Societies and Academies.

LONDON.

Royal Society, March 8.—A. B. **Wood,** H. E. **Browne,** and C. **Cochrane**: Determination of velocity of explosion-waves in sea-water; variation of velocity with temperature. An accurate determination of the velocity of explosion-waves in the sea gives:

(*a*) V = 4955·5 (±1) ft./sec., at 16·95 (±0·1)° C. and salinity 35 per cent.

(*b*) V = 4836 (±2) ft./sec., at 6·0 (±0·1)° C. and salinity 35·1 per cent.

(*c*) V = 4847 (±1·5) ft./sec., at 7·0 (±0·1)° C. and salinity 35·2 per cent.

In the new technique developed, it is unnecessary to know the exact position of charge relative to receivers. The results lead to a mean value of 10·9 ft./sec. per ° C. as the temperature-coefficient of velocity in the range 6° C. to 17° C. The following expression represents the velocity at any temperature t° C. within this range, and at any salinity S (parts per thousand):

$$V = 4627 + 13·7t - 0·12t^2 + 3·73S.$$

The salinity-coefficient is approximately 3 to 4 ft./sec. per 1 per cent. increase of salinity, the theoretical value being 3·73 ft./sec. per 1 per cent. No change was detected for charges varying in weight from 9 oz. to 300 lb. of explosive and no variation with depth. The coefficient of adiabatic compressibility of sea-water at 16·95° C. and 35 per cent. is $C_p = 42·744$ (±0·02) × 10^{-6}. Combining this with Ekman's value of C_θ, the ratio of the specific heats of sea-water under these conditions of temperature and salinity is $\gamma = 1·0094 \pm 0·0005$, in good agreement with 1·0090, deduced from thermo-dynamic data.—P. M. S. **Blackett**: The study of forked alpha-ray tracks. Forked alpha-ray tracks obtained by the Wilson condensation method were studied. The lengths of the tracks of the recoil atoms yield information concerning the relative ionisation due to different kinds of ionising particles, and of the average charge carried by them. Measurements of the angles between different parts of the tracks gave the masses of the recoil atoms in three particularly favourable cases.—A. **Egerton**: On the vapour pressure of lead.—I. The vapour pressure is measured by effusion of vapour at low pressure through a hole of measured area. Temperature is maintained constant by a selenium cell relay arrangement within 1/3° C. for many hours at about 800° C. Pressures were measured to 10^{-5} mm. The vapour pressure of ordinary lead between 1200-600° absolute is expressed by the equation $\log p = 7·908 - 9932/T$. The latent heat of vaporisation of lead (λ_0) is 47,000 ± 1000 cal. The chemical constant of lead is 1·84 ± 0·2, agreeing well with the theoretical value (1·853) obtained from the relation $3/2 \log M - C_0 = C$. The vapour pressures of lead and the uranium-lead isotope appear to differ by 2 per cent., but the result is rendered uncertain by an unexplained lowering of vapour pressure which lead undergoes on prolonged heating *in vacuo*.—A. C. **Egerton** and W. B. **Lee**: (1) Some density determinations. The Archimedes method of determining densities is rendered more accurate by utilising certain mobile and heavy organic liquids which avoid air bubbles and damping difficulties, and increase the weight of liquid displaced. Ethylene dibromide and carbon tetrachloride were employed with accuracy. A satisfactory sample of metal for density determination is prepared by filtering, casting, and heating *in vacuo*. The density of lead is 11·3437 at 20° C. The probable error of the nine determinations on three different samples is 1 part in 100,000. The maximum departure from the mean value for any single determination is less than 1 part in 12,000. A sample of uranium-lead would have an atomic weight of 206·26 from the density obtained. (2) Separation of isotopes of zinc. Two sets of distillations of pure zinc have been carried out in high vacuum, under conditions to obtain a slightly different concentration of the isotopes in the final residue of the final distillate. The samples are cast *in vacuo* and seeded with a particular kind of zinc. The first distillations gave a residue of slightly increased density, but the distillate possessed the same density as the original zinc. The second distillations gave a residue of increased density (about 1 part in 3700) and a distillate of decreased density (about 1 part in 3000). Determinations on seven samples of ordinary zinc give the density of zinc (prepared in the described way) as 7·1400 (the probable error being less than 1 part in 100,000). Flaws, allotropes, different physical conditions, and impurities are improbable. The amount of the separation agrees with Dempster's observations of isotopes of weights extending over six units (namely, 64-70), but is not so great as might be found for equal parts of 64 and of atoms of weights 66, 68, and 70.—E. **Hatschek** and P. C. L. **Thorne**: Metal sols in non-dissociating liquids. I.—Nickel in toluene and benzene. Very stable sols of nickel in a medium free from ions can be produced by decomposing nickel carbonyl dissolved in mixtures of toluene and benzene, containing a small amount of rubber, at 100° C. In the electric field the particles of disperse phase move to, and deposit on, *both* electrodes. Electrophoresis in fields of different strengths, all other factors being equal, shows that the amounts deposited are proportional to the first, or a lower, power of the potential gradient. Therefore positively and negatively charged particles are originally present in the sol. The sol resembles typical protected aqueous sols, inasmuch as it is coagulated by liquids which are not solvents for the protective colloid, *i.e.* rubber. The coagulum is only very imperfectly peptised again by rubber solvents, such as toluene or benzene.—H. **Hirata**: Constitution of the X-ray spectra belonging to the L series of the elements.

