Societies and Academies.

LONDON.

Royal Society, June 28.—**E. Jones**: Photographic study of detonation in solid explosives. Direct photography of a detonating cartridge possesses advantages over other methods for determining rates of detonation in that it is absolute and enables a continuous and permanent record of the progress of detonation to be obtained. Results are given to illustrate the two stable velocities of detonation peculiar to gelatinous explosives, and the effect of nitroglycerine content of a powder explosive on its velocity of detonation. Photographic records obtained with opaque explosives give the rate of propagation of detonation along the surface of the cartridge. The detonation front inside the cartridge is convex towards the undetonated portion, so that detonation is further advanced on the axis of the cartridge than on the surface. For one explosive, the stable form assumed by the detonation front inside the cartridge, and its effect on duration of detonation phenomenon over a plane transverse section of the cartridge, have been determined.

E. T. Whittaker: On the potential of the electromagnetic phenomena in a gravitational field. In classical electromagnetic theory, the electromagnetic field due to any number of electrons moving in any manner is determined by a theorem which expresses the scalar and vector potentials of the field in terms of the positions and velocities of the electrons. This theorem is extended to electromagnetic phenomena which take place in a gravitational field, so that the metric of space-time depends on the gravitating masses. The formula obtained is completely different from the well-known formula of classical electromagnetic theory, of which it is, nevertheless, the true generalisation.

B. Topley and **J. Hume**: The kinetics of the decomposition of calcium carbonate hexahydrate. Measurements have been made under controlled conditions of the rate of the reaction $CaCO_3 . 6H_2O = CaCO_3 + 6H_2O$, the substance being in contact with water in a dilatometer. The very large increase in velocity is due to a true temperature coefficient of reaction rate. The absolute rate of propagation of chemical change in the solid has been deduced, and the temperature coefficient has been measured over the range 0° to 15°. An attempt is made to relate together the absolute reaction rate and its temperature coefficient by means of a mechanism involving the vibration frequency of the ions in the interface between the two solid phases and the distribution of energy among the vibrating ions.

L. W. Nordheim: On the kinetic method in the new statistics and its application in the electron theory of conductivity. With proper definitions, the dynamical theory can be worked out both for the Einstein-Bose and the Fermi-Dirac statistics in just the same way as by Boltzmann for classical statistics. The modified form of the fundamental equation of the gas theory is given, and the equilibrium states and the H-theorem are deduced from it. In comparison with the classical theory some characteristic new terms occur, but in the case of the electron theory of conductivity, they just cancel out in the usual approximation owing to the large mass ratio of the electrons and the atoms. It is therefore justified in that special case to use the new distribution laws together with the old form of the fundamental equation.

R. W. Wood and **V. Voss**: The fluorescence of mercury vapour. The factors determining the fluorescence of mercury vapour excited by the aluminium spark have been determined. Very minute traces of water-vapour destroy the fluorescence. All the stronger atomic lines of mercury have been found in the fluorescence spectrum, in addition to bands due to the mercury molecule. The intensity of these lines is proportional to the square of the intensity of the exciting light (the 2536 line excepted). Bands due to mercury hydride have been observed in the spectrum, as well as the carbon line 2478.

E. Rudberg: The velocity distribution of photoelectrons by soft X-rays. By means of a special magnetic method, measurements are obtained of the velocity distribution in the photoelectric emission from targets of carbon, aluminium, copper, and silver produced by the soft X-radiation from a carbon anode. In all cases, the emission is constituted of a group of electrons of a few volts energy and a less prominent group with energy concentrated in the region 200-280 volts. Baking at 400° C. generally reduces the first group by about 50 per cent, but does not affect the second. The latter seems to consist of primary electrons directly produced by the incident radiation quanta, chiefly belonging to the carbon Kα-line (275 volts). The distribution in the first group is identical with that of the secondary emission produced by electron bombardment; it is inferred that this group results from the presence of fast primary electrons in the target. Preliminary experiments on gold-leaf indicate an absorption coefficient of about 3×10^5 cm.$^{-1}$.

P. Gôtz and **G. M. B. Dobson**: Observations on the height of the ozone in the upper atmosphere. Some fifty measurements have been made of the height of the ozone layer in the upper atmosphere over Arosa (Switzerland). It is greatest when the amount of ozone is large, and least when the amount is small, and there is also evidence of an increase of height from autumn to spring. The average height seems to be between 35 km. and 40 km.

