SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, May 8.—Captain Abney, President, in the chair.—Messrs. Frith and Rogers read a paper on the true resistance of the electric arc. It was pointed out by Prof. Ayrton, at the British Association meeting at Ipswich, that if the "true resistance" of an arc is defined as the ratio of a small increase of the P.D. between the carbons to the corresponding change in the current, it follows that this "true resistance" must be a negative quantity. In order to measure the "true resistance" without appreciably altering the form of the carbons, &c., the authors superpose a small alternating current on the main continuous current. The arc lamp employed was adjusted by hand, and the arc length was measured by projecting an image of the arc by means of a lens. The main (continuous) current and P.D. were measured by a Weston ammeter and voltmeter, while the auxiliary alternating current was measured by means of an air transformer and an electrostatic voltmeter. The authors find that between the limits employed the magnitude of the alternating current did not influence the results obtained for the resistance of the arc. The frequency, so long as it lies between the limits 250–7 complete alternations per second, and the wave form, do not influence the resistance, since the same results were obtained with a Pyke and Harris alternator, a Ferranti alternator, a Gramme alternator, and a Mordey transformer. For each make of carbon examined, four combinations were used:—+ cored, − cored; + cored, − solid; + solid, − cored; + solid, − solid. The general characteristic of the curves obtained is that for the + solid, − solid combination the "true resistance" is always negative; while for + cored, − cored it is always positive; the other curves lying between these two extremes, those which have the + carbon solid always being more negative than those which have the + carbon cored. In the case of the curves showing, for solid carbons, the relation between the resistance of the arc and the P.D. between the carbons, the current being constant (10 amperes), a minimum (maximum negative) value for the resistance occurs at about 55 volts. With combinations having a cored positive this minimum becomes more strongly marked, and occurs at a lower voltage. The authors find that for cored carbons the position of this minimum is closely connected with the presence or absence of the dark space in the arc. For points on the curve to the right of the minimum point, the dark space is absent; while for points to the left of the minimum, the dark space is always present. It was found that the effect of using as the + carbon a Carré carbon in which the core had been bored out, was to obtain a curve closely resembling that obtained when both carbons were solid. On filling this hollow carbon with plaster of Paris or kaolin, the resistance of the arc became positive. The above experiments were made with the + carbon uppermost; other experiments, made with the arc inverted, showed that with solid carbons the resistance is not appreciably altered by inverting the arc. With cored carbons, however, the resistance, as well as the physical character of the arc, is altered; since, on inversion, the dark space disappears, and the resistance considerably diminishes. If, however, the conditions under which the arc is burning are such that the dark space is absent, then inverting the arc does not alter the resistance. Attempts were made to measure the "true resistance" of a direct current hissing arc, but it was found that, even with the alternator at rest, there was a large deflection of the electrometer, showing that the current through a hissing arc was oscillatory. In order to elucidate the marked difference between their results for cored carbons and those deduced from Mrs. Ayrton's curves, the authors have made a series of measurements at low frequencies. They find that there is a critical frequency above which the resistance has a positive value which is independent of the frequency, and below which it has a negative value, this critical frequency lying between 7·5 and 0. In order to investigate the sign of the resistance at low frequencies, the vibrations of the needles of the ammeter and voltmeter were made use of. By an arrangement of mirrors, the needles and scales of both instruments could be observed simultaneously. In this way it could be seen whether the two needles were, at any instant, vibrating in the same or in opposite directions. If the needles vibrate in the same phase, *i.e.* if an increase of P.D. is accompanied by an increase of current, then the resistance must be positive; while if they are vibrating out of phase, *i.e.* if an increase of P.D. is accompanied by a decrease in current, then the resistance is negative. An attempt to run the arc off a continuous-current dynamo failed, since even with the alternator at rest the electrometer showed a large deflection, evidently due to the oscillation of the current, owing to the commutator of the dynamo having a finite number of segments. Prof. A. Gray doubted whether it was right to give the name "true resistance" of the arc to the slope of the curve connecting the potential difference (V) and the current (A). The authors' method of deducing $\delta V/\delta A$ was only true if the curve was a straight line; while in the case of the arc, E and α may both vary with the current. Mrs. Ayrton said, that with reference to the question of the existence of a back E.M.F. the evidence tended to show that it did not exist. By using an exploring carbon, no constant back E.M.F would be found. Prof. Ayrton said, that considering the arc as consisting of a back E.M.F. and a resistance, it was necessary to separate these two. Simply obtaining one value of the P.D. and the current was of no assistance in solving this question, but a series of values had to be taken. By taking the change in P.D. and current sufficiently small, the curve over the range considered was practically straight. It was curious to note that as long as observers obtained a positive value for the resistance of the arc, no fault was found with the method; but that now a negative value was found, the accuracy of this method was questioned. If a back E.M.F. does really exist, then it follows that the arc must have a negative resistance. Mr. Frith has shown why some people have got positive and some negative values for the resistance of the arc, and also that with an alternating current you may get either one or the other. Mr. Tremlett Carter asked if the fact that the arc had a negative resistance did not imply a back E.M.F. in order that the arc might be stable. If so, was a negative resistance such an absurdity? Mr. Campbell said he was very pleased to see that the authors had applied a method which he (Mr. Campbell) had suggested for measuring pulsating currents. If a pulsating current, such as could be obtained by means of a make and break, were passed through a thermopile, you would get a back E.M.F.; while if an alternating current were employed, you would not. Mr. Frith, in his reply, said that he had *defined* the "true resistance" as dV/dA. Mrs. Ayrton has shown that an arc will not run unless a certain resistance is placed in series with it; this resistance must be numerically equal to the negative resistance of the arc itself. Prof. Ayrton said Mr. Frith's remarks as to the cause of the want of stability of an arc without outside resistance, were most suggestive. The Chairman (Captain Abney) said he did not like the expression P.D. He suggested the employment of photography to facilitate the accurate registration of the instrument readings. The further discussion on the paper was adjourned to the next meeting on May 22.

