

of efficiency so that the scholarships might be filled up. This danger, with others, has been under the consideration of the committee, and steps have been taken in the case of certain classes of scholarship to reduce the number available, so that an efficient standard may be maintained. In framing the regulations which will govern the award of scholarships and exhibitions during the next academic year, the committee has endeavoured to arrange that, so far as possible, "no child or young person shall be debarred by poverty from obtaining the kind of education which will prepare him for the career for which his talents and character best fit him, and that the pecuniary emoluments attaching to the scholarships shall be sufficient to enable students to obtain the kind of education, whether industrial, scientific, or literary, which is best suited to their needs and capacities, but not sufficient to induce them to undertake a particular course of study with the object of securing the pecuniary advantages attaching to the scholarship."

As indicating the wide scope of the London County Council scholarship scheme, which has recently been amended, it may be said that in 1905 the Council awarded (a) 2600 junior county scholarships to children between the ages of eleven and twelve, and that the annual cost of awarding one of these scholarships annually was 85*l.*; (b) 390 probationer scholarships, each costing 56*l.*, to children of thirteen to fourteen years of age; (c) 100 intermediate county scholarships, each costing 129*l.*, to boys and girls of from fifteen to seventeen years of age; (d) fifty senior county scholarships, each costing some 200*l.*, to students more than eighteen years of age; and (e) various scholarships in science, art, and technology, at an expenditure of more than 18,000*l.* To state the scholarships which are to be offered for competition this year will indicate some of the changes which have been made as the result of four years' experience. There are to be (a) 1800 junior county scholarships, costing each the same as in 1905, and 300 supplementary junior scholarships of lower value; (b) 300 intermediate county scholarships, but the value of each, for sufficient reasons, has been reduced to 72*l.*; and (c) 150 senior county scholarships, each as in 1905, costing 200*l.* But, whereas the total expenditure in 1905 was 283,940*l.*, the amount in 1909 has, notwithstanding the greater wisdom of the conditions of award in the scheme, been reduced to 263,080*l.* The report of the Education Committee gives very satisfactory evidence to show that the object the education authorities in London have in view is to secure a high quality in the results they obtain, rather than to spread an incomplete and rudimentary education far and wide.

A NUMBER of people interested in the teaching of household and domestic science visited Battersea Polytechnic on June 29 to see the domestic economy training department. Since the department was opened in 1894 more than 400 students have obtained diplomas, and are now occupying responsible positions in leading institutions and schools; the present number of students above eighteen years of age in the department is 130. Students of the department attend, in their first year, a course in "science as applied to household work," which includes physics, chemistry, physiology, and hygiene. This course is taken in addition to the purely practical work of the domestic arts. During the second session the scientific basis of knowledge thus obtained is applied in the practice kitchens, laundries, and housewifery rooms and hygiene laboratories. In the third year's course the same subjects are treated in greater detail, special attention being directed to bacteriology and the examination of food-stuffs. The main objects of the science work are:—(a) to explain, so far as possible, the chemical composition and properties of the materials dealt with in household work; (b) to explain the principal chemical and physical changes taking place in the common household operations involved in cookery, laundrywork, &c.; (c) to give a training in the principles of scientific method. Special stress is laid on the fact that household work generally is really an application of a number of facts and principles in chemistry, physics, hygiene, bacteriology, &c., and that, in order to understand the *rationale* of the ordinary household processes, a knowledge of the general principles of the branches of knowledge just mentioned is necessary.

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SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society, May 27.**—Sir Archibald Geikie, K.C.B., president, in the chair.—Notes concerning tidal oscillations upon a rotating globe; Lord **Rayleigh**.—The absolute value of the mechanical equivalent of heat in terms of the international electrical units: Prof. H. T. **Barnes**. It is pointed out that the Clark cells used by the author in his determinations of the mechanical equivalent of heat in terms of the electrical units were prepared according to the old specifications. The absolute measurements of the Clark cell now being carried on with such precision in the various standardising laboratories are expressed in terms of the new form of cell with specially prepared mercurous sulphate. There is an important difference between the cells, which Wolff and Waters have shown amounts to 0.03 millivolts. The author has compared a set of modern cells with cells set up according to the old specifications, and finds the same constant difference. Taking 1.4330 international volts at 15° C. as representing the modern cells, then the cells made by the old specifications must be taken as 1.4333 international volts at 15° C. The author's measurements of the mechanical equivalent at different temperatures were calculated on the basis of a value for the Clark cell equal to 1.4342 international volts at 15° C. Re-calculating on the new basis, the value of the mean calorie is found to be 4.1849 joules. This agrees with Reynolds and Moorby's directly determined mean, which, expressed accurately for an interval of temperature between 0° C. and 100° C., comes to 4.1836 joules. Rowland's mean value between 5° C. and 35° C. is 4.185 joules, while the author's value between the same limits of temperature is 4.1826 joules. Thus, assuming the variation of the specific heat of water to be correctly determined, the value of the Clark cell, equal to 1.4330 international volts, brings the electrically determined mechanical equivalent into excellent agreement with the same constant measured by mechanical means.—An approximate determination of the boiling points of metals: H. C. **Greenwood**. Although high temperatures can now be easily attained by means of electric heating, no general investigation of the boiling points of metals has yet been carried out. Moreover, such values as are available have in most cases been deduced indirectly, and are very discordant. In the present investigation apparatus was devised for directly measuring the temperatures of ebullition under atmospheric pressure of a considerable number of metals, allowing of use up to 2700° C. Heating was effected electrically, and the metal, when unaffected by carbon, was contained in a thin-walled graphite crucible on the outside of which the temperature was estimated by means of a Wanner optical pyrometer. The difference in temperature between the internal and external surfaces of the crucible walls was found to be negligible. Accuracy of the temperature measurements was secured by checking the pyrometer against the "black body" melting points of specially purified strips of platinum, rhodium, and iridium. The following values were found:—aluminium, 1800° C.; antimony, 1440° C.; bismuth, 1420° C.; chromium, 2200° C.; copper, 2310° C.; iron, 2450° C.; magnesium, 1120° C.; manganese, 1900° C.; silver, 1955° C.; tin, 2270° C. In dealing with the metals aluminium, chromium, iron, and manganese, which readily combine with carbon, considerable difficulty was experienced in avoiding contact with carbon at the high temperatures in question. This was finally accomplished by the use of graphite crucibles brasqued with previously fused magnesia. In the absence of this protective lining the boiling point was very greatly modified by carburisation. The temperatures indicated for aluminium and manganese were far below those hitherto supposed necessary for ebullition.—Some results in the theory of elimination: A. L. **Dixon**. The eliminant of two quantics  $\phi(x), \psi(x)$ , each of the  $n^{\text{th}}$  degree, may be expressed as a determinant of the elements of which are  $(a_s, r_t)$ , where  $(a, r)$  is  $[\phi(a)\psi(r) - \phi(r)\psi(a)]/(a-r)$ , and  $a_1, \dots, a_n, r_1, \dots, r_n$  are two sets of  $n$  arbitrary quantities. For three quantics  $\phi(x, y), \psi(x, y), \chi(x, y)$ , each of the form  $\sum A_{rs}x^r y^s$  ( $r \leq n, s \leq m$ ), the eliminant is a determinant of the elements of which are  $F(a_s, b_s, a_t, \beta_t)$  where  $F(a, b, a, \beta) = (\phi(a, \beta)$

