

subjects, designed primarily, as the introduction to the Blue-book points out, to overcome the divorce between school and home life, which is nowadays a serious defect of education. Nature-study justifies its place in the curriculum only when it brings the pupils into direct contact with natural objects and phenomena, and develops in their minds habits of correct observation and intelligent discrimination. The guidance provided in the memorandum is practical, and preeminently designed to assist teachers, so that the pupils may derive from these lessons the advantages the study can ensure when rightly pursued. School gardens, excursions, collections, calendars, weather observations, and the care of animals, are some of the subjects selected for treatment, and the teachers who work in the spirit of the hints and suggestions which enrich these pages will have no reason to fear failure to develop in their pupils open-eyed interest in nature. An appendix by Prof. J. Arthur Thomson shows teachers in detail how the subject may be studied seasonally, and the difficulty of obtaining material obviated. The second section of the memorandum explains how the work in nature-study should develop later in the curriculum into a more formal study of experimental science, with the object of encouraging the habit and spirit of accurate investigation. Individual work on the part of the pupil is insisted upon, and the importance is pointed out of truthful and clear records of results. Outlines of work are put forward as indicating suitable courses of study for an intermediate school devoting three hours a week, in two equal periods, to the subject, as well as for higher schools. It is satisfactory to find it laid down that the value of the work will depend upon its spirit and method, and upon the power of initiative and self-reliance developed in the pupils, rather than upon the amount of examinable knowledge acquired.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society. February 20.—“On the Osmotic Pressure of Compressible Solutions of any Degree of Concentration. Part II. Cases in which both Solvent and Solute are Volatile.” By Prof. A. W. **Porter**. Communicated by Prof. F. T. Trouton, F.R.S.

In a former paper (see NATURE, September 5, 1907, vol. lxxvi., p. 487) the author found an exact relation between vapour pressures and osmotic pressure in the usual case in which the solute may be taken as involatile. The case now considered is the more general one, in which both solvent and solute are volatile.

The author has considered several cases in which the vapour pressure is changed, and found that in each case it is only necessary to know the partial pressure of the pure solvent the vapour of which is referred to in order to calculate what the change in the vapour pressure amounts to. The same method might presumably be applied to other cases also, such as magnetisation, &c.

March 19.—“On Vapour Pressure and Osmotic Pressure of Strong Solutions.” By Prof. H. L. **Callendar**, F.R.S.

The foundation of the vapour-pressure theory of solutions laid down in this paper is the assumption of a simple relation between the vapour pressure and the molecular constitution of the solution. That there should be a simple relation of this kind appears extremely probable when we consider that the concentration of the vapour phase in the solutions here examined is very small, and that such relations generally take a very simple form at extreme dilution. That such a relation should serve as a key to many of the phenomena occurring in solutions is not surprising in view of the fact that equality of vapour pressure is one of the most general conditions of equilibrium in physical chemistry. The relation of this assumption to the gas-pressure theory, or the hydrate theory, or the capillary pressure theory, as already indicated, is that it involves them all, since they may be regarded as merely different aspects of the same phenomena. An equivalent assumption may be formulated, at least approximately, in terms of partial pressure, or capillary pressure, or chemical attraction, but it would

merely be putting the same thing in different words. The vapour-pressure method appears to be the most direct line of attacking the problem. If, for instance, we regard the changes of capillary pressure in relation to vapour pressure as defined by the relation $UdP = vdp$, we should arrive at nearly the same result by similar approximations. But this method does not appear to be so convenient, because it involves the volume U , which is generally unknown and variable in an uncertain manner, whereas the volume of the vapour v at low pressures may be regarded as conforming very closely with the laws of gases.

There is no doubt that further experimental work may be required to establish the vapour-pressure theory generally, since accurate data for strong solutions are comparatively scarce. The interpretation of the ionisation factor, and its relation to the heat of dilution, requires further elucidation. Analysis of nearly all the data at present available, in addition to the examples above cited, fails to show any serious disagreement with the vapour-pressure theory. The theory cannot pretend to be exact for all ranges of temperature and concentration, but it seems likely to serve, at least as a second approximation, for coordinating results which have hitherto appeared discordant.

March 26.—“Comparison of the Board of Trade Ampere-standard Balance with the Ayrton-Jones Current Weigher; with an Appendix on the Electromotive Force of Standard Cells.” By T. **Mather**, F.R.S., and F. E. **Smith**.

The paper describes experiments by which the relation between the Board of Trade ampere and one-tenth C.G.S. unit of current, as realised by the Ayrton-Jones instrument (Ayrton, Mather, and Smith, Phil. Trans., A, vol. ccvii., p. 463), was determined.

The comparison was carried out by aid of a combination of standard cells and resistances used as a secondary standard of current. This combination was evaluated by the Ayrton-Jones current weigher at the National Physical Laboratory on each of the three days during which experiments were made at the Board of Trade Laboratory, so that if any change occurred in the secondary standard it would be detected.

