introduction of a new word. Hitherto we have spoken of plate-cultivating a given water, but this expression we find cut down to "plating" a water; as, however, the general practice is now to substitute dishes for plates, we shall probably be reduced to the ugly phraseology of "dishing" a water.

G. C. FRANKLAND.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At the Junior Scientific Club, on December 9, Mr. E. S. Goodrich read a paper on the "Evolution of the Ungulata," and Mr. E. C. Atkinson gave an account of some further experiments on rowing, exhibiting and describing also the improved form of his rowing indicator.

CAMBRIDGE.—All the graces which were non-placeted on December 10, were carried by considerable majorities. The professorship of Surgery has accordingly been suspended for one year, the professorship of Logic and Mental Philosophy is established, and the Sedgwick Memorial Museum of Geology will be built on the ground lately belonging to Downing College. At the same Congregation it was agreed to present to the Lord President of the Privy Council a memorial urging the necessity of legislation bearing upon secondary education.

Mr. Ernest Clarke, Hon. M.A., of St. John's College, Secretary of the Royal Agricultural Society, has been appointed the first Gilbey Lecturer in the History and Economics of Agriculture.

Mr. J. J. H. Teall, of St. John's, has been appointed an elector to the Professorship of Geology; and Dr. A. S. Lea an elector to the Professorship of Physiology.

THE Hamilton Court Building Company, consisting of friends of Columbia University, have purchased land in New York City, at a cost of two hundred thousand dollars, and will erect upon it, at a cost of one million dollars, a dormitory to accommodate 900 students of the University.

THE following are among recent announcements:—Dr. W. Valentiner, associate professor of astronomy at Heidelberg, to be full professor, and Dr. Knövenagel to be associate professor; Dr. P. Freiherr von Lichtenfels to be professor of mathematics in the Technical High School at Graz; Dr. W. Rothert to be associate professor of botany in the University of Kasan; Dr. Seitaro Goto to be professor of botany in the First High School at Tōkyō, Japan; Dr. Kepinsky to be associate professor of mathematics at the University of Krakau.

THE William Gossage Laboratories, just added to the Chemical Section of Liverpool University College, were formally opened on Saturday by Lord Derby, President of the College, in the presence of a large and representative gathering. The laboratories have been built and equipped at a cost of 7000*l.* by Mr. F. H. Gossage and his partner Mr. T. Sutton Timmis, as a memorial of the father of the former, the late Mr. Wm. Gossage, distinguished as a chemical investigator and inventor of chemical processes. An address was delivered by Prof. Ramsay on chemical education and the equipment of laboratories. A full report of the address and other speeches made upon the same occasion is given in the *Liverpool Courier* of Monday, December 14.

SIR P. MAGNUS, in the course of some remarks at the Norwood Technical Institute, on Wednesday of last week, reviewed the history of the polytechnic institutes in London and the provinces. He estimated the amount spent on evening teaching, exclusive of interest on capital outlay for buildings, at over 175,000*l.* a year. It was pointed out that the London institutes give facilities not only for technical but also for literary and general education, which are not obtainable on the same scale and on similar lines in any other capital in the world. The reason why in some other countries, especially in Germany and Switzerland, lads are better able to profit by the technical instruction of evening classes than they are in this country, is because the lads leave school at a later age and more generally attend continuation classes.

IT is very satisfactory to note that our political leaders have lately devoted themselves to expounding the connection of science with industry. Mr. A. J. Mundella, M.P., speaking at the Birmingham Municipal Technical School, on Friday last, on the subject of German competition, said he quite admitted that we had suffered loss from our past neglect, particularly in regard to the development of the new sciences and new discoveries, which Germany had adopted and developed in a marvellous manner. He instanced the growth of the colour trade in Germany. That industry was an English discovery, founded by a Birmingham man, and worked in Manchester. Yet English manufacturers, not for the want of money or want of enterprise, but from the want of knowledge, had allowed it to be exploited by Germany, and the trade, amounting to many millions a year, had almost entirely left this country.

