BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

JUNE, 1938.

New bands ending on the $1s\sigma 2p\sigma^1\Sigma_u$ state of H_2. O. W. RICHARDSON (Proc. Roy. Soc., 1938, A, 164, 316—345).—Two new band systems are described extending from the yellow to the photographic infra-red limit (11,750 A.). It is concluded that they are states with both the electrons in H_2 excited. Two alternative methods of classifying the new states and seven other abnormal states as states with both electrons excited are discussed. G. D. P.

High terms of Paschen series in hydrogen and deuterium. H. NAGAOKA and T. MISHIMA (Proc. Imp. Acad. Tokyo, 1938, 14, 53—56).—Using high dispersion and taking special precautions to reduce contamination, the existence of higher terms, hitherto masked by the secondary spectrum and lines due to O, is revealed. E. S. H.

Term values in carbon. C. W. UFFORD (Physical Rev., 1938, [ii], 53, 568—569).—The energies of the terms of the normal state of C I, $1s^2 2s^2 2p^2$, and of the excited state $1s^2 2s 2p^3$ are calc. with one-electron functions for a self-consistent field. Tables of radial integrals, abs. energies, and separations of the terms are given. N. M. B.

Spectroscopic investigation of the electrical oxidation of nitrogen. E. N. EREMIN, K. S. BOGOMOLOV, N. I. KOBOSEV, and S. S. VASSILIEV (J. Phys. Chem. Russ., 1938, 11, 33—44).—The emission spectrum of a glow discharge in N_2 contains the II positive, the I positive, and the I negative group of N_2 lines. In air, in addition to these, the γ group of NO and, at pressures >70 mm. Hg, a continuum between 5400 and 6000 A. appear. The intensity of the continuum rises, and that of the bands decreases, with increasing pressure (3—500 mm.). Both intensities increase with the current strength (100—300 ma.). Most of the emission is due to excited mols., and only 1·5—4% to excited ions. J. J. B.

High-pressure afterglow in nitrogen. J. KAPLAN (Nature, 1938, 141, 645—646).—An intense N afterglow has been produced at pressures >10 mm. There is a relatively strong excitation of the Vegard-Kaplan intercombination bands, and a strong line at 3470 A., which is tentatively identified as the hitherto unobserved at. N line ^2P—^4S (cf. A., 1938, I, 219). L. S. T.

Presence of sodium in the upper atmosphere. J. CABANNES, J. DUFAY, and J. GAUZIT (Compt. rend., 1938, 206, 870—872; cf. A., 1938, I, 166).—Interferometric examination of the yellow line in the spectrum of the twilight sky shows this line to consist of the $D_1 D_2$ doublet of Na. At night the intensity of the line corresponds with approx. 10^{11} $3p^2P$—$3s^2S$ Na atom transitions per sec. per cu. m. of the atm. A. J. E. W.

Interferometric study of the yellow radiation, λ 5893 A., of the sky at twilight ; proof of the presence of sodium in the upper atmosphere. R. BERNARD (Compt. rend., 1938, 206, 928—930; cf. A., 1938, I, 166; and preceding abstract).—The D_1 and D_2 lines, in the normal intensity ratio, have been interferometrically identified in the twilight sky spectrum. This indicates either an extended belt containing Na vapour, which gives rise to photo-luminescence in a max. temp. region 60 km. above the earth's surface, or a thin layer at the same height in which the Na is conc. The absence of Na lines in spectra of the aurora borealis, originating at heights >70 km., supports the latter view. A. J. E. W.

Possible presence of certain lines of the neutral sodium atom in the spectrum of the night sky. G. DÉJARDIN (Compt. rend., 1938, 206, 930—933).—The $\lambda\lambda$ of 12 lines in the spectrum correspond closely with the first members of the $2P$—nS and $2P$—nD series of Na. A group of lines corresponding with the forbidden $2P$—nP transitions is also observed. The occurrence of Na in the atm. is discussed. A. J. E. W.

Intensity variations of the D line of sodium in the spectrum of the light from the sky at twilight. R. BERNARD (Compt. rend., 1938, 206, 1137—1140). H. J. E.

Hyperfine structure and nuclear moments of aluminium. D. A. JACKSON and H. KUHN (Proc. Roy. Soc., 1938, A, 164, 48—61).—The resonance lines are investigated by absorption in an atomic beam of Al. The line $3^2P_{\frac{1}{2}}$—$4S_{\frac{1}{2}}$ ($\lambda = 3944$ A.) has three components, $3^2P_{\frac{1}{2}}$—$3^2D_{\frac{3}{2}}$ (3082 A.) two. The observed intensity ratio of the latter gives a val. 9/2 for the nuclear spin. Two other lines (6696 and 6699 A.) were observed in emission and found to be doublets. G. D. P.

Absorption spectrum of sulphur at high temperatures and pressures. B. ROSEN and L. NEVEN (J. Chim. phys., 1938, 35, 58—68; cf. A., 1937, I, 103).—Although the data support the conclusion, drawn from data at low temp. and pressures, that the vapour consists of mols. of S_2, the existence of a superimposed continuous band can only be explained by the existence of mols. of S_x ($x > 2$). C. R. H.

Emission band spectrum of chlorine (Cl_2^+). A. ELLIOTT and W. H. B. CAMERON (Proc. Roy. Soc.,

1938, **A**, **164**, 531—546; cf. A., 1937, I, 271).—Wave nos. are tabulated; vibrational and rotational analyses have been made and it is shown that the bands belong to a doublet system. The carriers of the spectrum are ionised Cl_2 mols. Vals. of the chief mol. consts. of $(^{35}Cl_2)^+$ are given. Many of the bands do not fit into the doublet system and it is likely that a second system has its origin near the first one. The energy of dissociation of the lower state of the doublet bands is > that calc. for the normal state of Cl_2^+ from mol. and at. ionisation potentials and from the heat of dissociation of the normal state of neutral Cl_2.

G. D. P.

First spark spectrum of manganese. C. W. CURTIS (Physical Rev., 1938, [ii], **53**, 474—481).— Using a hollow-cathode discharge and He as conducting medium for the whole range 800—6200 A., and A and Ne for certain regions, the spectrum of Mn II was photographed. Full data and classifications for >700 lines are tabulated. N. M. B.

L **spectrum of iron.** J. FARINEAU (Compt. rend., 1938, **206**, 1011—1012).—The *L*α line has max. intensity at 17·53 A., its limits being 17·51 and 17·64 A. The *L*β line has a similar form, with max. intensity at 17·18 A. The no. of electrons per atom in the N_1 level, deduced from the observed widths of these lines, is 0·6 instead of 0·22 given by magnetic measurements. The discrepancy is probably due to the Auger effect, which accounts for an increase of approx. 50% in the normal width of the lines.

A. J. E. W.

Arc spectrum of indium, In I. F. PASCHEN (Ann. Physik, 1938, [v], **32**, 148—154).—λλ from 9170 to 2180 A. have been measured and are tabulated. The fine structure of the groups $5^2P_j-4P^*_j$ has been measured. The analysis of the spectrum is discussed.

O. D. S.

Spectral distribution of the white light obtained by electrical excitation of xenon. F. GANS (Compt. rend., 1938, **206**, 1009—1011; cf. A., 1937, I, 336).—The energy distribution in the continuous spectrum given by Xe and Xe–Ne tubes (cf. A., 1937, I, 103 for method of excitation) is approx. that in the radiation of a black body at 3800°. The proportion of blue light increases with the energy dissipated in the positive column. In both Xe and Xe–Ne tubes the lines observed in the spectrum are arc lines of Xe; the intensity of the lines relative to the continuum also increases with increasing dissipation of energy in the positive column.

A. J. E. W.

First spark spectrum of cæsium. R. RICARD (Compt. rend., 1938, **206**, 905—906; cf. A., 1933, 200; 1938, I, 108).—λλ, comparative intensities, and proposed classifications of 19 new lines in the range 4270—5410 A. are recorded, and νν of 17 new electronic levels are given. Possible transitions must involve simultaneous excitation of two 5p electrons.

A. J. E. W.

Width of the mercury line λ 2536·7 A. G. P. BALIN (Physikal. Z. Sovietunion, 1937, **12**, 701—728). —The width of the Hg resonance line λ 2536·7 A. has been investigated by the absorption method at a pressure of 7·3 mm. Finite thickness of the emitting layer and diffuse reflexion are taken into account in estimating the form and shape of the line.

J. A. D.

Shape of mercury lines. V. FABRIKANT and F. BUTAEVA (Physikal. Z. Sovietunion, 1937, **12**, 761—763).—The shape of the line λ 4358 A. emitted by a high-pressure quartz Hg-vapour lamp at 10— 20 atm. is measured. The line shows self-reversal which diminishes with increase in pressure while the broadening and shift increase. The mechanism of self-reversal at high pressure is different from that at low pressure. Conditions favourable for reversal are discussed. J. A. D.

Width of spectral lines in the high-pressure mercury discharge. R. ROMPE and P. SCHULZ (Z. Physik, 1938, **108**, 654—667).—The width of a series of Hg lines from a high-pressure Hg lamp has been examined by a spectrophotometric method and the resultant broadening of the terms calc. The 2^1P_1 term shows a large unsymmetrical broadening associated with the high pressure, due to resonance interaction and collisions of the second order. Broadening of the $^1S_0$ state is negligible but the 3^1D_2 and 3^3D_2 terms undergo symmetrical broadening through electron collisions. Unsymmetrical broadening of lines of the triplet system probably results from " static " influences in the sense of the theories of Margenau and Kuhn. H. C. G.

*L*α **satellites for element 82 (Pb).** M. VALADARES and F. MENDES (Compt. rend., 1938, **206**, 744—746).—λλ and proposed classifications of nine $L\alpha_1$ satellites are recorded. The $L\alpha_2$ system shows complex structure on the short-λ side. A. J. E. W.

Light-excitation by particles of low velocity. A. KOTECKI (Z. Physik, 1938, **108**, 640—653).— Apparatus and method are described for the measurement of light-excitation by collision of H particles with H_2, Hg, A, and He, and of ionised A with H_2 and Hg. A low-voltage capillary arc was used as the source of ions, which were then given an energy of 1000—6000 v. The light resulting from collisions was examined and the results are used to confirm Döpel's working hypothesis. H. C. G.

Mutual light-excitation from atomic impact of helium or hydrogen on beryllium, magnesium, calcium, strontium, and barium. K. GAILER (Z. Physik, 1938, **108**, 580—591).—The above effect is studied by means of He and H canal rays impinging on roughened Be and Ca metals, and the oxides of Be, Ca, Sr, and Ba, supported on a Cu plate. The latter is positively charged to 2000 v. to hinder excitation due to electrons arising from the impact. The validity of the " impact model " of Döpel is confirmed. In such at. impacts, excitation of the alkaline-earth metals alone occurs, although the kinetic energy of the impinging partner exceeds the energy of excitation of He or H. L. G. G.

Continuous X-ray spectrum near the Duane– Hunt limit. E. BRUNNER (Physical Rev., 1938, [ii], **53**, 457—459).—The effect on the distribution of energy in the continuous X-ray spectrum near the Duane–Hunt limit of the extranuclear electrons in the atoms composing the target of the X-ray tube is

examined theoretically. Resonance effects explain the inflexion found by Du Mond (cf. A., 1937, I, 214) in the isochromat very close to the threshold.   N. M. B.

Comparison of intensities of spectral lines. D. FOSTER and H. W. HIGHRITER (Physical Rev., 1938, [ii], 53, 673—674).—In using a rotating logarithmic or stepped sector disc, errors arise from the variation of intensity of a given line along the length of the arc, and the effect varies from line to line. The difficulty is overcome by a simple method of illuminating the slit.   N. M. B.

Spectrum of Nova Herculis in the visual region. N. T. BOBROVNIKOFF (Proc. Amer. Phil. Soc., 1935, 75, 717—753).—Data are given.   CH. ABS. (e)

Admixtures and breakdown potential of argon. S. K. MORALEV (Physikal. Z. Sovietunion, 1937, 12, 667—684).—The breakdown voltages of pure A and the mixtures A-N_2, A-H_2, and A-Hg have been studied. It was found that 0·1% of N_2 has no influence on the breakdown voltage of A whereas 0·1% of H_2 decreases the breakdown voltage near its min. val., but increases it at p.d. >60 v. Hg in A increases the breakdown voltage. Traces of N_2 and H_2 in the presence of Hg vapour change the breakdown voltage.   J. A. D.

Quantitative measurements on high-current condensed discharges in hydrogen at low pressures. E. BLUM (Ann. Physik, 1938, [v], 31, 585—599).—Methods are described for the measurement of the max. increase or decrease of current during the discharge of a condensed spark and of the time occupied by the discharge. The variation with potential, tube dimensions, and circuit resistance of the max. current and max. increase and decrease of current in a discharge through H_2 at 5 to 500 Torr pressure has been investigated and is discussed.   O. D. S.

Periodic deviation from the Schottky line for tungsten. R. L. E. SEIFERT and T. E. PHIPPS (Physical Rev., 1938, [ii], 53, 493).—A reinvestigation of the thermionic emission of W for the temp. range 1560—1940° K. and field range at the filament surface 1800—260,000 v. per cm. gave results which, when plotted, show a small consistent fluctuation about the mean Schottky line. This was found to be independent of any inherent condition in the cell or circuit.   N. M. B.