$\psi(a, \beta), \chi(a, \beta) / (a - \alpha)(b - \beta)$ , and  $a_1, b_1, \dots, a_n, b_n, \dots$  are two sets of  $2n$  pairs of arbitrary quantities. The eliminant of two quantities  $\phi(x), \psi(x)$  may be expressed as a Pfaffian

$$\Sigma \pm [1, 2][3, 4][5, 6] \dots [2n-1, 2n]$$

where  $[r, s] = \{\phi(a_r^2)\psi(a_s^2) - \phi(a_s^2)\psi(a_r^2)\} / (a_r + a_s)$ . The eliminant of three quantities  $\phi(x, y), \psi(x, y), \chi(x, y)$  of the ordinary standard form  $\Sigma A_{rs}x^r y^s$ , ( $r + s = 2n$ ) is given by the Pfaffian

$$\Sigma \pm [1, 2][3, 4][5, 6] \dots [2n^2 - 1, 2n^2]$$

where

$$[r, s] = \{\phi(a_r b_s, a_r + b_s), \psi(a_r a_s, a_r + a_s), \chi(a_s b_s, a_s + b_s)\} / (a_r - b_s)(a_s - b_r)$$

—The liquidus curves of the ternary system aluminium-copper-tin: J. H. Andrew and C. A. Edwards. The study of the constitution of alloys is of great theoretical interest, and of some practical value; in fact, it may be said that the heat treatment of a given series of alloys cannot be correctly accomplished without an accurate knowledge of the structural changes which occur with varying temperature and concentration. We are now in possession of accurate data bearing on the constitution of a large number of alloys containing only two elements, but very little work has been published on mixtures of three or more metals. The object of the present research was to throw some light on the properties of ternary alloys, and, incidentally, the effect of impurities on binary alloys. The metals from which the alloys were made had the following degree of purity:—

|                  | Per cent. |
|------------------|-----------|
| Aluminium ... .. | 99.57     |
| Copper ... ..    | 99.98     |
| Tin ... ..       | 99.98     |

**Freezing-point determinations.**—The freezing points of the alloys were determined directly after mixing by means of a platinum + 10 per cent. iridium thermo-junction. The free ends of the wires were connected by a mirror galvanometer and balancing arrangement similar to that described by Messrs. Carpenter and Keeling in their work on the iron-carbon alloys. In order to locate the position of the isothermal curves, more than 400 alloys and melting-point determinations were made. **Conclusions.**—The character of the liquidus curves indicates that no well-defined ternary compound is deposited from any of the liquid alloys. The affinity of tin for either aluminium or copper is not sufficient to overcome the affinity of the last two elements for each other. As a consequence of the above, curves of the melting points of alloys containing a constant percentage of tin bear a striking resemblance to the liquidus curve of the aluminium-copper alloys. Tin is insoluble in by far the greater number of the alloys.—Studies on the structure and affinities of Cretaceous plants: Dr. M. C. Stopes and Dr. K. Fujii. This paper is the first account to be published of the anatomy of Cretaceous plants petrified in calcareous nodules. As an introduction to the flora, eighteen plants are described all of which are new. The age of these plants is Upper Cretaceous, as is determined from the ammonites which abound in the matrix of the nodules, and the locality of all the specimens described is Hokkaido, northern Japan. The plants include one fungus, three ferns, eight gymnosperms, and six angiosperms. These numbers seem to represent, roughly, the proportions of the flora of the nodules as a whole, of which many more specimens are in the hands of the authors than are described in the present paper. The most interesting of the plants are:—a new type of gymnosperm, *Yezonia*, of which the vegetative anatomy is different from that of any known genus; a gymnospermic fructification, also new, which there is good reason to believe belonged to *Yezonia*; an angiosperm which is included in the Sabiaceae; an angiosperm of the family Saururaceae; and the first petrified flower, *Cretovarium*, which has three carpels surrounded by the perianth. The names of the described plants are:—*Petrosphaeria japonica*, *Fasciostelopterus Tansliei*, *Schizaeopterus mesozoica*, *Niponophyllum cordatiforme*, *Yezonia vulgaris*, *Yezostrobilus Oliverii*, *Avaucarioxylon tankoensis*, *Cedroxylon Matsumurii*, *C. Yendoii*, *Cunninghamiostrobilus yubariensis*, *Cryptomeriopsis antiqua*, *Saururoopsis niponensis*,