Two methods of comparison were employed, both giving concordant results, viz. one Ayrton-Jones ampere = 1.0003 Board of Trade ampere, the latter ampere being, therefore, smaller than the former by about 1/30 per cent.

A difference of this order was anticipated, for a recent determination of the electrochemical equivalent of silver (Smith, Mather, and Lowry, Phil. Trans., A, vol. ccvii., p. 579) by the Ayrton-Jones instrument gave 1.11827 milligrams per coulomb, whereas the Board of Trade balance was adjusted to correspond with 1.118 milligrams.

According to these experiments, the Board of Trade ampere will deposit silver at the rate of 1.1179 milligrams per second, so that the Board of Trade ampere is equal to the international ampere, as defined by silver deposit, to within 1/100 per cent.

The above experiments, combined with figures given by Prof. Ayrton and the authors (Phil. Trans., A, ccvii., p. 536), enable the E.M.F.'s of standard cells to be expressed in terms of the Board of Trade volt, this being defined as the P.D. between the terminals of a resistance of one Board of Trade ohm when one Board of Trade ampere is passing. The results are:—

E.M.F. of normal Weston cadmium cell = 1.0186₈

Board of Trade volts at 20° C.

E.M.F. of normal Clark cell = 1.433₀

Board of Trade volts at 15° C.

The Reichsanstalt value for the cadmium cell is 1.0186 at 20° C., and that for the Clark cell, determined directly by Mr. Trotter, 1.4329 at 15° C.

April 30.—“On Scandium.” By Sir William **Crookes**, F.R.S.

Scandia is one of the rarest and least known of the recognised rare earths. It was discovered in 1879 by Nilson, who separated it, together with ytterbia, from erbia extracted from euxenite and gadolinite. Later in the same year Cleve extracted scandia from gadolinite, yttritanite, and keilhauite, and described the scandium sulphate, double sulphates, nitrate, oxalate, double oxalates,

selenate, acetate, formate, oxide, and hydrate, and gave some of the chief reactions of the new body.

In the course of the author's twenty years' work on the fractionation of the rare earths, he has repeatedly tested his products by examining their photographed spectra, using the dominant lines of the various elements as tests for their presence. Scandium has an extremely characteristic group of lines in its spectrum, situated between wave-lengths 3535.864 and 3651.983, the strongest being at 3613.984, midway between two strong iron lines. By using a part of the spectrum in which this occupies the centre of the photograph, it is easy to see if scandium is present. Detecting the dominant line, the presence of scandium can be verified by reference to the other lines of the group.

The author found scandium in some of the fractions, but only in small quantities. A few years ago he commenced an examination of all the obtainable rare earth minerals in order to see if any of them showed more than a trace of scandium. The minerals examined were:—*æschynite*, *allanite*, *alvite*, *auerlite*, *baddelite* (Ceylon), *bastnasite*, *bröggerite*, *cerite*, *cleveite*, *columbite*, *cryptolite*, *eudialite*, *euxenite*, *fergusonite* (Ceylon), *fergusonite* (Ytterby), *fluocerite*, *gadolinite*, *hielmite*, *homolite*, *keilhauite*, *knopite*, *koppite*, *lanthanite*, *monazite*, *mosandrite*, *orangite*, *orthite*, *pyrochlore*, *pyrochlore*, *rhabdophane*, *samaraskite*, *scheelite* (Bohemia), *scheelite* (New Zealand), *schorlomite*, *siyplite*, *tantalite*, *thalenite*, *thorianite*, *thorite*, *thorogummite*, *tscheffkinite*, *tysonite*, *urдите*, *wiikite*, *xenotime*, *yttergarnet*, *yttrialite*, *yttrocerite*, *ytrogummite*, *ytrotantalite*, *ytrotitanite*, *zirkelite* (Ceylon, sp. gr. 5.0), *zirkelite* (Ceylon, sp. gr. 4.42).

Of the minerals examined, scandium was detected in *auerlite*, *cerite*, *keilhauite*, *mosandrite*, *orangite*, *orthite*, *pyrochlore*, *thorianite*, *thorite*, and *wiikite*.

Wiikite is a black amorphous mineral of specific gravity 4.85. Its hardness is 6. It is infusible before the blow-pipe. It is imperfectly attacked by strong mineral acids, and breaks up easily when fused with potassium bisulphate. Heated to full redness in a silica tube, it gives off helium, water, and a distinct amount of sulphuretted hydrogen, followed by a white sublimate. The mineral begins to crack at a temperature a little below redness, and at the approach of redness gas is evolved with almost explosive violence, the mineral breaking up and flying about the tube. A fragment so treated examined under the microscope shows the surface covered with glistening points. With a high power these points are resolved into a mass of minute cubes, curiously regular in form and appearance. Heating drives off 5.83 per cent. of its weight; 5.82 of the loss is water and acid vapour, the difference, 0.01 per cent., consisting chiefly of helium, with a little hydrogen, carbon dioxide, and a mere trace of neon.