Temperature variation of the work function of clean and of thoriated tungsten. A. L. REIMANN (Proc. Roy. Soc., 1937, A, 163, 499—510).—By measurement of contact p.d. information is obtained concerning the variation with temp. of the work function of clean and fully activated thoriated W. The temp. coeffs. of the two work functions are the same; that for clean W is approx. that which will account for the observed val. of the thermionic const. on the assumption of practically perfect transmission. The small val. of this const. for W-Th is ascribed to internal reflexion.   G. D. P.

Photo-electric and thermionic investigations of thoriated tungsten surfaces. A. KING (Physical Rev., 1938, [ii], 53, 570—577).—The expected difference of temp. dependence of the thermionic and photo-electric work functions for a non-uniform surface was found. A simple patch theory leads to the following results : the saturation electron emission is independent of the size of the patches; the observed or characteristic work functions for composite surfaces are different at low temp. and approach each other at high temp.; the max. and min. vals. of the work function for a given surface do not vary linearly with temp.   N. M. B.

Force on the cathode of a copper arc. R. M. ROBERTSON (Physical Rev., 1938, [ii], 53, 578—582; cf. A., 1930, 832).—The force, studied as a function of pressure, for the Cu arc in N_2 remains of the order of magnitude of the vals. observed in air down to about 5 mm. pressure and then increases sharply but smoothly to the much larger vals. observed in vac. Various aspects of the arc in this transition region are examined, and force–current curves at various pressures of H_2 and N_2 are given. A brief study of the stability of the vac. arc and a summary of various explanatory theories are included.   N. M. B.

Energy balance for an infinitely small electron current in a uniform electric field. F. M. PENNING (Physica, 1938, 5, 286—297).—Theoretical. The proportions of the energy associated with the electron current which are lost in elastic collisions, ionisation, excitation of electronic and vibrational levels, and in increasing the kinetic energy of the electron stream, are calc., electron currents in Ne, A, Ne–A mixtures, N_2, and H_2 being considered.   A. J. E. W.

Most probable values for the electron charge and connected constants for 1938. R. A. MILLIKAN (Ann. Physik, 1938, [v], 32, 34—43).—$e = 4·796 \pm 0·005 \times 10^{-10}$ e.s.u., $h = 6·610 \pm 0·012 \times 10^{-27}$ erg sec., $N = 6·097 \pm 0·006 \times 10^{23}$.   O. D. S.

Relativistic variation of electron mass. C. T. ZAHN and A. H. SPEES (Physical Rev., 1938, [ii], 53, 511—521; cf. A., 1938, I, 223).—An analysis of the unmodified Bucherer–Neumann experiment reveals the possibility of serious errors. An examination of similar experiments designed to distinguish between Abraham and Lorentz electrons indicates that, at least for higher velocities, no satisfactory distinction has yet been made by direct electric and magnetic deflexion methods.   N. M. B.

Characteristic energy of the electron. A. MERCIER and T. GUSTAFSON (Compt. rend., 1938, 206, 1217—1219).—Mathematical.   A. J. E. W.

Relativity, resonance, and molecular diffusion. C. E. GUYE (Compt. rend., 1938, 206, 961—964).—Experimental verification of the principle of relativity is discussed.   A. J. E. W.

Polarisation of the light emission of positive rays. H. ANGENETTER and H. VERLEGER (Physikal. Z., 1938, 39, 328—332).—The polarisation of the spectral lines in the emission of positive rays of Li, Na, Ne, A, and Hg has been shown to be a general property of the atom. The extent of the polarisation depends on the series formula of the line, and thus on the two electronic states giving rise to the line. The polarisation, $I_{parallel}/I_{perp.}$, may be <1.   A. J. M.

Against the existence of heavy β-particles. (A) **Cloud chamber evidence.** (B) **Further evidence.** A. RUARK and C. C. JONES (Physical Rev., 1938, [ii], **35**, 454—456, 496).—(A) A study of cloud chamber photographs of collisions of Ra-E β-particles with electrons shows that Jauncey's hypothesis of heavy β-particles disagrees with experiment.

(B) The interpretation of various available data is opposed to the existence of heavy β-particles.
N. M. B.

Theory of electron showers in multi-grid tubes. W. SCHOTTKY (Ann. Physik, 1938, [v], **32**, 195—204).—A theory for the irregular variations produced in the electron stream by a grid with positive fore-potential placed in front of the anode of a multi-grid tube is developed.   O. D. S.

Theory of electron diffraction. I. E. LAMLA (Ann. Physik, 1938, [v], **32**, 178—189).—The dynamic theory of von Laue is developed to take into account the interaction of > two rays. The Kikuchi envelopes can be explained as due to incoherent scattering of electrons by atoms in surface layers.   O. D. S.

Signs of the nuclear magnetic moments of ^{6}Li and ^{41}K. J. E. GORHAM (Physical Rev., 1938, [ii], **53**, 563—567).—Non-adiabatic transitions between magnetic quantum states in an at. beam showed that the nuclei of ^{6}Li and ^{41}K have positive magnetic moments.   N. M. B.

New classification of the elements. M. OSWALD (Compt. rend. XVII Cong. Chim. Ind., 1937, 26—43).—A new form of the periodic classification is put forward. The periods are lettered K, L, M, etc., according to which electron level in the atom is filling up, and the table is based on the electronic structure of the atoms. The table in this form is of use as a guide in the separation of the rare earths, and to the elements which may be used with C in the prep. of electrodes for arcs suitable for special purposes.   A. J. M.

Disintegration of the deuteron by α-particles. H. L. SCHULTZ (Physical Rev., 1938, [ii], **53**, 622—628).—Using Ra-C' and Th-C' α-particles to bombard a gaseous target of D_2, and a BF_3-filled ionisation chamber surrounded by paraffin and connected to a thyratron recording system to detect emitted neutrons, the non-capture disintegration of the deuteron ($^2_1$H + $^4_2$He → $^1_1$H + $^1_0$n + $^4_2$He) has been observed. Mean cross-sections are 0.12×10^{-26} and 0.30×10^{-26} sq. cm. for the range intervals 5.7—6.9 and 7.4—8.6 cm., respectively.   N. M. B.

Unknown natural α-radiation. E. FØYN and I. T. ROSENQVIST (Tids. Kjemi, 1938, **18**, 64—65).—Radioactive HCl-insol. impurities in commercial Zn have been examined by a new method in which the whole apparatus is placed in a vac. Th, Ra-Th, and Th-X have been identified by their α-radiation. A feeble α-radiation (absorbed by 15 μ. Al), previously unknown, is possibly derived from Ma. The Th/radio-Th ratio may be used to determine the age of the Zn ore.   M. H. M. A.

Counting α-particles by their photographic action. F. HALBWACHS (J. Phys. Radium, 1938, [vii], **9**, 125—128).—The impressions left on a photo-graphic plate by a bundle of α-rays have been studied. A technique of development has been adopted whereby the particles are counted individually. The method has been applied to determine the ratio of α-rays from Th-C and Th-C'.   W. R. A.

Ionisation produced by certain α-ray sources used in radio-chemistry. W. MUND and C. DE VOS (Bull. Soc. chim. Belg., 1938, **47**, 149—161).—Direct determination of the max. ionisation produced by a small, thin-walled tube containing Rn gives results in agreement with calculations based on tables due to Capron *et al.* (A., 1933, 762). A method of calculating the ionisation produced in the interior of a spherical vessel with the Rn tube at its centre is developed.   A. J. M.

Determination of the upper energy limit of the β continuous spectrum of radioactive elements by the method of absorption. (MLLE.) A. BASCHWITZ (J. Phys. Radium, 1938, [vii], **9**, 120—122).—The conditions of application of the method of absorption for determining the upper energy limit of the β continuous spectrum of natural radio-elements have been investigated. The method is applicable for those elements which do not strongly emit γ-radiation. Results are also given for the radioactive forms of Sb, I, Eu, Dy, Au, and Ag.
W. R. A.

Continuous β spectra of natural radioactive elements. M. LECOIN (J. Phys. Radium, 1938, [vii], **9**, 81—95).—The continuous β spectra of several natural radioactive elements have been determined by the method of Wilson. The β-rays, varying from 600 to 2000, were photographed stereoscopically to eliminate errors due to irregularities in curvature. The results were compared with the theory of Konopinski and Uhlenbeck following the procedure of Kurie. The mean energy evolved by each dis-integration and the relation between the radioactive const. and the different characteristics of the con-tinuous spectra are discussed.   W. R. A.

Canalisation of γ-rays. F. L. HOPWOOD and T. E. BANKS (Nature, 1938, **141**, 687).—A curve showing the canalisation effect of an Fe tube on γ-rays from Ra-$B + C$, filtered by 0.5 mm. of Pt, is given.   L. S. T.

Diffraction spectrography of γ-rays from actinium and its products. M. FRILLEY (Compt. rend., 1938, **206**, 1013—1015).—λλ of fluorescence lines attributed to elements 81—84, 86, and 88 are in good agreement with measurements by Ingelstam on the K spectra; lines due to actinon predominate. The λλ of nuclear lines between 30 and 125 X are in accord with the β-ray spectra (A., 1937, I, 275); poorer agreement is found for λλ >175 X. New lines at 51.5 and 247.5 X, attributed to radio-Ac, are reported.   A. J. E. W.

Analysis of γ-rays of radium-E. J. A. GRAY and J. F. HINDS (Canad. J. Res., 1938, **16**, A, 75—76).—The absorption curve of γ-rays in Al has been determined.   E. S. H.

Radioactivity of potassium. A. BRAMLEY and A. K. BREWER (Physical Rev., 1938, [ii], **53**, 502—505).—In view of discordant available data the

radioactivity of K was measured with a Geiger counter by placing a thick layer of KCl under a thin Al window. Results, corr. for the relative abundance of ^{40}K, are : disintegration const. $1·56 \pm 0·6 \times 10^{-17}$, half life $14·2 \pm 3·0 \times 10^8$ years.   N. M. B.

Disintegration periods of the radiosilvers. A. MOUSSA and (MLLE.) H. LAURENT (Compt. rend., 1938, **206**, 1015—1017; cf. A., 1937, I, 544).—$^{110}_{47}Ag$ and $^{108}_{47}Ag$, produced by bombardment of Ag with slow neutrons from a Rn–Be source, have life-periods of 24 ± 2 and 150 ± 2 sec., respectively. The relative intensities under the conditions given show that the existence of $^{108}_{47}Ag$ must be allowed for in neutron absorption experiments.   A. J. E. W.

Determination of Eve's constant. R. SCHULZE (Ann. Physik, 1938, [v], **31**, 633—660).—Conditions for the abs. determination of Eve's const. K are discussed and defined. The val. $K = (5·5 \pm 0·1) \times 10^9$ ion pairs per cm. per g. Ra per sec. is obtained by experiment under these conditions and agrees with corr. vals. from earlier determinations.   O. D. S.

The universal length which enters into the theory of elementary particles. W. HEISENBERG (Ann. Physik, 1938, [v], **32**, 20—33).—It is shown that the introduction of a universal const. with the dimensions of a length will resolve divergences in the theory of β-decomp. and of high-energy collisions between particles.   O. D. S.

Nuclear isomers of ^{116}In. A. C. G. MITCHELL and L. M. LANGER (Physical Rev., 1938, [ii], **53**, 505—510; cf. A., 1937, I, 594).—The isomeric periods of ^{116}In, 13 sec. and 54 min., produced by the capture of slow neutrons by ^{115}In, were studied to determine the energy level scheme of ^{116}In. The 1·4 m.e.v. γ-ray (cf. A., 1937, I, 489) has a period of 54 min. No γ-ray of 13 sec. period could be found. The % transmission by B of resonance neutrons was measured, and is the same for both periods. The branching ratio is independent of the method of excitation and has the val. $1·12 \pm 0·06$. An energy level diagram accounting for all the experimental facts is constructed. The two excited levels of ^{116}In from which disintegration takes place are separated by 0·3 m.e.v. γ-Ray transitions between these two levels can be forbidden by choosing quantum nos. differing by 5 units.   N. M. B.

Bombardment of different substances by slow neutrons and the comparison of the radioactive intensities obtained. (MLLE.) A. BASCHWITZ (J. Phys. Radium, 1938, [vii], **9**, 123—124).—Under controlled conditions the intensities of substances rendered radioactive by bombardment with slow neutrons have been determined; from these results the order of magnitude of the intensities which would be obtained under other conditions can be ascertained.   W. R. A.

Diffusion of monokinetic neutrons through protons. B. PONTECORVO (Compt. rend., 1938, **206**, 1003—1005).—The mean free path in paraffin of neutrons produced by bombarding D_2O with γ-rays from radio-Th is 1·3 cm. This gives a val. of the effective cross-section which is in agreement with the Bethe–Bacher formula. A modification of the val. of

$|E_1|$, the energy of the state in which the proton and neutron spins are antiparallel, from 120,000 to $\sim$ 90,000 ev. is proposed.   A. J. E. W.

Neutron yield from Ra-γ + Be. V. DEMENTI, A. LEIPUNSKI, and V. MASLOV (Physikal. Z. Sovietunion, 1937, **12**, 764—765).—The total no. of neutrons from Be excited by a Ra γ-ray source is measured and the cross-section for absorption of photo-neutrons in Rh and Ag is estimated.   J. A. D.

