Societies and Academies.

LONDON.

Royal Society, Mar. 1.—A. E. H. Tutton : (1) The hexahydrated double sulphates containing thallium. Thallium salts corresponding to the potassium, rubidium, cæsium, and ammonium salts of the isomorphous series $R_2M\left(\begin{smallmatrix}S\\Se\end{smallmatrix}O_4\right)_2$. 6H$_2$O have been prepared. Four of them are double sulphates containing thallium as the R-metal, and magnesium, ferrous iron, manganese, or copper as the M-metals ; six are double selenates. (2) The hexahydrated double selenates containing thallium. The six salts are those in which R is thallium and the M-metal is magnesium, nickel, cobalt, ferrous iron, manganese, or copper. The results of the whole investigation (both papers) agree in showing that, as previously proved, potassium, rubidium, and cæsium salts of the great series invariably show crystal forms and properties which vary regularly with the atomic number of the alkali metal. The ammonium members, while showing no relation to atomic numbers or weights, resemble the corresponding rubidium salts containing the same M-metal so closely as to be practically iso-structural. Thallium salts invariably occupy a position well within the limits (as regards angles and constants) of potassium and cæsium salts. Thallium salts, however, have one strikingly outstanding property, that of very high optical refraction, occasionally exceeding even that of monobromonaphthalene and yet more so that of carbon disulphide.

W. H. J. Childs : The distribution of intensity in the band spectrum of helium : the band λ4650. Measurements of the intensity distribution in the helium band λ4650 (first of the main series) show that the predicted distribution is of the correct type, but agreement with observation is by no means complete. Notably the P and R' branches are much stronger, relative to the Q branch, than theory indicates. An expression of the form $ie^{-E/kT}$ where i is a linear function of j', is adequate to describe the observed distribution. As with many other bands, the temperature obtained by assuming that distribution of angular momentum is governed by the Boltzmann factor is much higher than the true temperature of the gas. In this case effective temperatures of approximately 750 A. and 1000 A. are found, depending on conditions of excitation. A higher temperature is obtained from the Q branch than from the P and R branches. Examination of Doppler width of band lines shows, however, that there is a distribution of translational velocities corresponding to true temperature.

M. C. Johnson : Studies in the behaviour of hydrogen and mercury at the electrode surfaces of spectrum tubes. The proportion of a hydrogen positive ray spectrum which is due to the neutralisation of protons is decreased by a temporary admission of mercury vapour. The accompanying domination of the spectrum by mercury can be delayed and weakened by the substitution of nickel for aluminium as the cathode material. The resistance at electrodes of different sensitivities to mercury contamination is not altered by that contamination if the tube is filled with hydrogen, but is sensitive to a change from hydrogen to air. Mercury is only liberated from a contaminated cathode during discharge. A solid mercury cathode can be made to disintegrate under bombardment in a manner different from its thermal evaporation, but the excessive disintegration product of the contaminated aluminium is from aluminium. The hypothesis is put forward that the increased cathode disintegration is the secondary effect of the removal of a surface layer of oxygen, allowing disintegration afterwards by

ordinary proton bombardment, and allowing escape of hydrogen from the aluminium structure. The spectrum changes are then consequences of the mass and critical potentials of mercury.

W. E. Curtis : The structure of the band spectrum of helium. Details are given of three new helium bands which have the final electronic level $2P$ in common. Two of them are due to the vibrational transition $1 \longrightarrow 1$, the initial electronic levels being $3S$ and $4S$. The other has an initial electronic level of effective quantum number 2.96, but its term type is uncertain. The rotation terms have been accurately evaluated for the three new bands and for three others previously described which also have the final level $2P$. The new evidence presented favours the view that the helium and hydrogen molecules are structurally similar.