Mathematical Society, April 23.—Major MacMahon, R.A., F.R.S., President, in the chair.—The President communicated a portion of the following abstract of a paper by Prof. W. Burnside, F.R.S., on the isomorphism of a group with itself. A one-to-one correspondence between the operations of a group, which leaves the multiplication table of the group unaltered, is spoken of as an isomorphism of the group with itself. Such a correspondence may clearly be represented as a substitution performed on the symbols of the operations of the group, *i.e.* the isomorphism may itself be regarded as an operation, and the totality of the isomorphisms of a given group will themselves form a group. This group is known as the "group of isomorphisms" of the given group. The only general theorems connected with the isomorphism of a group with itself hitherto published are due to Herr O. Hölder[1] and Herr G. Frobenius.[2] In the first part of the present paper I have reproduced such of the definitions due to Herren Hölder and Frobenius as are necessary to render it self-contained, and also one fundamental theorem. An isomorphism is defined to be cogredient or contragredient according as it can or cannot be obtained by transforming all the operations of the group by one of themselves. The theorem is that the cogredient isomorphisms form a self-conjugate sub-group of the complete group of isomorphisms. A definition, due to Herr Frobenius, involving an important new conception, is that of a characteristic sub-group. It is as follows. If a sub-group of a given group is transformed into itself by every isomorphism of which the given group is capable, the sub-group is called a characteristic sub-group. In the second part I have first

[1] *Cf.* The first ten pages of a memoir with the title "Bildung Zusammengesetzter Gruppen." *Math. Am.*, xlvi.