Albedo of slow neutrons. E. FERMI, E. AMALDI, and G. C. WICK (Physical Rev., 1938, [ii], **53**, 493; cf. A., 1937, I, 58).—A discussion of criticisms by Halpern (cf A., 1938, I, 112).   N. M. B.

Use of an ionisation chamber with a liquid dielectric for the study of neutrons. L. GOLDSTEIN and A. ROGOZINSKI (Compt. rend., 1938, **206**, 835—837).—Measurements of the absorption coeffs. of Pb and paraffin wax for γ-rays and neutrons from a Ra–Ac–Be source, made with an ionisation chamber filled with C_6H_{14}, show that such a chamber is an effective detector of neutrons. The ratio of the ionisation currents for γ-rays and neutrons passing through 7 cm. of Pb (39 : 61) is in agreement with the val. obtained with a N_2-filled ionisation chamber.   A. J. E. W.

Production of neutrons by bombardment of beryllium with α-particles. T. BJERGE (Proc. Roy. Soc., 1938, **A**, **164**, 243—256).—Excitation curves for neutrons and γ-rays are determined experimentally. The process $^9_4Be + ^4_2He \rightarrow ^{12}_6C + ^1_0n$ accounts for the presence of groups of neutrons with energies of several million ev. The $^{12}_6C$ is left in an excited state and emits a γ-quantum. Another process gives a group with energies of $\sim$100,000 ev.   G. D. P.

Minimum neutron energy to produce neutron loss process and its application to the measurement of Q values. R. SAGANE (Physical Rev., 1938, [ii], **53**, 492; cf. Pool, A., 1937, I, 490).—Data for min. neutron energy to produce the neutron loss process for several elements bombarded by neutrons of known max. energy are reported and the calculation of the max. energy of neutrons from various targets subjected to deuteron bombardment is discussed.   N. M. B.

Energy of the neutrons from the disintegration of carbon by deuterons. T. W. BONNER (Physical Rev., 1938, [ii], **53**, 496—497; cf. A., 1936, 1174).—The corr. energy of the neutrons calc. from new range-energy curves of low-energy recoil protons is $0·46 \pm 0·03$ m.e.v. for neutrons observed at 90° recoiling to the 0·88 m.e.v. deuterons, and the calc. energy of disintegration is $-0·25 \pm 0·05$ m.e.v.   N. M. B.

Wilson chamber study of the neutro-electric effect. S. KIKUCHI and H. AOKI (Nature, 1938, **141**, 645).—Photographs of 10,538 proton tracks, 6448 using D–D neutrons and 4090 using Li–D, show only 3 paired tracks in each case. This is < that obtained previously (A., 1938, I, 169), and is approx. one sixth of the no. expected on the basis of the neutro-electric effect.   L. S. T.

Cross-sections of the deuteron for the electric and magnetic nuclear photo-effect. H. VON

HALBAN, jun. (Nature, 1938, **141**, 644—645).—The cross-section of the deuteron for the total photo-effect for 2·64 m.e.v. γ-rays is $9\pm0.8 \times 10^{-28}$ cm.² An upper limit of 6×10^{-29} cm.² is indicated for the magnetic effect; this val. is $\ll$ that derived from the capture cross-section of protons for thermal neutrons.   L. S. T.

Cross-sections of interaction in reactions between very light atomic nuclei. S. FLÜGGE (Z. Physik, 1938, **108**, 545—579).—Collisions between two at. nuclei, containing between them up to four elementary particles, are considered theoretically. A method for calculating cross-sections of interaction is evolved on the assumptions that collisions are elastic and that a deuteron in combination with a neutron or proton approx. retains its shape. Results obtained are $\sim10^{-24}$ cm.² and are somewhat $<$ those derived from experiment. The angular distribution for the scattering of protons of 830 kv. energy by deuterons is calc. and compared with the experiments of Tuve et al. (A., 1936, 539). The D + D reaction is considered in detail as being the simplest nuclear transformation involving four elementary particles.   H. C. G.

γ-Radiation from boron bombarded by protons. W. A. FOWLER, E. R. GAERTTNER, and C. C. LAURITSEN (Physical Rev., 1938, [ii], **53**, 628—636; cf. A., 1937, I, 212).—Using a Wilson cloud chamber, the energy distribution of pairs and recoil electrons ejected from Pb and C laminæ by the γ-radiation from B bombarded by protons was determined. Both the pair and electron distributions indicate prominent γ-ray components at 4.3 ± 0.3, 11.8 ± 0.5, and 16.6 ± 0.6 m.e.v., with relative intensities 7 : 7 : 1, respectively. The radiation is probably due to proton capture by ^{11}B to form an excited state of ^{12}C which radiates in a single transition to the ground state or in a double transition through the intermediate state at 4·3 m.e.v.   N. M. B.

Boron + proton reactions. J. R. OPPENHEIMER and R. SERBER (Physical Rev., 1938, [ii], **53**, 636—638).—Evidence on the ^{11}B + ^{1}H reactions and their interpretations show that a satisfactory description cannot be obtained on the assumption that the same resonance level of ^{12}C is responsible for the 16 m.e.v. γ-ray (cf. preceding abstract) and for the long-range α-particle (cf. Neuert, A., 1937, I, 161).   N. M. B.

Energy of the proton groups emitted during transmutation of boron by α-rays. F. JOLIOT and I. ZLOTOWSKI (Compt. rend., 1938, **206**, 750—752).—Results obtained from Wilson cloud-chamber photographs of the proton trajectories in a magnetic field are recorded. Using a Po α-ray source, the max. observed val. of Q is 4·3 m.e.v., in accord with the val. calc. using Oliphant's at. masses. A new proton group with $Q = 2.0\pm0.3$ m.e.v. is reported. There is no evidence of a group with $Q = 3.1$ m.e.v. (cf. A., 1936, 1045).   A. J. E. W.

Resonance transmutations of carbon by protons. P. I. DEE, S. C. CURRAN, and V. PETRŽÍLKA (Nature, 1938, **141**, 642—643).—Investigation of the γ-ray emission of C bombarded by protons shows two resonances at approx. 470 and 560 kv. For 560-kv.

protons, the γ-ray energy is 7·4 m.e.v., and this peak must be ascribed to the formation of stable ^{14}N from ^{13}C. For the 470-kv. protons the γ-ray energy observed is 2·6 m.e.v. and the peak at 470 kv. must be attributed to the formation of radioactive ^{13}N from ^{12}C.   L. S. T.

γ-Radiation from ^{13}N. J. R. RICHARDSON (Physical Rev., 1938, [ii], **53**, 610).—Distribution curves for the photo-electrons ejected from Pb by the γ-radiation from ^{13}N showed two groups of tracks. Results indicate 2·5 quanta of 0·5 m.e.v. radiation per quantum of 0·3 m.e.v. radiation, or 0·8 quantum of 0·3 m.e.v. radiation for every positron emitted by ^{13}N. A Pb radiator is more sensitive than one of low at. no. in the low-energy region. A similar investigation of the radiation from ^{61}Cu and from a thin source of ^{13}N arranged so that most of the positrons were annihilated behind the Pb shield indicated that the radiation is probably nuclear in origin. Reaction mechanisms are discussed.   N. M. B.

Shape of the β-ray spectrum of ^{32}P. E. M. LYMAN (Physical Rev., 1936, [ii], **50**, 385).   L. S. T.

Radioactivity induced by neutrons in ruthenium. H. DE VRIES and J. VELDKAMP (Physica, 1938, **5**, 249—256).—Periods of 45 sec. and 4 min. induced by slow and fast neutrons (cf. Kurtschatow, A., 1935, 1050) are due to Rh present as impurity. With slow neutrons periods of 4 hr., 20 hr., and 45 days are also found; they are ascribed to ^{103}Ru, ^{105}Ru, and ^{105}Rh, respectively, the last giving rise to a chain reaction. The 39-hr. period observed with deuteron bombardment (Livingood, A., 1936, 1315) is probably due to the 20-hr. period with another deuteron-induced period superimposed. The 20-min. and 4-hr. periods induced by fast neutrons (A., 1937, I, 490) are confirmed. These results are discussed in relation to an isotope diagram for elements 44—49. Relations between the decay curve and the decay consts. for elements forming a chain process are discussed; it is shown that when $\lambda_1 > 2\lambda_2$, the simple exponentials into which the decay curve can be resolved have an extrapolated intensity ratio of $(\lambda_1 - 2\lambda_2) : \lambda_2$.   A. J. E. W.

Isomerides of radio-indium. M. L. POOL (Physical Rev., 1938, [ii], **53**, 611—612; cf. A., 1937, I, 594).—Available data are used to calculate the branching ratios for the periods involved. The abundance ratio ^{115}In : ^{113}In is 21·2. ^{112}In is an isomeric nucleus having two decay periods, 72 sec. and 4·1 hr., and abundance ratio approx. 2·0. Mechanisms are discussed.   N. M. B.

Electron capture and internal conversion in ^{67}Ga. L. W. ALVAREZ (Physical Rev., 1938, [ii], **53**, 606; cf. A., 1937, I, 487).—Evidence is given that ^{67}Ga transforms into ^{67}Zn by electron capture and then emits a K X-ray quantum in half of the cases. The excited state of the ^{67}Zn then emits either or both a 100 kv. and a 0·2—0·3 m.e.v. γ-ray quantum, the 100 kv. line being highly internally converted. Finally another 0·5 quantum of Zn K radiation is emitted.   N. M. B.

Radioelement of period 3·5 hours formed in uranium irradiated by neutrons. (MME.) I. CURIE and P. SAVITCH (Compt. rend., 1938, **206**, 906—908; cf. A., 1937, I, 423).—The element, which is formed directly from U by slow or fast neutron bombardment, is not an isotope of Th (cf. A., 1938, I, 9), as it can be separated from U-X with La. The chemical properties indicate that it is either an isotope of Ac, or a new trans-uranian element. The saturation intensity is about a quarter of that of the element of period 16 min. formed under similar conditions.　　A. J. E. W.

Radioactivity induced in the rare-earth elements by fast neutrons. M. L. POOL and L. L. QUILL (Physical Rev., 1938, [ii], **53**, 437—446).— All the rare-earth elements (except Il, Tm, and Lu) were bombarded with slow neutrons and with fast neutrons obtained from the Li + D reaction. The following periods for electron emission were observed : ^{140}La 31 hr., ^{142}Pr 19 hr., ^{147}Nd 84 hr., ^{149}Nd 2·0 hr., ^{151}Nd 21 min., ^{144}Il 12·5 hr., ^{151}Sm 21 min., ^{153}Sm 46 hr., ^{152}Eu 9·2 hr., ^{160}Tb 3·3 hr., ^{165}Dy 2·5 hr., ^{164}Ho 47 min., ^{166}Ho 30 hr., ^{169}Er 12 hr., ^{171}Er 5·1 hr., and the following for positron emission : ^{139}Ce 2·1 min., ^{140}Pr 3·5 min., ^{150}Eu 27 hr., ^{158}Tb 3·6 min., ^{159}Dy 2·2 min., ^{165}Er 1·1 min. There is evidence of two isomeric isotopes, ^{159}Gd 3·5 min. and 17 hr., and ^{175}Yb 2·1 hr. and 14 hr. Radioactivity data indicate four new stable isotopes : ^{152}Gd, ^{160}Dy, ^{164}Er, and ^{170}Yb.　　N. M. B.

Proton-induced radioactivities. L. A. DU BRIDGE, S. W. BARNES, J. H. BUCK, and C. V. STRAIN (Physical Rev., 1938, [ii], **53**, 447—453).—Previous reports (cf. A., 1937, I, 438) are summarised and extended by tabulated results and discussion of the radioactivities produced by 4 m.e.v. protons in targets of N, O, Ca, Cr, Co, Zn, Se, Mo, Pd, Cd, and In, with a detailed study in the case of O, Zn, and Se.　　N. M. B.

Concentration of radiohalides and failure to observe γ-rays from ^{128}I. A. ROBERTS and J. W. IRVINE, jun. (Physical Rev., 1938, [ii], **53**, 609).— There is evidence of <0·1 γ-ray of energy 0·5 m.e.v., per β-ray. A rapid and convenient modification of d'Agostino's method of concentrating radioactive I and Br is described.　　N. M. B.

Nuclear energy sources and stellar evolution. G. GAMOW (Physical Rev., 1938, [ii], **53**, 595—604).— Mathematical.　　N. M. B.

Rate of selective thermonuclear reactions. G. GAMOW and E. TELLER (Physical Rev., 1938, [ii], **53**, 608—609; cf. preceding abstract).—Mathematical.　　N. M. B.

Statistical theory of nuclear collisions. L. GOLDSTEIN (J. Phys. Radium, 1938, [vii], **9**, 96—104).—Theoretical.　　W. R. A.

Electromagnetic properties of nuclear systems. W. E. LAMB, jun., and L. I. SCHIFF (Physical Rev., 1938, [ii], **53**, 651—661).—Mathematical.　　N. M. B.

Heavy β-rays ? G. E. M. JAUNCEY (Physical Rev., 1938, [ii], **53**, 669).—A discussion of the nature and properties of scattered β-rays previously reported (cf. A., 1938, I, 168, 169).　　N. M. B.