H. A. Wilson : The Saha theory and the conductivity of flames containing alkali metal vapours. Noyes and Wilson have shown that the equilibrium constants for the reaction $M = M^+ + e$ (where M denotes atom of alkali metal and e electron) can be deduced from measurements of the electrical conductivity of flames at about $2000°$ K, and that equilibrium constants so obtained agree approximately with those calculated by the Saha theory. This assumes that all salt sprayed into the flame is reduced to metal vapour and that all negative carriers are free electrons. It is now shown that these assumptions may be omitted without affecting the equation. Bennett's results on the conductivity of rubidium in flames give a value of the equilibrium constant nearly equal to that given by Saha's theory ; Gouy's results on light emitted by sodium flames require the fraction of sodium reduced to metallic state to be independent of the concentration of sodium, and hence the fraction of ions which are electrons must be independent of concentration.

R. G. Lunnon : Fluid resistance to moving spheres. By timing the falls of metal spheres in water, through distances up to two metres, the resistance of a fluid at high speeds has been measured both for accelerated and for uniform motion. During accelerated motion, the resistance is increased in a regular way, which can be described approximately in terms of a carried mass, varying from one-half to twice the mass of the displaced fluid.

N. F. Mott : The solution of the wave equation for the scattering of particles by a Coulombian centre of force. The solution splits up into incident wave, representing on-coming electrons, and scattered wave ; the quantum theory result agrees exactly with that of classical theory. The analysis is applicable to a- and to β-particles.

G. H. Briggs : A redetermination of the velocities of particles from radium-C, thorium-C and -C'. A redetermination by the magnetic deflexion method of Hρ for a-particles from radium-C gives 3.993×10^5 E.M. units. Using the theoretical value of e/m deduced from electrochemical data, the velocity is 1.923×10^9 cm. per sec. The corresponding values found by Rutherford and Robinson were 3.983×10^5 and 1.922×10^9. Velocities for thorium-C and -C' were found to be 1.704×10^9 and 2.053×10^9.

Physical Society, Feb. 10.—**Allan Ferguson** and **Eric J. Irons :** A simple graphic method for the determination of galvanometer and fluxmeter constants, with a note on the measurement of intense magnetic fields. The paper deals with methods for evaluating the principal construction constants of moving coil instruments by the graphical treatment of observations of logarithmic decrement and its variation with circuit resistance.—**J. C. Hudson :** The application of electrical resistance measurements to

the study of the atmospheric corrosion of metals. The procedure is suited for quantitative field tests on the atmospheric corrosion of metals, and is based on the determination of the change produced on exposure in the electrical resistance of wire specimens. The method is capable of great accuracy. In the case of copper, the percentage resistance change due to corrosion is inversely proportional to the diameter of the wire ; it is thus possible to use the method as an 'acceleration test' by conducting experiments on relatively thin wires, which are appreciably affected by corrosion within a few weeks.—C. J. Smith : On a method of constructing the caustic curve formed by refraction at a plane surface. The method depends on the properties of an ellipse which cuts the rays orthogonally.

Royal Meteorological Society, Feb. 15.—L. F. Richardson and R. E. Munday. Memoir No. 2 (published 1926) : The single-layer problem in the atmosphere and the height-integral of pressure. Atmospheric tides are supposed to be such that a single vector suffices to specify the momentum of a whole column of air. Are ordinary weather disturbances of the same sort, or must each column be regarded as two or more layers moving independently ? The answer to this question is extracted from the international collection of the records of registering balloons. It is found that Laplace's equations for *free* tidal oscillations are a very bad description of ordinary disturbances of the European atmosphere; in other words, the 'dynamic height' of the atmosphere is extremely variable.—L. F. Richardson, D. Proctor, and R. C. Smith. Memoir No. 4 (published 1926) : The variance of upper wind and the accumulation of mass. Using the pilot-balloon observations made during the War, Durward's study of the variation of wind between two places at the same time is continued, by working up specially simultaneous observations at short distances (11 to 28·5 km.), and, surprisingly, the variation is found to be greater. Paired times at the same place are also investigated. The mathematical study of smooth functions accustoms us to the idea that accuracy is to be obtained by proceeding to the limit of smallness ; but the wind seems not to possess the required kind of smoothness.—J. Glasspoole : The distribution over the British Isles of the average number of days with rain during each month of the year. While the east is the dry side of Great Britain and of Ireland, in the case of the number of days with rain the increase is more pronounced from the south-east to north-west of the British Isles. Actually, the average number varies from 150 along the Thames Estuary to 270 in the Outer Hebrides. There are only 10 days with rain on the average along the Thames Estuary in June, July, and September, and 26 in December in the north-west of Scotland and in the mountains of Kerry, Connemara, and Donegal. June is the month of fewest days with rain over the British Isles generally, namely 14, while December has most with 20. May also has less days with rain than either July or August, so that the popular call for early holidays is well supported by rainfall statistics. The amount of rain per rain-day is greater during the last six months of the year than the first six months, so that on the average May and June are again more favourable for holiday makers than July and August.