IN the course of an address at the Battersea Polytechnic, on Wednesday in last week, the occasion being the distribution of prizes and certificates to evening students, Mr. John Morley, M.P., referred to a few points of importance to science and education. He remarked that those who had studied the education question seriously were aware that a London polytechnic was not the same thing as a German polytechnic. In German polytechnic institutions the students learned the highest, most important, and profoundest principles in connection with the scientific subject which they there studied. The main object in the London polytechnic institutes was a different one; it was that the craftsman, the man who made things and did things with the labour and skill of his hand, should have opportunities brought within his reach of training not merely in the mechanical details but in the principles and the basis of his work. It was difficult, however, it was impossible, to put scientific methods and spirit into the habits of people who had not already undergone a preliminary training. There was a direct connection between technical education and an improvement in their national system of secondary education which did not yet exist. He hoped that the Government before many weeks were over would lay before the House of Commons a scheme for the improvement of secondary education. Every one saw that a higher appreciation of science, of the technical arts, of the improvement of scientific research and investigation on the part of the great English manufacturers was of the very utmost importance. One very often heard of the workmen being complained of; but it was now being seen that the leaders and captains of industry, especially the employers and the heads of great manufacturing enterprises, must open their minds to the improving of scientific investigation and research and training, both for the heads of the enterprises as well as for those who had the actual conduct and the carrying of them out. When the sources of the successful competition against this country in certain branches of industry were investigated, he believed that competent men in trade who had examined the matter would say that one great source of the success of foreign competition, and especially of German competition, had been the existence in Germany for some years of an organised and systematic plan for technical education, technical education connected with the other branches of education; and he hoped that this country would speedily amend and reform its system. . . . A scheme was being framed for a Teaching University for London—a most important scheme. It was most desirable that this body, when it was established, should not be so constituted as to discourage the evening teaching and evening learning of such places as the Battersea Polytechnic. They should allow students from such institutions as this to be admitted by their examinations.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, December 11.—Prof. Ayrton, Vice-President, in the chair.—A paper on the applications of physics and mathematics to seismology was read by Dr. C. Chree. Prof. J. Milne has attempted to account for certain changes in the indications of spirit-levels and delicately suspended pendulums by the supposition that they are due to meteorological agencies, such as rainfall or evaporation. Thus he considers that a relative excess of moisture—say, on the west of an observatory—is equivalent to a surface load on that side tending to make the ground, on which the observatory rests, slope downwards from east to west. The author, by making the assumptions as to the physical state of the substance of the earth that it is a homogeneous, isotropic, elastic solid, has examined in as general a manner as possible the amounts of flexure which would be produced by different systems of loading. He points out that the alteration in the reading of such an instrument as