Absorption of high-energy electrons. III. A. J. RUHLIG and H. R. CRANE (Physical Rev., 1938, [ii], **53**, 618—621; cf. A., 1937, I, 594).—Losses in Pb of electrons with energies above and below the range 2—11 m.e.v. were measured. For the high-energy group (5—15 m.e.v.) the electrons and positrons produced by the Li + ^{1}H γ-radiation were used. The vals. found are about 50% > the calc. losses due to ionisation and radiation, but are in good accord with previous experimental vals.　　N. M. B.

Nature of the heavy electron. I. M. FREEMAN (Physical Rev., 1938, [ii], **53**, 606—607; cf. A., 1938, I, 115).—Mathematical. It is suggested that the " new " particle is 137 times as heavy as a normal electron.　　N. M. B.

The heavy electron. J. L. DESTOUCHES (Compt. rend., 1938, **206**, 1095—1097).—The mass of the heavy electron is given as about 230 times that of the normal electron.　　H. J. E.

Heavy electrons in cosmic rays. E. J. WILLIAMS and E. PICKUP (Nature, 1938, **141**, 684—685; cf. A., 1937, I, 390).—Additional evidence for the existence of particles of mass between that of the electron and proton is given. Four curved tracks obtained in a Wilson chamber using magnetic fields of 1000 and 2200 gauss indicate that the mass of the new particle is nearly 200 times that of the electron.　　L. S. T.

Hard cosmic-ray showers. K. SCHMEISER and W. BOTHE (Ann. Physik, 1938, [v], **32**, 161—177; cf. A., 1938, I, 57).　　O. D. S.

Properties of the penetrating component of cosmic radiation. (MME.) T. GRIVET-MEYER (Compt. rend., 1938, **206**, 833—835).—Measurements of the total vertical intensity, the intensity of the hard component, and no. of cosmic showers, made under different conditions of screening, are described, and the variation of these factors is discussed. The results are in accord with the theory that the penetrating component consists of heavy particles of varying masses (A., 1938, I, 224).　　A. J. E. W.

Penetrating component of cosmic radiation. H. J. BHABHA (Proc. Roy. Soc., 1938, **A**, **164**, 257—294).—Analysis of the experimental data suggests that they are best explained by assuming the penetrating component to consist of particles with masses between those of the electron and the proton. The implications of this assumption are discussed.　　G. D. P.

Penetrating component of cosmic radiation. R. M. LANGER (Physical Rev., 1938, [ii], **53**, 494—495; cf. Bowen, A., 1938, I, 171).—A review of available data supports the hypothesis that there are, in secondary cosmic radiation, electrons of the usual mass, of much greater mass, and of intermediate mass. The treatment of electronic mass as a quantised parameter is examined.　　N. M. B.

Remarkable ultra-ray shower. H. MAIER-LEIBNITZ (Naturwiss., 1938, **26**, 217—218).—A photograph of a " hard " ultra-ray shower is given.　　A. J. M.

Latitude effect of the soft component of cosmic rays. B. GROSS (Physical Rev., 1938, [ii], 53, 607). —Mathematical. The latitude effect of the high-altitude part of the absorption curve is evaluated.

N. M. B.

Cosmic rays and the aurora of Jan. 25–26th, 1938. V. F. HESS, R. STEINMAURER, and A. DEMMELMAIR (Nature, 1938, 141, 686—687). L. S. T.

Intensity of primary cosmic radiation and its energy distribution. T. H. JOHNSON (Physical Rev., 1938, [ii], 53, 499—501; cf. A., 1938, I, 171).— The no. of primary cosmic rays incident on one horizontal sq. cm. at the top of the atm. is calc. There is evidence of a low energy limit at $4\cdot4 \times 10^9$ v. The no. of primary rays increases from 0·03 at the equator to 0·36 per sq. cm. per sec. at latitudes above 45°. The total cosmic-ray current to the earth is 8×10^{17} rays per sec., or 0·13 amp. N. M. B.

Investigation of the Bhabha–Heitler theory of shower formation by cosmic rays for the case of coal. A. VALKÓ (Helv. Phys. Acta, 1938, 11, 59—86; cf. A., 1937, I, 440).—The variation with thickness of the no. of showers produced in coal has been investigated and the absorption of the secondary rays from coal and Pb measured. The max. no. of showers in coal is produced at about 80 cm. thickness, in agreement with the Bhabha–Heitler theory. For the thickness of max. intensity, the absorption coeff. of secondary rays from coal is < that of Pb secondaries and is const. The absorption coeff. of Pb secondaries decreases with increasing thickness of the absorption layer up to about 1·5 cm. Pb, when it becomes equal to that of the coal secondaries. This result agrees with the Bhabha–Heitler theory. O. D. S.

Cosmic-ray ionisation in the neighbourhood of a lead block. E. G. SCHNEIDER (Physical Rev., 1938, [ii], 53, 615—617).—An analysis of 2500 stereoscopic photographs of electron tracks shows that about 75% of the ionisation is due to single particles, 20% to photon-produced pairs, and 5% to secondaries ejected by particles. N. M. B.

Atomic hydrogen. K. S. BAGDASARJAN (Uspech. Chim., 1936, 5, 39—65).—A review. CH. ABS. (e)

Electricity and the nucleus of atoms. M. DE BROGLIE (Nuovo Cim., 1937, 14, 439—444).—A survey of the constitution of at. nuclei. O. J. W.

Recent models of the structure of the atomic nucleus. C. F. VON WEIZSÄCKER (Naturwiss., 1938, 26, 209—217, 225—230).—A review. A. J. M.

Quantum of action and the atomic nucleus. N. BOHR (Ann. Physik, 1938, [v], 32, 5—19).—A survey of the quantum theory of heavy nuclei.

O. D. S.

Self-consistent field for iron. M. F. MANNING and L. GOLDBERG (Physical Rev., 1938, [ii], 53, 662—667).—The results of self-consistent field calculations for the d^6s^2 configuration of Fe are reported. A brief discussion of the relation of the results to spectroscopy and to Slater's theory of ferromagnetism is given. N. M. B.

Self-consistent field with exchange for calcium. D. R. HARTREE and W. HARTREE (Proc. Roy. Soc., 1938, A, 164, 167—191).—The results of calculations for Ca^{++} are tabulated. Fock's equation is solved for the (4s), (4p), and (3d) states of Ca^+ and the $(4s)^2$, $(4s)(4p)^3P$, and ^1P states of neutral Ca. Energy vals. of these are compared with those observed. Transition probabilities of lines of astrophysical interest are calc. G. D. P.

Screening numbers and transitions between the multiplets of the ground term of the rare-earth ions. H. GOBRECHT (Ann. Physik, 1938, [v], 31, 755—760).—Theoretical. The multiplet structures, as determined from fluorescence and infra-red absorption measurements, are given for the ground terms of the rare-earth ions from Ce^{+++} to Yb^{+++}, and screening nos. are deduced. O. D. S.

Structure of heavy elementary particles. G. BECK (Nature, 1938, 141, 609).—Theoretical.

L. S. T.

Penetrability of a simple type of potential barrier. F. C. HOYT (Physical Rev., 1938, [ii], 53, 673).—Mathematical. For possible use in nuclear radii calculations, the transmission coeff. is expressed exactly in terms of known functions and applies to a potential barrier which is the negative of the Kratzer potential joined to a square well near the origin.

N. M. B.

Heating of crystals by the Kossel effect. M. VON LAUE (Physikal. Z., 1938, 39, 339—343).— Mathematical. The stationary temp. distribution in a cylindrical anticathode, taking into account the depth of penetration of electrons, is calc. A. J. M.

Chemical composition and internal structure of stars. H. HAFFNER (Naturwiss., 1938, 26, 164—168).—A review of papers given at a conference at Göttingen in Jan., 1938, dealing with the Vogt–Russell law, and deviations from it, the abundance of elements in stars, and solar radiation in the Lyman region. A. J. M.

Geometrical structure of space and electronic atmospheres. G. FOURNIER (Compt. rend., 1938, 206, 1097—1099). H. J. E.

Form of the solutions of the Dirac equations, and of the equations of the photon. G. PETIAU (Compt. rend., 1938, 206, 991—993).—Mathematical.

A. J. E. W.

Artificial boundary conditions in the Kepler problem. A. SOMMERFELD and H. WELKER (Ann. Physik, 1938, [v], 32, 56—65).—Mathematical. The Kepler problem is solved for the case in which a boundary is imposed, as by a steep potential barrier, and the ground states of the confined H atom are determined. O. D. S.

Critical velocity principle in the materialisation of the photon. S. A. DE MAYOLO (Compt. rend., 1938, 206, 988—990; cf. A., 1937, I, 492).— Theoretical. A. J. E. W.

Change and exchange of rest mass of elementary particles during collisions. F. ZWICKY (Physical Rev., 1938, [ii], 53, 611; cf. A., 1938, I, 172).—Mathematical. N. M. B.

X particle. A. BRAMLEY (Science, 1938, 87, 281—282).—A summary of the properties of the new

particle, which has the same charge as an electron but a spin $> \frac{1}{2}$, to be expected on the basis of the Dirac theory.   L. S. T.

Rate of an atomic clock in motion. H. E. IVES (Nature, 1938, **141**, 551).—Using an improved canal-ray tube of the Dempster type and a diffraction grating of 15,000 lines to the inch, a displacement of H lines of approx. 0·05 a. towards the red, which is independent of the orientation of the apparatus, has been observed. This positive effect confirms the Larmor–Lorentz theory of the relation between matter and the luminiferous æther.   L. S. T.

Collision between a high-energy neutron and a proton, treated by the Born approximation method. T. KAHAN (Compt. rend., 1938, **206**, 742—744).—Mathematical.   A. J. E. W.

Transmutation function for deuterons. P. L. KAPUR (Proc. Roy. Soc., 1937, **A**, **163**, 553—568).—The results of a theoretical investigation are compared with experiments on Cu. Fair agreement is obtained when the binding energy of the deuteron is taken to be 2·25 mv.   G. D. P.

Magnetism and the vibratory electron. E. T. JONES (Phil. Mag., 1938, [vii], **25**, 682—693).—Theoretical.   H. J. E.

Magnetic moments of ^6_3Li, ^7_3Li, and $^{19}_9F$. I. I. RABI, S. MILLMAN, P. KUSCH, and J. R. ZACHARIAS (Physical Rev., 1938, [ii], **53**, 495).—The vals. measured by the mol. beam method (cf. A., 1938, I, 172) are 0·823±0·005, 3·265±0·016, and 2·635± 0·014 nuclear magnetons, respectively. Results are compared with available data of other investigators.   N. M. B.

Nuclear magnetic moments. D. R. INGLIS (Physical Rev., 1938, [ii], **53**, 470—474).—The separability of the orbital and spin moments of protons and neutrons is discussed.   N. M. B.

Fine structure of the nuclear ground level of ^7Li. G. BREIT and J. R. STEHN (Physical Rev., 1938, [ii], **53**, 459—469).—Calculations are made of the fine structure of the ground level of the ^7Li nucleus to throw light on the form of the interaction energy between pairs of nuclear particles and show how, with approx. assumptions about the wave function, adjustable parameters should be chosen to agree with observed fine structure. A general rule simplifying the calculation of the spin–orbit interaction with a closed shell is developed for interactions between pairs of particles. An examination of considerations affecting the choice of parameters emphasises that at present the calculations are only qual.   N. M. B.

Positive column of a mercury arc. (A) **Emission of radiation.** (B) **Mechanism in mercury vapour at intermediate pressures.** B. T. BARNES and E. Q. ADAMS (Physical Rev., 1938, [ii], **53**, 545—556, 556—563; cf. A., 1935, 272).—(A) Intensities, corr. for absorption, of the principal lines of λλ 2259—11,289 are given for 4-amp. Hg arcs operated at 0·03, 20, 450, and 500 mm. v.p. Intensity data are plotted on the basis of two alternative theories of arc mechanism and the results discussed.

(B) Calculations based on the radiant intensity for the principal spectral lines of 4-amp. Hg arcs at 450 and 500 mm. pressure indicate, for low quantum states, a dynamic equilibrium with electrons at approx. 6000° K., the temp. indicated by the abs. intensity for three reversed lines. For higher quantum states, differing only in total quantum no., there appears to be a tendency towards Boltzmann equilibrium due to collisions with normal atoms at ~ 2500° K., the temp. calc. from the heat balance by Langmuir's theory of conduction and convection in gases. This agrees with predictions from the principle of spectroscopic stability.   N. M. B.

Multiple states in the high-pressure discharge. C. G. SUITS (Physical Rev., 1938, [ii], **53**, 609).—Data are reported for a normal arc state I and glow states II and III in H_2 at 1 atm. pressure and pure C electrodes. The transitions I → II and II → III are accompanied by changes in total voltage of 96 and 130 v., respectively. Photographs show that I is a highly luminous column, II is a less intense striated discharge with a well-developed cathode dark space, and III has the same column as II but the dark space is replaced by an intense glow from which streamers emanate. Evidence of additional states with W and with Cu electrodes was found.   N. M. B.