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*Jugloxylon Hamaoanum*, *Populocaulis yezoensis*, *Fagoxylon hokkaidense*, *Sabiocaulis Sakurii*, *Cretovarium japonicum*. The phylogeny and distribution of these plants is considered so far as possible.

June 17.—Sir Archibald Geikie, K.C.B., president, in the chair.—The nature of the hydrogen flocculi on the sun: Prof. G. E. Hale. Photographs of the H $\alpha$  line in the spectrum of the solar disc, made on Mount Wilson with high dispersion, were shown on the screen. The line appears as follows:—(1) A broad dark line, differing greatly in intensity and width in different regions of the sun. Except in eruptive or rapidly changing phenomena, the differences in width are not very marked. (2) Within the boundaries of the dark line a narrow single or multiple bright line is photographed in many parts of the sun. Sometimes the appearance resembles that of the calcium lines K $_2$  and K $_3$ —i.e. the bright line lying on its dark background is divided into two components by a central dark line. In other regions the bright line is divided into a larger number of components, varying in width and separation. The images of dark hydrogen flocculi, on spectroheliograph plates taken with camera slit about equal in width to H $\alpha$ , appear to be due, in the main, to local increase in the intensity of the dark line. In some parts of the sun, particularly those where the line is distorted, variations in the width of the line may also play an important part. The increased intensity of the dark line is probably the result of increased absorption. Slides were shown to illustrate the fact that prominences at the sun's brink are frequently recorded as dark flocculi when photographed in projection against the disc. The possible effects of anomalous dispersion were discussed, and photographs were exhibited of the same region of the sun, taken simultaneously with light from the red and violet edges of H $\alpha$ . The similarity of these photographs apparently indicates that anomalous dispersion is not the prime factor in producing the hydrogen flocculi. Certain minor differences suggest, however, that it may perhaps play a secondary part in modifying their form.—The origin of certain lines in the spectrum of  $\epsilon$  Orionis (Alnitam): Sir Norman Lockyer, K.C.B., F.R.S., F. E. Baxandall, and C. P. Butler. The star  $\epsilon$  Orionis (Alnitam) is of great importance as offering a possible transition stage between the helium and bright-line stars, and the only outstanding lines of unknown origin were those at 4097, 4379.8, and a conspicuous double at 4647.6, 4650.8. In the case of 4097, the clue to the identification was obtained from a spark spectrum of chromium, showing local intensifications of certain lines at one of the poles. Two of these lines were found to be the previously known silicon (iv) lines, 4089, 4116, probably present as impurities in the fused chromium, while one of the remaining two lines was found to coincide with the  $\epsilon$  Orionis line at 4097. These four lines are shown under various conditions in the plate, indicating the steps taken in tracing their origin to nitrogen. In the spectrum of nitrogen, under the special conditions which gave the above lines at 4097, 4103, another line was found at 4379.8, which was greatly strengthened in comparison with its intensity in the ordinary spark, and this line coincides with the unknown line in  $\epsilon$  Orionis. During the work on the above lines, one of the photographs taken of an alcohol spectrum showed abnormal intensifications on either side of the oxygen line 4649.2, suggesting the presence of a new double. The wave-lengths of the components of this double were determined as 4647.6, 4650.8, coinciding with the wave-lengths of the components of the strong double in  $\epsilon$  Orionis. By a series of comparison photographs of spectra under varied conditions, the origin of the double was traced to carbon, and one of the strips of the plate (carbon spark in hydrogen) shows it quite isolated as it appears in the stellar spectrum. Further evidence of the validity of the identification is afforded by the peculiar nature of the components of the double.—Electric induction through solid insulators: Prof. H. A. Wilson. This paper contains an account of a series of experiments on the variation of the capacity of ebonite and other condensers, with the time of charging and with the potential difference. It is shown that the capacity