a spirit-level depends not only on the bending of the surface of the earth, but also on the attraction exerted by the load, which slightly alters the direction of "gravity." He shows that if ψ_1 is the alteration in level produced by the bending, and ψ_2 the alteration in the direction of gravity, then the ratio ψ_1/ψ_2 depends only on the elastic constants of the earth, and is quite independent of the shape and size of the loaded area. In the case of a material having the elasticity of steel $\psi_1/\psi_2 = 2$, for brass $\psi_1/\psi_2 = 5$, and for an incompressible material $\psi_1/\psi_2 = 11$. The author considers that this last value most truly represents what occurs in practice, and hence that the pressure effect is considerably larger than the gravitational effect. The pressure effect is worked out for the cases where the loaded area is a square, and a long narrow rectangle, and it is found that for a square of 100 metres side the effect, at a point one metre from one side, of loading the square with a layer of water one centimetre thick, is to alter the level by 0·0012 second of arc. For the case of a tidal river 100 yards wide, and for a rise of 5 metres, the effect on an observatory at 100 yards from the bank would be to alter the level by 0·1 second of arc. Hence the effect of an estuary or tidal river is likely to be much more marked than differential evaporation or rainfall. The author also considers the effects of the attraction of the sun and moon, producing as they must "tides" in the solid crust of the earth, on the reading of a level and the measured altitude of a star as obtained with an artificial horizon. Finally the author considers the light the measurements on the velocity of propagation of earthquake disturbances throw on the credibility of the hypotheses he has made us to the elastic constants of the earth. He shows that the two observed velocities of 2·5 and 12·5 kilometres per second would lead to values for Young's modulus, and the rigidity below those found in the case of iron; the bulk modulus, however, obtained is very high, and this he considers quite probable on account of the enormous pressure to which the earth's deep-seated material is subjected. Prof. Perry said he had thought of taking up the subject from an experimental point of view, and trying the effect of loading a large block of indiarubber. He had not had time to refer to the author's paper, in which the reasons were given for taking the earth as incompressible. He (Prof. Perry), however, thought that this assumption led to results in contradiction to actual observed facts. Prof. Milne had obtained results which, for want of any other explanation, he had been compelled to attribute to meteorological causes. The reason Dr. Chree had obtained so small a value for the effect of loading by surface water might be because he had assumed erroneous values for the elastic constants. If he took a value for Poisson's ratio such as we meet with in practice, the effects would be much larger. Prof. Darwin had also investigated the folding of the surface of the earth due to loading. The results obtained by the author with reference to the velocity of waves did not seem quite satisfactory. The small waves which were found, both at Berlin and the Isle of Wight, to precede the main waves coming from an earthquake in Japan were not accounted for. The wave velocity in an infinite mass of steel (a very elastic material) was about 6 kilometres per second, which was very different from 12·5 kilometres per second. The author had assumed such values for the elasticity as would give the correct velocity. The author in reply said that in applying the equations of elasticity to the earth's interior, unless the material were supposed nearly incompressible, one obtained values for the strains too large to be consistent with the fundamental mathematical hypothesis, that the square of strains are negligible. In the case of surface loading no such restriction was necessary, so far as the surface layers, at least, are concerned. The differences between the several numerical estimates for the ratio of the gravitational and pressure effects of a surface load were principally due to the differences in the hypothetical values ascribed to the rigidity. It was his wish to make it clear that the pressure and gravitational agencies treated in detail in the paper were not the only ones likely to affect the level; he had specially called attention to solar heating and possible direct influence of moisture on the foundations of buildings, &c. The reason why for the one wave velocity so much higher a value was obtained than that Prof. Perry calculated for steel, was solely the high value, 24 : 1, found for the ratio of Thomson and Tait's elastic constants m and n. He knew Prof. Darwin had treated of the phenomena met with in loose earth in some cases, but could not say whether this was what Prof. Perry referred to. He had himself once thought of attempting an application of what Prof. Karl Pearson termed the "equations of pulverulence," as treated in detail by Prof. Boussinesq, but had not done so, partly from a feeling of uncertainty as to their physical value. Supposing these equations satisfactory, they ought to give better results than the equations of elasticity when surface load was applied to a deep alluvial soil.—A paper on musical tubes, by Mr. R. T. Rudd, was, in the absence of the author, read by the Secretary. The author has examined a set of tubes ranging in length from 95 inches to 12 inches, made out of "1-inch" gas-tube. Having tuned these to a diatonic scale, he found that there was a very marked difference in the character of the sound of the long, the middle, and the short tubes. Commencing with the long tubes, the first two octaves have a full rich tone very similar to that of a church bell. They range from D of 145 vibrations per sec. to D of 580 vibrations. At about this point the tone changes from that of a church bell to one peculiar to tubes, the note also falls back in the scale more than a fifth, viz. to F♯ (360), the same tube giving two notes, to either of which the attention can be directed. In order to distinguish these different classes of sound produced by tubes, the author calls the tone corresponding to that of a church bell the "low grade," the next one the "middle grade," and that produced by short tubes (27 in. and under) the "high grade." At the junction between the high and middle grade there is a fall in the note of about an octave and a half. The following formula may be used for calculating the pitch of the note given by a tube: $V = DC/L^2$, where V = frequency, D = external diameter, L = length, and C is a constant which for iron tubes has the value 100×10^4, 62×10^4, or 22×10^4, according as the note belongs to the low, the middle, or the high grade. The author explains the effects by a consideration of the partial tones present and their effect on the ear. Prof. Rücker said he thought it a great pity that in England such confusion of nomenclature existed, so that partials were often called over-tones. He considered that the author had made an extremely ingenious attempt to explain the differences of pitch observed, this explanation apparently resembling that given by Prof. Everett to account for combination tones. The author explains the presence of a note of frequency 630, as being formed in the ear by the harmonies having frequencies of 1260, 1900, and 2600. He also explains the absence of lower partials having frequencies of 780, 390, and 140 by the supposition that they are so far removed from the "focus" as not to appreciably affect the ear. Another explanation of the presence of a note of frequency about 630 would, however, be the formation of a difference tone between the partials of frequency 780 and 140. Mr. Blaikley agreed with Prof. Rücker as to the vagueness of the terms often employed, and said that it appeared that in the "high grade" the note was caused by the first proper tone, in the "middle grade" by the second, and in the "low grade" by a difference tone produced by the fourth, fifth, and sixth proper tones. The distance of the nodes from the end of the tube was ·224 of the length, and not ·25, as the author states, and in the case of a tube clamped at the node, this difference in the position of the clamp would have a marked effect on the tone. A great distance in the tone was also produced by varying the hardness of the hammer. Prof. Ayrton said he had once investigated the behaviour of some tubes by analysing the note given out by means of a Helmholtz analyser. In the case of the tubes that gave a good note, it was found that the components were few and well-marked, while in that of the tubes which gave a bad note, the components were numerous and sometimes very ill-defined. The relative length, diameter, and thickness of the tube had a great influence on the tone.

Chemical Society, December 3.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read: Constitution and colour, by A. G. Green. Colouring matters may be classified in two groups, viz.: (1) Colours whose leuco-compounds are not readily oxidised on exposure to air; (2) colours whose leuco-compounds are rapidly oxidised on exposure to air. It is shown further that the members of class 1 are all para-derivatives, whilst those of class 2 can all be represented as ortho-compounds.—Derivatives of α-hydrindone, by C. Revis and F. S. Kipping. The authors have studied α-hydrindone in order to determine whether its reactions are analogous to those of camphor, which it resembles somewhat in constitution; there is, however, a marked difference between the chemical behaviour of the two ketones.—Notes on nitration, by H. E. Armstrong.—3′-Bromo-β-naphthol, by