After the crude earths, chiefly yttria, ytterbia, and scandia, have been separated from the mineral, they are "fractionated" by methods described in the paper. Towards the end of the fractionation the chief impurity is ytterbium. Fortunately, the very strong dominant line of the ytterbium spectrum, wave-length 3694.344, occurs at a vacant part of the scandium spectrum, and near the characteristic group of scandium. A sample of scandia is not taken as satisfactory if the least trace of this line is seen on an over-exposed spectrum of scandium, and if the atomic weight is higher than 44.1. The atomic weight of ytterbium being 173, a very little of it as an impurity raises the atomic weight of scandium.

The author has prepared and analysed the following compounds of scandium:—scandium hydroxide, scandium carbonate, hydrated scandium chlorides, hydrated scandium bromides, scandium chlorate, scandium perchlorate, scandium bromate, scandium sulphates, anhydrous scandium sulphate, basic scandium sulphate, scandium and potassium double sulphate, scandium selenates, scandium nitrates, scandium formate, scandium acetate, scandium propionate, scandium butyrate, scandium iso-butyrate, scandium iso-valerate, scandium oxalates, scandium picrates, scandium pyromellitate, scandium camphorate.

Royal Anthropological Institute, May 5.—Prof. W. Ridgeway, president, in the chair.—Report on the Hythe crania: F. G. Parsons. An account was given of nearly 4000 measurements which the author made on 575 of the

skulls under Hythe Church, Kent. The author reviewed the various historical facts in connection with them, as well as the numerous traditions and explanations which had from time to time been put forward to account for the presence of the crania. He declined to believe any of the numerous battle theories, and pointed out that skulls of women and children were plentiful, that earth was present in many of the crania, and that the injuries which have so often been referred to battle-axe and spear wounds were certainly inflicted many years after death, and were made probably by spades and pickaxes in digging up the skulls. From numerous details of collateral evidence the author argued that the bones probably must have come to their present place before the Reformation, and, as there were femurs of about 4000 people in the stack, must have represented the burials of more than a century. Mr. Parsons believed that the bones were of the thirteenth, fourteenth, and fifteenth centuries. The chief point of interest in the measurements was the shortness of the skulls, which averaged 17.9 cm. for the males. This is 1 cm. shorter than the two large London series lately recorded by Dr. Macdonnell, and goes far to disprove that observer's suggestion that the English head is gradually growing shorter and broader. The teeth were remarkable for their freedom from caries and for the wearing down of the crowns, pointing to hard, coarse fare. Many pathological specimens of bones were exhibited showing that osteo-arthritis and syphilis were very rife. The various abnormalities in the skull bones and sutures were classified, and their frequency recorded for future anatomical comparison.

Chemical Society, May 7.—Prof. E. Divers, F.R.S., in the chair.—The refraction and dispersion of triazo-compounds: J. C. Philip. A study of these constants shows that the contribution which the N_3 -group normally makes to the molecular refraction is 8.91 units, and that to the molecular dispersion 0.36-0.37, but ethyl triazofornate, phenylazoimide, and α -naphthylazoimide show refractive and dispersive powers above the normal values. The bearing of these results on the formulation of the N_3 -group is discussed.—The dissociation constants of triazoaetic and α -triazopropionic acids: J. C. Philip. The values found show that the introduction of the N_3 -group into the molecule of acetic or propionic acid increases the strength of the acid nearly as much as the introduction of a bromine atom.—The fermentation of mannose and lævulose by yeast-juice (preliminary note): A. Harden and W. J. Young. Mannose is fermented by yeast-juice at almost the same rate as dextrose, whilst lævulose is fermented somewhat more rapidly. The peculiar influence of phosphates on the fermentation of these sugars by yeast-juice is described in detail.—The constituents of olive leaves: F. B. Power and F. Tutin. The following substances were isolated:—(1) a new monocarboxylic acid, $C_{22}H_{45}.CO_2H$; (2) a mixture of fatty acids containing oleic acid; (3) hentriacontane, $C_{31}H_{64}$; (4) pentatriacontane, $C_{35}H_{72}$; (5) oleasterol, $C_{26}H_{54}O$, a new crystalline alcohol related to the phytosterols; (6) a new crystalline alcohol, olestranol, $C_{25}H_{42}O_2$, which appears to be a hydroxy-phytosterol; (7) homo-olestranol, $C_{27}H_{46}O_2$, a compound similar to olestranol; (8) *d*-mannitol; (9) a sugar which yields *d*-phenylglucosazone; (10) a trace of an essential oil; (11) oleanol, $C_{31}H_{48}O(OH)_2.N_2O$, which contains one alcoholic and one phenolic hydroxyl group.—The constituents of olive bark: F. B. Power and F. Tutin. The following crystalline compounds were obtained, together with some amorphous products:—(1) a new monocarboxylic acid, $C_{34}H_{67}.CO_2H$; (2) a new monocarboxylic acid, $C_{24}H_{45}.CO_2H$; (3) a new monocarboxylic acid, $C_{34}H_{69}.CO_2H$; (4) a new monocarboxylic acid, $C_{29}H_{57}.CO_2H$; (5) a substance, probably a tertiary alcohol, $C_{35}H_{68}O$; (6) pentatriacontane, $C_{35}H_{72}$; (7) a phytosterol, $C_{27}H_{46}O$; (8) a substance identical with ipuranol, recently isolated by Power and Rogerson from *Ipomoea purpurea*; (9) a new phenolic substance, olenitol, $C_{14}H_{10}O_6$; (10) *d*-mannitol; (11) a sugar which yields *d*-phenylglucosazone.—The reaction of diazonium salts with mono- and di-hydric phenols and with naphthols: K. J. P. Orton and R. W. Everatt. All diazonium salts couple quantitatively with