[2] *Cf.* Parts of memoirs with titles "Ueber Endliche Gruppen" and "Ueber auflösbare Gruppen II." *Berliner Sitzungsberichte*, 1895.

investigated the conditions under which a group should have no characteristic sub-group. This condition is that the group should be generated by a number of holohedrically isomorphous simple groups, such that every operation of any one of them is permutable with every operation of all the rest; or, in the phraseology of Herr Hölder, the group must be the direct product of a number of holohedrically isomorphous simple groups. The following theorem is then proved. If G is a group which has no characteristic sub-group, and if R is the group of greatest order that contains G self-conjugately, while at the same time no operation contained in R, and not in G, is permutable with every operation of G; then the group R admits of no contragredient isomorphisms, and contains no self-conjugate operation except identity. A special case of this theorem is that the group defined by the congruences

$$\begin{aligned} x_1' &\equiv \alpha_{11}x_1 + \alpha_{12}x_2 + \ldots + \alpha_{1n}x_n + \beta_1, \\ x_2' &\equiv \alpha_{21}x_1 + \alpha_{22}x_2 + \ldots + \alpha_{2n}x_n + \beta_2, \quad (\text{Mod. } \lambda, \text{ prime}) \\ &\cdots\cdots\cdots\cdots \\ x_n' &\equiv \alpha_{n1}x_1 + \alpha_{n2}x_2 + \ldots + \alpha_{nn}x_n + \beta_n, \end{aligned}$$

dmits only cogredient isomorphisms. In the third part I consider the group of isomorphisms of certain simple groups, some of whose properties I have already dealt with in vol. xxv. of the Society's *Proceedings*. For the simple group of order $2^n(2^{2n}-1)$ there defined, I show that the order of the group R of isomorphisms is $2^n(2^{2n}-1)n$, and that if H is the group of cogredient isomorphisms, the factor group R/H is a cyclical group of order n. For the simple groups of order $\frac{1}{2}\lambda^n(\lambda^{2n}-1)$, λ an odd prime, it is shown that the order of the group R of isomorphisms is $\lambda^n(\lambda^{2n}-1)n$, the factor group R/H being the direct product of cyclical groups of orders 2 and n. The latter class includes as a special case, $(\lambda^n = 3^2)$, the alternating group of six symbols. In Herr Hölder's paper, referred to above, the isomorphisms of the alternating group are dealt with, and, as compared with all other degrees, it is found that the alternating group of degree 6 behaves exceptionally, and requires rather elaborate treatment. There seems, however, to be no reason for regarding the alternating groups of different degrees as a set of groups which are characterised by common group-properties in the same way, for instance, as the groups of the modular equation for different prime transformations are; and this view is borne out by the fact that there is nothing exceptional in the behaviour of the alternating group of degree 6 when regarded as one of the class of groups here considered. —The President also read an abstract of a paper on division of the Lemniscate, by Prof. G. B. Mathews.—Dr. Hobson, F.R.S., read a paper on some general formulæ for the potentials of ellipsoids, shells, and discs.—The President offered some remarks on the compensation for difference of capital in gambling *à outrance*, being a contribution to the theory of the "Duration of Play."—Mr. Basset, F.R.S., read a paper on the stability of a frictionless liquid and the theory of critical planes. In the theory of the stability of the steady motion of a frictionless liquid which is bounded by the parallel planes $y=0$ and $y=a$, the disturbed motion depends upon the equation

$$(n/k + U)(d^2v/dy^2 - k^2v) = vd^2U/dy^2 \quad \ldots \quad (1)$$

The usual process of solution fails whenever there is a plane, called a *critical* plane, at which $n/k + U = 0$, and the object of this paper is to examine the nature of the solution when such a plane exists. In steady motion $U = \phi(y)$, where ϕ is a given function; and if a critical plane exists, $-n/k = \phi(c)$, which determines the relation between the time-constant n and the wave-constant k, provided a *real* value of c can be found which lies between 0 and a. The integral of (1) is of the form

$$v = Af_1(y) + Bf_2(y).$$

The boundary conditions require that $v=0$ when $y=0$ and $y=a$. At a critical plane $d^2U/dy^2=0$ or $v=0$. If the first condition is satisfied, and if neither of the functions f become infinite between $y=0$ and $y=a$, the boundary conditions enable the constants A and B to be eliminated, which leads to a relation of the form $F(a, k, c)=0$, and the conditions for the existence of a critical plane require that this equation should furnish at least one *real* value of c lying between 0 and a. But if one of the functions—say f_2—becomes infinite between the limits, $B=0$, and the boundary conditions cannot usually be satisfied, in which case a critical plane cannot exist. When the form of U is such that d^2U/dy^2 does not vanish when $y=c$, a critical plane cannot exist except in very special circumstances. The paper concludes by showing that the particular solutions obtained by the hypothesis that x and t enter into the solution in the form of the factor $e^{ikx+int}$ can always be generalised by Fourier's theorem, so as to include every possible disturbance which does not violate the boundary conditions. The author and Mr. Love, F.R.S., joined in a discussion on the subject of the communication.