H. E. Armstrong and W. A. Davis. 3′-Bromo-β-naphthol is prepared by digesting 1 : 3′-dibromo-β-naphthol with hydriodic acid.—Derivatives of nitro-β-naphthols, by W. A. Davis.—Morphotropic relations of β naphthol derivatives, by W. A. Davis. The author shows that a marked crystallographic relation exists between a number of 1 : 2 and 1 : 3′ : 2 naphthalene derivatives; although the crystalline systems of the various substances examined are not the same, yet the axial ratio $c : b$ is nearly the same in all.—Researches on tertiary benzenoid amines, by Miss C. de B. Evans. A number of sulphonic acids of benzenoid amines have been prepared; it is shown that although orthosulphonic acids are readily obtained from aniline derivatives, there is usually extraordinary difficulty in preparing metasulphonic acids.—On the circumstances which affect the rate of solution of zinc in dilute acids, with especial reference to the influence of dissolved metallic salts, by J. Ball. The effects on the rate of solution of zinc in dilute acids of (1) variations of concentration of the acid; (2) previous special treatment of the acid; (3) variations of temperature; (4) variations of pressure; (5) variations of the surface condition of the zinc; (6) admixture of other metals with the zinc; (7) performance of the solution in vessels of different materials; and (8) addition of various substances to the acid solution, have been studied. It is of interest to note that the addition of foreign salts to the solution always accelerates the dissolution of the zinc.—The oxidation of ferrous sulphate by sea-water, and on the detection of gold in sea-water, by E. Sonstadt. The author shows that by prolonged agitation of half-a-gallon of sea-water with twenty grains of mercury, an appreciable quantity of gold is taken up by the mercury.

Mineralogical Society, November 17.—Annual Meeting; Dr. Hugo Müller, F.R.S., in the chair.—The balance-sheet for the year ending December 31, 1895, was presented, and showed that the state of the finances of the Society continues to be very satisfactory. The number of members is now 130. Two numbers of the journal have been issued during the past year, including an index of authors and subjects for the ten volumes of the journal which have now been published. The Council were able to congratulate the Society upon the continued steady sale of the journal. Mr. Thomas Henry Holland, superintendent of the Geological Survey of India, Calcutta, was elected a member of the Society. The following papers were then read: Notes on Zirkelite and Derbylite, by E. Hussak and G. T. Prior; some crystals of iron pyrites from Cornwall, by A. Hutchinson; crystallographic notes on Zinckenite, Wolfsbergite, Plagionite, Stephanite, Enargite, and Anglesite, by L. J. Spencer; the discovery of Prehnite in Wales, by T. J. Harrison.—It was subsequently announced that the following gentlemen had been duly elected as Officers and Council of the Society for the ensuing year: President, Prof. N. S. Maskelyne, F.R.S.; Vice-Presidents, Rev. S. Houghton, F.R.S., and Dr. Hugo Müller, F.R.S.; Treasurer, Mr. F. W. Rudler; General Secretary, Mr. L. Fletcher, F.R.S.; Foreign Secretary, Prof. J. W. Judd, F.R.S.; ordinary members of Council, Mr. W. Barlow, Prof. A. H. Church, F.R.S., Prof. H. A. Miers, F.R.S., and Mr. W. J. Pope; in addition to the following members not requiring re-election: Prof. Geikie, Messrs. Harker, Hutchinson, Kitto, Prof. Lewis, Lieut.-General McMahon, Messrs. Tutton and Watts.

Geological Society, November 18.—Dr. Henry Hicks, F.R.S., President, in the chair.—On *Cycadeoidea gigantea*, a new cycadean stem from the Isle of Portland, by A. C. Seward. The specimen described by the author was discovered a short time since in one of the Purbeck dirt-beds, and is now in the Fossil Plant gallery of the British Museum. A comparison of this fossil with recent cycads and ferns brought out many points of close agreement with the former, and as regards the structure of the ramenta, evidence was afforded of an interesting survival of the closer resemblance which formerly existed between cycadean and fern-like plants. The stem has been named *Cycadeoidea gigantea*.—The fauna of the Keisley limestone (Part ii., conclusion), by F. R. C. Reed. The author described the ostracoda, brachiopoda, mollusca, echinodermata, and actinozoa of the Keisley limestone. He gave a list of fossils from the limestone, and indicated those species which occurred in the limestone of Kildare, the *Leptæna*-limestone of Sweden, and Stage F of the East Baltic provinces. As a result of his researches he concluded that the fauna had a thoroughly ordovician facies; that it was closely comparable with that of the limestone of the Chair of Kildare, and of the *Leptæna*-limestone, and less closely with that of Stage F of the East Baltic provinces; that its palæontological features pointed to its stratigraphical position being at the base of the Upper Bala, and that it must be regarded as the locally thickened development of a bed which was elsewhere in Great Britain very thin, or entirely absent, or represented by beds having different lithological characters and a different fauna; and that the fauna had certain unique characters which marked it off from all other known assemblages of fossils in Great Britain.