T. M. Lowry and **M. A. Vernon**: An improved method of ultra-violet polarimetry: anomalous rotatory dispersion of sodium tartrate. Improved sensitiveness has been obtained by measuring with a densimeter the density of the photographic image of the middle and outer portions of a triple field. By plotting the ratio of the densities against the readings of the analyser scale, the setting which gives equal photographic densities can be read off within about 0·005°. In this way a curve of anomalous rotatory dispersion has been plotted for a 1 per cent solution of sodium tartrate, which gave a maximum dextrorotation of only 0·5°.

J. B. Cohen, **C. H. Browning**, **S. Ellingworth**, and **R. Gulbransen**: Antiseptic compounds: some further derivatives of anil-quinoline. Compounds of larger molecular weight have been prepared and tested. Owing to limitations of solubility, no great increase in mass of the quinoline portion of molecule was possible, but powerful antiseptics were obtained by condensation of various nitroso compounds with methochlorides of methyl and ethyl quinaldyl carbamates. Addition of further aromatic nuclei to the benzene portion of the molecule diminishes antiseptic potency, but where the additional nucleus is reduced, thus assuming an aliphatic nature, activity is greater. Particularly potent substances are obtained by condensation of nitroso derivatives of tetrahydro-quinoline and methyl tetrahydro-quinoline with quinaldine compounds. Products were also prepared from nitroso mono-methyl aniline, practically as active as the corresponding dimethylamino compounds, whereas primary amino derivatives are less potent. Thus in the anil-quinoline series, the distinction appears to lie between those substances containing, on one hand,

a primary basic group, and, on the other, a secondary or tertiary group, in the benzene nucleus.

R. J. Ludford: Vital staining of normal and malignant cells (1). Vital staining with trypan blue and the cytoplasmic inclusions of liver and kidney cells. By the cytological technique described it is possible to demonstrate in kidney and liver cells of animals stained intravitally with trypan blue: (*a*) Dye droplets and mitochondria; (*b*) dye droplets and Golgi apparatus. No definite relation can be established between dye droplets and mitochondria. The dye droplets make their appearance in relation to the Golgi, and when formed break away from it. The formation of the droplets resembles the formation of secretion granules in gland cells. The observations suggest a functional inter-relation between the Golgi apparatus and the mitochondria.

E. D. Denny-Brown: Inhibition as a reflex accompaniment of the tendon-jerk and of other forms of muscular response. Close examination of cessation of tonic posture action currents during a tendon jerk in the same muscle reveals that the cessation is an inhibition. The silence is found by analysis to be due in part to a refractory period of the motor units involved, combined with a proprioceptive reflex inhibition of all units of the centre, caused by stimulation of some end organ in the muscle by the motor excitation. There is reason to believe that this end organ is the muscle spindle, and that every reflex activation evokes a proprioceptive inhibitory effect upon the muscle.

Physical Society, June 8.—**L. F. Richardson** and students of Westminster Training College: Contact potential in the Dolezalek electrometer connected idiostatically. The deflection x was related to the voltage V by the formula $x = k\{\frac{1}{2}V^2 + \eta V\}$, k being constant from month to month, but η varying from 0·3 to 1·2 volts on different days. If it is desired to measure V, it is therefore essential to reverse the polarity in order to eliminate η.—**G. P. Barnard**: Some experiments on the light-sensitivity of commercial selenium cells. Part 1.—The relation connecting the change in conductivity of selenium cells with illumination. The change in conductivity C due to a given intensity of illumination I is proportional to some power of the illumination I—*i.e.* $C \propto I^x$. The index value x varies from cell to cell, and is probably dependent on the construction of the cell. Part 2.—The reaction of selenium to various spectral regions. The change in conductivity of selenium cells is dependent, not on the number of foot-candles incident on the cell, but rather on the amount of radiant energy received. For the same amount of energy received, the action of the infra-red is relatively much weaker than that of the shorter wave portion of the spectrum. Experiments on the decay of conductivity of selenium after exposure to radiation from various portions of the visible spectrum indicate that, throughout a large portion of the visible spectrum, the internal state of the selenium, as determined by the change in conductivity, is independent of the wave-length of the exciting radiation.—**J. R. I. Hepburn**: The vapour pressure of water over sulphuric acid–water mixtures at 25° C., and its measurement by an improved dew-point apparatus. A critical study has been made of data previously used by Wilson in the construction of a mean curve for the vapour pressure of water over sulphuric acid–water mixtures at 25° C. The observations of Sorel (employed by Wilson over the concentration range 44-82 *per cent sulphuric acid) are shown to be probably inaccurate, by calculations based* on thermodynamics, and by determinations at 25° C., using an improved dew-point apparatus.