Geological Society, April 29.—Dr. Henry Hicks, F.R.S., President, in the chair.—Descriptions of new fossils from the carboniferous limestone. (1) On *Pemmatites constipatus*, sp. nov., a lithistid sponge. (2) On *Palæacis humilis*, sp. nov., a new perforate coral; with remarks on the genus. (3) On the jaw-apparatus of an Annelid, *Eunicites Reidii*, sp. nov., by Dr. G. Hinde.—(1) The *Pemmatites*, belonging to genus hitherto only known from the Permo-Carboniferous beds of Spitzbergen, was discovered in the Yoredale beds of Yorkshire by Mr. J. Rhodes, and is the only fairly complete sponge which has hitherto been detected in the Yoredale beds of North-west Yorkshire. The author gave a full description of the species. (2) The *Palæacis* was found by the Rev. G. C. H. Pollen in the carboniferous limestone and shale series, on the banks of the Hodder, near Stonyhurst. The specific characters of the form were given by the author, who, in the light of the new information, gave a fresh definition of the genus *Palæacis*, which appears to represent a distinct family of perforate corals, in some features more nearly allied to the Favositidæ than to the Madreporidæ or Poritidæ. (3) The third specimen was discovered by Miss Margery A. Reid in the Lower Carboniferous beds of Halkin Mountain, Flintshire, and is named in honour of its discoverer. A description of it was given, and it was stated that, notwithstanding certain peculiarities, the individual pieces correspond so closely with those of the recent *Eunice* family that it may well be included in the genus *Eunicites*.—The Eocene deposits of Dorset, by Clement Reid. The new survey of the western end of the Hampshire basin shows that the Reading beds become fluviatile and gravelly in Dorset (as was already known), and contain, in addition to chalk flints, many fragments of Greensand chert. The London clay thins greatly and becomes more sandy, but is apparently still marine. The Bagshot sands become coarser and more fluviatile, changing rapidly west of Moreton Station, till they consist mainly of coarse subangular gravel. These gravels, formerly referred to the Reading series, are now shown to be continuous with the Bagshot sands, which as they become coarser cut through the London clay and Reading beds to rest directly on the chalk. The Bagshot gravels contain, besides chalk flints and Greensand chert, fragments of Purbeck marble and numerous Palæozoic grits and other stones probably derived from the Permian breccias of Devon.—Discovery of mammalian remains in the old river-gravels of the Derwent near Derby, Part i., by H. H. Arnold-Bemrose. A few mammalian bones were found in sinking a well at Allenton. On April 8, 1895, the authors commenced further excavations, and were successful in finding a number of bones of a *Hippopotamus*, an *Elephas*, and of a *Rhinoceros*. They were found in a dark-coloured sand above the river-gravel, at a depth of 9 feet 8 inches below the surface. Mr. Clement Reid found some twenty or more species of plant-remains in the sand. These plants "indicate a moist meadow or swampy ground, and a temperate climate. The species are all widely distributed." Part ii., by R. M. Deeley. The deposits in which the bones were found occupy a wide trench which occurs on the inside edge of a gravel-terrace stretching for several miles south of Derby, at a height of 15 or 20 feet above the modern alluvial plain. The gravels are of later age than the great chalky boulder clay, and were formed at a time when the rivers were removing from their preglacial valleys the older boulder clays, with which they had been partially filled. Gravels of two ages are recognised: (*a*) recent gravels well stratified, undisturbed, and covered in many places by a thick layer of brick-earth; and (*b*) high-level gravels showing "trail" and contorted bedding. It is in these latter gravels that the trench containing the mammalian remains occurs.