Royal Microscopical Society, November 18.—Mr. A. D. Michael, President, in the chair.—The Secretary read a note, from Mr. E. M. Nelson, on the Hugh Powell Microscope in the Society's collection. A discussion ensued, in which Mr. Ingpen, Mr. Vezey, Prof. Bell, Mr. Beck, and the President took part.—Lieut.-Colonel H. G. F. Siddons exhibited and described a portable cabinet for mounting apparatus.

Linnean Society, November 19.—Mr. A. D. Michael, Vice-President, in the chair.—Dr. D. Morris, C.M.G., exhibited from the Royal Gardens, Kew, the inflorescence of *Pterisanthes polita*, a singular species of the Vine Order (Ampelideæ), received in 1894 from Mr. H. N. Ridley, of Singapore, and now in flower for the first time in Europe. *Pterisanthes* is closely allied to *Vitis*, but shows in a more interesting manner the true nature of the tendrils, and a special modification of the receptacle suggested only in *Vitis macrostachya*. Dr. Morris also exhibited dried flower-stems of the Australasian twin-leaved Sundew (*Drosera binata*, Labill.), received at Kew from the Sheffield Botanic Garden. In this instance the stems were 3 feet 6 inches high, bearing about thirty to fifty large pure white flowers, nearly 1 inch across. The plant grown in gardens in this country is seldom more than 9 inches to a foot high.—Mr. W. G. Ridewood read a paper on the structure and development of the hyobranchial skeleton and larynx in *Xenopus* and *Pipa*. The conclusions were drawn that *Pipa* and *Xenopus* are descended from tongue bearing ancestors, and that in spite of the anatomical differences between the two genera, the sub-order Aglossa is a natural one.—A paper was then read by the Rev. T. R. Stebbing, F.R.S., "On the collection of Amphipoda in the Copenhagen Museum." Some of the more striking rarities were described, together with a few of a less uncommon type. The collection being cosmopolitan, the opportunity was taken of bringing into notice certain other new or insufficiently known forms received from Prof. Haswell, of Sydney, N.S.W., and from Mr. G. M. Thompson, of Dunedin, N.Z. The range of the various specimens described extends from Cuba to Ceylon; from the North Atlantic to the South Pacific; from the western coast of Scotland to the eastern coast of Australia and New Zealand. Nine genera and ten species were discussed, six of each being new.

Zoological Society, December 1.—Sir W. H. Flower, K.C.B., F.R.S., President, in the chair.—Mr. R. E. Holding exhibited and made remarks on a three-horned fallow deer's head and a malformed head of a roebuck.—Mr. H. E. Dresser exhibited and made remarks on a specimen of Pallas's willow-warbler (*Phylloscopus proregulus*), shot at Cley-next-the-Sea, Norfolk, on October 31, 1896, being the first instance of the occurrence of this bird in Great Britain.—Dr. Forsyth Major gave an account of the general results of his zoological expedition to Madagascar in 1894-96. Amongst the more important results attained by Dr. Major was the discovery of remains of a new fossil monkey (*Nesopithecus*), forming the type of a new family of Quadrumana, and of about twenty new species of living mammals, several of these belonging to new genera. A very fine series of bones of the extinct Æpyornithes obtained by Dr. Major would enable some nearly complete skeletons of this group to be put together for the first time.—A communication was read from Mr. Stanley S. Flower, containing an annotated list of all the reptiles and batrachians known to occur in the Malay Peninsula and on the adjacent islands. A new species of gecko (*Gonatodes penangensis*) was described, and original observations relating to the distribution, variation, and habits of known species were added, especially with regard to the tadpoles of various batrachians.—Mr. G. A. Boulenger, F.R.S., read descriptions of some new fishes from the Upper Shiré River, British Central Africa, based on specimens collected by Dr. Percy Rendall, and presented to the British Museum by Sir

Harry Johnston, K.C.B. The present collection contained examples of fourteen species, of which five were now described as new to science.—A second communication from Mr. Boulenger contained remarks on the lizards of the genus *Eremias*, section *Boulengeria*.—Mr. R. Lydekker, F.R.S., gave an account of an apparently new deer from North China, living in the menagerie of the Duke of Bedford, at Woburn Abbey, to which he proposed to assign the name *Cervus bedfordianus*.—The Secretary read a communication from Mr. A. J. North, of the Australian Museum, Sydney, containing an account of a cuckoo in the Ellice Islands (*Eudynamys taitensis*), which appears to lay its eggs in the nest of a tern (*Anous stolidus*).—The Rev. T. R. R. Stebbing communicated a paper by Dr. H. J. Hansen, of the Copenhagen Museum, on the development and the species of the Crustaceans of the genus *Sergestes*.