Oxidation in arc cathodes. C. G. SUITS and J. P. HOCKER (Physical Rev., 1938, [ii], **53**, 670; cf. preceding abstract).—Evidence is reviewed which shows that with " cleaned " electrodes in O_2-free gases, the arc form cannot occur in low current ranges, a striated glow being obtained. With greater currents an incipient discharge tends to take a long path to uncleaned parts of the electrode or to the oxidised magnetic pole pieces. Arc stability and interpretations are discussed.   N. M. B.

Spectrum of tervalent thulium. H. GOBRECHT (Ann. Physik, 1938, [v], **31**, 600—608).—The absorption spectrum of $Tm_2(SO_4)_3,8H_2O$ and the emission spectrum of Tm phosphors have been measured and analysed. Frequencies of the centres of the groups are tabulated.   O. D. S.

Fluorescence and absorption spectra of Pr^{+++} and Eu^{+++}. I. Energy states of Pr^{+++}. H. LANGE (Ann. Physik, 1938, [v], **31**, 609—619).—The method of Slater (A., 1930, 126) is applied to the analysis of the spectra of Pr^{+++}. The analysis of Gobrecht (A., 1938, I, 119) is confirmed and extended.   O. D. S.

Spectra of the monoxides of cerium and praseodymium. W. W. WATSON (Physical Rev., 1938, [ii], **53**, 639—642).—Vibrational quantum assignments are given for five sparsely developed emission band systems of CeO and one of PrO, and comparison is made with two GdO systems and one LuO system. Reasons for incomplete or absent rare-earth oxide band systems are discussed. Fairly intense systems seem to exist only for those rare earths having a d electron in their normal configuration.   N. M. B.

Band system of antimony nitride. (MISS) N. H. COY and H. SPONER (Physical Rev., 1938, [ii],

53, 495).—A new band system extending from 2890 A. to longer $\lambda\lambda$ and degraded towards the red has been photographed in a discharge through a mixture of N_2 and Sb vapour. The system shows the same intensity distribution as the band spectra of PN and AsN. N. M. B.

Band spectrum of indium hydride. B. GRUND-STRÖM (Nature, 1938, **141**, 555).—Details of the spectrum of InH, obtained in the region 5600—8500 A. from an arc between electrodes of In and C in H_2 at high pressure, are given. Some bands also appear in the red and infra-red. Rotational consts. are recorded. L. S. T.

Ultra-violet emission spectrum of the slow thermal dissociation of sodium azide. R. AUDU-BERT (Compt. rend., 1938, **206**, 748—750).—The emission spectrum of NaN_3 undergoing decomp. at >365° has been investigated between 1890 and 2800 A., using a quartz prism monochromator and a CuI photon counter. The observed bands coincide with those for AgN_3 (A., 1937, I, 493), although the energy of activation for the decomp. of NaN_3 above 365° (23—25 kg.-cal.) is ≪ that for AgN_3 at the temp. used (46—48 kg.-cal.). The bands, which are probably due to transitions in the N_2 mol., are likely to occur with all azides. A. J. E. W.

Absorption spectra of some metallic salts at higher temperatures. Y. SHIBATA and T. NAKAI (J. Chem. Soc. Japan, 1936, **57**, 166—172).—The absorption spectra of 0·05M-$CO(NH_2)_2$ solutions of $CrCl_3,6H_2O$, $[Cr\{CO(NH_2)_2\}_6]Cl_3$, $CoCl_2,6H_2O$, $NiCl_2,6H_2O$, $CuCl_2,2H_2O$, $CuSO_4,5H_2O$, and $UO_2(NO_3)_2,6H_2O$ were studied at 145—150°. The two Cr salts have approx. the same absorption. The Ni salt gave the same absorption as its EtOH solution at a lower temp. The U salt showed 11 absorption bands. Ch. Abs. (e)

Optical and photochemical study of cuprous halide vapours. J. TERRIEN (Ann. Physique, 1938, [xi], **9**, 477—538).—The polymerised vapours of Cu_2Cl_2, Cu_2Br_2, and Cu_2I_2 have similar properties; they show continuous absorption of short $\lambda\lambda$ in the ultra-violet, and the absorption extends to longer $\lambda\lambda$ with rise of temp. and pressure. In the case of Cu_2Cl_2 it reaches a max. around 2230 A., and a study of the fluorescence shows that the radiation absorbed in this region induces dissociation into two CuCl ions, one of which is excited and emits bands in fluorescence characteristic of CuCl. The fluorescence spectrum includes the Cu doublet $\lambda\lambda$ 3247—3274 due to the expulsion, in a second mode of dissociation, of Cu from the Cu_2X_2 mol. followed by an optical resonance characteristic of these moment-arily liberated atoms. The velocity of these atoms at the moment of photodissociation, and the ultra-violet λ limit of each mode of dissociation, have been determined. The dissociation energy of each mode agrees with the val. calc. thermochemically. The band spectrum of CuCl, for which only the vibrational structure was known, has been obtained with strong intensity by a discharge in Cu_2Cl_2 vapour, and photographed with high dispersion. The rotational structure has been investigated and the bands of

four isotopic CuCl mols. have been separated and identified. N. M. B.

Polarisation of the absorption lines of single crystals of rare-earth salts. K. S. KRISHNAN and D. C. CHAKRABARTY (J. Chem. Physics, 1938, **6**, 224—225).—From a study of the absorption spectra of rare-earth salts of the type $M_2(SO_4)_3,8H_2O$ Spedding concluded that the rare-earth ions should have cubic symmetry. Many of these crystals are magnetically anisotropic, indicating deviation from cubic sym-metry. The absorption spectra of $Pr_2(SO_4)_3,8H_2O$ and $Nd_2(SO_4)_3,8H_2O$ in polarised light have been examined and the results indicate deviation from cubic symmetry. W. R. A.

Visible radiation of pure liquids under the action of fast electrons. P. A. TSCHERENKOV (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Phys., 455—492; cf. A., 1937, I, 220, 546).—Fast electrons passing through pure liquids cause a weak visible radiation with anomalous polarisation. The spec-trum of the radiation is continuous and extends into the far ultra-violet. The energy distribution of the spectrum increases with decreasing λ. The radiation is asymmetric and is propagated in the direction of the beam of electrons, but the max. radiation is at a definite angle with the direction of the electrons related to the n of the liquid. The results are in agreement with the theory of Frank et al. (A., 1937, I, 220). A. J. M.

Wave-length of radiation emitted by electrified dielectrics; its theoretical interpretation. F. PERRIER (Compt. rend., 1938, **206**, 831—833; cf. A., 1937, I, 346; 1938, I, 119).—The absorption coeff. of celluloid for the radiation emitted by electrified amber, ebonite, and S has been measured; the results indicate that the radiation has a λ of the order of 10 A. It is postulated that the frequency of the emitted radiation is $\propto$ the p.d. between the faces of the dielectric. A. J. E. W.

Electron spectra of polyatomic molecules. I. The Franck–Condon principle. F. DUSCHINSKI (J. Phys. Chem. Russ., 1938, **11**, 112—123).—Theoretical. J. J. B.

Effect of position of substituents on the ultra-violet absorption of the benzene chromophore. III. M. PESTEMER and H. FLASCHKA (Monatsh., 1938, **71**, 325—332; cf. A., 1937, I, 494).—The behaviour of the C_6H_6 nucleus as a chromophore when conjugated with an atom (I) or an ion (O^- or SO_3^-) has been investigated. The absorption curves in the ultra-violet of the following substances were deter-mined : o-, m-, and p-$C_6H_4I\cdot NH_2$, PhOH, o-, m-, and p-$NH_2\cdot C_6H_4\cdot OH$, $PhSO_3Na$, and o-, m-, and p-$NH_2\cdot C_6H_4\cdot SO_3H$, in N-NaOH, N-$H_2SO_4$, and H_2O. Two bands occur in the absorption spectra, one of lower λ (A) and one of higher λ (B). Both bands of the unsubstituted parent substances (PhI, $PhSO_3Na$, PhOH) are displaced to lower frequencies on intro-duction of NH_2. The band B is affected most strongly when the substitution is p, and least when it is o. The addition of excess of acid to the solvent causes the effect of the introduced NH_2 to disappear. A. J. M.

Secular equation for molecular vibrations. E. B. WILSON, jun., and B. L. CRAWFORD, jun. (J. Chem. Physics, 1938, 6, 223).—A modification of the procedure adopted by Redlich and Tompa (A., 1937, I, 445) for eliminating the six zero roots of the secular equation for the vibration frequencies of an N-at. mol. is discussed. Other methods are reviewed and disadvantages of the several methods are discussed.

W. R. A.

Continuous absorption spectrum of methyl bromide and its quantal interpretation. P. FINK and C. F. GOODEVE (Proc. Roy. Soc., 1937, A, 163, 592—605).—The extinction coeff. is measured photographically in the range of frequencies 34,000 to 53,000 cm.$^{-1}$ A theoretical treatment, previously applied to the bands of diat. mols., is extended to interpret the band of MeBr. The extinction coeff. curve is resolved into the parts arising from mols. in various vibrational states.

G. D. P.

Inner rotation and normal vibrations of ethane. I. Infra-red spectrum and the normal vibrations of ethane. E. BARTHOLOMÉ and J. KARWEIL. **II. Inner heat of rotation of ethane between 94° and 150° K.** W. HUNSMANN (Z. physikal. Chem., 1938, B, 39, 1—22, 23—43; cf. A., 1937, I, 495).— I. The infra-red absorption spectrum of C_2H_6 has been examined over the frequency range 2000—3300 cm.$^{-1}$ and is accounted for on the basis of the point-group D_{3h}. New vibrational bands are recorded, involving an important new frequency at 740 cm.$^{-1}$ The view that fortuitous resonance occurs between two vibrational states, accounting for hindrance of inner rotation (ibid., 112), is probably incorrect.

II. A method for determining the thermal conductivity of gases at pressure $\ll 10^{-3}$ mm. is described. Data for C_2H_6 at $\ll 95°$ K. are not in accord with lit. or theoretical vals. At $<140°$ K. a sharp decrease of internal heat of rotation is observed, the val. reaching 0·4 g.-cal. per g.-mol. at 95° K. Possible explanations of these results are discussed. The entropy of C_2H_6 at 25°, deduced from these results, is compared with the val. calc. from other data. J. W. S.

Near infra-red absorption spectrum of sucrose crystals in polarised light. J. W. ELLIS and (MISS) J. BATH (J. Chem. Physics, 1938, 6, 221—222).— The absorption spectrum of sucrose crystals in polarised light has been investigated between 0·8 and 2·5 μ. Bands associated with CH groups and with free and perturbed OH groups have been identified. The spectroscopic evidence supports the X-ray results and the potentialities of the method in the elucidation of the structure of org. mols., as an adjunct to X-rays, are outlined. W. R. A.

Infra-red absorption spectrum of nickel carbonyl vapour. C. R. BAILEY and R. R. GORDON (J. Chem. Physics, 1938, 6, 225).—Ni(CO)$_4$ vapour has been examined from 1 to 20 μ. The results favour the tetrahedral model rather than the plane square model. The force consts. of the Ni–C and C–O bonds are 2·35 and 17·35 × 10^5 dynes/cm. approx.

W. R. A.

Rotational transitions associated with radiation in water molecules in non-polar solvents. J. W. ELLIS and E. L. KINSEY (Physical Rev., 1938,

[ii], 53, 672; cf. A., 1937, I, 443).—A preliminary report is made of the extension of previous investigations on absorption bands of H_2O in CS_2 in the region 1—2 μ. to H_2O in CCl_4. Similar bands are found (cf. A., 1938, I, 174). N. M. B.

Application of infra-red absorption spectra to the determination of the position of the ethylenic linking in an aliphatic carbon chain. P. LAMBERT and J. LECOMTE (Compt. rend., 1938, 206, 1007—1009; cf. A., 1937, I, 112, 394).—Unsaturated aliphatic hydrocarbons with branched chains give two strong absorption bands at ~ 850 and 890 cm.$^{-1}$; with unbranched chains these bands are displaced to 910—920 and 980—990 cm.$^{-1}$ if the C:C linking is at the end of the chain, or to 910—920 and 950—960 cm.$^{-1}$ in other cases, whilst the length of the chain only slightly affects the position of the bands. The position of a C:C linking which does not terminate a chain may be deduced from absorption bands in the range 720—780 cm.$^{-1}$; thus Δ^β-heptene gives bands at 725 and 770 cm.$^{-1}$, which are absent with Δ^γ-heptene. The above results are also confirmed for a no. of compounds containing Br, CN, and OH. The observed bands are due to the C chain vibrating as a whole; the existence of two bands in each case may indicate the occurrence of two forms of mol.

A. J. E. W.

Raman and infra-red spectra of chlorobromomethanes. H. VOLKRINGER, J. LECOMTE, and A. TCHAKIRIAN (J. Phys. Radium, 1938, [vii], 9, 105—108).—The Raman and infra-red spectra of CCl$_3$Br, CCl$_2$Br$_2$, and CClBr$_3$ have been studied. The spectroscopic results agree with a tetrahedral structure for these mols. W. R. A.

Modification of the phosphorescence of a zinc sulphide semi-conductor under the influence of an electric current. G. DÉCHÈNE (J. Phys. Radium, 1938, [vii], 9, 109—119).—An extension of earlier work (cf. A., 1938, I, 12). W. R. A.