Mineralogical Society, June 12.—**F. Slavík** and **L. J. Spencer**: Place-names of mineral localities in central Europe. Many important mining districts in the former Austro-Hungarian monarchy are now in other countries and the localities are now known officially by other names. Lists are given for each county and province, with equivalent place-names in the various languages (fifteen in all), together with a statement of the principal minerals from each locality. A key to the pronunciation of letters, with diacritical marks and also a glossary of geographical terms that enter into the construction of place-names are added.—**L. J. Spencer**: Eleventh list of new mineral names. The first list of this series was published in 1897 and gave all the names of minerals not in the sixth edition of Dana's "System of Mineralogy" (1892). Others have appeared every three years at the end of each volume of the *Mineralogical Magazine*. They are intended as dictionary lists of new names rather than lists of new minerals. About 170 names are now added.—**A. F. Hallimond**: On the atomic volume relations in certain isomorphous series (3). It has already been shown that the volume differences in isomorphous series derived from the same group of eutropic elements stand in a constant ratio in all series, and that this relation can be used to calculate atomic volumes for the elements in the combined state. It is now shown that compressibilities agreeing with those determined by Slater for eleven alkali halides can be calculated from the atomic volumes already assigned to the combined elements, by means of the relations $\beta = V/K$, $\beta' = V'/K'$, where β, V are the compressibilities and atomic volumes of the combined metals; β', V' those of the halogens. For all the metals, K has the value -4×10^{-6}; for the halogens K' is approximately $-2{\cdot}5 \times 10^{-6}$. The compressibilities of the free metals, as well as the atomic volume relations and the compressibilities in the combined state, are consistent with relations of the type $pv = K$, already indicated by Richards for the free metals; K, the constant for the eutropic group, assuming a new value in each isomorphous salt-series. The atoms thus behave as regions of a perfect gas under a high pressure.—**H. Collingridge**: On the determination of optic axial angles and crystal-forms from observations by the Becke method in thin sections. A suggested method of combining separate observations of different sections in one stereographic diagram and incidentally finding from the combined diagram the forms and axial ratios and optic axial angle of the crystal. The method is illustrated by an example of olivine in an olivine-basalt.—**S. I. Tomkeieff**: A contribution to the petrology of the Whin Sill. Certain rare varieties of the Whin Sill are described, such as the coarse gabbroidal rock, occurring in the form of bands within the mass of the normal dolerite, the coarse rock with red granophyric spots, the red felsitic veinlets, and spherical aplitic inclusions. A scheme of differentiation is applied to explain the origin of these varieties.

Geological Society, June 13.—**G. B. Barbour**: A re-excavated Cretaceous valley on the Mongolian border. The valley, originally cut in pre-Cretaceous lavas, was completely filled by the Nantienmen Beds, levelled off by erosion, and entirely covered by a heavy capping of plateau-basalts. During late Pliocene times a stream followed part of this old Mesozoic valley-axis. The valley bottom was again filled up by wind-blown loess *in mid-Pleistocene times, again partly excavated in late Pleistocene, and once more filled with very late* Pleistocene or early recent gravels. At present, the course is being opened for the fourth time. The

Cretaceous valley deposit (Nantienmen Beds) has been left clinging to the side-walls in many places.—**S. I. Tomkeieff**: The volcanic complex of Calton Hill (Derbyshire): a petrological study. There are two phases of vulcanicity:—(i) Effusive phase—represented by, besides the agglomerate and tuff of the old volcanic cone, a highly decomposed lava. Petrologically and chemically it is comparable with the other contemporaneous Lower Carboniferous lavas of the district. The vesicles are filled up with a chlorite of delessite type. (ii) Intrusive phase—represented by a fresh analcite-basalt, which has intruded into the old volcanic chimney and spread amœba-like in the volcanic cone, detaching large masses of vesicular lava.