Entomological Society, December 2.—Dr. Sharp, F.R.S., Vice-President, in the chair.—Dr. Sharp exhibited the series of Longicorn Coleoptera of the genus *Plagithmysus* from the Hawaiian Islands, of which a preliminary account had recently been given by him elsewhere. He said that these examples were the result of Mr. Perkins' work for the Sandwich Islands Committee, and afforded a fair sample of his success in the other orders, which would be found to have completely revolutionised our knowledge of the entomological fauna of these islands. He stated that Mr. Meyrick had recently informed him that the *Geometridæ* would be increased from six species to forty-four, and that the genus *Plagithmysus* showed an almost equal increase; and that the working out of the specimens was very difficult, owing to the variability of the species and to their being closely allied.—Mr. Malcolm Burr exhibited a specimen of a cockroach, *Pycnoselus indicus*, Fabr., taken in a house at Bognor, Sussex. He said this was the first record of the occurrence of the species in England. According to De Saussure, it was distributed throughout India, Ceylon, Mexico, and the United States.—Mr. P. Crowley exhibited a remarkable variety of *Abraxas grossulariata* taken in a garden at Croydon last summer.—Mr. Tutt exhibited some Micro-Lepidoptera from the Dauphiné Alps. Several specimens of *Psecadia pusiella*, Röm., showing considerable difference in the width of the black zigzag band crossing the centre of the forewings longitudinally. The species was taken at La Grave, in a gully at the back of the village. A large number of specimens were secured, chiefly resting on the trunks and branches of two or three ash and willow trees growing on the bank at the side of the gully. A few specimens, however, were obtained drying their wings on the grass on the bank, but Mr. Tutt stated that he failed to find pupa-cases. Mr. Tutt also exhibited specimens of a "plume" which had been named *Leioptilus* (*Alucita*) *scarodactyla*. He also exhibited specimens, from Le Lautaret, of *Gelechia spuriella*, *Sophronia semicostella*, *Pleurota pyropella*, *Œcophora stipella*, and *Butalis fallacella*. The latter were chiefly interesting from the fact that they were taken at an elevation of about 8000 feet.—Lord Walsingham, F.R.S., read a paper entitled, "Western Equatorial African Micro-Lepidoptera." A discussion ensued, in which Dr. Sharp, Herr Jacoby, and others, took part.

CAMBRIDGE.

Philosophical Society, November 9.—Mr. F. Darwin, President, in the chair.—"On the Nature of the Röntgen Rays," by Prof. Sir G. G. Stokes. In this communication the author explained the views he had been led to entertain as to the nature of the Röntgen rays, and to a certain extent the considerations which had led him to those conclusions. As Röntgen himself pointed out, the X-rays have their origin in the portion of the wall of the Crookes' tube on which the so-called kathodic rays fall, and it is natural that notions as to the nature of the X-rays should be intimately bound up with those entertained as to the nature of the kathodic rays. Two different views have been adopted on this question. Several eminent German physicists hold that the kathodic rays are essentially a process going on in the ether, the nature of which nobody has been able to explain; and that if any propulsion of molecules from the kathode accompanies them, it is merely a secondary phenomenon. The other view is that the kathodic rays are not proper rays at all, but that they are essentially streams of molecules. The author expressed the fullest conviction that the kathodic rays are no mere process going on in the ether, but that the propulsion of molecules is of the very essence of the phenomenon; only it is to be remembered that the molecules are not to be thought of as acting merely dynamically, by virtue of their mass and velocity; they are carriers of electricity; and it would seem to be mainly to this circumstance that some at least of their effects are due. He indicated what he believed to be the true answers to the objections of those who regard the kathodic rays as processes in the ether; and adopting the theory that they are streams of molecules explained how, in his opinion, this theory, taken in connection with the more salient features of the X-rays to which the kathodic rays give birth, leads us to a theory of the nature of the X-rays. Everything points to the X-rays as being, like rays of light, some process going on in the ether, and sufficient indications of their polarisation appear to have been obtained (at least when those indications are taken along with the undoubted polarisation of the Becquerel rays with which they have so many properties in common) to refer the Röntgen as well as the Becquerel rays to a disturbance transverse to the direction of propagation. The absence of refraction, which is so remarkable a feature of the X-rays, suggests that their progress through ponderable matter takes place by vibrations in the ether existing in the interstices between the ponderable molecules; a view which, if correct, leads incidentally to a somewhat novel view as to the mechanism of the refraction of light. The absence, or almost complete absence, of diffraction and interference of the X-rays leads to one of two alternatives—either that they are of excessively short wave-length, or that they are non-periodic or only very slightly periodic, the X-light being on the latter supposition regarded as a vast succession of independent pulses analogous to the "hedge-fire" of a regiment of soldiers. According to the author's view, each electrically charged molecule on arrival at the target gives rise to an independent pulse, and the vastness of the number of pulses depends on the vastness of the number of molecules in even a minute portion of ponderable matter.—"On the Contact Relations of certain Systems of Circles and Conics," by Mr. W. McF. Orr.—"On certain cases of discharge in vacuo, and on the zigzag path of Lightning," by Mr. J. Monckman.

