (the evening students of this country) had, as the leaders of their industries, men of an equal training to that of their competitors. The general tendency of Prof. Meldola's remarks was to encourage more concentrated effort on the part of such large urban districts as Barking, East Ham, Dagenham, and surrounding parishes, which contain a population of some 40,000 people, and he expressed the hope that the local committees would see their way to federation and joint action in the carrying on of organised day classes, as well as the evening work upon which they had hitherto concentrated their efforts. At the conclusion of the address the Countess of Warwick, in a short and forcible speech, also urged the importance of organised day work, and endorsed the wish expressed by Prof. Meldola that Barking would be in possession of such schools at no very distant period. Mr. W. Bewers, to whom the success of the Barking School is so largely due, and who is chairman of the local committee, presided at the meeting.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 13. — Captain Abney, President in the chair.—A paper on some experiments with Rontgen's radiation, by Prof. Threlfall and Mr. Pollock, was, in the absence of the authors, read by the Secretary.—The authors describe a form of Crookes' tube which, while it can be made by any one capable of the most elementary glass-blowing, gives a plentiful supply of Röntgen rays. The results of their experiments may be summed up as follows: (1) The Röntgen radiation does not consist in the projection of gaseous matter, or, if it does, the amount of such matter involved is extraordinarily small. (2) The Röntgen radiation does not consist in the projection of æther streams having a velocity above a couple of hundred metres per second; this is true, whether the radiation takes place in air or in benzene. (3) The properties of the æther regarded as determining the velocity of electromagnetic waves are not greatly changed (*i.e.* not at all within our experimental limits) by the Röntgen radiation; and this applies alike to the æther in air and in benzene. (4) A selenium cell composed of platinum electrodes and highly purified selenium, is affected by Röntgen radiation to an extent which is comparable with the effect produced by diffused daylight. (5) No permanent or temporary electromotive force is set up in a selenium cell by the Röntgen radiation. The authors have come to the first conclusion by exposing an exhausted tube placed in parallel with a spark-gap, so adjusted that the spark just passes over the gap rather than through the tube, to the Röntgen radiation. They find that a vacuum tube in parallel with a spark-gap is very sensitive to changes in pressure within the tube. Conclusions (2) and (3) were arrived at by using Michelson's arrangements for the interference of two beams of light. Mr. Shelford Bidwell said he had made some experiments on the effect of Röntgen rays on the resistance of selenium, but with a negative result, although he would have detected a much smaller change than that found by the authors. It might be that this difference was due to the tube, for, in his experiment, the radiation started from a platinum plate within the tube, while in the authors' arrangement the radiation starts from where the kathode rays strike the glass of the tube. Prof. Silvanus Thompson said there were a number of points with reference to the Röntgen radiation which required clearing up. For instance, the suggestion that they were vortices in the æther had not been tested. Again, Lafay says that if the rays are passed through a metal screen which is charged with electricity, then the rays can be deflected by a magnet. He (Prof. Thompson) had not been able to repeat this experiment, neither had he that of Galitzine on the polarisation of the rays by tourmaline. The statement of Prof. J. J. Thomson, that under the influence of the radiation paraffin became a conductor, had not been satisfactorily proved. As to the wave-length, while some observers obtained values about one-tenth that of the extreme violet, another had obtained a value greater than that of the extreme red. He (the speaker) did not understand the authors' device for detecting changes in the vacuum of a tube, since every one who has worked with Crookes' tubes has found that the resistance is always greater for a spark in one direction than the other, and also varies with the battery power employed. Lenard, adopting Hertz's arrangement, uses as anode a cylinder surrounding the kathode (a disc), the idea being that by using such a symmetrical arrangement the kathode radiation was more homogeneous. It might be advisable, when seeking to produce homogeneous Röntgen rays, to adopt such a symmetrical arrangement.—Mr. Bryan then read a paper, by himself and Dr. Barton, on the absorption of electrical waves along wires by a terminal bridge. The authors employ, for the generation of the oscillations, an arrangement of the same description as that used by Bjerknes, the waves being propagated along two parallel wires about 116 m. long. In order to measure the waves, they use a small electrometer with an uncharged needle. The resistances employed to form the bridge consist of pencil-marks on ground glass. Bridges of three resistances have been examined, one having, as nearly as may be, the resistance necessary, according to Heaviside's theory, to give complete extinction of the reflected wave, and, of the others, one was of higher, and the other of lower resistance. In each case the results confirm the theory, and it is thus experimentally proved that by using a bridge of this description the reflected train of waves can be completely extinguished. Mr. Blakesley asked if the authors had made any allowance for the capacity of the wires. Mr. Campbell asked if the resistances given were expressed in ohms or in electro-magnetic units. Mr. Bodwell asked if the authors had found that the pencil-trace resistances obeyed Ohm's law. He had found that if you balanced with one cell in the battery circuit, then, on increasing the battery power to two cells, the resistance altered. Mr. Appleyard suggested that the variation was caused by the contacts at the ends not being good. Mr. Campbell said the same variation occurred in the case of mixtures of clay and plumbago, where the contacts were quite good. Mr. Carter suggested electroplating the ends to give good contact. Mr. Bryan, in his reply, said that they had not considered the question of capacity, and that, in their case, they did not require to know the resistance very accurately.

