Societies and Academies.

LONDON.

Royal Society, Feb. 9.—**O. W. Richardson**: On the extraction of electrons from cold conductors in intense electric fields. The attraction of an electron by its mirror image in a conductor is treated as a Schrodinger wave problem. The sharpness of the photo-electric effect at a metal surface is accounted for. A formula is obtained for the field currents from cold conductors, which agrees well with the experimental data. The result implies that electrons are being generated at a rate proportional to $(\psi\bar{\psi})^{\frac{3}{2}}$.

R. H. Fowler: The restored electron theory of metals and thermionic formulæ. This note amplifies the recent work of Sommerfeld on the electronic theory of metals by applying his ideas to thermionic phenomena. The equilibrium state of an assembly consisting of a heated metal and an atmosphere of free electrons is calculated. It appears that the vapour pressure has twice the commonly accepted value owing to the two orientations of each electron. This result is then applied to the theory of thermionic emission, and gives values in excellent agreement with the best observations.

R. H. Fowler: The photo-electric threshold frequency and the thermionic work function. The old equation for the saturation current required assumptions for which there is no justification. Sommerfeld's theory of metals leads quite simply to the existence of a sharp photo-electric threshold frequency ν_0, and to the equality of this $h\nu_0$ with the thermionic work function χ. These points have been recently considered by O. W. Richardson, but in a more elaborate manner which appears capable of simplification.

P. A. M. Dirac: The quantum theory of the electron. In order to make the quantum theory, when applied to atomic structure, agree with observation, one has had to assign to each electron a spin and a magnetic moment. This is not necessary; agreement with observation can be obtained without arbitrary assumptions by a correct relativistic application of the general quantum theory to a point-charge electron. The Hamiltonian function on which the present theory is based is linear in the energy and momentum. The spinning electron model, applied in the previous non-relativistic way, is justifiable for many purposes. The motion of an electron in a central field of force is worked out, and the energy levels obtained are shown to be the same as those given by the model in the first approximation for a Coulomb law of force.

H. T. Flint and **O. W. Richardson**: On a minimum proper time, and its application to (1) the number of the chemical elements, (2) some uncertain relations. The existence of a minimum proper time h/m_0c^2 is deduced by a method which is independent of the assumptions about the metrics of space and time used previously. This leads to an upper limit $\left(\frac{n}{n+1}\right)^{\frac{1}{2}}c$, on the velocity of an electron in an atom in an orbit of total quantum number n. This involves an upper limit (97) on the atomic number of any chemical element and also an upper limit on the quantum number of an intranuclear orbit. This limit is a function of the atomic number of the nucleus.

H. Jeffreys: Some cases of instability of fluids. The problem of the instability in a liquid produced by heating below is rediscussed by a formally accurate method. Where the fluid is enclosed between two perfectly conducting solid boundaries, the honeycomb structure is not developed when the liquid is flowing, being replaced by a division into long strips. There is a formal analogy between this problem and G. I. Taylor's problem of the stability of liquid between two rotating cylinders. In atmospheric problems the earth's rotation will have a considerable effect in modifying the motions produced by excessive heating below; this will probably be in the direction of making the departures from the adiabatic gradient needed to cause instability greater than in the absence of rotation (though they will still be very small) and of confining the ascending currents to regions of smaller horizontal extent.

H. A. Wilson: The emission of light by flames containing sodium and the absorption of light by mercury vapour. It was shown by Gouy in 1879 that the intensity of the light from a sodium flame is proportional to the square root of the mass of sodium in the flame per square cm. of area, perpendicular to the direction of the light emitted. This result can be explained by assuming that the sodium atoms absorb and emit light like simple damped oscillators. The absorption of mercury resonance radiation by mercury vapour can be explained in the same way by assuming that the mercury atoms absorb the resonance radiation like simple damped oscillators.

C. N. Hinshelwood and **H. W. Thompson**: The kinetics of the combination of hydrogen and oxygen. An examination has been made by a static method of the combination of hydrogen and oxygen, at constant temperature and volume, from the region of purely catalytic surface reaction up as nearly as possible to the point of explosion. In the last fifty degrees of this range a reaction, approximately of the fourth order, comes into prominence; it is strongly autocatalysed by steam, and has a high temperature coefficient. The normal positive catalytic effect of the walls of the reaction chamber gives place to a negative effect, which may be due to the catalytic destruction of an autocatalyst for the main reaction, or the interruption of 'reaction-chains,' or to both causes. It is concluded that the reaction measured is the true gas reaction between hydrogen and oxygen.