Zoological Society, February 6.—Sir S. F. Harmer, vice-president, in the chair.—Oldfield **Thomas**: (1) A new rock-kangaroo, *Petrogale godmani*, sp. n. It is like *P. assimilis*, but with a whitish tail, broader nasals, and larger secator. Its habitat is Black Mountain, near Cooktown, N. Queensland. (2) Skull of a pygmy fruit-bat from Sumatra. The generic name Æthalops is proposed.—C. A. Adair **Dighton**: Coat-colour in greyhounds.—E. G. **Boulenger**: The experiments of Dr. Kammerer and others upon amphibians and insects.—E. Leonard **Gill**: The Permian fishes of the genus Acentrophorus.—Charles F. **Sonntag**: On the vagus and sympathetic nerves of the terrestrial carnivora.—E. P. **Allis**: The postorbital articulation of the palato-quadrate with the neurocranium in the Cœlacanthidæ.—G. S. **Giglioli**: On the linguatulid arachnid, *Raillietiella furcocerca* (Diesing, 1835), Sambon, 1922.—Mrs. Rita **Markbreiter**: Some Microfilaria found in the blood of birds dying in the Zoological Gardens, 1920–1922.

February 20.—Dr. A. Smith Woodward, vice-president, in the chair.—D. **Seth-Smith**: Sexual display of the Magnificent Bird-of-Paradise (*Diphyllodes magnifica hunsteini*).—Einar **Lönnberg**: Remarks on some palearctic bears.—E. W. **Shann**: The embryonic development of the porbeagle-shark, *Lamna cornubica*.—Robert **Gurney**: Some notes on *Leander longirostris*, M.-Edwards, and other British prawns.