α - and β -naphthols in alcoholic media, but under similar conditions these salts do not combine with monohydric phenols. The dihydric phenols, resorcinol and orcinol, behave like the naphthols in alcoholic solution, but in aqueous solution only diazonium salts, with a preponderance of halogen atoms in the benzene nucleus, couple with the two dihydric phenols.—The condensation of benzoin with methyl alcohol: J. C. **Irvine** and D. **McNicoll**.—The mutual solubility of 2-methylpiperidine and water: O. **Flaschner** and B. **MacEwen**.—The melting points of the anilides, p -toluidides, and α -naphthalides of the normal fatty acids: P. W. **Robertson**. The irregularities in melting points in the series of anilides and p -toluidides seem to tend always in the reverse direction to those observed in the case of the amides. The disturbing factor appears to be a function of the lack of symmetry of the molecule, and is to a great extent eliminated on taking the mean melting points of the amides and anilides and of the amides and p -toluidides. In the fatty α -naphthalides, where the substituent group is heavier, irregularities tend to disappear.—The absorption spectrum of camphor: W. N. **Hartley**. The author confirms Baly, Marsden, and Stewart's statement that strong solutions of camphor in alcohol show a band in the spectrum due to the CO and CH₂ groups, but otherwise the substance is remarkably diactinic.—The viscosity of solutions: C. E. **Fawsitt**. A continuation of work on colloidal and alcoholic solutions.—The action of fused potassium hydroxide and of hydrogen peroxide on cholesterol (preliminary note): R. H. **Pickard** and J. **Yates**.—The volumetric estimation of silver: W. R. **Lang** and J. C. **Woodhouse**.—A criticism of Werner's theory, and the constitution of complex salts: J. A. N. **Friend**.—The action between potassium sulphite and potassium pentathionate: E. **Divers**. The author points out that the accuracy of Debus's investigation of the action between a sulphite and a pentathionate (*Trans. Chem. Soc.*, liii., 278) is not affected by Colefax's quite recent work (*ibid.*, 1908, xciii., 798).—Note on phenolic thetines and their action with benzoyl chloride: E. de B. **Barnett** and S. **Smiles**.—The relation between dielectric constant and chemical constitution, part i., stereoisomeric compounds: A. W. **Stewart**. Examination of active and racemic compounds, and also of geometrical isomerides, shows that the influence of the spacial arrangement of atoms on the dielectric constants of isomeric substances is not clearly marked. In one case the active isomeride had a stronger absorptive power than the racemic form.—An apparatus for determining the specific inductive capacity of organic liquids: A. W. **Stewart**.—The influence of solvents on the rotation of optically active compounds, part xii., ethyl tartrate in aromatic halogen derivatives: T. S. **Patterson** and D. P. **McDonald**.—A new test for silver: A. W. **Gregory**. A solution of a silver salt to which has been added a mixture of aqueous ammonium salicylate with ammonium hydroxide furnishes on further addition of ammonium persulphate an intense brown colour. Lead does not give this reaction.—The spontaneous crystallisation of substances which form a continuous series of mixed crystals; mixtures of naphthalene and β -naphthol: H. A. **Miers** and F. **Isaac**.