PARIS.

Academy of Sciences, December 7.—M. A. Cornu in the chair.—Pleurisy in man studied by means of the Röntgen rays, by M. Ch Bouchard. The existence of pleurisy in the human subject is very clearly indicated by the Röntgen ray shadows, but the method offers no advantages over the ordinary clinical diagnosis.—On the composition of the gases which are evolved from the mineral waters of Bagnoles de l'Orne, by MM. Ch. Bouchard and Desgrez. The gas contained traces of helium, 4·5 per cent of argon, 5·0 per cent. of carbon dioxide, the remaining 90·5 per cent. being nitrogen.—The theory of the confluence of the lymphatics and the morphology of the lymphatic system of the frog, by M. L. Ranvier.—On the quaternary elephants of Algeria, by M. A. Pomel. In the two quaternary geological horizons six species of elephant have been found, the distinguishing characteristics of which are described.—The quaternary rhinoceri of Algeria, by M. A. Pomel.—Observations on the total solar eclipse of August 9, 1896, made in Japan by M. H. Deslandres.—Optical analysis of urine, and the exact estimation of proteids, glucosides, and saccharoid non-fermentable materials, by M. Fr. Landolph.—Germination of the spores of the truffle, by M. A. G. Grimblot.—Modification of a fundamental principle relating to imaginary quantities, by M. L. Mirinny.—An air compressor with two cylinders, by M. J. Niffre.—Comparison of the observations of Vesta with the tables, by M. Leveau.—On a class of paraboloids, by M. A. Mannheim.—On the problem of Dirichlet and the fundamental harmonic functions attached to a closed surface, by M. Le Roy.—On the equations representable by three linear systems of points, by M. Maurice d'Ocagne.—The construction of standard plates for the optical measurement of small air thicknesses, by MM. A. Pérot and Ch. Fabry.—On the property of discharging electrified conductors communicated to gases by the X-rays by flames and by electric sparks, by M. Emile Villari. A reply to the claim for priority in this subject by M. E. Branly.—On lithium nitride, by M. Guntz. It is practically impossible to prepare lithium nitride in a pure state, as it exerts a solvent action upon every substance used as a containing vessel.—On the heat of formation of selenic acid and some selenates, by M. René Metzner. Measurements are given for the heat of neutralisation of selenic

acid with soda, potash, baryta, lead oxide, and silver oxide; and of the heat of formation of the various hydrates.—Estimation of phosphorus in the ashes of coal and coke, by M. Louis Campredon. It is shown that the whole of the phosphorus cannot be extracted from the ash even after a very prolonged heating with hydrochloric acid. Fusion with alkaline carbonates of the residue left after extraction with acid always gives a further amount of phosphate, which is the larger the longer the ash has been ignited.—Analysis of commercial copper by the electrolytic method, by M. A. Hollard. Details are given of the method employed for the exact estimation of the copper in crude coppers.—On ozone and the phenomena of phosphorescence, by M. Maurice Otto. Most organic substances are capable of giving rise to phosphorescence when placed in contact with ozone. The luminosity produced with ordinary distilled water is shown to be due to the presence of minute quantities of organic matter.—On the new bread for military purposes, by M. Balland.—Researches on the modifications of nutrition in cancerous subjects, by MM. Simon Duplay and Savoire. The alkaloidal substance isolated by M. Griffiths, in 1894, from cancerous urines, would appear to be due to the introduction of foreign micro-organisms; when the cancerous growth is in a part of the body naturally aseptic, no such substance can in general be found in the urine. An alkaloidal substance, differing in its reactions from that described by Griffiths, was, however, present in one case of sarcoma.—On a new method of collecting the venom of serpents, by M. Paul Gibier. It has been found that after suitable arrangements have been made for holding the snake and collecting the venom, the serpent refuses to emit a single drop of the venom. This difficulty is overcome by stimulating the venom glands and neighbouring muscles with a weak alternating current, when, in a few seconds, the glands are completely emptied.—Use of the grisometer in the medico-legal examination for carbon monoxide, by M. N. Gréhant The gas is extracted by the aid of acetic acid and the mercury pump, and the carbon monoxide determined in the gas mixture by means of the grisometer.—On the development of some annelids, by M. Auguste Michel.—Observations on the rhizoctone of the potato, by M. E. Roze.—Destruction of *Heterodera Schachtii*, by M. Willot.—The endomorphic transformations of the granitic magma of Ariège, in contact with limestones, by M. A. Lacroix.—Artificial reproduction of pirssonite, northupite, and gaylussite, by M. A. de Schulten.—The Upper Jurassic strata in the neighbourhood of Angoulême, by M. Ph. Glangeaud.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 17.