E. T. Copson: On electrostatics in a gravitational field. Prof. Whittaker has recently discussed the effect, according to the general theory of relativity, of gravitation on electromagnetic phenomena. In particular, he has considered electrostatics in gravitational fields of two kinds, namely, those specified by the quasi-uniform metric and by Schwarzschild's metric. Algebraic expressions for the potential of an electron in these gravitational fields are now obtained by the use of Hadamard's theory of 'elementary solutions' of partial differential equations. The expression for the potential in the quasi-uniform field is the same as that obtained by Prof. Whittaker, who used entirely different methods.

W. R. Brode: The analysis of the absorption spectrum of cobalt chloride in concentrated hydrochloric acid. The principal absorption band, between 720 and 850 $\mu\mu$, consists of at least seven component bands. By different mathematical methods of analysis, the observed curve is resolved into seven similarly shaped components. There is a constant frequency difference between each of these components, and this frequency difference is the highest common factor of the frequencies of these component bands. There is apparently a definite relation between the odd and even numbered multiples or component bands and their relative intensities of absorption.

Society of Public Analysts, Jan. 11.—**J. R. Nicholls**: Determination of small quantities of benzoic acid and cinnamic acid, with some notes on the colorimetric determination of salicylic acid. The method of determining benzoic acid is based on its partial oxidation, in a constant proportion, to salicylic acid by means of hydrogen peroxide in the presence of ferric chloride,

and colorimetric determination of the salicylic acid under specified conditions. Cinnamic acid may be determined by first oxidising it quantitatively to benzoic acid.—**L. E. Campbell**: Report of the Preservatives Determination Committee of the Chemists of the Manufacturing Confectioners' Alliance and of the Food Manufacturers' Federation, on the determination of sulphur dioxide in foods. A normal procedure and an apparatus have been devised, and details of standard volumetric and gravimetric determinations are given, together with details of the treatment required in certain special cases, such as starch, gelatin, meats, dried fruits, etc.—**J. W. Black** and **B. J. W. Warren**: Notes on the effect of other reducing substances on the determination of SO_2. In some cases (*e.g.* glucose and gelatin) the interference of other reducing substances is negligible, but in others (nutmeg, mustard, ginger, etc.) it is considerable, and a time limit must therefore be set to the distillation period.—**H. R. Jensen**: (1) Rapid estimations of sulphites by alkaline liberation, or extraction, and titration. The sulphite content of certain products, such as glucose syrup and cornflour, may be satisfactorily determined by direct extraction followed by titration with iodine. (2) Barium sulphate losses in gravimetric estimations. Too low acid concentration favours adsorption of barium chloride; hence it is desirable to add the reagent in a very fine jet, and to have an excess to reduce the solubility of barium sulphate and the adsorption of alkaline sulphate.—**Osman Jones**: Determination of sulphur dioxide in sausages. On the addition of sulphite to sausages there is an immediate loss of sulphur dioxide, so that the amount found is invariably lower than that added. A method of vacuum distillation is described, which gives results agreeing well with those of the Committee's standard method.—**H. M. Mason** and **G. Walsh**: Note on the oxidation of sulphites by air. Carbon dioxide must be quite free from oxygen if used in a lengthy sulphite distillation. Removal of the adsorbed air from the foodstuff by the use of a vacuum before the heating will prevent oxidation losses, but good results are also obtained by extremely rapid heating and distillation.—**H. M. Mason**: Note on the titration of dilute sulphite solutions with standard iodine solutions. The low results obtained when sulphite solutions are titrated with iodine are due to oxidation and to the escape of sulphur dioxide set free by the hydriodic acid formed during the titration, the latter being responsible for 70 per cent. of the loss.—**A. W. Knapp** and **R. J. Phillips**: Determination of sulphur dioxide in fatty substances. In rancid fats free from sulphur dioxide, volumetric determinations show an apparent content of sulphur dioxide; hence only the gravimetric process should be used in such cases.

Royal Anthropological Institute, Jan. 17.—**R. Ruggles Gates**: A pedigree study of Amerindian crosses in Canada. Crosses between French and Indians began in Ontario about 1660. The present study concerns interrelated pedigrees extending through six generations from crosses involving Cree and Ojibway Indians on one hand and French, Scotch, and English on the other. Pedigrees and ancestry of many individuals of mixed blood were obtained, with photographs of persons having many different degrees of Indian blood. The inheritance of features was studied as well as eye-colour, skin colour, and hair characters. Individuals of three-sixteenths Indian ancestry were found having essentially blue eyes and at least one factor for skin pigmentation. It is concluded that the Indian probably has more than two factors for skin colour, and that certain of these factors are independent of certain factors for eye-colour. Independent segregation of genetic factors was found in several families. People with one-sixteenth Indian blood and distinct eye pigmentation showed the presence of an undilutable factor for skin colour. There is evidence that certain tribes probably have fewer factors for skin colour than others. This appears to be the first attempt to apply genetical pedigree methods to the study of the results of interracial crossing in man. There is abundant scope for the application of this method to anthropological crosses in many parts of the world.