Linnean Society, May 7.—Prof. W. A. **Herdman**, F.R.S., president, in the chair.—*Exhibits*.—Fruits of the "Buddha's Claw" variety of *Citrus medica* obtained at Easter from the gardens at La Mortola, formerly belonging to the late Sir Thomas Hanbury, also a normal fruit for comparison: Prof. F. E. **Weiss**.—Representation of the movements of Peripatus and other invertebrate animals by means of the Newman fire-proof kinematograph: F. Martin **Duncan**. The special feature of the apparatus used was that it enabled one to analyse all movement, picture by picture, instead of having to run the whole film through from end to end without a stop, as in ordinary kinematograph projectors. The effect of concentrated light upon different species of invertebrate animals had proved of interest and frequently a difficulty, so that colour filters and isochromatised negative film had in some cases to be used to obtain a satisfactory record.—*Papers*.—Colony-formation as a factor in organic evolution: H. M. **Bernard**.—Antipatharia from the voyage of H.M.S. *Sea-*

lark: C. F. **Cooper**.—Fresh-water fishes, batrachians, and reptiles obtained by Mr. J. Stanley Gardiner's expedition to the Indian Ocean: G. A. **Boulenger**.—The madreporarian corals, part i., the family Fungidae, with a revision of its genera and species and an account of their geographical distribution: J. S. **Gardiner**.

Faraday Society, May 12.—Mr. L. Gaster in the chair.—Apparatus for determining the boiling points of very small quantities of liquids: L. **O'Dowd** and Dr. F. Mollwo **Perkin**. This consists of a capillary tube which is placed in about 1/5 c.c. of the liquid the boiling point of which is to be determined. The liquid is contained in a small test-tube, which passes through a hole in the cork in such a way that the end containing the liquid comes in close contact with the thermometer also passed through the same cork. A stirrer is also provided. The heating liquid is contained in a flask capable of holding from 100 c.c. to 120 c.c., and may be either sulphuric acid, glycerin, or other suitable liquid. One end of the capillary tube is sealed, and the open end is so arranged as to be at the bottom of the liquid. On raising the temperature bubbles commence to give off from the end of the capillary tube, and when a constant stream of bubbles comes off the source of heat is removed. The thermometer is read at the moment the bubbles cease to be given off, that is, the temperature at which the temperature of the vapour in the capillary is equal to the atmospheric pressure and is the boiling point of the liquid. Numbers were given, showing for high boiling substances, and also for low boiling substances, that accurate results can be obtained.—Ozone, particularly in connection with water purification: Dr. F. Mollwo **Perkin**. After a historical introduction, the apparatus of Messrs. Siemens and Halske was described in detail. It consists of two concentric electrodes, the inside one of aluminium and the outside one of glass. The inner electrode is hollow, and is kept cool by a circulation of water. The outer one is also surrounded by water in order to prevent heating. The aluminium electrode is connected with one pole of the high-tension current (8000 volts). The containing vessel, which is filled with water, is of iron, and is earthed. This is thus the negative pole, and as water surrounds the glass pole it becomes electrified. Dried air is passed up an annular space between the two electrodes, and by means of the silent electric discharge becomes ozonised. From the ozoniser the air passes up towers filled with pebbles, over which water trickles. By this means a large surface of water is exposed to the action of the ozone; it thus becomes sterilised, and from here passes over cascades in order to remove any dissolved ozone. Messrs. Siemens and Halske have large installations dealing with the purification of water supply at Wiesbaden and at Paderborn. Other uses of ozone, such as the preparation of vanilla, the bleaching of flour, and other purposes of oxidation, were also mentioned. An apparatus for laboratory use was exhibited in working.—Dr. **Veley** showed an apparatus for the determination of dielectric constants of non-conducting liquids.

Royal Meteorological Society, May 20.—Dr. H. R. Mill, president, in the chair.—Upper air observations in Egypt: B. F. E. **Keeling**. The whole prosperity of Egypt is connected with the weather of the neighbouring country of Abyssinia. As the summer rainfall is greater or less in Abyssinia, so is the Nile flood, and in consequence the area of land cultivated and the general prosperity is greater or less. In years when a bad, low stage of the river is to be expected, following on a bad flood, the early spring showers in Abyssinia are then of very great importance. As, unfortunately, there is no meteorological service in Abyssinia, it is not possible to obtain information about the rainfall over that region, so steps have recently been taken to obtain observations on the upper air over Egypt by means of pilot balloons and kites. Mr. Keeling gave an account of the methods employed, and of the directions in which it was hoped in the near future to develop the work. He also stated that the observations of the anti-trade winds made by M. Teisserenc de Bort and Mr. A. L. Rotch have been confirmed. At Helwan the anti-trade wind is reached at a height of about 6500 feet above sea-level. The greatest height so far reached by a balloon

was 54,000 feet, and on that occasion the south-west antitrade wind was apparently penetrated and a north-west upper current encountered.—Balloon experiments in Barbados, November 6-8, 1907: Prof. J. P. **d'Albuquerque**.—Observations on the colour of lightning made at Epsom, 1903-7: S. C. **Russell**. The author had for the past five years kept a record of the colours or series of colours noted during each thunderstorm or display of sheet lightning, and tabulated them under their respective colour. He had thus results of observations of fork lightning made during fifty-seven thunderstorms, and seventy-eight observations of sheet lightning. It appears that in fork lightning red is the colour of the most frequent occurrence, and this is followed closely by blue, the least frequent colours being orange and green. White is of the greatest frequency in sheet lightning, red and yellow being next. It seems that the presence of hail, when occurring in association with a thunderstorm, is intimately connected with blue lightning.