CAMBRIDGE.

Philosophical Society, Jan. 16.—N. Feather and R. R. Nimmo : The ionisation curve of an average α-particle. Systematic photometry of the track images from a cloud expansion chamber made possible the calculation of the variation of the light scattering power of an α-particle track over the last two centi-

metres of its length in standard air, and the variation of this quantity was finally identified with the variation of ionisation along the track. In air, helium, and hydrogen, the maximum ionising efficiency of the α-particle occurs when it possesses the velocity appropriate to the distances 3·0, 2·55, and 2·25 mm., respectively, from the end of its path in standard air. —F. L. Arnot : The interference of light in a wedge. When white light from a very narrow slit is reflected from a thin wedge, and then analysed in a spectroscope, interference bands are seen in the spectrum provided the edge of the wedge is parallel to the slit-source and to the slit of the spectroscope. Under certain conditions, the bands become clearer and more sharply defined as the width of the source is increased. These conditions are (1) that the light is incident on the wedge from the direction of its thick edge, and (2) that the distance between the wedge and the spectroscope has a certain value depending upon the angle of incidence of the light on the wedge.

PARIS.

Academy of Sciences, Jan. 30.—The president announced the death of Félix Henneguy.—E. Goursat : The rôle of the double characteristics in the problem of the deformation of surfaces.—Hadamard : The ergodic principle.—A. Rateau : The number of specific turns and the specific power of motor turbines.— C. Sauvageau : The Adelopyceæ of the Litosiphon.— René Maire and Louis Emberger : General view of our phytogeographical knowledge of Morocco : the regions, domains, and sectors.—A. Khintchire : The law of large numbers.—S. A. Janczewski : Homogeneous differential systems of the fourth order.— Rolf Nevanlinna : Complements to the theorems of unicity in the theory of meromorph functions.—Paul Dumanois : Concerning the theory of antidetonants. The hypothesis that antidetonants, such as lead tetraethyl, act by accelerating combustion is regarded as disproved by the experimental work of Moureu, Dufraisse, Chaux, Pigrot, Aubert and Villey, Egerton and Gates, Dumanois and Lafitte. The suggestion that antidetonants act by preventing the formation of peroxides (Moureu, Dufraisse, and Chaux) during compression is more in accord with the known facts.— Pierre Dive : The rotation round an axis of a heterogeneous fluid mass with ellipsoidal stratification.— Émile Belot : The origin of satellites with inverse revolution and the velocity of the primitive nebula.— Nicolas Kryloff : The variational algorithm and the fundamental problem of mathematical physics.— J. Nageotte : The study of myeline vesicles with the ultra-microscope.—C. and H. Gutton : The high frequency electrical discharge. The potential at which discharge (in hydrogen) takes place is measured as a function of the pressure, at wave-lengths of 3 to 5620 metres. —J. Aicardi : A new method of alinement by Hertzian waves. A description of a method of radio signalling by the use of which a ship or an aeroplane can follow a definite route during fog.—Jean Thibaud : Absorption discontinuities in the intermediate domain (K bands of carbon, nitrogen, and oxygen).—G. Balasse : Study of the continuous emission spectrum produced by the electrodeless discharge. The theory suggested in a previous communication leads to the conclusion that a continuous emission spectrum must be produced for all elements. This has already been proved experimentally for the elements cadmium, potassium, lead, calcium, mercury, and phosphorus, bismuth, sulphur, and iodine have now been added. Since these nine elements are distributed in five different columns of the periodic table, it may be considered that the continuous emission spectra produced by the electrodeless discharge is a general phenomenon extending to all elements. — A. Couder : The con-