Phosphorescence and phosphors. A. J. MEE (Sci. Progr., 1936, 30, 635—643).—A review.

CH. ABS. (e)

Effect of temperature on the Raman spectrum of liquid carbon tetrachloride. Preliminary considerations. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1938, 7, A, 196—207).—The Raman spectrum of liquid CCl$_4$ has been examined between 25° and 200°. The degenerate vibrations at 218, 314, 762, and 790 cm.$^{-1}$ and, to a smaller extent, the symmetrical vibration at 459 cm.$^{-1}$, show considerable broadening at higher temp. The symmetrical vibration also shows a small diminution in frequency (2—3 wave nos.) at higher temp. Contrary to Placzek's theory, rise of temp. does not cause any appreciable increase in the intensity of the Stokes lines, and it is suggested that the effect of anharmonicity of the nuclear vibrations and the centrifugal stretching of the mol. due to rotation are responsible. C. R. H.

Raman effect in sodium nitrate. P. PATTABHIRAMAYYA (Proc. Indian Acad. Sci., 1938, 7, A, 229—234).—Using a large crystal of NaNO$_3$, it has been shown that raising the temp. to 280° reduces

the frequency of the main 1069 cm.$^{-1}$ line by 3—4 wave nos. Of the two lattice oscillations at 185 and 95 cm.$^{-1}$, the former is more intense at room temp., the latter at 280°. The differences suggest a release of the crystal lattice forces at high temp. without any setting in of a free rotation of NO_3'. With solutions of $NaNO_3$, the principal frequency at 1069 cm.$^{-1}$ due to NO_3' decreases with dilution, and the 730 cm.$^{-1}$ line gains in intensity when compared with the 1400 cm.$^{-1}$ line. In solutions the pattern due to NO_3' resembles that due to CO_3'' in the solid state.

C. R. H.

Effect of oblique refraction at the prism surfaces on the relative intensities of Raman lines. A. V. RAO (Proc. Indian Acad. Sci., 1938, 7, A, 208—213).—The effect on the intensity of Raman lines of the alteration of the state of polarisation of the incident beam due to passage through the instrument, and of the direction of illumination, is discussed. Well polarised lines suffer a greater intensity loss than unpolarised lines after passing through the instrument. Side illumination diminishes and top illumination increases the intensity of well polarised lines in relation to unpolarised lines.

C. R. H.

Raman effect. LXXXII. Nitrogen compounds. 10. (α-Amino- and α-hydroxy-propionic acid and their esters.) O. BURKHARD and L. KAHOVEC (Monatsh., 1938, 71, 333—345).—The Raman spectra of NH_2·CHMe·CO$_2$H and its Me, Et, Pr$^\beta$, and Bu esters, NMe$_2$·CHMe·CO$_2$H and its Me and Et esters, OH·CHMe·CO$_2$H and its Me, Et, Pr$^\beta$, and Bu esters, OMe·CHMe·CO$_2$H and its Me and Et esters, CHClMe·CO$_2$H, CHBrMe·CO$_2$H, and their Me, Et, Pr$^\beta$, and Bu esters are recorded. The NH- and CO-frequencies are calc. The replacement of Me by OH or NH$_2$ produces no alteration in the spectral type, from which it is concluded that the NH$_2$ group in the acids and esters behaves as in the aliphatic amines. A. J. M.

Low and high Raman frequencies of water. G. BOLLA (J. Chem. Physics, 1938, 6, 225—226).—Microphotometric tracings of the Raman spectrum of H_2O are reproduced in support of arguments to prove that lines reported at 172, 510, 780, 2150, and 3990 cm.$^{-1}$ have real existence, in spite of the doubt cast on this by Rao and Koteswaram (A., 1937, I, 496). W. R. A.

Fine structure of the totally symmetrical Raman lines in benzene and hexadeuterobenzene. A. LANGSETH and R. C. LORD, jun. (J. Chem. Physics, 1938, 6, 203—204).—The origin of the four satellites of the 992 cm.$^{-1}$ Raman line of C_6H_6 is discussed; two are totally symmetrical frequencies of $^{12}C_5^{13}CH_6$; the other two are due to transitions from the first excited state of the E_g^+ vibration (ν_6) to the two levels of the resonance doublet E_g^+ (ν_8). On the basis of this interpretation, quant. predictions of the frequencies and intensities of the satellites agree satisfactorily with experimental data. In C_6D_6 the 945 cm.$^{-1}$ Raman line has fewer satellites, since in this case ν_8 is a single frequency. W. R. A.

Raman spectrum and constitution of pentaerythritol. P. G. N. NAYAR (Proc. Indian Acad. Sci., 1938, 7, A, 251—256).—The 21 frequencies observed in the Raman spectrum are < half the total no. of possible normal modes of vibration, viz., 57. This suggests tetrahedral structure, since with pyramidal structure >28 vibrations would be expected. Tetrahedral structure is indicated for both the inner C core (neopentyl group) and the mol. as a whole, in agreement with X-ray evidence. From the frequency of the O–H band in pentaerythritol, viz., 3252 and 3335 cm.$^{-1}$, it is considered that the mols. are linked by H bonds. C. R. H.

Raman spectra of some molybdates in aqueous solution. (MLLE.) M. THEODORESCO (Compt. rend., 1938, 206, 753—754; cf. A., 1932, 445).— $Na_2MoO_4,2H_2O$ gives the vv 313, 839, and 897 cm.$^{-1}$, due to MoO_4''. $(NH_4)_6Mo_7O_{24},4H_2O$ and $Na_6Mo_7O_{24},21H_2O$ give 938, 892, 431, 349, 293, and 211 cm.$^{-1}$, probably due to Mo_7O_{24}''; these compounds thus do not behave as double salts in solution. A. J. E. W.

Dissociation of ethane by electron impact. J. A. HIPPLE, jun. (Physical Rev., 1938, [ii], 53, 530—533).—The dissociation of C_2H_6, investigated with a new mass-spectrometer, shows one negative, two doubly-charged, and 14 positive ions corresponding with the various states of dissociation of the mol. An analysis of processes taking place in the upper mass-range is given. N. M. B.

Simple critical potentials of carbon monoxide. J. SAVARD and M. DE HEMPTINNE (Compt. rend., 1938, 206, 998—1000; cf. A., 1937, I, 170, 279).— The possibility of interpreting the observed crit. potentials as min. activation energies of different electronic states of the mol., and the applicability of the Franck–Condon principle, are discussed.

A. J. E. W.

High-voltage polarisation in sodium nitrate. B. M. HOCHBERG (Physikal. Z. Sovietunion, 1937, 12, 644—657).—The mechanism of low-voltage chemical polarisation, based on a conception of equilibrium between electrical and diffusion forecs, cannot be extended to high-voltage polarisation. The latter can be accounted for by postulating that the impurities in the body of the dielectric set up an internal field which prevents the escape of ions.

J. A. D.

Capacity at the contact of a metal and a semi-conductor. G. DÉCHÈNE (Compt. rend., 1938, 206, 828—830).—Such contacts have the electrical characteristics of a resistance (r) shunted by a condenser, the effective capacity (c) of which increases with the conductivity of the semi-conductor. Vals. of r and c for a Hg–yellow HgO interface are recorded, and the Cu–Cu$_2$O interface is discussed. A. J. E. W.

Permanent volume polarisation in certain types of multi-layers. R. W. GORANSON and W. A. ZISMAN (Physical Rev., 1938, [ii], 53, 668).— One of the two types of Langmuir–Blodgett multi-layers is electrically neutral by internal compensation; the other should have a permanent vol. polarisation, and this was demonstrated by the deflexion in the field between parallel charged plates of a suspended ebonite cylinder on which had been deposited a

hemicylindrical coating of 340 layers of Ca stearate. The effect of field variation and of dipping the cylinder in H_2O, Hg, or dil. acid is described. The observed deflexion corresponds with a moment per mol. perpendicular to the surface of 0.1×10^{-18} compared with a calc. val. 0.27×10^{-19}.   N. M. B.

Dielectric polarisation of liquids in asymmetric fields. F. H. MÜLLER (Wiss. Veröff. Siemens-Werken, 1938, **17**, 20—37).—The effects of inhomogeneity of field on the dielectric const. (ϵ) of liquids are discussed. A non-homogeneous field should cause orientation of quadrupole mols. and translation of dipole mols. yielding a redistribution of concn. until equilibrium is attained with osmotic pressure effects. Actually changes in ϵ are small under ordinary conditions, but the use of a cylindrical condenser with a very thin wire as central electrode permits determination of quadrupole moments.
      J. W. S.

Variation of the delay in discharge in oil in a non-uniform field with spark length. R. STRIGEL (Wiss. Veröff. Siemens-Werken, 1938, **17**, 38—47).—Data are recorded for discharges in oil between pointed electrodes 0.3—10 mm. apart, and between ball electrodes 5 cm. in diameter at similar distances, comparison being made with previous results (*ibid.*, 1937, **16**, 38) for a uniform field.   J. W. S.

Physics of dielectric loss. P. O. SCHUPP (Wiss. Veröff. Siemens-Werken, 1938, **17**, 1—19).—The relationships between dielectric const., loss angle, and power loss are discussed for various arrangements of condensers with series and parallel resistances. The results are compared with deductions from the Wagner inhomogeneity theory and the Debye dipole theory, and an electrical representation of the dipolar mol. is deduced. The practical applications of these theories to various examples are discussed.   ·
      J. W. S.

Theory of rotation transitions. G. HETTNER ·(Ann. Physik, 1938, [v], **32**, 141—147; cf. A., 1938, I, 121).—The variation of the dielectric const. of solid HCl in the neighbourhood of its transition point is discussed.   O. D. S.

Dielectric constant of carbon disulphide at low temperature. R. GUILLIEN (Compt. rend., 1938, **206**, 1001—1002).—Vals. of ϵ and of the mol. polarisation in the temp. range $-115°$ to $20°$ are recorded; the ϵ–θ curve is linear down to the m.p., below which a rapid increase of ϵ occurs. The anomaly at $-90°$ recorded by Mazur (A., 1932, 9) is observed only with inefficient stirring and consequent inhomogeneity of the CS_2.   A. J. E. W.

Dielectric constant and dipole moment of aluminium bromide. V. A. PLOTNIKOV, I. SCHEKA, and S. JANKELEVITSCH (Mem. Inst. Chem. Ukrain. Acad. Sci., 1938, **4**, 382—383).—The temp. variation of fused $AlBr_3$ is given by $\epsilon = 3.375 - 0.003(t - 100)$. In liquid Br or CS_2 ϵ increases uniformly with concn., whereas in C_6H_6 it increases rapidly at very low and at high concns., and slowly at intermediate concns. The dipole moment is zero for the substance when fused or dissolved in Br or CS_2, corresponding with symmetrical Al_2Br_6 mols. The val. in dil. C_6H_6 solution, 5.03 D., indicates the existence of $AlBr_3$ or solvated mols.   F. L. U.

Spatial arrangement of the thianthren molecule. E. BERGMANN and A. WEIZMANN (Chem. and Ind., 1938, 364; cf. Keats, A., 1937, II, 466).—The dipole moment of 2 : 6-dichlorothianthren in C_6H_6 at $25°$ is 1.37 D., confirming the slight departure from the plane in thianthren ($\mu_{corr.} = 1.47$ D.).   I. McA.

Dipole moment and free rotation. A. RIEDINGER (Physikal. Z., 1938, **39**, 380—384).—The dipole moment of hydrocarbons depends on the amplitude of rotational vibrations about the C–C linking, which is a function of temp. and potential gradient. The depth of the potential trough is determined·by the strength of the polar groups and their mutual separation. To investigate the effect of the latter on the magnitude of the moment the dipole moments of saturated hydrocarbons with various H atoms substituted by Ph have been determined in C_6H_6 solution. Even with a small separation of the substituents there is practically no mutual effect, so that the polar group can rotate freely, and the $\cdot CH_2 \cdot$ chains can rotate. In addition there is an independent arrangement of substituents in the direction of an applied electric field, which is confirmed by the high moments of $\alpha\gamma\epsilon$-triphenylpentane, $\alpha\epsilon\iota$-triphenylnonane, and $\alpha\gamma\epsilon\eta$-tetraphenylheptane.   A. J. M.

Dispersion and optical anisotropy of molecular oxygen in relation to its absorption spectrum. P. PATTABHIRAMAYYA (Proc. Indian Acad. Sci., 1938, **7**, A, 235—244).—Mathematical. A new dispersion formula for gaseous O_2 has been derived which is simultaneously able to explain the observed optical anisotropy of the O mol. and its dispersion. The formula also predicts an increase of optical anisotropy in the ultra-violet region.   C. R. H.

Birefringence of liquids under the action of ultrasonic waves. R. LUCAS (Compt. rend., 1938, **206**, 827—828).—A train of ultrasonic waves in a liquid may cause rotation of the plane of polarisation of a perpendicular beam of polarised light, the magnitude of the rotation depending on the liquid and on the angle between the plane of polarisation and the sound waves. The theory of the effect is given.   A. J. E. W.