Entomological Society, November 4.—Prof. Raphael Meldola, F.R.S., President, in the chair.—Mr. McLachlan exhibited a collection of the cast nymph-skins of more than one-third of the species of European dragon-flies from the Département de l'Indre, France, sent to him by M. René Martin. Two or three of the species had been reared in an aquarium, but the identification of most of them had been secured by finding the imago drying its wings in the immediate vicinity of the cast skin.—Mr. R. Adkin exhibited a long series of *Acidalia marginepunctata* taken on the sea-coast at Eastbourne, Sussex, during the past eight summers.—Mr. Horace St. John Donisthorpe exhibited a female specimen of *Dytiscus circumcinctus*, Ahr., with elytra resembling in form those of the male. He said the specimen had been taken in Wicken Fen in August last.—Mr. Tutt exhibited a specimen of *Mellinia ocellaris* recently taken near Southend, together with a specimen of *M. gilvago* for comparison; also four specimens of *Argyresthia atmoriella* taken by Mr. Atmore last June at Lynn, Norfolk. Mr. Tutt also exhibited a long series of a *Melampias* which he had captured at Le Lautaret in the Dauphiné Alps, at an elevation of 7000-8000 feet. He observed that the specimens exhibited were peculiar in some very important particulars, combining some of the characteristics of *Erebia* (*Melampias*) *melampus*, and *M. pharte*. He said his attention had been first drawn to this form by some fine examples captured by Dr. Chapman and himself on Mont de la Saxe in 1895. Compared with the Tyrolean examples of *M. melampus*, this form showed a tendency to a lengthening of the forewings and to an obsolescence of the black dots, thus approaching *M. pharte*, but the females presented none of the typical characters of the female of *M. pharte*. On the whole, he felt satisfied that the Mont de la Saxe specimens were a form of *M. melampus*. Mr. Elwes observed that though all the continental butterflies had been so long studied by European entomologists, he did not think the form exhibited by Mr. Tutt had been hitherto noticed.—Mr. E. Ernest Green exhibited a typical specimen of *Ephyra omicronaria*, together with what he believed to be a remarkable melanic variety of the same species, taken by Dr. Dudley Wright at Pegwell Bay, near Ramsgate, in September last. Some of the Fellows present, after an examination of the specimen, expressed an opinion that it was a variety of an Acidalia, and not of *Ephyra omicronaria*.

Anthropological Institute, November 10.—Mr. E. W. Brabrook, President, in the chair.—Mr. P. L. Sclater exhibited a draught-board from Nyasaland; Mr. C. H. Read, a dance-mask