ROYAL SOCIETY, at 4.30.—On the Dielectric Constant of Liquid Oxygen and Liquid Air: Prof. Fleming, F.R.S., and Prof. Dewar, F.R.S.—On the Effect of Pressure in the Surrounding Gas on the Temperature of the Crater of an Electric Arc: Correction of Results in former Paper: W. E. Wilson, F.R.S., and Prof. FitzGerald, F.R.S.—Influence of Alterations of Temperature upon the Electrotonic Currents of Medullated Nerve: Dr. Waller, F.R.S.—Subjective Colour Phenomena attending Sudden Changes of Illumination: S. Bidwell, F.R.S.—On the Occurrence of Gallium in the Clay-Ironstone of the Cleveland District of Yorkshire: Prof. Hartley, F.R.S., and H. Ramage.—On some Recent Investigations in Connection with the Electro Deposition of Metals: J. C. Graham.

LINNEAN SOCIETY, at 8.—On the Chalcididæ of the Island of Grenada: Dr. L. O. Howard.—On the Development of the Ovule of Christisonia, a Genus of the Orobancheæ: W. C. Worsdell.

CHEMICAL SOCIETY, at 8.—On the Experimental Methods employed in the Examination of the Products of Starch-hydrolysis; on the Specific Rotation of Maltose and of Soluble Starch; on the Relation of the Specific Rotatory and Cupric-reducing Powers of Starch-hydrolysis by Diastase: Horace T. Brown, F.R.S., Dr. G. H. Morris, and W. H. Millar.

ROYAL STATISTICAL SOCIETY, at 5.30.

FRIDAY, DECEMBER 18.

EPIDEMIOLOGICAL SOCIETY, at 8.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Wells, and Well-Sinking: John W. Kitchin.

SUNDAY, DECEMBER 20.

SUNDAY LECTURE SOCIETY, at 4.—Creatures of Other Days: Rev. H. N. Hutchinson.

TUESDAY, DECEMBER 22.

ROYAL INSTITUTION.—Use of Liquid Air in Scientific Research (before H.R.H. the Prince of Wales): Prof. Dewar, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Steel Skeleton Construction in Chicago: E. C. Shankland.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Alterations of Personality; A. Binet, translated by H. G. Baldwin (Chapman).—The Cell in Development and Inheritance: Dr. E. B. Wilson (Macmillan).—Second Annual General Report upon the Mineral Industry of the United Kingdom of Great Britain and Ireland for the Year 1895: Dr. C. le Neve Foster (Eyre and Spottiswoode).—Light as the Interpretation of the Law of Gravity: A. M. Cameron (Sydney, Angus and Robertson).—London University Guide and University Correspondence College Calendar, 1896–7 (Clive).—Hygiene for Beginners: Dr. E. S. Reynolds (Macmillan).—Compressed Air Illness: Dr. E. H. Snell (Lewis).—Roentgen Rays and Phenomena of the Anode and Cathode: E. P. Thompson (Spon).—Knowledge, Vol. xix (326 High Holborn).—Studies in the Morphology of Spore-producing Members: Prof. F. O. Bower. II. Ophioglossaceæ (Dulau).—Die Leitfossilien: Dr. E. Koken (Leipzig, Tauchnitz).—Elementary Non Metallic Chemistry: S. R. Trotman (Rivington).—The Fauna of British India, including Ceylon and Burma. Moths, Vol. iv.: Sir G. F. Hampson (Taylor and Francis).

PAMPHLETS.—Die Seen des Salzkammergutes und die Österreichische Traun: Dr. J. Müllner (Wien, Hölzel).—Die Abfluss-und Niederschlagsverhältnisse von Böhmen, &c.: Dr. A. Penck (Wien, Hölzel).—Atlas der Österrischischen Alpenseen, i. Liefg.: Dr. F. Simony and Dr. J. Müllner (Wien, Hölzel)—Ditto, ii. Liefg.: Dr. E. Richter (Wien, Hölzel.—The Results of the Use of Tuberculin in the Castlecraig Herd: J. Wilson (Edinburgh, Johnston).

SERIALS.—Lloyd's Natural History. Game Birds: W. R. Ogilvie-Grant, Parts 1 and 2 (Lloyd).—Himmel und Erde, November (Berlin, Paetel).—Engineering Magazine, December (Tucker).—Journal of the College of Science, Imperial University, Japan, Vol. x. Part 1 (Tōkyō),—American Journal of Science, December (New Haven).—Transactions of the Yorkshire Naturalists' Union, Part 20 (Leeds, Taylor).—Bulletin de l'Académie Royale des Sciences, &c., de Belgique, 1896, Nos. 9 and 10 (Bruxelles).—Journal of the Franklin Institute, December (Philadelphia).—Botanische Jahrbücher, &c., Zweiundzwanzigster Band, 3 Heft (Leipzig, Engelmann).

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