Zoological Society, May 5.—Dr. John Anderson, F.R.S., Vice-President, in the chair.—Mr. W. E. Hoyle exhibited a Röntgen-ray photograph of a snake in the act of swallowing a mouse.—Mr. G. A. Boulenger, F.R.S., read a paper on some little-known Batrachians from the Caucasus, based chiefly on specimens recently transmitted to the British Museum by Dr. Radde, of Tiflis. Among these was an example of the new frog of the genus *Pelodytes*, for which he had proposed the name *P. caucasicus*. Altogether ten species of Batrachians

were now known from the Caucasus.—Mr. F. E. Beddard, F.R.S., read the second of his contributions to the anatomy of Picarian birds. The present communication related to the pterylosis of the *Capitonidæ*.—Mr. M. F. Woodward read a paper on the dentition of certain Insectivores, and pointed out that there was strong evidence to show that the milk-dentition was undergoing reduction in this group as a whole, some of the milk-teeth in *Erinaceus* and *Gymnura* being present as small calcified tooth-vestiges only, while in *Sorex* there were apparently no calcified milk-teeth, but only vestigial milk-enamel organs.—A communication from Mr. A. D. Bartlett contained some notes on the breeding of the Surinam Toad (*Pipa americana*), as recently observed in the Society's Gardens. It had been observed that the eggs when issued from the cloaca of the female, which was protruded into a bladder-like process during their production, were arranged on the back of the female by the action of the male.

Anthropological Institute, May 12.—Mr. E. W. Brabrook, President, in the chair.—Mr. H. W. Seton-Karr exhibited and made remarks on a collection of stone implements discovered by him in Somaliland. Sir John Evans, Prof. Rupert Jones, and Mr. C. H. Read spoke and complimented Mr. Seton-Karr upon his discovery.—Dr. J. G. Garson read a paper on recent observations on the Andamanese by Mr. M. V. Portman. A discussion followed, during which remarks were made by Sir William Flower, Prof. Keane, Mr. C. H. Read, and Prof. Brigham of Honolulu. Dr. Garson read another paper on photographic apparatus for travellers, and exhibited a number of cameras of various designs.

EDINBURGH.

Royal Society, May 4.—Prof. M'Kendrick in the chair.—Dr. John Macintyre made a further communication describing new results with the X-rays. Some of these have already appeared in NATURE (vol. liii. p. 614). He found that his coil gave better results when a mercury interrupter was used, and, on regulating this to give one flash in the tube, he was struck by the peculiar colour of the discharge. He exhibited a photo of the hand taken with one flash, which was quite distinct. With ten flashes it was excellent. What the exposure would be in the case of one flash, he could not say. He had tried the effect of the rays on tourmaline, but could find no trace of polarisation. Prof. M'Kendrick said he had satisfied himself that the rays had no effect on the electric phenomena of the pulsating heart, nor on the motor nerves, but that they had an influence on the currents referable to the retina.—Dr. J. C. Dunlop read a paper on the action of acids on the metabolism. He showed them to have a marked diuretic action, to affect the acidity of the urine only slightly, the acidity being to a great extent neutralised by an increased alkali excretion, and to produce an increased excretion of nitrogen as pre-formed ammonia and extractives, but not as urea. His results did not agree with those of Dr. Haig in the same field.—The Secretary read a paper on clouds, by Mr. John Aitken.—Dr. C. G. Knott read a paper by Prof. J. M. Dixon, on a graphical representation of emotion as expressed in rhythm. The author plotted a graph of the number of syllables in each stanza of Browning's "Abt Vogler," and endeavoured to deduce from the graph the variations in Browning's feelings. Other specimens were treated similarly.

PARIS.