Faraday Society, February 19.—Sir Robert Robertson, president, in the chair.—A. W. **Porter** and J. J. **Hedges**: The law of distribution of particles in colloidal suspensions with special reference to Perrin's investigations. Pt. ii. The behaviour of particles specifically lighter than the medium has been examined in regard to distribution with height, using for the purpose emulsions of paraffin in water. The change of concentration occurs only at the bottom of the containing vessel. There is an increase of concentration with height reckoned from the bottom. A type of curve is suggested which fits closely the experimental results.—D. B. **Macleod**: On a relation between surface tension and density. The empirical relation $\gamma/(\rho_l - \rho_v)^4 = C$, where γ is the surface tension at any temperature, ρ_l and ρ_v the densities of the liquid and the vapour at the same temperature and C is a constant for each liquid, fits the experimental figures with remarkable accuracy for temperatures ranging from the melting-point to the critical temperature.—D. B. **Macleod**: (1) On a relation between the viscosity of a liquid and its coefficient of expansion. If $\varkappa_0$ be the volume of the free space in 1 c.cm. of a liquid at 0° C. and $1 - \varkappa_0$ the volume occupied by the molecules, it is assumed that at a temperature t° C. the volume of the free space is $\varkappa_0 + \alpha t + \beta t^2 + \gamma t^3$ —the volume of the molecules remaining constant. The viscosity of liquids is expressed as a function of the free space, thus $\eta\mu\varkappa_t^A = C$. For normal liquids A is nearly unity. For associated liquids it has a higher value. The values obtained for the free space for various liquids at their boiling-points are practically constant and of the order required by Van der Waal's theory. An expression is given for the viscosity of liquids at different temperatures and pressures. (2) On the viscosity of liquid mixtures showing maxima. The viscosity of liquid mixtures is a function of the free space of the constituents and of the mixture. In the case of liquid mixtures showing a maximum, the increase of viscosity is due mainly to the increase of density, which in turn is due to the chemical affinity between the constituents. It is probable that complexes which are formed further reduce the free space and consequently increase the viscosity.—F. H. **Jeffery**: Electrolysis with an aluminium anode, the anolyte being (1) solutions of sodium nitrite, (2) solutions of potassium oxalate. With solutions of sodium nitrite probably the primary product of reaction at the anode is aluminium nitrite which is hydrolysed rapidly to hydrated aluminium oxide and nitrous acid, the latter giving rise to nitric oxide and nitric acid. With solutions of potassium oxalate the product of reaction at the anode is a complex anion derived from aluminium. The salt $K_3\{Al(C_2O_4)_3\} \cdot 3H_2O$ can be derived from the anolytes after electrolysis. It is probable that the salt is a true complex salt comparable with potassium chromi-oxalate, and if this be true, the alumini-oxalate complex can be represented in three dimensions just as Werner represented the chromioxalate. The isolation of a complex salt from an anolyte does not imply necessarily that the constitution of the anionic part of this salt is identical with that of the complex anion present in the anolyte after electrolysis. —Maurice **Cook**: Crystal growth in cadmium. Evidence has been obtained that unworked crystals can grow under certain conditions. The usual methods of preparing metallic specimens for microscopic examination are useless, since the specimen cannot be regarded as unworked after it has been sawn off the original, ground, and polished. In these experiments the metal is cooled in such a way as to be free from the stresses usually set up during solidification. The results obtained indicate that during annealing considerable crystal growth has taken place. Irregularity in the shape of the grains is probably a factor greatly facilitating crystal growth.—S. D. **Muzaffar**: Electric potential of antimony-lead alloys. Measurements of the electric potential of the antimony-lead alloys were made by means of a quadrant electrometer against a calomel electrode in N KOH, N $Pb(NO_3)_2$, and tartar emetic with tartaric acid solutions. The results reveal an identity of potential up to 98 per cent. antimony with that of lead, which show the formation of no solid solution and no chemical compound between the two metals.

Royal Microscopical Society, February 21.—Prof. F. J. Cheshire, president, in the chair.—Sir W. M. **Bayliss**: Colloids and staining. The histologist is concerned with the staining of particles, large or small, sometimes present in the living cell, sometimes formed by fixing agents. The process is a complex one; but, as would be expected from the heterogeneous nature of the systems concerned, adsorption is the chief factor, especially in its electrical aspect; chemical combination seems to be of less importance. Thus, surfaces with a positive charge take negative (" acidic ") dyes, those with negative charge take " basic " or positive dyes. The degree depends on the magnitude of the charge, as shown by the effect of electrolytes, alcohol, heat, isoelectric point, etc. The removal of the amino groups from proteins has no effect on the process. Adsorption can be distinguished from chemical combination in certain cases, such as silk dyed with the acid of Congo-red. The fixation of stains by heat is difficult to explain. The action of mordants is also obscure; chemical combination as " lakes " is only a partial explanation, since these are stated to be resistant to acids. Differentiation appears usually to be a process of colloidal dispersion of the " lake." In a few cases, as the staining of fat by Soudan III., partition in accordance with solubility is the main factor. A. **Mallock**: The resolving power and definition of optical instruments. Resolving power is taken as indicating the least distance (angular or linear) at which two points can be seen as separate in the field of the instrument; definition is the ratio of that area of the field over which the resolving power is maintained to the whole area, or, shortly, the dimensions of the least objects appreciable and the range over which the appreciability extends. Optical images are formed when and where a number of paths from one point to another have the same optical length, in which case either point may be considered as the image of the other. By optical length is meant the length measured in wave-lengths in the medium through which the path proceeds. The constancy of this length causes all the waves emanating from one of the points to arrive at the other in the same phase, and this condition may be used to determine the form of the reflecting or refracting surfaces required to make one point the image of another. Resolving power depends on the rapidity with which the length of the optical path varies as the distance from the geometrical focus is increased: the more rapid the variation the greater is the concentration of the light and the smaller the luminous area which forms the image of a point. For telescopes where the angular aperture of the lens is small the variation is proportional to the diameter of the object glass, and a perfect lens one inch in diameter should have a resolving power of 4 in. of arc. For microscopes where the angular aperture of the lens is large the least appreciable distance is about $\lambda/2$ or 1/100,000 in. with ordinary light. Test plates for microscope objectives consist of groups of fine lines ruled on films of anilin colour, the thickness of which is only a small fraction of a wave-length of light.