C after a time of charging  $t$  is given by the formula  $C = C_0(1 + B \log(1 + pt))$ , where  $C_0$  denotes the capacity when  $t=0$  and  $B$  and  $p$  are constants. In the case of ebonite at  $30^\circ$  C. this formula represents the results obtained to within 1 part in 2000. The values of the constants have been found for several substances at different temperatures. The capacity is shown to be independent of the potential difference within the limits of error. It is shown that after the temperature of an ebonite condenser has been changed, then a very slow change in the capacity goes on which continues for more than 100 hours at constant temperature.—The effect of pressure on the band spectra of the fluorides of the metals of the alkaline earths: R. **Rossi**. It was shown by A. Dufour that the band spectra of the fluorides of the alkaline earths show a marked Zeeman effect, and it was thought interesting to see whether these particular bands would also be displaced by pressure, for it is known that the cyanogen bands, which, like most bands, do not show a Zeeman effect, are not displaced by pressure. The large  $2\frac{1}{2}$ -feet concave grating spectrograph of the physical laboratory of the Manchester University was used, and the bands of the fluorides of calcium, barium, and strontium were found to be shifted by pressure. The order of magnitude of the displacement is about the same as for line spectra.—The components into which the bands are resolved are widened by pressure, and the linear relation between pressure and displacement found by former observers on line spectra seems to hold also for these bands. There does not seem to be any evident relation between the magnitudes of the Zeeman and pressure-shift effect in the case of these bands.—The ionisation produced by an  $\alpha$  particle: Dr. H. **Geiger**. The aim of the experiment was an accurate determination of the number of ions produced by an  $\alpha$  particle when completely absorbed in air. The most direct way to find the number of ions would be to measure the whole ionisation produced by the  $\alpha$  particles from a known quantity of radium C. Since it is, however, practically impossible to obtain the saturation current due to the  $\alpha$  particles at atmospheric pressure, it was necessary to adopt an indirect method. This method was briefly as follows:—The ionisation due to the whole number of  $\alpha$  particles expelled from a known quantity of radium C was measured at a low pressure, allowing only a small definite portion of the range of each  $\alpha$  particle to be effective. The ratio of the ionisation produced within this small portion of the range to the ionisation produced along the whole path was then found from an accurate determination of the ionisation curve. It was found that the number of ions produced in air by an  $\alpha$  particle from radium C along its whole path is  $2.37 \times 10^8$ . Since the  $\alpha$  particles from different radio-active products differ only in their initial velocity, it was possible by the aid of the ionisation curve of radium C to calculate the number of ions produced by the other products.—A diffuse reflection of  $\alpha$  particles: Dr. H. **Geiger** and E. **Marsden**. It was observed that a diffuse reflection takes place when  $\alpha$  particles are incident on a plate. The reflected particles were counted by the scintillations produced on a zinc sulphide screen. The effect was found to vary with different metals as reflectors, the amount of reflection being approximately proportional to the atomic weight of the reflecting substance. Using different numbers of thin gold foils as reflectors, it was found that the reflection was a volume effect, and thus similar to the reflection of  $\beta$  particles. Taking a measured quantity of radium C as source, and using a plate of platinum as reflector, it was found that, of the incident  $\alpha$  particles, about 1 in 8000 suffers reflection.—The decay of surface waves produced by a superposed layer of viscous fluid: W. J. **Harrison**. An estimate is obtained of the effect of a thin layer of viscous liquid on the decay of waves at the surface of a slightly viscous liquid. The period equation for the motion is of the fourth degree, and has two real and two complex roots in the case of waves of less than a certain length, and four complex roots in the case of waves of greater length. The real roots correspond to dead-bent modes, the complex roots to propagated modes. No general expression of any use can be obtained for the damping, but the equation

can be solved numerically in any particular case. In the paper the velocity of propagation and the modulus of decay are given for waves of length 2, 5, 10, 20 cm. at the surface of mercury on which is superposed a layer of glycerine 1 mm. in depth. An estimate is also obtained for the damping when the wave-length is small compared with the depth of the layer. Two other problems in the decay of surface waves are discussed.—The passage of electricity through gaseous mixtures: E. M. **Wellisch**. (1) An experimental method (based on Langevin's method) has been devised in order to ascertain whether there are two distinct mobilities for the positive or for the negative ions produced by Röntgen rays in a mixture of two gases, or of a vapour and a gas. (2) No evidence was found of the existence of the two distinct mobilities; accordingly it is necessary to conclude that the motion of the ion through the medium must involve a mechanism of a character such as to produce a statistical average. (3) Experiments were conducted with regard to the effect produced on the ionic mobilities in air by adding small quantities of vapours. The mobilities showed a marked decrease on the addition of alcohol and acetone, but were not sensibly affected by the addition of the heavier vapours of methyl iodide and ethyl bromide. (4) Experiments were performed with regard to the ionic mobilities in mixtures of a gas and a vapour, the ions being formed from the latter constituent only. As a result of the experiments, it was shown that there must be, at all events initially, a transference of the charge (both positive and negative) from the vapour to the gas molecule. (5) Experiments were performed with regard to the stability of the vapour ions in the presence of hydrogen; it was shown that the vapour molecules can accompany the charge to an appreciable extent, even in the presence of a considerable quantity of hydrogen. (6) The mechanism by which the transference of charge from one molecule to another is effected has been discussed; there is reason to believe that the transference takes place by the medium of a detachable unit of positive electricity. (7) From the experimental results a theory of the mechanism underlying the passage of electricity through gases at ordinary temperatures and pressures has been deduced.—A study of the use of photographic plates for the recording of position: Dr. C. E. K. **Mees**.—The coefficients of capacity and the mutual attractions or repulsions of two electrified spherical conductors when close together: Dr. A. **Russell**. The computation of the electrostatic energy of two spherical conductors when close together is an important problem in spark systems of wireless telegraphy. In this case the formulæ previously given for the capacity coefficients are very laborious to evaluate. By extending a mathematical theorem due to Schlämilch, an approximate formula is obtained for the sum of a certain infinite series. By using this theorem, it is shown that when the spheres are close together the ordinary series formulæ for the capacity coefficients can be written in forms which can be readily computed to any required degree of accuracy. The author has re-computed and extended in this way Kelvin's table for the capacity coefficients of two equal spheres when the least distance between them does not exceed half the radius of either. When the spheres are at microscopic distances apart, the formulæ become very simple. Kelvin's table also for the rates at which the capacity coefficients of two equal spheres alter with the distance between them, when this distance does not exceed half the radius of either, has been re-computed and extended. When the spheres are very close together the laws of attraction and repulsion are simple. Let the radius of each sphere be  $a$ , let  $x$  denote the least distance between them, and suppose that the ratio  $V_1/V_2$  of the potentials of the two spheres is not nearly equal to unity, and that  $x/a$  is very small compared with unity. In this case the mutual force between the spheres is attractive, and is given by