Academy of Sciences, May 11.—On the *rôle* of the induction ring of iron in dynamo-electric machines, by M. Marcel-Deprez. A discussion as to the cause of the effect produced by the ring of iron in dynamos of the Pacinotti type. Some experiments are cited which tend to show that the explanations usually given in text-books are insufficient. The complete theory will be given in a future paper.—Nitrates in potable waters, by M. Th. Schloesing. The results are given of a large number of determinations of nitrates and of calcium in potable waters from various sources. Curves are given showing the variations of these with the season.—On the crepuscular phenomena, and the appearance of the dark face of Venus, by M. Perrotin.—On regular non-linear substitutions, by M. Antoine.—An elementary demonstration of a theorem of M. Picard on complete functions, by M. E. Borel.—Remarks on the preceding communication, by M. Picard.—On the periodic solutions of the problem of the movement of a body suspended by one of its points, by M. G. Kœnigs.—On the rotation of solids and Maxwell's principle, by M. R. Liouville. An examination of a case for which Maxwell's principle does not hold good.—Observations concerning the note of M. Dongier on a method of measuring double refraction, by M. G. Friedel. It is pointed out that the method of M. Dongier was anticipated by the author in 1893.—On the lowering of the explosive dynamic potential by ultra-violet light, and the interpretation of certain experiments of M. Jaumann, by M. R. Swyngedauw. The study of the influence of the rate of variation of potential upon the explosive potential must be made in the absence of ultra-violet light. The neglect of this precaution vitiates the results obtained by M. Jaumann.—On the condensation of dark light, by M. G. Le Bon. Two plates of metal (copper and lead), after exposure to an electric arc for an hour, were made to enclose a negative and a sensitive plate, the faces that had not been exposed to the light being inwards. Precautions were taken to eliminate the possible effects of heat and of contact. That the resulting image must have been caused by something stored on the surface of the metal plates during the exposure to the arc lamp, was definitely proved by the negative results of parallel experiments with plates not exposed to the arc lamp.—The action of hydrogen bromide upon thiophosphoryl chloride, by M. A. Besson (see Notes, p. 63).—The action of air and of peroxide of nitrogen upon some halogen compounds of bismuth, by M. V. Thomas. The halogen compounds studied included the tribromide, triiodide, and the dichloride, which yielded as ultimate products bismuth oxybromide, bismuthic oxide, and bismuth oxychloride respectively.—Action of ethyl-oxalyl chloride upon the aromatic hydrocarbons in presence of aluminium chloride, by M. L. Bouveault. Under suitable conditions this reaction readily results in the production of ethyl phenyl-glyoxylate, or its derivatives.—On a new method of separating the methylamines, by M. Marcel-Delépine. The mixture of amine hydrochlorides is boiled with caustic soda, and the gases passed into commercial formaldehyde. This distillate is now heated with caustic soda, and, after drying, submitted to fractional distillation. Three principal fractions are obtained, at 15°-20°, 67°-68°, and 166° C. The first is trimethylamine, and the two latter, on heating with alcoholic hydrochloric acid, yield the pure hydrochlorides of dimethylamine and methylamine. The separation is more perfect than in the classical method with ethyl oxalate.—On the Synascidia of the genus *Colella*, and the polymorphism of their buds, by M. Maurice Caullery.—On the nephridia of *Branchiobdella varians* (var. *Astaci*), by M. D. N. Voinov.—Formation of an anti-coagulating substance by the liver in presence of peptone, by M. C. Delezenne.—On the effects produced on certain animals by the toxins and anti-toxins of diphtheria and tetanus injected into the rectum, by M. P. Gibier. Toxins and anti-toxins injected *per rectum* are without any effect, and appear to be destroyed or retained by the rectal mucus. For the animals used in the experiments (rabbit, dog, and guinea-pig), the toxins did not poison, and the anti-toxins conferred no immunity.—Hydrographical researches of M. Spindler in Lake Peypous, by M. Venukoff.

PHILADELPHIA.