struction and trial of a telescope mirror of a particular form in Pyrex glass. The mirror is made in the form of a cylindrical tube closed at one end. The surface of the end is worked into a parabolic mirror of 136 cm. focus. The deformations produced by flexure are discussed : owing to the low coefficient of expansion of Pyrex glass, the thermal deformations have proved to be negligible.—**Y. Rocard** and **Ph. de Rothschild** : The absence of enlargement of spectral lines after reflection. It is concluded from the results of the experiments described that the enlargement of the lines by reflection on a mirror, the atoms of which possess thermal agitation, and might be expected to result in a considerable lowering of the order of limiting interference, does not exist.— **Néda Marinesco** : The molecular weight and association of chlorophyll in solution. The molecular weight determinations are based on the diffusion coefficient and the viscosity (Einstein equation). For sufficiently dilute solutions (less than 0.053 gram per litre) the molecular weight of chlorophyll is about 800, corresponding to the 817 for one atom of magnesium : for higher concentration there is evidence of the presence of associated molecules.—**G. Denigès** : The direct micro-estimation of the phosphoric ion by ceruleomolybdimetry in liquids from the animal organism, natural waters, fermented drinks, etc.—**Paul Dop** and **F. Duffas** : The water-bearing calyx of Clerodendron.— **S. S. Kharbush** and **Mlle. Panca Eftimiu** : The phenomena of chromatic reduction in the family of the Erysiphaceæ.—**Maurice Fontaine** : The reactions, at high pressures, of the pneumogastric of the frog immersed in a hypotonic solution.—**C. Motas** : A new Hydracarus collected at the Grand Lautien (Var).— **Y. Manonélian** and **J. Viala** : Nerve cells and the virulence of the suprarenal capsules.—**E. Rouboud** : The unfitness of *Plasmodium præcox* for development during the winter in *Anopheles maculipennis*, and its epidemiological consequences for northern Europe.

GENEVA.

Society of Physics and Natural History, Dec. 15.— Aimé Pictet and H. Vogel : The synthesis of milk sugar. An equimolecular mixture of β-glucose and β-galactose heated to $175°$ C. in a vacuum gives lactose. The reaction takes place in two phases,

$$C_6H_{12}O_6 = C_6H_{10}O_5 + H_2O$$
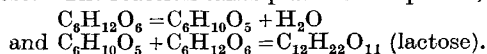
and $C_6H_{10}O_5 + C_6H_{12}O_6 = C_{12}H_{22}O_{11}$ (lactose). —**E. Briner** and **A. Morf** : Some new addition compounds of phenols with ammonia. Ammonia in the presence of β-naphthol, α-naphthol, α-oxyanthraquinone, salicylic acid, pyrocatechol, resorcinol, hydroquinone, or pyrogallol has given in each case one or two addition compounds corresponding to fixed conditions of temperature and pressure.—**E. Briner** and **G. Lunge** : The reactions between nitrogen peroxide and sulphur dioxide. These two substances in the liquid state give the compound $S_2O_9N_2$, containing six normal acid functions. It may be regarded as an anhydride of nitrosylsulphuric acid.— **R. Wavre** : The field of gravity in the interior of the planets.—**Raoul Pictet** : Integral transformation into motive power of the heat furnished to a gas. According to the author, who does not accept the second law of thermodynamics, it should be possible to convert the whole of the heat furnished to a gas into work.

ROME.