CAMBRIDGE.

Philosophical Society, May 21.—**A. G. Hutchison**: The metamorphic history of the Dee-side limestone, Aberdeenshire. The metamorphic history can be divided into three episodes: (*a*) Regional (of the highest grade) characterised in the limestone by diopside-hornblende epidotezoisite and scapolite, and in the Older Granite intrusions by hornblende pegmatites. (*b*) Thermal by Newer Granites, characterised by wollastonite-grossularite-idocrase hornfelses, chiefly confined to the neighbourhood of the hochnager granite mass. (*c*) Post-thermal emanations from the Newer Granites, chiefly the hochnager and Birsemore, resulting mainly in a widespread development of prehnite and, to a less extent, in wollastonite, grossularite, idocrase, scapolite.—**L. R. Wager**: The mechanism of replacement as illustrated by metasomatic alteration of the Whin Sill. A steady change in composition, by diffusion through small openings in the rock, of the solution responsible for the metasomatism, is used to explain a gradual transition from altered to unaltered dolerite and to show that plagioclase, orthoclase, and other minerals are in equilibrium with aqueous solutions at the low temperature of the metasomatism.—**W. A. Wooster**: Demonstrations on piezo-electric effects. The alternating electric field which may be obtained from a suitable circuit containing a triode valve has been applied to the detection of piezo-electricity in crystal grains. When these are placed between the plates of a condenser included in the oscillatory circuit and the frequency of the latter continuously varied, large changes in the anode current occur at the resonance frequency of each crystal grain.—**J. D. Bernal**: An X-ray photogoniometer. The description of a new universal instrument for all forms of X-ray crystallographic and spectrometric work by photographic methods. The apparatus can be used (1) as an optical goniometer; (2) for rotating crystal photographs with (*a*) plane plate, (*b*) cylindrical camera; (3) for oscillating crystal photographs; (4) for Debye-Scherrer powder photographs; (5) as an X-ray spectrometer.

DUBLIN.

Royal Irish Academy, June 11.—**J. K. Charlesworth**: Glacial geology of North Mayo and West Sligo. During the Glacial period, North Mayo and West Sligo were completely overwhelmed by extraneous ice which proceeded north-westerly from the ice-centres in Leitrim and Connemara. This is shown by the striæ, dispersal of erratics, and the distribution of the moraines. The ice, on its retreat, uncovered the higher mountains, as the Ox Mountains and the Nephin Beg range, and with the steady enlargement of these nunataks dissolved into valley glaciers. The various phases in the break-up of the ice and its complete withdrawal from the area can be readily followed by the well-developed and abundant moraines and the marginal drainage features. Local glaciers associated with the highest corries came into existence at an early phase of the recession; they cover an area of but a few square miles, and correspond to a snowline of about 1000 feet on north and east slopes.

EDINBURGH.

Royal Society, June 4.—**G. Leslie Purser**: *Calamoichthys calabaricus*, J. A. Smith (Part 1): The alimentary and respiratory systems, concluded. The histology of the mucous membrane of the alimentary tract is extremely uniform, and, though their size and proportions vary in the different organs, the cells are only of three kinds, (*a*) cells forming digestive granules (scarcely to be found in œsophagus), (*b*), goblet cells secreting various mucoid substances, and (*c*), the ordinary columnar ciliated cells. These latter lose their cilia in the cul-de-sac, in the fundus of the œsogaster, which is much more muscular than any other part of the tract other than the pyloric region. In fact there appears to be an inverse relation between the ciliation and the musculature along most of the canal. There is a well-developed spiral valve in the first two-thirds of the intestine, but the histology is so similar throughout that no subdivision other than a purely topographical one is justifiable.—**P. R. C. Macfarlane**: Salmon (*Salmo salar*) of the River Moisie (E. Canada), 1926 and 1927. This report, the third of a series dealing with Moisie salmon, is based on a collection of 900 scale samples taken during the months of June and July in 1926 and 1927. As in the two previous investigations, the outstanding features are the large proportion of 'spring' fish, the high percentage of fish on their second or subsequent return to the river for spawning purposes, and the absence of grilse. Smolt ages vary from two to five years; the two- and three-years-old smolts, in practically equal proportions, together form 97 per cent of each year's collection, the remainder being four-years-old smolts, with one exception, which had spent five years of river life before migrating to the sea. The average weight and length of each age group, except in the case of the two+ winters fish, are very similar to those found in Scottish collections. It is possible, however, that the main run of summer fish in the Moisie occurs after the sampling ceased in July. The figures obtained for 'condition,' the relationship between weight and length, corroborate the findings of the former investigations in that spring fish are in better condition than summer fish, the reverse of that found in the Rivers Dee and Spey in Scotland.—**R. A. Sampson**: The present-day performance of clocks. A study of the actual performance of two of the clocks at the Royal Observatory, Edinburgh, Shortt No. 0 and Shortt No. 4, during 1927. The clocks are at constant temperature as well as constant pressure, the arc is read daily to 2″, and besides transit circle determinations the two clocks are compared with one another by an oscillograph daily to $\frac{1}{100}$ sec. Shortt No. 4 showed an increase in the pendulum of 0·012μ per day. Allowing for this, the rate was reasonably constant, showing only fluctuations in accumulated error which reached 0·1 sec. five times and once exceeded this. Reason is given to attribute this to residual escapement error.