Academy of Natural Sciences, March 31.—Prof. Henry A. Pilsby called attention to a fine collection of barnacles obtained from the bottom of a vessel recently returned from a voyage to Hong Kong from San Francisco and back, by way of Java and India. *Balanus tintinabulum* was the commonest of the species represented, the varieties *zebra* and *spinosus*, although growing under identical conditions, retained their individuality perfectly.—The question of the constancy of varietal characters was debated by Messrs. Sharp, Pilsby, and Heilprin.—Mr. Pilsby also described a specimen of *Pugnus parvus*, a ringiculate mollusc. The species is involute, a unique character, none of the fossil forms of the family possessing it. He also described a Central American Melanian, under the name *Pachycheilus Dalli*. It is distinguished by a remarkable double sinuation of the outer lip, which has a deep and wide pleurotonoid sinus above, and a rounded projecting lobe in the middle, below which it is again retracted.—On the nomination of the Entomological Section, Dr. Henry Skinner was elected Professor in the Department of Insecta. In response to an invitation from the Committee having charge of the celebration of the fiftieth year of Lord Kelvin's tenure of office as Professor of Natural Philosophy in the University of Glasgow, General Isaac Jones Wistar was appointed to represent the Academy on the occasion.

March 25.—Dr. George H. Horn made a communication regarding the synonymy of the Elateridæ. He specially described the prosternum of Ludius. A Lower California form had the pro-

sternum of different shape from that of other members of the genus, the mesosternum being more protuberant. It will probably be referred to Probothrium.—Mr. Chas. S. Welles exhibited specimens of the larva of *Harrisimemna trisignata*. When full-grown they bore into wood preparatory to changing into chrysalids.—A paper was read entitled "The breeding habits of *Periplaneta orientalis*," by C. Few Seiss. Three females deposited twenty-five egg-cases. Each of these contains sixteen eggs, so that a new generation of 400 cockroaches was represented by the deposit. The first of these egg-cases were dropped May 5 and May 14, 1895, and were hatched November 9. In most cases the deposits were dropped with no attempt at concealment, although in a few instances they were placed in little trenches made by the insect, and then covered up. The development of the capsules was described. The young, probably, receive no maternal care or protection.—Mr. Lancaster Thomas exhibited an improved form of insect net-frame made from a continuous piece of rounded aluminium wire.—Mr. Westcott suggested linoleum as a substitute for cork in the arrangement of insects.—Dr. Henry Skinner called attention to a fungus, *Polyporus betulinus*, which might be used for the same purpose with advantage.—Mr. William J. Fox stated that about ninety species of Hymenoptera, six of which were perhaps new to science, were included in the collections of insects brought by Dr. A. Donaldson Smith from Western Somaliland, Africa.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, MAY 21

ROYAL SOCIETY, at 4.30.—On the Changes produced in Magnetised Iron and Steels by cooling to the Temperature of Liquid Air: Prof. J. Dewar, F.R.S., and Dr. J. A. Fleming, F.R.S.—Note on the Larva and of the Post-Larval Development of Leucosolenia variabilis, H. Sp., with remarks on the Development of other Asconidæ: E. A. Minchin.—Helium and Argon. Part III. Experiments which have yielded Negative Results: Prof. Ramsay, F.R.S., and Dr. Collie.—On the Amount of Argon and Helium contained in the Gas from the Bath Springs: Lord Rayleigh, Sec.R.S.

ROYAL INSTITUTION, at 3.—The Art of Working Metals in Japan: W. Gowland.

CHEMICAL SOCIETY, at 8.—The Diphenylbenzenes. I. Metadiphenylbenzene: F. D. Chattaway and R. C. T. Evans.—Derivatives of Camphoric Acid: Dr. F. S. Kipping.—Some Substances exhibiting Rotatory Power, both in the Liquid and Crystalline states: W. J. Pope.

FRIDAY, MAY 22.

ROYAL INSTITUTION, at 9.—Hysteresis: Prof. J. A. Ewing, F.R.S.

PHYSICAL SOCIETY, at 5.—On Dielectrics: R. Appleyard.—The Field of an Elliptical Current: J. Viriamu Jones.—An Instrument for Measuring Frequency: A. Campbell.

SATURDAY, MAY 23.

GEOLOGISTS' ASSOCIATION (Paddington, at 11.45).—Excursion to Chippenham, Calne, Kellaways, and Corsham.

YORKSHIRE NATURALISTS' UNION, at Hellifield.—Four Days' Excursion for the investigation of Bowland.

MONDAY, MAY 25.

LINNEAN SOCIETY, at 3.—Anniversary Meeting.

TUESDAY, MAY 26.