Royal National Academy of the Lincei, Nov. 20.— G. Scorza : Fundamental sub-groups of a group.— L. Tonelli : An observation on derivation by series. —U. Cisotti : The solenoidal character of Ricci's tensor for ternary forms.—S. Franchi : Tectonic enigmas in the mountains of Valdieri and along the valleys of Gesso, Stura, and Vermenagna.—S. Baglioni and L.

Settimj : The nutritive value of the nitrogenous substances of certain types of preserved foods. Experimental investigations on albino rats. The nitrogenous matter contained in the dilute acid extract of cheese, dried stockfish, and dried edible fungi, and that contained in the part of cheese, stockfish, casein, and commercial hydrolysed casein which is insoluble in dilute acid, is capable not only of maintaining in equilibrium the nitrogen balance of albino rats, but also of allowing an accumulation of nitrogen and an increase in body-weight. The highest percentage increase in body-weight is obtained by means of a mixed diet composed of hydrolysed casein, the insoluble part of stockfish, and the soluble part of the fungi. The nitrogenous matter of that portion of the fungi which is insoluble in water is incapable of maintaining in equilibrium either the nitrogen balance or the weight of albino rats.—**D. Graffi** : Functions of vectorial variety. — **Cristina Eula** and **Odoardo Franceschi** : Projective study of surfaces.—**R. Cacciopolli** : A class of surfaces admitting of quadrature.—**U. Crudeli** : A category of stationary motions of (heavy) viscous liquids between two vertical cylindrical (round) tubes. —**A. Masotti** : The contact between lines of flux and lines of current in the motions of fluids.—**A. Rosenblatt** : Energy flux in the exceptional case of Kutta-Joukowski's theorem. — **B. Caldonazzo** : Viterbi motions and the triple orthogonal systems of surfaces determined by them.—**L. Fernandes** : The resolution of an absorption band regarded as common to praseodymium and neodymium. At a temperature approximating to that of liquid air, the line of wave-length 469 A. of the absorption spectra of praseodymium and neodymium is resolved into thin, sharp lines, the intensities and wave-lengths of these differing considerably with the two metals.—**A. Ferrari** and **A. Baroni** : The crystalline structure of the double cæsium cadmium chloride $CsCdCl_3$: considerations on the monometric structure of the type $A[B X_3]$. This salt exhibits a monometric lattice, with an elementary cell with the side 5.20 A. The ion $CdCl_3^-$ has dimensions lower than those given by the sum of the dimensions of the component ions Cd^{++} and Cl^- ; this property appears to be general for complex ions. The crystallographic analogy between cadmium and mercury is emphasised by the identity in structure between the salts $CsCdCl_3$ and $CsHgCl_3$.—**G. Natta** and **M. Freri** : X-ray analysis and crystalline structure of cadmium–silver alloys. For the a-phase of the system cadmium–silver, representing solid solutions of cadmium (up to 44 atomic per cent.) in silver, the length of the side of the elementary cell varies linearly with the composition, increasing from the value 4.07 A. for pure silver to 4.14 A. for the alloy containing 31 atomic per cent. of cadmium. For the β-phase, corresponding with the compound AgCd and with solid solutions of cadmium in this, the photograms are of quite different appearance, the few lines present being arranged easily according to a body centred cubic lattice of the cæsium chloride type, and the calculated intensities agreeing well with the experimental values. Petrenko and Fedorow observed that at $460°$ the compound AgCd undergoes a transformation, which they interpreted as a decomposition of the unstable β-alloy into the neighbouring a- and γ-phases. The results now obtained show, however, that this consists of a polymorphic transformation, since all the lines of the photograms conform well with a hexagonal or rhombohedral lattice with the axial ratio 1.62 ; the side of the cell is $a = 3.01$, and the elementary cell contains one molecule of AgCd, the calculated density being 9.57.—**G. Piccardi**: Relations between the ionisation potentials of the first and second order of homologous elements.—**R. Savelli** : Fruits of two varieties borne by the same plant.