and a curious carving from the north-west coast of America; and Mr. Thompson, some small terra-cotta heads from ancient Mexico.—Mr. Henry Balfour exhibited various native Indian preparations of hemp for consumption, and an ancient bow of Assyrian type found in Egypt in a tomb of the XXVIth Dynasty, on which he read a paper. The interesting point about the bow was that it was of the composite type, at least one of the ingredients of which was not to be found in Egypt. The evidence available pointed to a more northern region, probably Assyria, as its place of origin, and this supposition was also borne our by historical facts. The indigenous Egyptian bow, a specimen of which was originally found near the other, and was now exhibited with it, was fundamentally different, being plain and not composite; the arrows also differed absolutely. A somewhat similar bow was now in the Berlin Museum. Mr. Balfour also exhibited a screen of typical Asiatic composite bows, and some transparencies in the form of thin sections cut from a number of bows of the same kind. Mr. Balfour subsequently read a paper on the life-history of an Aghori Fakir, illustrated by an extensive exhibition of drinking-cups made from human skulls. At the conclusion of the paper Dr. Leitner made some interesting remarks on the Aghori sect.

MANCHESTER.

Literary and Philosophical Society, November 3.—On methods of determining the dryness of saturated steam, and the condition of steam gas, by Prof. Osborne Reynolds, F.R.S. In certain recent attempts to ascertain the proportion of steam and water in the fluid which enters a steam engine, by means of what is called the wire-drawing calorimeter, the published results show that there remains from 0 to 5 per cent. by weight of water in the steam, after it has been drained by gravitation, in the same manner as the steam on which Regnault's experiments were made. This has necessarily excited great interest in steam engineering, and is naturally welcome, as it apparently brings the performance of the engines by so much nearer perfection. Although the results of these recent experiments appear to show the condition of dry saturated steam to be other than that on which Regnault's experiments were made, and from which the present steam tables have been calculated, still these tables have been used in deducing the percentage of water latent in the steam. Whereas, if the latent water exists, it must have existed in the steam used by Regnault, and the steam tables must also be subject to identical corrections; and, consequently, the percentage of theoretical performance of steam engines would be unchanged. It is then pointed out that, in the reduction of such of these results as have been published, use has been made of Regnault's determination of the specific heat at constant pressure of steam gas (0·48) in a manner which is not consistent with the theory of thermodynamics. Thus, in Rankine's notation, S_1 is the weight of steam per pound of fluid, and H_1 the total heat per pound from 0° C. to T_1°, h_1 the heat required to raise water per pound, and H_2, h_2, T_2, the corresponding values for saturated steam at the pressure after wire-drawing, and T_s° the observed temperature after wire-drawing. The notation assumed for the equation of heat, neglecting incidental losses, is

$$S_1(H_1 - h_1) + h_1 = H_2 + 0{\cdot}48\,(T_s^\circ - T_2^\circ) \ldots (1)$$

Whereas, it has been proved by Rankine that the thermodynamic expression for the total heat in superheated steam at T_s° C., provided it has reached the condition of steam gas, to which the 0·48 only applies, is

$$C_1 + 0{\cdot}48\,(T_s^\circ - T_0^\circ)$$

C_1, being a constant, depends only on the temperature of the water, (T_0°) from which the steam is produced, the value of which from 0° C. is 606·7, approximately, as deduced by Rankine. Using Regnault's formula for H_2, the right member of equation (1) becomes

$$606{\cdot}5 + {\cdot}305\ T_2^\circ + 0{\cdot}48\,(T_s^\circ - T_2^\circ)$$

while the value by the thermodynamic formula is

$$606{\cdot}7 + 0{\cdot}48\ T_s^\circ$$

which gives us the excess of heat over that assumed

$${\cdot}2 + 0{\cdot}175\ T_2^\circ$$

This excess, if T_2 were 100° C., is 17·7 thermal units, and if the initial steam pressure were 200 lbs. above the atmosphere, the latent heat being 467·5 thermal units, the percentage of water it would evaporate, at boiling point, is

$$\frac{177}{4675} = 3{\cdot}8 \text{ per cent.},$$

which is about as much as needs to be accounted for. It is also shown that, in order to render Rankine's formula applicable to wire-drawing experiments, it is necessary that the wire-drawing should be continued till the steam is gaseous, whence arises the difficulty of securing that this state has been reached. This, however, may be secured by lowering the pressure gradually after wire-drawing, and so increasing the extent of wire-drawing while observing the temperature (T_s°), which, after falling, will gradually become constant as the wire-drawing increases, and, when constant, will be a definite indication of this gaseous state. The necessary conditions to ensuring accuracy are then considered, and, in conclusion, it is stated that a research to verify these conclusions has been commenced by Mr. J. H. Grindley, in the Engineering Laboratory of Owens College, Manchester.