ROYAL INSTITUTION, at 3.—The Building and Sculpture of Western Europe: Prof. T. G. Bonney, F.R.S.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Apparatus for Photography on Small Plates (smaller than Quarter Plates).

WEDNESDAY, MAY 27.

GEOLOGICAL SOCIETY, at 8.—On the Pliocene Deposits of Holland, and their relation to the English and Belgian Crags, with a Suggestion for the Establishment of a New Zone—"Amstelien"—and some Remarks on the Geographical Conditions of the Pliocene Epoch in Northern Europe: F. W. Harmer.—The Lingula-Flags and Igneous Rocks of the Neighbourhood of Dolgelly: Philip Lake and S. H. Reynolds.—The Kildare Inlier: C. J. Gardiner and S. H. Reynolds.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

THURSDAY, MAY 28.

ROYAL INSTITUTION, at 3.—Lake Dwellings: Dr. Robert Munro.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Utilisation of Water-Power, especially with a Small Fall, with some Examples of Plants for the Generation of Electrical Energy: Alph. Steiger.

CHEMICAL SOCIETY, at 8.—Lothar Meyer Memorial Lecture: Prof. P. Phillips Bedson.

SATURDAY, MAY 30.

ROYAL INSTITUTION, at 3.—The Moral and Religious Literature of Ancient Europe: Dr. E. A. Wallis Budge.

ROYAL BOTANIC SOCIETY, at 3.45.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The Evolution of Bird-Song: C. A. Witchell (Black).—Meteorological Results of the Observations taken at the Bangalore, &c., Observatories, 1893-94: J. Cook (Bangalore) —Earth Knowledge: W. J. Harrison and H. R. Wakefield, Part 2 (Blackie).—The Flora of the Alps: A. W. Bennett, 2 Vols. (Nimmo).—Attaque des Places: Lieut.-Colonel E. Hennebert (Paris, Gauthier-Villars).—La Spectroscopie: Prof. J. Lefèvre (Paris, Gauthier-Villars).—Grundriss der Entwicklungsgeschichte des Menschen und der Sängethiere: Dr. O. Schultze, Erste Hälfte (Leipzig, Engelmann).—Southall's Organic Materia Medica: J. Barclay, 5th edition (Churchill).—Schlich's Manual of Forestry. Vol. v. Forest Utilization: Prof. Fisher (Bradbury).—Water Supply: Prof. W. P. Mason (Chapman).—A Dictionary of the Names of Minerals: Prof. A. H. Chester (Chapman).—Leerboek der Organische Chemie: Dr. A. F. Holleman (Groningen, Wolters).—The Elements of Physics: E. L. Nichols and W. S. Franklin. Vol. 1. Mechanics and Heat (Macmillan).—Memoirs of Frederick A. P. Barnard: J. Fulton (Macmillan).—Nature's Byepaths: Dr. J. E. Taylor. 6th edition (W. H. Allen).—The Aquarium: Dr. J. E. Taylor, 6th edition (W. H. Allen).—Mathematical Papers read at the International Mathematical Congress held in connection with the World's Columbian Exposition, Chicago, 1893 (New York, Macmillan).—Stanford's Compendium of Geography and Travel, new issue. Asia, Vol. 1: A. H. Keane (Stanford).—Gehirn und Seele: Dr. P. Flechsig (Leipzig, Veit).

PAMPHLETS.—Remarkable Eclipses: W. T. Lynn (Stanford).—The Old Light and the New: W. Ackroyd (Chapman).—Nineteenth Report of the State Entomologist on the Noxious and Beneficial Insects of the State of Illinois (Springfield, Ill.).

SERIALS.—Engineering Magazine, May (Tucker).—Science Progress, May (Scientific Press).—Strand Magazine, May (Newnes).—American Naturalist, May (Philadelphia).—Bulletin of the American Mathematical Society, April (New York, Macmillan).—Journal of the Chemical Society, May (Gurney).—Journal of the Royal Microscopical Society, April (Williams).—Astrophysical Journal, May (Chicago).—Royal Natural History, Part 31 (Warne).

CONTENTS.