Optical activity in ketones. Rotatory dispersion and circular dichroism of m-methyl*cyclo*hexanone and of pulegone in their ketonic absorption bands. T. M. LOWRY, D. M. SIMPSON, and C. B. ALLSOPP (Proc. Roy. Soc., 1937, A, **163**, 483—498).—Mol. extinction coeffs., circular dichroism, and rotatory dispersion in the ultra-violet are recorded. Analysis of the observations shows that the rotation due to the ketonic absorption band of methyl*cyclo*hexanone is $>$ that of the single asymmetric C atom, and is opposite in sign. A similar result is obtained for pulegone. The optical activity of the carbonyl group is attributed to the lone-pair electrons of the O atom, and the theory of "induced dissymmetry" is re-interpreted.
      G. D. P.

Structure and properties of molecules. I. (1) Structure and polar properties. (2) Application to inorganic and organic compounds. II. Structure and acid and basic properties of molecules. V. RASUMOVSKIJ (Bull. Soc. chim., 1938, [v], 5, 233—242, 243—249, 249—256).—I. A general discussion.

II. The strengths of acids and bases are discussed in terms of electronic structure. E. S. H.

The building of molecules. R. ROBINSON (Proc. Durham Phil. Soc., 1938, 9, 360—381).—A lecture.

Stereochemistry of boric acid-diol derivatives. P. H. HERMANS (Rec. trav. chim., 1938, 57, 333—341; cf. A., 1925, 500).—The derivatives are of two types, $\begin{matrix}>C\cdot O\\>C\cdot O\end{matrix}>B\cdot OH$ (I) and $\left[\begin{matrix}>C\cdot O\\>C\cdot O\end{matrix}>B<\begin{matrix}OH\\OH\end{matrix}\right]H$ (II), B being 3- or 4- (strongly acid) -valent respectively. The greater interat. distances between the O atoms of (II) (2·42 A.) and between O and B (1·48 A.) compared with (I) (2·32; 1·35 A.) are discussed. A. T. P.

Liquid state. R. W. GURNEY and N. F. MOTT (J. Chem. Physics, 1938, 6, 222).—Theoretical. W. R. A.

λ-Phenomenon of liquid helium and the Bose–Einstein degeneracy. F. LONDON (Nature, 1938, 141, 643—644).—Fröhlich's proposed mechanism (A., 1937, I, 505) for the λ-phenomenon is criticised, and a different interpretation is put forward. L. S. T.

Extension of Carlsohn's law to the crystalline state. R. LAUTIÉ and M. OSWALD (Bull. Soc. chim., 1938, [v], 5, 277—285).—Carlsohn's law (A., 1925, ii, 1044) has been generalised for cryst. parameters. The results permit calculation of unknown parameters. E. S. H.

Numerical valency in polyatomic molecules. H. LESSHEIM and R. SAMUEL (Phil. Mag., 1938, [vii], 25, 667—677).—A review and discussion of the relationship between electron configuration and valency. H. J. E.

Valencies of carbon. R. TRUCHET (Bull. Soc. chim., 1938, [v], 5, 468—479; cf. A., 1938, I, 122).—The ethylenic linking is examined on the assumption that three of the C bonds lie in a plane inclined at 120° to each other, but that the fourth electron is mobile and may associate with one or more other electrons of similar nature, the stability of this linking depending on the general mol. structure. Known properties (chemical reactivity, isomerism, with brief reference to magnetism, interat. distances, absorption spectra) of ethylene, allyl, and erythrene compounds, C_6H_6, Ph_2, CPh_3, anthracene, and phenanthrene are shown to be in accordance with the scheme. M. R.

Relationship between the density distribution of certain valency electrons (B-electrons) and reactivity in aromatic hydrocarbons. O. SCHMIDT (Z. physikal. Chem., 1938, B, 39, 59—82; cf. A., 1937, I, 286; 1938, I, 14).—The non-reactivity of aromatic hydrocarbons, in spite of their unsaturated character, is explained by the localisation of the B-electrons in the inside of the aromatic ring, causing them to be shielded from external attack. The

theory is discussed with reference to the internuclear distances in aromatic and other cyclic compounds. J. W. S.

Improved Wigner–Seitz method for the calculation of electronic energy bands. G. WANNIER (Physical Rev., 1938, [ii], 53, 671).—Limitations of the method as reported by Shockley (cf. A., 1938, I, 14) are overcome. N. M. B.

Electronic structure of some polyenes and aromatic molecules. IV. Nature of the links of certain free radicals. C. A. COULSON. **V. Comparison of molecular orbital and valency bond methods.** G. W. WHELAND. **VI. Phenylethylene, stilbene, tolane, and the phenylmethyl radical.** W. G. PENNEY and G. J. KYNCH (Proc. Roy. Soc., 1938, A, 164, 383—396, 397—408, 409—420).—IV. Formulæ are given for the lengths of the links of free radicals and mols. of chain-form $C_{2n+1}H_{2n+3}$. The effect of resonance is to remove some of the characteristic properties of alternate single and double bonds. Numerical vals. are given for the cases $n = 2, 3$, and 4. The mean length of the links is approx. const., but the end link is always about 0·04 A. shorter than the others.

V. The two methods give concordant results when applied to polyenes and other mols., but in the case of cyclobutadiene, C_4H_4, discrepancies occur. These discrepancies are examined and the differences between C_4H_4 and C_6H_6 are discussed.

VI. Two methods (electron pairs and mol. orbitals) are used to calculate the internuclear distances in mols. containing the system C:CPh. The double linking is the same length as in C_2H_4; the ring distances are equal to those in C_6H_6, but the single linking has the short length 1·44 A. In the system C:CPh the triple linking is of normal length, 1·20 A.; the ring distances are as in C_6H_6, but the single linking has a length 1·41 A. These results are in agreement with the experimental vals. found by Robertson and Woodward (see below). G. D. P.

X-Ray analysis of the dibenzyl series. V. Tolane and the triple bond. J. M. ROBERTSON and I. WOODWARD (Proc. Roy. Soc., 1938, A, 164, 436—446).—Crystal data : $C_{14}H_{10}$, m.p. 60°, ρ (calc.) 1·134; monoclinic prismatic, space-group $P2_1/a$. Four mols. per unit cell of dimensions a 12·75, b 5·73, c 15·67 A., β 115·2°. The dimensions are similar to those of stilbene. The C–C triple bond distance is 1·19 A., and for the single bond joining these atoms to the C_6H_6 ring the unusually small distance 1·40 A. is found (cf. preceding abstract). G. D. P.

Anomalous vibrational spectra. M. BLACKMAN (Proc. Roy. Soc., 1938, A, 164, 62—79).—An elastic continuum becomes unstable when the elastic consts. obey certain relations. The instability leads to a characteristic change in the vibrational spectrum of a lattice in which these relations hold. No actual crystals are near enough to the crit. regions for the effect to be apparent in the sp. heat, but in some cases it should be noticeable in the vibrational spectrum. G. D. P.

Calculation of the potential function and fundamental frequencies of the molecules

$C_2H_xD_y$ ($x + y = 4$). Y. L. TCHANG (Ann. Soc. Sci. Bruxelles, 1938, **58**, [i], 87—97; cf. A., 1937, I, 67, 223, 398, 443).—Divergencies between observed $\nu\nu$ and those calc. from the potential function of Manneback (*ibid.*, 67) increase with D content, and are due to neglect of anharmonicity. A correction for this (cf. A., 1935, 1057), giving for H and D the " spectroscopic " masses 1·088 and 2·126, is proved from $\nu\nu$ of C_2H_4 and C_2D_4. Parameters and force consts. are redetermined. Calc. and observed $\nu\nu$ for C_2H_3D, C_2HD_3, and *cis*-, *trans*-, and *as*-$C_2H_2D_2$ now agree to $<1·4\%$. Predictions include the infra-red ν 693$\pm$2 cm.$^{-1}$ for C_2D_4.   I. McA.

Rotational energy levels of a diatomic molecule in a tetrahedral field. H. M. CUNDY (Proc. Roy. Soc., 1938, A, **164**, 420—435).—The Schrödinger equation is solved by application of the theory of groups for the case of a diat. mol. when the potential energy has tetrahedral symmetry. Numerical vals. of the energy levels are obtained by use of the Mallock electric calculating machine and the results are shown graphically.   G. D. P.

Forces acting between atoms and ions and the physical properties of matter in bulk. J. A. WASASTJERNA (Phil. Trans., 1938, A, **237**, 105—133). —Mathematical. A method is developed for the analysis, with the aid of available experimental data, of the dependence of the potential energy on the interat. distance for atoms and ions with closed shells. From the results, theoretical calculations are made of the compressibilities, elastic consts., proper frequencies of vibrations, amplitudes of the thermal vibrations, and energy of crystals, and comparisons are made with available experimental data. The structure of the lattice and the dependence of interat. distance on the no. of geometrically equiv. nearest neighbours is examined, and a theoretical interpretation of empirical results is given.   N. M. B.

Theory of orientation separation of ionic crystals. I. N. STRANSKI and L. KRASTANOV (Monatsh., 1938, **71**, 351—364).—Theoretical.
                A. J. M.

Migration of energy in crystals and molecular complexes. F. MÖGLICH and M. SCHÖN (Naturwiss., 1938, **26**, 199).—That migration of energy in crystals and mol. complexes occurs is indicated by the phenomena of phosphorescence, C assimilation by plants, and radiative mutation of genes. Such an energy migration may occur through electron exchange.   A. J. M.

Stability of polyatomic molecules in degenerate electronic states. II. Spin degeneracy. H. A. JAHN (Proc. Roy. Soc., 1938, A, **164**, 117—131; cf. A., 1937, I, 552).—A polyat. mol. cannot possess a stable non-linear configuration in an electronic state having spin degeneracy unless this degeneracy is the special twofold one which can occur only when the mol. contains an odd no. of electrons. The irreducible two-valued representations of all the point-groups are tabulated.   G. D. P.

Continuum and swarm theories of the nematic phase. (A) H. ZOCHER. (B) R. FÜRTH and K. SITTE (Ann. Physik, 1938, [v], **31**, 570—578, 579—

582).—A criticism of Fürth and Sitte (A., 1937, I, 553) and a reply.   O. D. S.

Action of intermolecular forces in gases and liquids. E. STEURER and K. L. WOLF (Z. physikal. Chem., 1938, B, **39**, 101—125).—From measurements of gas pressure in unsaturated vapours of alcohols, ketones, and hydrocarbons, and of mol. wts. of alcohols in non-polar solvents a comparison of the effects of intermol. forces in gases and liquids is made. Apparatus for measuring gas pressures and v.p. is described.   T. H. G.

Calculation of surface tension from measurements of sessile drops. A. W. PORTER (Phil. Mag., 1938, [vii], **25**, 752—754).—The problem of the calculation of surface tension from the height and radius of drops of all sizes has been solved. A better way of displaying results obtained by Bosanquet's method is discussed.   T. H. G.

Determination of parachor in solution. II. Parachor of inorganic salts in aqueous solution. S. K. RAY (J. Indian Chem. Soc., 1938, **15**, 43—46; cf. A., 1934, 1295 and following abstract).—Parachors of NH_4Cl, NH_4Br, NH_4NO_3, KCl, and KI in aq. solution increase with increasing concn. but tend to const. vals. Distinction must be made between at. and ionic parachors.   M. R.

Determination of the parachors of inorganic salts in solution and their structure. I. Potassium salts. J. V. LAKHANI and R. P. DAROGA (J. Indian Chem. Soc., 1938, **15**, 37—42).—Parachor vals. of various K salts in 0·01—0·06M aq. solution at 30° have been found by an extension of the equation applicable to mixtures of two liquids. Experimental vals. are in agreement with calc. $\Sigma[P]$. The at. parachor of K is taken as 110 for univalent salts and 106 for bivalent salts containing two K atoms.
                M. R.

Scattering of X-rays by liquid metal eutectics. V. J. DANILOV and J. V. RADTSCHENKO (Physikal. Z. Sovietunion, 1937, **12**, 756—760).—X-Ray photographs indicate that in the eutectic melts of Bi–Sn, Sn–Pb, Pb–Bi, and Sn–Zn the at. distribution is influenced by the same type of interat. forces as determine the structure of the solid phases.
                J. A. D.

Structure of liquid metals near recrystallisation. V. J. DANILOV and J. V. RADTSCHENKO (Physikal. Z. Sovietunion, 1937, **12**, 745—755).— Intensities of X-ray diffraction photographs of liquid Sn, Bi, and Pb are compared with the curves given by Prins and Petersen (cf. A., 1936, 553) for statistical regularity of interat. spacings in the liquid lattice. When the metal is just above the m.p., nuclei are formed in which the mols. have the same arrangement as in the solid crystal.   J. A. D.

Photography of reciprocal lattice planes in a crystal with X-rays. W. F. DE JONG and J. BOUMAN (Physica, 1938, **5**, 220—224).—Previous theory (cf. A., 1938, I, 234) is extended and summarised, and disadvantages of the method are reviewed.   A. J. E. W.

Scattering of X-rays by crystals of variable structure. I. M. LIFSCHITZ (Physikal. Z. Soviet-

union, 1937, **12**, 623—643).—Formulæ are derived for the intensity, direction, and half-width of the X-ray diffraction lines from lamellar variable-structure crystals which have domains of variable size and orientation, and variable lattice const. in each domain. Different types of aggregation are discussed and the results applied to crystals and alloys which show variable structure. J. A. D.