$$\frac{a(V_1 - V_2)^2}{8x} \text{ approximately.}$$

If the potentials of the spheres be equal, the repulsive force between them is, to a first approximation, given by Kelvin's formula for the repulsive force between two equal

spheres when in contact. When the charges on the spheres are  $+q$  and  $-q$  respectively, and  $x/a$  is small compared with unity, the attractive force between them is given by

$$\frac{2q^2}{ax\{\log_e(a/x)\}^2} \text{ approximately.}$$

—The effect of previous magnetic history on magnetisation: **E. Wilson**, **G. E. O'Dell**, and **H. W. K. Jennings**. It is well known that if a piece of iron be subjected to a considerable magnetising force, and then be tested for permeability corresponding to a lower force, the permeability so obtained may differ widely from the permeability which would have been obtained had the material been previously demagnetised. The principal object of this paper is to examine the effect of previous history upon the dissipation of energy by magnetic hysteresis. A ring of iron was carefully demagnetised, and the hysteresis loop No. 1, corresponding to a force  $H$ , was obtained. The force was then increased to a value  $H$ , for the purpose of producing previous history, and removed. A hysteresis loop No. 2, corresponding to the force  $H$ , was then obtained. As is well known, this loop shows a reduced permeability. The ring was carefully demagnetised, and a hysteresis loop No. 3 obtained as follows. A magnetising force supplied by an additional coil was gradually increased, until on reversal of the original force  $H$  a change of magnetic induction exactly equal to that observed in the case of loop No. 2 was obtained. Two loops (Nos. 2 and 3) have now been obtained, each having the same change of magnetic induction and the same net change of force  $H$ . The change from loop No. 1 to loop No. 2 has been brought about by inter-molecular force, whereas the change from loop No. 1 to loop No. 3 has been brought about by the application of an externally applied constant force. If the effect of inter-molecular force were capable of being exactly equivalent to that of the externally applied constant force, one would expect to find that the energy required to perform a complete cycle would be the same in each case—that is, the area of loop No. 2 would be equal to the area of loop No. 3. The experiments show that within certain limits the area of loop No. 2 is greater than that of loop No. 3, the difference depending upon the magnitude of the reversed force  $H$  and the previous history.

**Mineralogical Society**, June 15.—Principal **H. A. Miers**, F.R.S., president, in the chair.—Carnotite and an associated mineral-complex from South Australia: **T. Crook** and **G. S. Blake**. The carnotite of Radium Hill, near Olary, South Australia, occurs in a definitely crystalline condition. The crystals are tabular and orthorhombic in symmetry. The carnotite of Colorado, though not so definitely crystalline, also contains tabular crystals which are orthorhombic in symmetry, and probably identical in mineral characters with those of South Australia. From the general characters of these crystals it appears that carnotite is a mineral belonging to the uranite group, and that it may be regarded as the vanadium analogue of autunite. The black lodestuff in which the Radium Hill carnotite occurs is heterogeneous in constitution. It consists essentially of ilmenite, which is impregnated with magnetite, rutile, carnotite, and a mineral which is possibly tscheffkinite. The evidence provided by a study of the complex does not necessitate the view that new minerals are present, such as that to which the name "davidite" has been given.—The species pilolite, and the analysis of a specimen from China: **G. S. Whitby**. The specimen examined is from a new source, and possesses the formula  $Al_2O_3 \cdot 2SiO_2 \cdot 2(MgO \cdot 2SiO_2) \cdot 7H_2O$ , a formula which is simpler than those given by Heddle and by Friedel to the pilolites which they investigated. The author considered that, for the present, the term pilolite should be applied to those varieties of mountain leather and mountain cork which (1) cannot be referred to asbestos, on account of their large water-content; (2) cannot be identified with serpentine asbestos, on account of the relatively small amount of magnesia which they contain; and (3) hold their water in such a way that, when it has been expelled

by heating, it is gradually re-absorbed to its original amount from the atmosphere.—Phenakite from Brazil: **Dr. G. F. Herbert Smith**. Crystals of phenakite recently discovered at the gold mine, San Miguel de Piracicaba, Brazil, all display the new form {2,352} noted by other observers, and another, {4506}, lying near it. The tetartohedral character of the symmetry is clearly marked.—Preliminary note on the occurrence of gyrolite in Ireland: **F. N. A. Fleischmann**. The mineral gyrolite, though well known as occurring in the basalts of the western islands of Scotland, has not hitherto been recorded from Ireland. Specimens have now been found in the basalts and dolerites in the neighbourhood of Belfast. The mineral occurs in small spherical aggregates, forming a crust on feroelite; it is associated with apophyllite, and occasionally with chabazite. The chemical composition and the optical characters of the mineral agree with those of gyrolite. The mineral is found only in the harder and denser layers of the basalt, and never in the soft, highly amygdaloidal layers.