Royal Meteorological Society, Jan. 18.—**Hugo Hergesell**: The observation of clouds, with special reference to the safety of aviation (*v.* NATURE, Jan. 28, p. 143).—**Sir Gilbert Walker**: World weather. Comparisons by graphical methods of variations of pressure, temperature, and rainfall have during the past half century brought to light a number of relationships between conditions at places separated by considerable distances; these have in recent years been studied systematically by taking 30 centres widely distributed over the earth and calculating by statistical methods the relationships between their seasonal values. It appears that there are three main oscillations or swayings: (1) the North Atlantic; (2) the North Pacific; and (3) the southern, affecting the Pacific and Indian Oceans. These relationships have obvious applications for seasonal forecasting.

Linnean Society, Jan. 19.—**C. V. B. Marquand**: The botanical collection made by Capt. F. Kingdon Ward in the Eastern Himalaya and Tibet in 1924–25. Capt. F. Kingdon Ward, travelling eastwards from Gyantse to Tsetang over unexplored ground, and crossing the Temo La to Tumbatse, entered the region in the neighbourhood of Lat. 29° 40′ N., Long. 95° E., where the most important part of the collection was made. A short distance east of Tumbatse a number of high passes over the eastern extremity of the Himalaya were traversed. On the highest of these passes, the Nam La, over a southern spur of the lofty Namcha Barwa at an altitude of 17,500 ft., a large number of alpines were collected. In Aug. 1924 an extensive collection was made around the Trasum Lake, and the Banda La, a pass over 18,800 ft., the most northerly point of the Expedition, was visited. Excluding the three genera Meconopsis, Rhododendron, and Primula, the collection comprises 446 species, including 54 new species as well as 26 new varieties. The genera most strongly represented, apart from the three above, are Saxifraga, Gentiana, and Pedicularis.—**F. W. Edwards**: Insect-collecting in the Southern Andes. The expedition described was a joint one arranged by the British Museum (Natural History) and the Bacteriological Institute of the National Department of Health of Argentina, its object being to make investigations regarding the mosquitoes and other bloodsucking flies of the Southern Andes, and to form a general collection of insects from the southern beech-forests. Two and a half months, October 1926 to January 1927, were devoted to collecting, most of the time being spent around Lake Nahuel Huapi, close to the western border of Argentina in latitude 41° S. From here the party worked their way across to the Chilean coast; the route taken was the regular one over the Perez Rosales Pass and across Lakes Nahuel Huapi, Frias, Todos los Santos, and Llanquihué, an ancient route which is now being increasingly used by tourists.

PARIS.

Academy of Sciences, Jan. 9.—**Pierre Termier**: The strata of the Aiguilles d'Arves between Lauteret