PARIS.

Academy of Sciences, November 9.—M. A. Cornu in the chair.—On the composition of the fruits of *Phœnix melanocarpa*, by M. Aimé Girard. The average weight of the fruit was nearly 8 gr., 80 per cent. of which was edible. The analysis of the latter part showed that about one-half was soluble, the chief constituent being levulose (39 per cent.); no other sugar could be detected.—On the mode of formation of the sedimentary deposits of phosphate of lime, by M. A. Carnot. From an experimental study of the ratio of fluorine to phosphorus in phosphates of various origin, and from the artificial production of such apatites by the action of solutions of fluorides upon bone, the conclusion is drawn that phosphatic deposits are of animal origin, the alkaline liquid resulting from the putrefaction of organic remains having the property of dissolving calcium phosphate to a small extent, and depositing it again upon organic substances in a manner analogous to the petrifaction of wood. The fluorine must be supplied by the sea-water. Since fluorine had not been proved with certainty to exist in sea-water, a careful examination was made, and fluorine found in sea-water in amount corresponding to 1·69 gr. per cubic metre.—On a method of steering aërostats, by M. L. Baudey.—On the distribution of motion in a homogeneous medium, and the formation of cyclones, by M. E. Leclère.—On the production of floods in the basin of the Seine, by M. H. Tarry.—Observations on the new Perrine comet (November 2, 1896), made at the Paris Observatory, by M. G. Bigourdan.—Occultation of the Pleiades, of October 23, 1896 (Lyons Observatory), by M. Ch. André.—Observations on the sun, made at the Lyons Observatory, during the third quarter of 1896, by M. J. Guillaume.—On a geometry of ruled space, by M. René de Saussure.—Linear forms of the divisors of $x^2 \pm A$, by M. P. Pépin.—On the resistance of bridges under the passage of periodic loads, especially of those provided against in the regulation of August 29, 1891, by M. Marcellin Duplaix.—On the compressibility of some gases at 0° C., and near atmospheric pressure, by M. A. Leduc. With a view of determining the molecular volumes of gases at 0° at corresponding pressures, a pressure of 1/76th of the critical pressure was chosen, so that the values fell between 35 and 113 centimetres of mercury. By means of a modified Regnault apparatus, the variations from Boyle's law were measured in the cases of carbon dioxide, nitrous oxide, hydrogen chloride, ammonia, and sulphur dioxide.—A method of studying the expansion of liquids by means of photography, by M. Alphonse Berget. Two balances of equal sensibility, with their planes of oscillation at right angles, carry two weight thermometers, one containing the liquid under examination, and the other mercury. A ray of light is reflected from two mirrors, one on each beam, and this records on a sensitive plate a curve analogous to Lissajou's figures. This curve is the graphical representation of the expansion of the liquid.—On some abnormal cases of solubility, by M. Le Chatelier.—Action of aluminium chloride upon camphoric anhydride, by M. G. Blanc. By carrying out the reaction in presence of an inert solvent, such as chloroform, a new acid $C_9H_{14}O_2$ is obtained, the salts, ethers, and chloride of which are described.—On essence of roses, by MM. Eug. Charabot and G. Chiris. This essence appears to contain minute quantities of an ether, to the presence of which in French essences the latter probably owe their more fragrant odour.—On a new ferment in the blood, by M. Hanriot. Under the name of lipase, a new ferment of blood serum is described, which is characterised by its power of saponifying fatty ethers. This ferment is destroyed by heating to 90° C.—On a chemical method of valuing commercial wheaten flours, by M. E. Fleurent. The gluten is shown to consist of two substances, to which the

names gliadine and glutenine are given. The baking value is shown to depend upon the ratio in which these two are present in the flour.—On the origin of the beetroot disease, by M. Paul Vuillemin. It is shown that the parasite named *Entyloma leproideum* by M. Trabat, and *Œdomyces leproides* by M. Saccardo, is not a new species, but is identical with the *Cladochytrium pulposum* of Fischer.—New observations on scab in potatoes, by M. E. Roze.—On the mode of formation of zeolites, by M. A. Lacroix. In the Pyrenees, zeolites are found in considerable quantity which have been formed by the action of nearly pure water, at temperatures near 0° C., upon basic felspathic rocks.—The application of Röntgen rays to Palæontology, by M. Lemoine.—On the apparent density of clays deposited from water, by M. J. Thoulet.—On the return of some exceptional meteorological phenomena in November 1896, by M. Chapel.—On the destruction of *Heterodera schachtii*, and other animals prejudicial to the culture of the beet-root, by M. Willot.