PARIS.

Academy of Sciences, June 4.—**E. Goursat**: A problem of Monge with several independent variables.—**A. Mesnager**: A rectangular specimen undergoing normal pressures on its bases.—**A. Cotton**: Remarks concerning the note of MM. Cabannes and Daure on molecular diffusion.—**Ch. Gravier** and **J. L. Dantan**: Some points of the biology of the polychætal annelids of the *Nereis* family.—**Gabriel Bertrand** and **Hirosi**

Nakamura: The importance of manganese for animals. Description of feeding experiments with mice. Manganese would appear to take part in the whole of the nutritive exchanges in animals.—P. Helbronner: Deviations from the vertical in the French Alps. Figures for the astronomical latitude minus the geodesic latitude and astronomical longitude minus the geodesic longitude are given for eight stations between the Lake of Geneva and the Mediterranean.—André Blondel: The measurement of the brightness of diffusing surfaces.—Georges Claude and Paul Boucherot: The utilisation of the thermal energy of the sea. A description, with diagram, of the experimental installation at Ougrée.—H. Le Chatelier: Remarks on the preceding communication. The 50 kilowatt machine was worked by a heat engine with a temperature range of 10° C. only, an achievement hitherto regarded as impossible.—Jean Baptiste Senderens and Jean Aboulenc: The action of sulphuric acid on the aromatic acids: the sulpho-aromatic acids.—E. Mathias: Magnetic measurements in Creuse, Dordogne and Haute-Vienne.—G. Rempp: The comparison of meteorological results and the effects of chance. A development of results obtained by L. Besson and proof of their generality.—J. Popken: The arithmetical nature of the number *e*.—V. Hlavatý: The second fundamental form relative to the torsion factor. Rèmes: The solutions of differential equations, considered as functions of the initial point.—J. Delsarte: A group of functional rotations with one parameter and the connected functional differential equations.—Maurice Thomas: A new arrangement utilising, without a fall, liquid or gaseous currents, as well as waves.—Louis Breguet: Landing of aeroplanes and brake power. A discussion of the effects of various types of brake with special reference to safety of landing.—Carl A. Garabedian: Circular and rectangular thick plates loaded at the centre.—P. Swings: The relations between the Riemann potentials and differential quadratic forms of stationary fields with spherical symmetry.—Seth B. Nicholson and Nicolas G. Perrakis: The spectroscopic proof of the presence of boron in the sun. A direct comparison was made of the region λ4645-5137 of the arc spectrum of boric acid with the same region of the sunspot spectrum, the latter obtained with the 75-feet spectrograph of the large telescope of Mount Wilson Observatory. 81 strong lines were measured, but 55 of these could not be used, either because of the neighbourhood of a strong line showing the Zeeman effect or of other strong lines. Of the remaining 26 lines, 25 were identified.—A. Danjon: A visual stellar photometer.—Frédéric Joliot: The resistivity of thin metallic layers obtained by cathodic pulverisation.—Soulié: An arrangement permitting the maintenance of a constant potential feeding a receiver branched on an alternating current network.—S. Pieńkowski: The fluorescence of mercury vapour excited electrically.—J. Cabannes and P. Daure: Spectroscopic analysis of the light obtained by molecular diffusion of a monochromatic radiation in the middle of a fluid.—Jean J. Trillat: Spectrographic researches on beating out thin sheet metal. X-ray spectrography has been applied to the study of the changes produced in the structure.—L. Andrieux: The preparation by electrolysis of the borides of calcium, strontium, and barium. These borides can be obtained by the electrolysis at 1000° C. of a mixture of calcium (strontium or barium) borate with the corresponding fluoride. Analysis showed them to be of the composition $Ca(Sr,Ba)B_6$.