**Zoological Society**, June 15.—**Dr. A. Smith Woodward**, F.R.S., vice-president, in the chair.—The organ of **Jacobson** in **Orycteropus**: **Dr. R. Broom**. **Orycteropus** has a long narrow organ of **Jacobson** which opens into the naso-palatine canal. The arrangement of the cartilages is quite different from the type found in the higher Eutheria, and there is also a marked difference from the arrangement in **Dasyus**. The general structure comes nearest to that of the marsupials, though there are a number of striking differences.—Some points in the structure of the lesser anteater (*Tamandua tetradactyla*), with a note on the cerebral arteries of *Myrmecophaga*: **F. E. Beddard**.—Decapod Crustacea from Christmas Island, collected by **Dr. C. W. Andrews**: **Dr. W. T. Calman**.—An abnormal individual of the echinoid *Amblypneustes*: **H. L. Hawkins**.—The decapods of the genus *Gennadas* collected by **H. M. S. Challenger**: **S. Kemp**.—Notes on a young walrus (*Odobenus rosmarus*) recently living in the society's gardens: **Dr. P. C. Mitchell**.—Notes on the viscera of a walrus (*Odobenus rosmarus*): **R. H. Burne**.

**Royal Meteorological Society**, June 16.—**Mr. H. Mellish**, president, in the chair.—Interdiurnal variability of temperature in Antarctic and sub-Antarctic regions: **R. C. Mossman**. The author discussed the day-to-day difference in the mean temperature of successive days at a few places in the Antarctic regions for which the necessary detailed daily observations are available. The greatest mean annual temperature variability, viz.  $5.9^\circ$ , was recorded during the "drift" of the *Belgica* in the ice pack, this high value being closely followed by a mean of  $5.3^\circ$  at the South Orkneys. In the Victoria Land region, Ross Island and Cape Adare have a somewhat lower temperature variability of  $4.5^\circ$ , the values of the southern station being higher in summer and autumn and lower in winter and spring than at the northern station. South Georgia occupies an intermediate position between a continental and an oceanic climate in its curve of variability, the mean monthly values varying according to the proximity of the pack ice. At this station the seasonal values show a small variation, and this is also the case at Ushuaia, in Tierra del Fuego. The variability at the Falkland Islands and New Year's Island is very small, pointing to the conserving influence exerted by the insular conditions which prevail at these places. The maximum variability occurs in winter, and the minimum in summer, at the three Antarctic stations, as well as at South Georgia and the South Orkneys. The smallest variability at any season for any station occurs at the South Orkneys in summer, being only  $1.4^\circ$ . It is at this season that cloud amount and fog frequency are at a maximum, while, at the same time, rapidly moving cyclonic disturbances are of infrequent occurrence.—Temperature records during balloon ascents: **E. Gold** and **Dr. W. Schmidt**. The authors described experiments made with the view of ascertaining if appreciable errors could enter into the temperatures recorded in balloon ascents owing to errors in the alcohol-carbonic acid method of testing the apparatus.—The exposure of thermometers: **L. C. W. Bonacina**.

## EDINBURGH.

**Royal Society.** June 7.—**FR.** Cium Brown, vice-president, in the chair.—The anatomy of the Weddell seal: Prof. D. **Hepburn.** Dr. W. S. Bruce, leader of the Scottish National Antarctic Expedition, had been fortunate to catch a young male seal only two or three days old, and it was this young specimen of the Weddell seal the anatomy of which was described in detail. Attention was particularly directed to the abdominal cavity, and especially to the peritoneal arrangements and the organs of alimentation. The length of the animal was 51.5 inches, and the length of the intestine 50 feet.—Lower Palaeozoic Hyolithidæ from Girvan: F. R. Cowper **Reid.** The description was based on specimens in Mrs. Gray's collection. Nearly all the species were new; ten well-defined species of Hyolithes were established, also three of its subgenus Orthotheca. Two other forms were referred to Ceratotheca, and five new species of Pterotheca were recognised. The affinities of these new species were found to be rather with the Scandinavian than with English members of the group. The rich development of the Hyolithidæ in the Girvan district as compared with other British areas was noticed, and a marked feature of their stratigraphical distribution was the abundance of species in the Blaclatchie beds.—The atomic weight of platinum: Prof. E. H. **Archibald.** The experimental feature of the paper was the extreme care taken to ensure absolute purity of the platinum salts of chloro- and bromo-platinic acids used in the determination. Assuming the values given by the International Committee for the atomic weights concerned in the calculation, the author found the atomic weight of platinum to be not far from 193.25.—Group-velocity and the propagation of waves in a dispersive medium: G. **Green.** The aim of the paper was to develop the idea of group-velocity contained in Kelvin's paper of 1887 on the waves produced by a single impulse in water, &c., and to remove difficulties raised by Kelvin in later papers as to the applicability of Osborne Reynolds's and Rayleigh's dynamical interpretation of group-velocity. The idea of group-velocity used was essentially the same as the principle of "stationary phase" used by Lamb in his investigation of ship waves, but applied in this paper to the Fourier trains which constitute any wave-disturbance. The whole investigation was useful in directing attention to the manner in which group-velocity was concerned in the modification of an initially regular group of waves, or of any disturbance initially confined to a finite portion of a dispersive medium, and in showing, thereby, that the idea of group-velocity contained the explanation of the *modus operandi* of dispersion.—The theory of Jacobians in the historical order of development up to 1860: Dr. T. **Muir.**—*Nematourus lecointei*, a deep-sea fish first discovered by the *Belgica*, and found again by the Scottish National Antarctic Expedition: Prof. Louis **Dollo.** The one specimen obtained by Dr. W. S. Bruce was found in lat. 62° 10' S. and long. 41° 20' W. at a depth of 1775 fathoms, and it constitutes the first macrurid found in the Antarctic seas. The corresponding Arctic zone has yielded eight species in six genera. The results were regarded by Prof. Dollo as unfavourable to the theory of bipolarity.—An experiment with the spark gap of an induction coil: Dr. Dawson **Turner.** When the spark gap is just long enough to prevent the easy passage of the spark, a dielectric rod or plate brought near the positive electrode facilitates the discharge, but when brought similarly near the negative electrode it has no obvious influence on the passage of the spark.