Institution of Mining and Metallurgy, May 21.—Mr. Alfred James, president, in the chair.—The electrical equipment of gold mines: H. J. S. **Heather**. Continued discussion on this paper.—The behaviour of tellurium in assaying: Sydney W. **Smith**. An examination of the behaviour of this substance during pot-fusion, scorification, and cupellation in order that some reasons may be offered for taking the precautions which are generally regarded as necessary to ensure successful work. The paper describes a number of careful observations made with this end in view, and a summary of the conclusions arrived at is given.—The average rate of accumulation and absorption of gold amalgam by copper plates: Edward **Halse**. The absorption and accumulation of gold on copper plates: W. F. A. **Thomae**. These two papers deal with the same subject, the general conclusion of the two authors being that the absorption of gold by copper plates may be ignored by the mill-man in view of its small importance. In no case does the average rate appear to exceed a fraction of a grain per ton milled, and in the case of ore containing coarse gold it is practically nil. The authors look at this matter from somewhat different points of view, Mr. Thomae especially thinking that further data might be worth placing on record.—A journey to Central Asia: A. **Adiassewich**. This paper records the results of travels in Central Asia, with special reference to the position and prospects of the mining industry there. After a general description of the conditions of mining, the author passes in review the leading districts, Orenburg, the Khirgiz Steppes, &c., and gives details of the occurrence of gold, silver, copper, iron and other ores, coal, and petroleum.

PARIS.

Academy of Sciences, May 18.—M. H. Becquerel in the chair.—The hovering flight of birds: Marcel **Deprez**.—The turning of aeroplanes: Paul **Renard**. To turn an aeroplane requires that the apparatus should incline transversely a given amount; it will, in addition, usually have the effect of lowering the trajectory. Before making a turn it will therefore be necessary to rise if the original height is to be maintained at the end of the turn.—The profile of the polar masses of dynamos: Paul **Girault**.—The ultramicroscopic examination of charged centres in suspension in gases: M. **de Broglie**.—The re-combination of the ions in dielectrics: P. **Langevin**. On the supposition that in gases the re-combination of the ions with contrary signs is due to the attraction of their electric charges, the author has shown in an earlier paper that relation $\frac{\alpha}{4\pi(k_1 + k_2)} \leq 1 = \epsilon$ holds, in which α is the coefficient of re-combination, k_1 and k_2 the mobilities of the positive and negative ions. In the present paper the application of this formula to the case of solid dielectrics is considered, and a simple method described of determining ϵ .—The influence of the surrounding atmosphere on the friction between solid bodies: F. **Charron**. The presence of moisture, benzene vapour, or alcohol vapour in the air reduces the friction, but no variation could be observed when the air round the moving parts was replaced by dry hydrogen, carbon dioxide, or ethylene.—