—Paul Bary: The formation of filaments of ferric oxide by drying colloidal solutions.—Maurice Auméras: The solubility of cadmium sulphide in hydrochloric acid. The experimental results were in agreement with the formula deduced from the application of the ionic hypothesis and the law of mass action, assuming that hydrogen sulphide dissociates into $\overline{HS}$ and $\overset{+}{H}$.—Paul Riou and Léon Lortie: The influence of some colloidal substances on the velocity of absorption of carbon dioxide by solutions of neutral sodium carbonate.—P. Job: Application of the spectrographic method and the spectrophotometric method to the study of the hydrolysis of some alkaline salts.—Mlle. Choucroun: The selective permeability of membranes. The influence of the mobility of the ions on the polarisation.—Robert F. Le Guyon and Roger F. Auriol: The microtitration of lead cations and chromic ions by the centrifugal volumetric method. This method, described in an earlier communication, gives exact results in the titration of lead by a chromate. It may be useful for the estimation of lead in biological chemistry and in blood and urine.—P. Brenans and Ch. Girod: Chloriodophenols obtained from 5-chloro- and 3, 5-dichlorosalicylic acids.—A. Wahl and J. P. Sisley: Improvements in the method of elementary organic analysis. By reducing the quantity of material taken for combustion to 80-100 milligrams, a shorter combustion tube may be employed and the operation can be completed in 25-45 minutes.—André Léauté and Georges Dupont: A method for the partial dehydrogenation of certain hydrocarbons to render them more suitable for use in briquetting coal. It is possible partially to remove hydrogen from tar or oil by heating to a moderate temperature with sulphur. The viscosity and agglutinating power of the oil are increased, and the amount of sulphur remaining in the oil is not high enough to interfere with its application to briquetting.—Jacques de Lapparent: Mineralogical knowledge of the Pays de Fenouillet bauxites.—Mihaïlovitch Jélénko: The great earthquakes in Bulgaria in 1928.—L. Aufrère: The relations between the cold currents, oceanic absence of rain, insular deserts, and coast deserts in tropical and subtropical regions.—C. Dauzère and J. Bouget: The influence of the geological constitution of the soil and the points struck by lightning. The position of places liable to be struck by lightning is partly determined by the geological constitution of the soil. Some examples are given.—G. Nadson and G. Philippov: The formation of new stable races in the lower fungi under the influence of the X-rays.—Roger Heim: Preliminary observations on the genus *Inocybe*.—Georges Nichita: The pseudobranchia of *Girardinus Guppyi*.—Béhague, Garsaux, and Ch. Richet, Jr.: The minimum oxygen pressure compatible with life. The absolute pressure of the oxygen is not the only element which governs the respiratory life of animals.—Mlle. Andrée Courtois: Variations in the proportion of amino-acids of some Lepidoptera during nymphosis.—P. Bourcet and A. Fourton: The chemical nature of digitalic acid. The various substances described under this name are merely succinic acid containing more or less impurities.—Mlle. Suzanne Ancel: The action of various gases on the egg of the fowl. Assimilation of carbon monoxide as an inert gas. Eggs kept for eight days in an inert atmosphere of nitrogen or of hydrogen afterwards develop in the normal manner. Abnormal development occurs after exposure to sulphur dioxide, ammonia, hydrogen chloride, chlorine, acetylene, carbon dioxide, or coal gas. After eight days in carbon monoxide the eggs develop normally. Hence carbon monoxide behaves as an inert and not as a toxic gas.—R. Coquoin: The method of determination of the respiratory elimination of acetone in man.—A. Philibert and J. Risler: The bactericidal action of colouring matters.—C. Levaditi and Mlle. R. Schoen: The penetration and multiplication of protozoa in the nerve cell.