PARIS.

Academy of Sciences, February 19.—M. Albin Haller in the chair.—G. **Urbain**: Celtium, element of atomic number 72. A discussion as to the priority of Coster and Hevesy. The author cites the earlier work of Dauvillier and himself, and concludes that Coster and Hevesy were not the discoverers of element 72, but have only found a material in which it is present in a relatively high proportion. The author claims that the name celtium has priority over hafnium for this element.—J. L. **Breton**: Spark-gaps in which the spark in a gaseous dielectric is deflected by a strong air current. Two types of spark-gap are described. The simpler of the two consists of a conducting disc of metal or graphite rotating with a high velocity in a hermetically closed cylinder filled with coal gas or the vapour of alcohol. The sparks play between this disc and two graphite electrodes. Long uninterrupted working is secured by water-cooling or by a fan. The apparatus has been successfully applied to the working of a high-frequency-induction furnace.—Jules **Andrade**: Isochronism and quadratic friction.—Georges **Friedel**: Cholesteric bodies.—C. **Sauvageau**: The prolonged quiescent state of an ephemeral Alga (Mesogloia).—M. W. C. Brögger was elected a foreign associate in the place of the late M. Schwendener.—A. **Myller**: Systems of curves on a surface and the parallelism of M. Levi-Cività.—M. **Juvet**: A generalisation of Jacobi's theorem.—M. **Malaval**: Permanent deformations by extension and compression.—M. **Mesnager**: Observations on the preceding note.—P. **Dumanois**: An aerodynamical arrangement for testing motors. The usual fan resistance does not permit of continuous variation. The author encloses the fan in a cylindrical drum closed by two plane parallel walls, one of which is constructed of radiating shutters. By partially opening the shutters, when fixed to a 12 h.p. motor, the number of turns per minute can be varied between 950 and 1470, a sufficient variation for practical conditions of use.—M. **Rateau**: Remarks on the preceding communication. M. Dumanois' apparatus has advantages over the Froude brake.—A. **Weinstein**: The unicity of sliding movements.—Charles **Bohlin**: The autologous series belonging to the problems of two and three bodies.—Ernest **Pasquier**: A simple expression of the acceleration of mercury in the case of the problem of two bodies, taking into consideration the movement of the perihelion of the planet.—Thadée **Peczalski**: The relation between Young's modulus and the ratio of density to atomic mass. The relation $E=B(\delta/M)^2$ is deduced, in which E is Young's modulus, δ is the density, M the atomic mass, and B a constant (8×10^5 kilograms per sq. mm.). The calculated and experimental values are compared for nine metals.—A. **Marcelin**: Superficial fluids. The unlimited extension of oleic acid. A study of the "superficial pressure" exerted by a thin layer of oleic acid on water. When the layer of oleic acid is one molecule thick the acid may be regarded as being in an intermediate state between the free and dissolved states, to which the name of "superficial solution" is given.—St. **Procopiu**: The appearance of the flame, arc and spark lines in the arc-spectra of metals in a vacuum.—Albert **Portevin** and François **Le Chatelier**: A phenomenon observed during the test by extension of alloys in course of transformation. The peculiarity observed was confined to aluminium alloys of the duralumin type with or without the addition of other metals (manganese, zinc). The elongation of the test pieces, instead of increasing continuously with the pull, progressed by repeated oscillations of an amplitude amounting to 4 per cent. of the load and with a frequency of several oscillations per second. The phenomenon attained its maximum amplitude immediately after tempering.