## PARIS.

**Academy of Sciences,** June 21.—M. Bouchard in the chair.—Dimethylcamphor and dimethylcampholic acid: A. **Haller** and Ed. **Bauer.** Camphor forms a sodium derivative when treated with sodium amide, from which the monoalkyl and dialkyl derivatives are readily obtained. The mixture of monoalkyl and dialkyl derivatives can be separated by taking advantage of the fact that only the mono-derivatives combine with hydroxylamine to form an oxime. Dimethylcamphor, heated with sodium amide, gives an amide, probably dimethylcampholamide, from which the corresponding acid has been obtained.—The strata of the island of Elba: Pierre **Termier.**—The new

Daniel comet: M. **Javelle.** Observations of this comet were made at Nice on June 16, 17, 18, and 19. The comet was nearly circular, with a diameter of 1.5'. There was a faint nucleus of magnitude 11 to 12.—Observations at the Observatory of Marseilles of the comet 1909a (Borrelly): Henry **Bourget.** Nucleus scarcely perceptible, of about 10.5 magnitude.—Observations of the comet 1909a (Borrelly-Daniel) made at the Observatory of Besançon with the bent equatorial: P. **Chofardet.** Observations made on June 17 and 19. Diameter, 1.5'; nucleus, very faint; magnitude, 11 to 12.—A question of minimum: S. **Sanielevici.**—The series of Dirichlet: Marcel **Riesz.**—Flight and the shape of the wing: L. **Thouveny.**—An experimental method for aerodynamical researches: A. **Rateau.** The surfaces or models to be studied are placed in a very homogeneous air current moving with a definite velocity. The results of experiments on a thin rectangular plane are shown graphically, and it is shown that there is no possible angle of inclination of the plane between 29° and 36°. This discontinuity was quite unexpected.—The heat of polonium: William **Duane.** The sensitive differential calorimeter used in these experiments has been described in an earlier paper; 0.2 gram of polonium salt gave off 0.0117 calorie per hour. Polonium and radium in quantities which give the same ionisation currents give off practically the same quantities of heat. This fact is favourable to the hypothesis that the heat given off by these bodies is due to the kinetic energy of the  $\alpha$  rays.—The ionisation of air by high-tension electric mains: L. **Houlevigue.** The observed case of a hailstorm following exactly the direction of a high-tension cable has been explained by the suggestion that the wire emits torrents of ions carrying large electric charges. Direct experiment fails to confirm this hypothesis. The number of ions, positive and negative, existing in the neighbourhood of a high-tension wire is sensibly *nil*. Indeed, the high-tension lines appear to reduce the number of ions in the immediate neighbourhood rather than increase them.—A new form of the characteristic equation of gases: A. **Leduc.**—A new application of the superposition, without confusion, of small electrical oscillations in the same circuit: E. **Mercadier.** The original experiments were carried out with a complete metallic circuit; similar experiments have now been successfully carried out between Paris and Lyons, using a single telegraph wire with earth return.—A galvanometer for alternating currents: M. **Guinchant.** The galvanometer described was designed to replace the telephone in Kohlrausch's method of measuring the resistance of electrolytes. The accuracy of the measurements is of the same order as when the telephone is used.—The action of some organo-magnesium compounds on methyl-2-pentanone-4: F. **Bodroux** and F. **Taboury.** The reaction is complex, as employing the reagents in molecular proportions there is always a considerable proportion of unaltered ketone in the reaction product, together with the ethylene hydrocarbon corresponding to the tertiary alcohol which should normally have been produced. The tertiary alcohol is formed with a yield varying from 40 per cent. to 60 per cent. of the theoretical.—Some derivatives of thioindigo: M. **Péchamp.**—Elastic acid: A. **Berg.**—Pseudomorphine: Gabriel **Bertrand** and V. I. **Meyer.** Cryoscopic methods indicate that pseudomorphine is derived from two molecules of morphine with the loss of two atoms of hydrogen, and its formula would thus be  $C_{31}H_{38}N_2O_8$ .—The crystalline schists of the Ural: L. **Duparc.**—The elaboration of the nitrogenised material in the leaves of living plants: G. **André.**—The influence of time on the anti-virulent activity of the secretions of vaccinated animals and the relative immunity of the tissues: L. **Camus.**—The influence of a prolonged stay at a very high altitude on the animal temperature and the viscosity of the blood: Raoul **Bayeux.** The body temperature and the viscosity of the blood, under the influence of high altitudes, undergo modifications which are proportional to the stay at the high altitude.—Hay fever: Pierre **Ponnier.**—The tectonic relations of the earthquake in Provence: Paul **Lemoine.**—A geological sketch of the regions situated to the east and north-east of Tchad: G. **Garde.**—The geology of the Peloponnesus: Ph. **Négris.**—The position of the localities which appear to

have been most troubled in the earthquake of June 11, 1909: M. **Jullien**.—The oxydases of the waters of Chaldetta (Lozère): F. **Garrigou**.