The auto-excitation of a tri-phase alternator by means of electric valves: C. **Limb**.—The differences of contact potential between metals and liquids: L. **Bloch**. The apparent difference of contact potential between metal and liquid is smaller for alkaline solutions than for water, and smaller for water than for acid solutions. Salts give effects differing only slightly from water. The method is sensitive enough to detect traces of acid and alkali beyond the reach of detection by colour reagents.—The radiography of the lungs and stomach of the foetus and still-born infants: M. **Bouchacourt**. In infants whose lungs have been filled with air, the lungs show definitely in the radiograph, but the usual practice of artificial inspiration in the case of infants apparently still-born may lead to the erroneous conclusion that the child has lived. The causes of the visibility of the stomach in the radiograph are also discussed.—Observation on the time required for the solution of substances: Gaston **Gaillard**. The substances studied were sodium thiosulphate, sugar, and sodium sulphate. The effect of the size of the crystal and rate of agitation have a great influence on the results, and it is only when these two factors are kept as constant as possible that comparative measurements can be obtained.—A photographic action of infra-red light: A. Gargam **de Moncetz**. The gelatinobromide plates were fogged by the X-rays previous to the exposure to the red rays, the light being filtered through a solution of iodine in carbon bisulphide capable of cutting off all rays between 800 λ and 4 λ . The plate showed clear effects of the exposure for wave-lengths between 920 λ and 1350 λ . The preliminary fogging of the plates by ordinary light instead of by the X-rays did not give these results.—The kinematographic study of the Brownian movements: Victor **Henri**. The path described by a particle, as shown by these experiments, was very complex; it varies from one particle to another, and is absolutely independent for each particle even when two particles only 2 μ apart are compared. The trajectory often shows abrupt changes of direction. The displacements measured for 0.05 second were compared with those deduced by Einstein's formula, and were found to be about four times greater than the latter.—The iodomercurates of thorium and aluminium: A. **Duboin**. The preparation and properties of $\text{ThI}_4 \cdot 5\text{HgI}_2 \cdot 18\text{H}_2\text{O}$ and $\text{AlI}_3 \cdot \text{HgI}_2 \cdot 8\text{H}_2\text{O}$ are described.—The definite compounds of silicon and palladium: Paul **Lebeau** and Pierre **Jolibois**. Silicon and palladium unite directly with evolution of heat, giving rise to two definite silicides, Pd_2Si and PdSi , the first of which has been separated and analysed. The existence of the other silicide has been deduced from the determination of the fusibility curve and the metallographic study of the ingots obtained. These silicides are analogous to the platinum silicides already known.—A method for the volumetric estimation of tartaric acid in argol and cream of tartar: Em. **Pozzi-Escot**. The method is based on the insolubility of barium tartrate in alcohol, and the solubility of barium bromide in the same solvent. The excess of barium used is converted into the oxalate, and the latter determined with potassium permanganate.—The elimination of carbon monoxide from coal gas: Léo **Vignon**. Details of laboratory experiments on three methods are given: the conversion into methane by reduced nickel, the transformation into carbon dioxide by heating with oxide of iron at definite temperatures, and the direct absorption with cuprous chloride. The question of the cost of treatment or the value of the gas after such treatment is not dealt with by the author.—Propargylcarbinol: MM. **Lespieau** and **Pariselle**. Starting with the ester $\text{CH}_2\text{Br}-\text{CHBr}-\text{CH}_2-\text{CH}_2-\text{OCH}_3$, this is successively converted into 1:2:4-tribromobutane by the action of hydrobromic acid, 2:4-dibromobutene, from the preceding by the action of potash, the alcohol, $\text{CH}_2=\text{CBr}-\text{CH}_2-\text{CH}_2\text{OH}$, and the sought for acetylenic alcohol,



—The mixed trihalogen derivatives of methane: V. **Auger**. A description of the preparation and properties of CHCl_3I , CHCl_2I , CHBr_2I , and CHBrI_2 .—The constitution of the combinations of tetramethyl-diamino-benzhydrol with some methylenic derivatives: R. **Fosse**.—Some orthobenzylated colouring matters from triphenylmethane:

A. Guyot and P. Pignet.—The cytology of the renal labyrinth of the *Thysanoura*: L. Bruntz.—The biology of a parasitic Rhabdocoele of *Cardium edule*: Paul Hallez.—The action of the X-rays on the evolution of the mammary gland during pregnancy in the rabbit: MM. Cluzet and Bassal. The evolution of the mammary gland may be hindered at all stages by the application of the X-rays, the maximum effect being produced when it is made in the course of the first fortnight.—The arrest and prolonged detention of radium sulphate in the living tissues: H. Dominici and Faure-Beaulieu.—The theory of electrical stimulation: Louis Lapicque.—An attempt to separate hypertensive substances from the urine: J. E. Abelous and E. Bardier.—Epithelioma and the parasitic nature of cancer: F. J. Bosc.—Acute tuberculous septicaemia of the guinea-pig: André Jousset.—Tubercles and fossil stems of Equisetum: P. H. Fritel and René Viguer.—The utilisation of faults for the determination of the mean density of the earth: A. Berget.—The study of the sea floor in the bay of the Seine: J. Thoulet.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* (physico-mathematical section), part i. for 1908, contains the following memoirs contributed to the society:—

December 21, 1907.—The Pyrenomycetes and Tubercaceae of the Göttingen flora: A. Peter.—The fundamental equations for the electromagnetic processes in moving bodies: H. Minkowski.

February 8, 1908.—Researches from the Göttingen University chemical laboratory (xix.) (1) Dissociation by the addition of water in terpene compounds; (2) synthesis of α -phellandrene; (3) synthesis of isofenchone (C₁₀H₁₆O) from nopinone (C₉H₁₄O): O. Wallach.—The differential equations of binary semi-invariants and invariants in independent substitutions: W. Fr. Meyer.

February 22.—The uniformisation of algebraic curves (imaginary substitution-groups): P. Koebe.

DIARY OF SOCIETIES.

THURSDAY, MAY 28.

ROYAL SOCIETY, at 4.30.—On the Theory of Capillarity: Prof. E. T. Whittaker, F.R.S.—Effect of a Cross Wind on Rifled Projectiles: A. Mallock, F.R.S.—Transparent Silver and other Metallic Films: Prof. T. Turner.—Mrs. Ayrton will give Demonstrations of Wave-Motion in Water. (Paper read January 30, 1908.)