—A. **Bigot**: The action of heat on kaolins, clays, etc. Black pottery. A study of the black pottery from the Bouchets Cave (Ardèche), from Basutoland, and of Etruscan black vessels.—André **Brochet**: The hydrogenation and dehydrogenation of castor oil and its derivatives. Castor oil with active nickel was treated with hydrogen at 150° C. under pressure. The pressure showed a series of oscillations which can be interpreted by assuming a series of hydrogenations and dehydrogenations. The fully hydrogenated product gave off hydrogen on heating with nickel to about 280°, but the product finally obtained did not correspond with the original oil.—René **Locquin** and Sung **Wouseng**: the hydration of the dialkylethinylcarbinols and the preparation of the α-hydroxymethyl ketones. Tertiary acetylenic alcohols of the type $RR.C(OH).C\equiv CH$ are readily converted into the ketones $PR.C(OH).CO.CH_3$ by Denigès' reagent (acid sulphate of mercury). Details of the method are given and a description of five ketones prepared by this general method.—Henry **Joly**: Stratigraphical observations on the Oxfordian and Lusitanian at certain points in the Celtiberic chain (Spain).—Léon **Bertrand** and Antonin **Lanquine**: The large Provençal sheets of Audibergue and Cheiron (Maritime Alps).—E. **Schnæbelé**: The present structure of the primary Vosges. The application to the whole of the Vosges of observations made especially to the north of the valley of Villé.—L. **Giraux**: The geological position of the neolithic workshops of the forest of Montmorency.—J. **Beauverie**: The relations existing between the development of wheat rust and climate. The sharp contrast between the climatic conditions in 1921 and 1922 showed that *Puccinia triticina* is especially the rust of dry seasons and *P. graminis* is the rust of wet seasons, the latter doing the most damage from the point of view of yield of grain.—M. **Rose, J. Dragoiu**, and F. **Vlès**: The reversibility of the phenomena of arrest by lowering the *p*H in the evolution of the eggs of the sea urchin.—M. and Mme. G. **Villedieu**.—The action of insoluble oxides on the mildew of potato (*Phytophthora infestans*). It is generally admitted that for a substance to act on a living organism it must first be rendered soluble. Experiments on the toxic action of the insoluble oxides of various metals (magnesium, cadmium, nickel, cobalt, zinc, copper, mercury) on the conidia of potato mildew are in direct contradiction with this hypothesis.—R. **Herpin**: Comparison between the sexual behaviour of some nereidians from the coasts of the Channel.—Ch. **Gravier**: Remarks on the preceding communication.—Auguste **Lumière**: The possibility of realising intestinal disinfection. An account of some experiments with sodium argentothioglycerine sulphonate, $AgS.CH_2.CH(OH).CH_2.O.SO_3Na$. Experiments on a dog showed that while a dose of 1 gm. of benzonaphthol per day had no effect on the number of organisms in the fæcal matter, the administration of the same weight of the silver compound sterilised the intestine in four days.

Official Publications Received.

Report of the Canadian Arctic Expedition, 1913–18. Vol. 6: Fishes and Tunicates. Part B: Ascidiacea. (Southern Party, 1913–16.) By A. G. Huntsman. Pp. 14. Vol. 7: Crustacea. Part G: Euphyllopoda. By Frits Johansen. Pp. 34. Part N: The Crustacean Life of some Arctic Lagoons, Lakes, and Ponds. (Southern Party, 1913–16.) By Frits Johansen. Pp. 31. Vol. 8: Mollusks, Echinoderms, Cœlenterates, etc. Part G: Alcyonaria and Actinaria. By Prof. A. E. Verrill. Pp. 164. Part I: Hydroids. By C. McLean Fraser. Pp. 5. (Ottawa.)

Minutes and Proceedings of the Institution of Civil Engineers; with other Selected Papers. Edited by Dr. H. H. Jeffcott. Vol. 214. Pp. iv+362+6 plates. (London: Gt. George Street.)