NEW SOUTH WALES.

**Linnean Society**, April 28.—Mr. C. Hedley, president, in the chair.—The geology and petrology of the Canoblas, N.S.W.: C. A. **Süssmlich** and Dr. H. I. **Jensen**. The Canoblas are a group of extinct volcanoes in the vicinity of Orange, N.S.W. The western tableland here has an elevation of about 3000 feet. The surface of the tableland is a peneplain, above which rise residuals of a still older plain. This peneplain was cut out of a series of folded Devonian and Silurian rocks, and has since been elevated to its present altitude (3000 feet). The Canoblas Mountains proper consist of lavas and tuffs, deposited upon the peneplain.—Observations on the development of the marsupial skull: Prof. R. **Broom**. A fairly complete series of the diprotodont *Trichosurus vulpecula*, and an interesting early stage of the polyprotodont *Dasyurus viverrinus*, have been studied.—Notes on the synonymy and distribution of certain species of Australian Coleoptera, with descriptions of new species of Tenebrionidæ: H. J. **Carter**. The paper comprises notes upon the synonymy and distribution of a number of species referable to the three families Buprestidæ, Tenebrionidæ, and Cerambycidæ, accumulated during a recent visit to Europe, and especially to the museums in Brussels, Paris, London, and Oxford, together with the descriptions of twenty-one species of Tenebrionidæ proposed as new.

CALCUTTA.

**Asiatic Society of Bengal**, May 5.—A *Goniomya* from the Cretaceous rocks of southern India: H. C. **Dae-Gupta**.—*Coptis*: I. H. **Burkill**. The author endeavours to determine the source of the roots of *Coptis* sold in India. Three kinds are sold, one, as is well known, coming from the Mishmi hills, and being derived from *Coptis Tecta*, Wall, the other two imported over-seas, and possibly being, respectively, roots of *Coptis Tecta*, var. *chinensis*, Fine and Gagnep, and of *Coptis anemoneifolia*, Sieb. and Zucc. Plants of *Coptis Tecta* in cultivation at the Lloyd Botanic Garden, Darjeeling, have been studied, and figures drawn from them.—Morphological and physiological differences between *Marsilea* left on dry land and that growing in water: Nibaran Chandra **Bhattacharjee**. *Marsilea quadrifolia* does not fruit when growing in water, but only on dried earth.—Notes on the history of the district of Hughli before the Mohammedan period: Nundo Lal **Dey**.—The drug *astukhudus*, nowadays *Lavandula dentata*, and not *Lavandula Stoechas*: I. H. **Burkill**. It is probable that the importation of *Lavandula dentata* into India began with the Portuguese trade. Before that, *Lavandula Stoechas* from Asia Minor served as the drug *astukhudus* from the time when the Mohammedans introduced it.—The Manikyala tope: H. **Beveridge**.—First notes on *Cymbopogon Martini*, Stapf: I. H. **Burkill**. The two varieties, *Motia* and *Sofia*, are to be distinguished from one another by the absence or presence of the chemical body carvon, by the angle at which the leaves arise, and by different preferences in the matter of climate.

CAPE TOWN.

**Royal Society of South Africa**, May 19.—Dr. L. Crawford in the chair.—The possible existence at Kimberley of oscillations of level having a lunar period: Dr. J. R. **Sutton**. The outstanding seismic feature of Kimberley is the diurnal variation of level whereby the crust of the earth rises and falls once a day under the influence of some solar action as yet uninterpreted. This matter was discussed in a paper read before the Royal Society of South Africa last July. The present discussion is concerned more with variations of level depending upon the gravitational influence of the moon. The observations do not cover a sufficiently extended period to admit of an exhaustive analysis, but, so far as they go, they imply perhaps that when the moon is south of the equator its attractive force causes the whole of the enormous protuberant mass of the earth's crust forming South Africa to oscillate periodically east and west during the course of the lunar day. This oscillation tends to mask whatever true lunar tide there may be in the solid earth. Only

when the moon is nearest to the earth does the pendulum move in such a manner as to suggest that there is such a tide.—The rainfall of South Africa. The possibility of prediction over the south-west: A. G. **Howard**. For this investigation, which extended over five complete years, three stations were selected, so as to secure a triangle of observations, and at each the rise or fall of the barometer in twenty-four hours was noted, together with the direction of the wind at L'Agulhas. From a consideration of the various conditions, which fell under twenty-six heads, and were worked out daily during five complete years, it was found possible to construct a table for prediction purposes. This was applied to the rainfall for the year 1908, and the element of error under each condition of barometer was:—(1) when the pressure was decreasing generally, 5.23 per cent., and (2) when the pressure was increasing generally, about 11 per cent., proving the argument that it is possible to predict rainfall over the district from the date suggested.

DIARY OF SOCIETIES.

MONDAY, JULY 5.  
ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Captain Tilho's Explorations in the Lake Chad Region: Lieut. Mercadier.  
WEDNESDAY, JULY 7.  
BRITISH ASTRONOMICAL ASSOCIATION, at 5.

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