ROYAL INSTITUTION, at 3.—The Chemistry of Photography: Dr. Alexander Scott, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.

FRIDAY, MAY 29.

ROYAL INSTITUTION, at 9.—Ancient and Mediæval Projectile Weapons other than Firearms: Sir Ralph Payne-Gallwey, Bart.

MONDAY, JUNE 1.

ARISTOTELIAN SOCIETY, at 8.—Person and Thing: Prof. G. Dawes Hicks.

INSTITUTE OF ACTUARIES, at 5.—Annual General Meeting.

TUESDAY, JUNE 2.

ROYAL INSTITUTION, at 3.—Animal Heat and Allied Phenomena: Prof. William Stirling.

WEDNESDAY, JUNE 3.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Studies in Steam Distillation. Part iii. The Fatty Acids: H. Droop Richmond.—The Detection of Poisonous Metals: Dr. G. D. Lander and Mr. H. W. Winter.—The Estimation of Coconut Oil in Butter: Raymond Ross.—Ochoco Fat: Dr. Julius Lewkowitsch.—The Detection of Small Quantities of Methyl Alcohol in the Presence of Ethyl Alcohol: I. E. Hinkel.—The Separation of Certain Volatile Fatty Acids by Extraction with Benzene or Toluene: T. R. Hodgson.

ENTOMOLOGICAL SOCIETY, at 8.—On certain Nycteribiidæ, with Descriptions of Two New Species from Formosa: Hugh Scott.—Descriptions of some new Hesperidæ from Central and South America: Hamilton H. Druce.—Mimicry in Tropical American Butterflies: J. C. Moulton.—Heredity in the South-east African Form (*cenea*) of *Papilio dardanus* (*merope*): G. F. Leigh.

GEOLOGICAL SOCIETY, at 8.—On the Fossiliferous Rocks of the Southern Half of the Tortworth Inlier: F. R. C. Reed and Prof. S. H. Reynolds.

THURSDAY, JUNE 4.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: On the Aberration of Sloped Lenses and on their Adaptation to Telescopes of Unequal Magnifying Power in Perpendicular Directions: Lord Rayleigh, O.M., Pres. R.S.—On the Viscosity of Ice: R. M. Deeley.—The Effect of Tempera-

ture on the Neutralisation-Volume Change for Different Salts at Different Concentrations: Miss Ida Freund.—Note on a New Sounding Machine for Use on Lakes and Rivers without a Boat: Prof. E. J. Garwood.

ROYAL INSTITUTION, at 3.—The Chemistry of Photography: Dr. Alexander Scott, F.R.S.

LINNEAN SOCIETY, at 8.—Note on the Spicules of *Chirodota gemmifera* Dendy Hindle: Prof. A. Dendy, F.R.S.—Two New Fungus Diseases: E. S. Salmon.—The Caryophyllaceæ of Tibet: F. N. Williams.—Polychæta of the Indian Ocean: F. A. Potts.—The Stylasteria of the Indian Ocean: Dr. S. J. Hickson, F.R.S., and Miss Helen M. England.—A Contribution to the Mycology of South Africa: W. N. Cheesman and T. Gibbs.—*Exhibits*: Drawings prepared to illustrate Descourty's "Ornithologie brésilienne": C. E. Salmon.—Lantern-slides of the Life-history of a Wood-boring Wasp: F. Enoch.

INSTITUTION OF MINING ENGINEERS, at 11 a.m.—Presidential Address by C. E. Rhodes.—The Mineral Resources of Trinidad: J. Cadman.—The Occurrence of Fluorspar in Derbyshire: C. B. Wedd and G. C. Drabble.—Calcing-kilns: G. Jones.—Cobalt and Northern Ontario: J. B. Tyrrell.

CHEMICAL SOCIETY, at 8.30.—Condensation Products from Pinene Amino-dicarboxylic Acid: W. Godden.—A Delicate Test for Bromides alone, or in Solution with Chlorides: J. S. Jamieson.—Experiments on the Synthesis of *trans*-Methylcyclohexylidene-4-acetic Acid: W. H. Perkin and W. J. Pope.—The Triazo-group. Part iv., Allyl Azoimide: M. O. Forster and H. E. Fierz.

FRIDAY, JUNE 5.

ROYAL INSTITUTION, at 9.—The Nadir of Temperature and Allied Problems: Sir James Dewar, F.R.S.

INSTITUTION OF MINING ENGINEERS, at 11 a.m.—Winding-engine Tests, with Notes and Suggestions on the Design and Testing of Plant: S. L. Thacker.—The Utilisation of Sewage for the Production of Crude Oil and Ammonia: M. F. Purcell.—The Oil Prospects of Central British South Africa: Dr. C. Sandberg.—Oil-mining: D. M. Chambers.—Mining in the Boundary District of British Columbia: F. Keffer.

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