NEW SOUTH WALES.

Linnean Society, September 30.—The President, Mr. Henry Deane, in the chair.—The Sooty-Mould (*Capnodium citricolum*, n.sp.) of Citrus trees: a study in polymorphism, by D. McAlpine. The species so far as known is peculiar to Australia. It has a remarkable life-history, and well illustrates the phenomenon of polymorphism.—Australian Lampreys, by J. Douglas Ogilby.—On the botany of the Rylestone and Goulburn River Districts, N.S.W., by R. T. Baker.—Note on *Cypræa angustata*, Gray, var. *subcarnea*, Ancey, by C. E. Beddome.—Mr. Edgar R. Waite contributed a note on the range of the Platypus. The northern habitat is extended to 16° 45′ S. and localities quoted on the Gulf of Carpentaria 140° 56′ E., the most north-westerly point hitherto recorded.—Mr. T. Whitelegge exhibited a rare and curious Isopod, *Amphoroidea australiensis*, originally described from N.S. Wales by Dana in 1852, since when it appears to have escaped notice. The specimen exhibited was obtained on seaweed at Maroubra Bay last June; when alive it was bright olive-green, and of a similar tint to the seaweed to which it was adhering.—Prof. David contributed the following note on a remarkable radiolarian rock from Tamworth, N.S.W.:—"On September 10, in company with Mr. D. S. Porter, I observed the occurrence of a remarkable radiolarian rock on the Tamworth Temporary Common. Of this rock a hand specimen and section prepared for the microscope are now exhibited. The section is an opaque one prepared by cementing a slice of the rock about one-tenth of an inch thick on to an ordinary glass slip with Canada balsam and then etching its upper surface with dilute hydrochloric acid. The rock being partially calcareous, probably an old radiolarian ooze, the lime filling in the delicately latticed shells and interstices between the spines of the radiolaria is dissolved out, and the siliceous shells of the radiolaria become exposed to view. Some of them are exquisitely preserved for palæozoic radiolaria. The rock of which they constitute by far the larger proportion weathers into a brown pulverulent friable material like bath brick. The unweathered portions are dark bluish-grey and compact. The radiolaria appear to be chiefly referable to the porulose division of the Legion *Spumellaria*. This discovery confirms the previous determinations by me of radiolarian casts in the rocks of the New England district, and of the Jenolan Caves, N.S. Wales. The geological age of the formation in which this rock occurs is probably either Devonian or Lower Carboniferous, as *Lepidodendron australe* appears to occur on a horizon not far removed from that of this radiolarian rock. The Moor Creek limestone, near Tamworth, I find also contains numerous radiolaria."