and Vallouise.—**Ch. Fabry**: A phenomenon which accompanies binocular vision when the two visual images are not combined into one.—**J. S. Townsend**: The theory of high-frequency currents through gases.—**B. Hostinsky**: The probabilities relative to repeated transformations.—**Hadamard**: Remarks on the preceding note.—**Julius Wolff**: On the series $\sum \frac{A_k}{z-a_k}$.—**P. Bessonoff**: Nearly periodic meromorph functions defined in the whole plane.—**P. Faton**: The movement of the perihelion of the planets.—**Wright**: A photograph of Jupiter, obtained at the Lick Observatory (California). The photographs were taken in approximately monochromatic light with the large 95 cm. Crossley reflector. In the first series the light had passed through a screen permitting the passage of only ultra-violet light of about λ3700: in the second series the screen is transparent only for rays about λ7600 in the extreme red. The photographs show great differences, the causes of which are discussed.—**L. Décombe**: The electrified spherical pellicules and the fine structure of the spectral lines.—**Paul Woog**: The extension of lubricants over solid surfaces.—**P. Schwartz**: A method of radioelectric direction finding applicable to geodesy. The radiogoniometric method described gives the position of emitting stations with a precision comparable with that obtained by optical methods.—**G. Colange**: The electrocapillary properties of mercury in contact with air. The capillary constant of mercury increases when it is electrified negatively and diminishes when it is positively electrified. There is a maximum capillary constant for mercury, which under the experimental conditions described corresponds to a negative potential of 15,000 to 20,000 volts.—**Marcel Dufour**: The refraction of a parallel light beam normal to a cylindrical lens.—**Pierre Brun** and **Jean Granier**: The dielectric properties of aqueous-alcoholic mixtures. Measurements of the dielectric capacity (high-frequency current, wave-length 50 metres) of isobutyl alcohol—ethyl alcohol—water and isoamyl alcohol—ethyl alcohol—water mixtures. The results are shown graphically. It is concluded that the Maxwell formula relating dielectric capacity and refractive index of organic liquids ($K=n^2$) should be replaced by $K=n^2+k_2$, in which k_2 is a variable, a function of the number of free hydroxyl ions in the solution.—**Mlle. Suzanne Veil**: The evolution of nickel sulphide and cobalt sulphide in the presence of water. The changes in the sulphides are followed by means of the changes in the magnetisation coefficient.—**F. Bourion** and **E. Rouyer**: Ebullioscopic determination of the molecular equilibria of resorcinol in aqueous solutions of calcium chloride.—**M. Tiffeneau** and **Mlle. Jeanne Lévy**: The comparative migratory aptitudes of acyclic radicals in the semipinacolic transposition of the phenyldialkylglycols. Their relations with the affinity capacities.—**Georges Brus**: The crystallised dihalogen derivatives of pinene.—**Paul Fallot**: The western termination of the Sierra de Cazorla (Andalusia).—**Henri Schoeller**: The stratigraphical characters of the Embrunais layer and of the outer edge of the Briançonnais layer to the north of the Pelvoux region.—**G. Mangenot**: The signification of the red crystals appearing, under the influence of cresyl blue, in the cells of certain algæ. The red crystals are the iodide of the oxonium derivative of cresyl blue, and indicate the presence of iodides. The distribution of iodides in algæ can be determined by means of this reagent.—**Bogdan Varitchak**: The nuclear evolution in *Ascoidea rubescens*.—**M. Bridel** and **P. Picard**: The primeveroside of salicylic acid.—**Maurice Fontaine**: The analogies existing between the effects of a tetanisation and those of a compression.—**M. Raymond-Hamet**: The action of chloralose on the sympathetic and parasympathetic.—**Jean Timon-David**: Contribution to the knowledge of the fats of insects: the butter from the insects parasitic on *Pistacia Terebinthus*. The aphides *Pemphigus utricularius* and other species of Pemphigus give about 20 per cent of their weight as a fat soluble in ether. The chemical constants of the fat are given.—**G. Lavier**: The prebasal vacuole of trypanosomes.—**Ch. Pérard**: A disease of the mackerel (*Scomber Scomber*) due to a myxosporidium, *Chloromyxum histolyticum*.—**Marage**: The nature of the deafness of Beethoven.

SYDNEY.

Linnean Society of New South Wales, Nov. 30.—**A. H. S. Lucas**: Notes on Australian marine algæ (No. 5). This paper contains (1) a list of the algæ collected at Michaelmas Cay, near Cairns, Qld., (2) Chlorophyceæ from Bowen, including records new for Australia, (3) a description of a new species of Codium, (4) notes on Caulerpa with a description of *C. Hedleyi*, (5) distributional notes on Fucoideæ, and (6) descriptions of two new species of Chondria.—**B. Bertram**: Mosquito control in the municipality of Lane Cove, New South Wales. The problem was to deal with *Culex fatigans*, breeding in natural waters polluted by house drainage. Oiling gave useful results, but channelling was equally satisfactory, more permanent, and likely to be less expensive. The widespread benefit felt from the treatment of certain creeks suggests that the range of flight of *C. fatigans* is greater than is usually supposed.—**Rev. H. M. R. Rupp**: A new Dendrobium from New South Wales and Queensland. The new species is allied to *D. Becklerii* and *D. Mortii* and occurs throughout the brushes among the foothills of Barrington Tops, N.S. Wales, and also at Tambourine Mt., S. Queensland.

VIENNA.

Academy of Sciences, Dec. 1.—**A. Müller** and **A. Sauerwald**: The behaviour of aluminium-triethyl under the influence of nickel catalyser at higher temperatures.

Dec. 9.—**K. Przibram**: The theory of the coloration of rock-salt by Becquerel rays; also remarks on the natural blue rock-salt. Pressure is supposed to be part cause of the colouring.—**E. Steinach, M. Dohrn, W. Schöller**, and **W. Hohlweg**: The biological actions of the female sexual hormone in aqueous form. A hormone oil containing extract of placenta has been prepared with a strength of 50,000 mouse-units per gram. The active substance is soluble in water to a solution of 500 mouse-units per cubic centimetre. Experiments have been made with albino guinea-pigs, making it easy to observe the reddening or hyperæmia of the mammæ. Marked effects have been produced in the early maturity of the mammæ and uterus in females which had been castrated when young. The effects of injecting water-soluble hormone are similar to the action of physiological hormone obtained by transplantation of ovary.—**E. Steinach**: Reactivation of the ovary and the whole female organism by the hormone method. Senile females of the rat are rejuvenated by the water-soluble hormone.

Dec. 15.—**K. Fritsch**: Observations on flower visiting insects in Styria, 1906.—**F. Frankl**: Topological relations of compact portions of Euclidean space to their components and application to the theory of prime ends. The results of Alexander's work on the Jordan-Brower theorem are extended.