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The Elements of Physics: E. L. Nichols and W. S. Franklin. Vol. 2. Electricity and Magnetism (Macmillan).—The Gases of the Atmosphere; the History of their Discovery: Prof. W. Ramsay (Macmillan).—A New Speculation on the Past and Future Temperature of the Sun and Earth: W. H. (J. Heywood).—Colliery Working and Management: H. F. Bulman and R. A. S. Redmayne (Lockwood).—Autobiography of Sir George Biddell Airy (Cambridge University Press).—Cat and Bird Stories (Unwin).—Cowham's Graphic Lessons in Physical and Astronomical Geography, 6th edition (Westminster School Book Depôt).—New Zealand Papers and Reports relating to Minerals and Mining (Wellington, Mackay).—Experimental Science: A. Hubble (Chapman).—Light: W. T. A. Emtage (Longmans).—Physiography for Beginners: A. T. Simmons (Macmillan).—Alternating Currents and Alternating Current Machinery: Profs. D. C. and J. P. Jackson (Macmillan).—The Buddhist Praying Wheel: W. Simpson (Macmillan).—Physics Note-Book (Macmillan).—An Introduction to Structural Botany: Dr. D. H. Scott, Part 2 (Black).—Mountaineering and Exploration in the Japanese Alps: Rev. W. Weston (Murray).—The Scientific Papers of John Couch Adams. Vol. 1 (Cambridge University Press).—Catalogue des Bibliographies Géologiques: E. de Margerie (Paris, Gauthier-Villars).—L'Éclairage: Éclairage électrique: Prof. J. Lefèvre (Paris, Gauthier-Villars).—Bibliographia Physiologica, 1895: Prof. Ch. Richet (Paris, Alcan).—Fuel and Refractory Materials: Prof. A. H. Sexton (Blackie).—Versuch einer Philosophischen Selektionstheorie: Dr. J. Unbehaun (Jena, Fischer).—Das Klima von Frankfurt am Main (Frankfurt a.M.).—A Text-Book of Special Pathological Anatomy; Prof. E. Ziegler, translated and edited by Drs. MacAlister and Cattell, Sections i. to viii. (Macmillan).—Hand-Atlas der Anatomie des Menschen: Profs. His and Spaltcholz, 2 Band, 1 Abthg. (Leipzig, Hirzel).—Elementary Solid Geometry and Mensuration: Prof. H. D. Thompson (Macmillan).—Life in Ponds and Streams: W. Furneaux (Longmans).—Life of Brian Houghton Hodgson: Sir W. W. Hunter (Murray).—The Principles of Sociology: Herbert Spencer, Vol. 3 (Williams).—The Survival of the Unlike: L. H. Bailey (Macmillan).—Report of the Commissioner of Education for the Year 1893–94, Vol. 1, Part 1 (Washington).—Lehrbuch der Vergleichenden Mikroskopischen Anatomie: Dr. H. Fol, 2 (Schluss) Liefg. (Leipzig, Engelmann).—Physiologische Pflanzenanatomie: Dr. G. Haberlandt (Leipzig, Engelmann).—Festschrift zum Siebenzigsten Geburtstage von Carl Gegenbaur Am 21 Aug., 1896, 2 Vols. (Leipzig, Engelmann).—De la Double Réfraction Elliptique et de la Tétraréfringence du Quartz: Dr. G. Quesneville. I. Examen et Critique des Recherches Anterieures (Paris, *Moniteur Scientifique*).

PAMPHLETS.—Rules for regulating Nomenclature: Lord Walsingham and J. H. Durrant (Longmans).—A Short Catechism of Chemistry: A. J. Wilcox, Part 1 (Simpkin).—Demeter und Baubo: E. Hahn (Lübeck, Schmidt).—Agricultural Science, its Place in a University Education: Prof. R. Warington (Frowde).

SERIALS.—Geographical Journal, November (Stanford).—Scribner's Magazine, November (S. Low).—Observatory, November (Taylor).—Proceedings of the Physical Society of London, November (Taylor).—Humanitarian, November (Hutchinson).—Strand Magazine, November (Newnes).—Psychological Review, Monograph Suppleinent. No. 3. The Mental Development of a Child: K. C. Moore (Macmillan).—Journal of the Chemical Society. November (Gurney).—Veterinarian, November (Adlard).—American Journal of Science, November (New Haven).—Transactions of the Edinburgh Field Naturalists' and Microscopical Society, Sessions 1894–96 (Blackwood).—Quarterly Journal of the Geological Society, No 208 (Longmans).—Engineering Magazine, November (Tucker).—Journal of the Franklin Institute, November (Philadelphia).—Psychological Review, November (Macmillan).—Zeitschrift für Physikalische Chemie, xxi. Band, 2 Heft (Leipzig, Engelmann).—Bulletin of the Geological Institution of the University of Upsala, Vol. 2, Part 2, No. 4 (Upsala).—Beiträge zur Geophysik. iii. Band, 1 Heft (Leipzig, Engelmann).—L'Anthropologie, tome vii. No. 5 (Paris, Masson).—American Naturalist, November (Philadelphia).

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