Crystal structure of insulin. I. Air-dried insulin crystals. D. Crowfoot (Proc. Roy. Soc., 1938, **A**, **164**, 580—602).—X-Ray investigation shows that insulin crystallises in the rhombohedral system, space-group $R3$, the unit cell having a 44·4 A. and α 114° 48′; referred to hexagonal axes $a = 74·8$, $c = 30·9$ A. The density of several samples varied from 1·292 to 1·316. The mol. wt. is calc. as 39,700 (± 1000). When allowance is made for the H_2O content of the crystal the mol. wt. of the protein in the unit cell is 37,600. There is no crystallographic evidence that this wt. constitutes a single mol. Fourier synthesis shows the distribution of matter in the unit cell. It is suggested that the spacings 10 and 22 A. are related to the characteristic spacings of many proteins, both globular and fibrous. G. D. P.

Space-group of the stable modification of the crystals of m-nitrobenzoic acid. V. C. Thakar (Current Sci., 1938, **6**, 446).—Examination by the rotation and oscillation method gives a 10·41, b 10·70, c 13·22 A., β 91° 12′; 4 mols. per unit cell; space-group C_{2h}^5. L. S. T.

Study of the crystals of p-nitroaniline and p-nitrotoluene by X-ray single-crystal rotation method. M. Prasad and R. N. Merchant (J. Indian Chem. Soc., 1938, **15**, 47—52).—Unit cell dimensions found are: $p\text{-}NH_2\cdot C_6H_4\cdot NO_2$, a 15·31, b 6·085, c 8·36 A.; β 126° 11′; space-group C_{2h}^5. $p\text{-}C_6H_4Me\cdot NO_2$, a 6·41, b 14·10, c 15·39 A.; space-group Q_A^5. In each case one mol. forms an asymmetric unit of the cell. M. R.

Space-group determination of the crystals of o- and p-benztoluidides by the X-ray rotating-crystal method. M. Prasad and A. B. Khan (J. Indian Chem. Soc., 1938, **15**, 53—58).—Unit cell dimensions are respectively: a 26·116, 30·54, b 9·117, 8·24, c 9·87, 9·246 A.; space-group Q_A^{15}, Q_A^{11}. In each case one mol. forms an asymmetric unit of the cell. M. R.

X-Ray investigation of the structure of boron nitride. A. C. Breger (J. Phys. Chem. Russ., 1938, **11**, 28—32).—BN is hexagonal, a 2·51, c 6·69 A.; the unit cell contains 2 B with the co-ordinates $(\frac{1}{3}, \frac{2}{3}, 0)$ and $(\frac{2}{3}, \frac{1}{3}, \frac{1}{2})$, and 2 N with the co-ordinates $(0, 0, 0)$ and $(0, 0, \frac{1}{2})$. J. J. B.

Crystal structure of pentaerythritol tetra-acetate. T. H. Goodwin (Proc. Roy. Soc., 1938, **A**, **164**, 369—383).—The substance crystallises in the space-group $P4_2/n$; the tetragonal unit, having a 12·00 and c 5·506 A., contains two mols. The acetate group is planar. Interat. distances and valency angles are tabulated. G. D. P.

Space-group of cryolite, Na_3AlF_6. G. Menzer (Naturwiss., 1938, **26**, 236; cf. A., 1930, 140).—

Further investigation shows that cryolite has the space-group C_{2h}^5, the cleavage direction being parallel to [101]. The arrangement of atoms in the elementary cell remains the same as before. A. J. M.

Polymorphism of alkaline-earth carbides. H. H. Franck (Compt. rend. XVII Cong. Chim. Ind., 1937, 1160—1165; cf. A., 1937, I, 320).—Further X-ray and thermal analysis of CaC_2 has revealed a face-centred cubic form CaC_2 IV, stable above 450°, having a 5·91 A. at 480°. Conditions for the occurrence, stability, and transformation of the 4 forms with respect to temp., grinding, and content of technical impurities ($CaCN_2$; CaS, Ca, etc.) are summarised. SrC_2 III and BaC_2 III cannot be obtained. I. McA.

X-Ray and optical properties of barium–copper stearate films. C. Holley (Physical Rev., 1938, [ii], **53**, 534—537; cf. A., 1936, 539).—Measurements of the X-ray spacing of films, built by successive deposition of layers 1 mol. thick and used as diffraction crystals to obtain X-ray spectra, give a const. val. of approx. 50·47 A. for films of the same composition of thickness 301—3000 layers, but varying with the % Cu in the film. The spacing is the same for mols. in adjacent layers oriented in the same or in opposite directions, and the unit decrement of n is $5·1 \times 10^{-6}$. Measurements with a Michelson interferometer gave 24·23 A. for the spacing of mol. layers, and hence twice the layer spacing or 48·46 A. was expected (instead of 50·47 A.) for the grating spacing of films in which the mols. in adjacent layers were oriented in opposite directions. The discrepancy indicates that the X-ray spacing is not determined by the method of building the film. N. M. B.

X-Ray studies on liquids : inner peak for alcohols and acids. W. C. Pierce and D. P. MacMillan (J. Amer. Chem. Soc., 1938, **60**, 779—783).—Fourier analysis shows that the inner peak is due to an at. distribution not present in other liquids such as paraffins and esters. The distribution is explained on the basis of mol. clusters, due to association by H bridge formation, giving a plane rich in O atoms and lying at right angles to the hydrocarbon chains. The theory is applied to published data. E. S. H.

Rôle of foreign matter in the structure of crystalline liquids. P. Gaubert (Compt. rend., 1938, **206**, 1030—1032; cf. A., 1938, I, 125).—The formation and occurrence of filaments due to impurities in anisotropic liquid drops of p-azoxyanisole or -phenetole on mica cleavage faces is discussed. These filaments give rise to optical anomalies, particularly for bands in which a strong pseudo-dichroism, due to the separation of particles of impurity near the filaments, is observed. A. J. E. W.

Focussing of an X-ray beam by a rock-salt crystal. R. M. Bozorth and F. E. Haworth (Physical Rev., 1938, [ii], **53**, 538—544).—A single crystal was bent plastically and cut so that X-rays of a narrow range of $\lambda\lambda$ coming from the focal point of the X-ray tube are focussed at another point; the beam of about 6° divergence is thus monochromatised and conc. so that the intensities of the Fe $K\alpha$ lines

are about 30 times as great as when monochromatised by reflexion from a plane crystal. The point of focus was placed on the reflexion circle of a Seeman–Bohlin focussing camera and powder photographs were taken, with the advantage that the background is much diminished without serious loss of line intensity.

N. M. B.

Résumé of electron diffraction. G. L. Clark and E. Wolthuis (J. Chem. Educ., 1938, **15**, 64—75).—A review. L. S. T.

Properties of a bundle of monokinetic electrons after penetration of an absorbing foil. J. J. Trillat and A. Hautot (Ann. Physik, 1938, [v], **31**, 583—584).—A reply to Kirchner (A., 1938, I, 69). The discrepancy between the vals. of Trillat and Hautot (A., 1937, I, 541) and of Boochs (Kirchner, *loc. cit.*) for the energy loss of 45-kv. electrons on penetration of a 1 μ. Al foil is within the experimental error. O. D. S.

Further observations with the electron microscope. E. W. Müller (Z. Physik, 1938, **108**, 668—680).—The structure of the single-crystal W tip of the cathode is studied by means of images formed when Ba vapour is projected laterally on to the tip. It is confirmed that the tip has a smooth spherical surface of approx. radius 0.8×10^{-5} cm. and under suitable conditions a magnification of 10^6 is obtained. Adsorption of single Ba ions may be observed during spread of the metal over the W surface. L. G. G.

Electron-optical observation of metal surfaces. III. Crystal growth and allotropic transition in zirconium. IV. Appearance of "lines" of high emissivity on nickel–iron crystals. W. G. Burgers and J. J. A. Ploos van Amstel (Physica, 1938, 5, 305—312, 313—319).—III. Observations with an electron microscope on the $\alpha \rightleftharpoons \beta$ transformation in Zr are described and illustrated. On cooling the β-crystallites, having an "equiaxed" texture, below the transition point (865°), a martensitic α-texture appears; the original β-crystallites are replaced by regions of parallel lamellæ. On re-transformation the β-crystallites reappear, and almost the same lamellar pattern is formed when the specimen is again cooled. These observations support the conclusion that the transition occurs through a homogeneous transformation, by shearing and dilatation of coherent lattice regions parallel to definite crystallographic directions. The process thus resembles the formation of martensite in steel. Above 1150° the β-crystallites show rapid growth phenomena; the capacity for growth of any individual crystallite may be reversed by a temporary transition into the α-form. This is probably due to lattice distortions and stresses between neighbouring crystallites, set up by the successive transitions. During evaporation of the Ba activator from Zr at 600—700°, reversal of the relative intensities of emission of neighbouring crystallites is observed.

IV (cf. A., 1936, 1188). If a Sr–SrO activator is deposited on a Ni–Fe cathode at 900°, previously activated with Sr and Ba, an abnormal increase of emission intensity occurs along definite lines, the lines in each crystallite being parallel, and related in direction to the underlying crystal lattice. The formation of the lines is attributed to increased adsorptive power for the activating atoms in the neighbourhood of surface irregularities.

A. J. E. W.

Structure of boron hydrides. V. Tetraborane B_4H_{10} and the pentaborane B_5H_{11}. S. H. Bauer (J. Amer. Chem. Soc., 1938, **60**, 805—812; cf. A., 1938, I, 236).—Electron-diffraction investigation shows that B_4H_{10} has a configuration analogous to that of C_4H_{10}, with the interat. distances B—B 1.84 ± 0.04, B—H 1.28 ± 0.03 A. B_5H_{11} has a structure similar to that of either *n*- or *iso*-C_5H_{12}, with B—B 1.81 ± 0.03 and B—H 1.26 ± 0.03 A. The valency angles are approx. tetrahedral; internal rotation must be assumed. The general formulation of the constitution of B hydrides is discussed.

E. S. H.

Oxidation of aluminium foils. K. Tanaka and H. Kano (Mem. Coll. Sci. Kyoto, 1938, **A**, **21**, 1—4).—The structure of the film of γ-Al_2O_3 formed on heating Al foil has been examined by electron diffraction. On gradual heating some cubic crystals of γ-Al_2O_3 are formed and are oriented in the same way as the cubic crystals of Al in the original foil. When the foil is suddenly heated (900°) this effect is not observed. A. J. M.

Domain theory of ferromagnetics under stress. II. Magnetostriction of polycrystalline material. W. F. Brown, jun. (Physical Rev., 1938, [ii], **53**, 482—491; cf. A., 1937, I, 556).—Expressions are derived for the magnetostriction of polycryst. Fe and Ni when the domains are isotropic, and when they are cryst. and have (111) and (100) as the direction of easy magnetisation. Results are discussed and compared with experimental data. N. M. B.

Photochemical processes in crystals. R. Hilsch and R. W. Pohl (Ann. Physik, 1938, [v], **32**, 155—160; cf. A., 1938, I, 120).—The variation with temp. of the quantum efficiency of the decomp. of mixed crystals of KBr–KH and KBr–KD is described. Decomp. takes place at lower temp. for KBr–KH. The absorption bands of RbBr and RbH are compared. The positions of the bands are in agreement with vals. calc. on the hypothesis that light absorption gives rise to the transference of an electron from anion to cation. O. D. S.

Effect of hydrostatic pressure on the susceptibility of Rochelle salt. D. Bancroft (Physical Rev., 1938, [ii], **53**, 587—590; cf. A., 1935, 288).—An investigation of the electric susceptibility as a function of temp. and pressure in the range $-20°$ to $60°$ and up to 10,000 atm. shows that both the upper and lower crit. temp. are altered by the pressure, but the pressure coeffs. for the alterations are different in the two cases. An attempt to correlate the experiment with statistical mechanical theory is made. N. M. B.

Piezo-electric relaxation time in Seignette salt crystals. R. D. Schulvas-Sorokin (Physikal. Z. Sovietunion, 1937, **12**, 685—700; cf. A., 1935, 288).—The variation of piezo-electric modulus with frequency has been measured, and also the changes of

relaxation time with temp. and the effect of an electric field. The connexion between mechanical and electrical relaxation time is discussed with reference to the mechanism of polarisation in the crystal.
J. A. D.

Velocity of grain growth in aluminium. M. KORNFELD and F. RIBALKO (Physikal. Z. Sovietunion, 1937, **12**, 658—666; cf. A., 1935, 433).—New grains develop with anistropic velocity during the recrystallisation of plastically deformed single crystals of Al. They join to the octahedral planes of the mother-crystal with different irrational plane indices. The anisotropic growth occurs within a narrow temp. range and vanishes at high temp. J. A. D.

Mol. wt. of phosphorus pentoxide between. 670° and 1100°. E. V. BRITZKA and E. HOFFMANN (Monatsh., 1938, **71**, 317—324).—Determination of the v.d. of P_2O_5 gives the following mean vals. for the mol. wt. at the temp. stated : 670°, 304 ; 870°, 303 ; 1000°, 291 ; 1100°, 301. (P_4O_{10} requires 284.)
A. J. M.

Absolute measurement of resistance and reactance at frequencies of the order 300×10^6 cycles per sec. R. A. CHIPMAN (Physical Rev., 1938, [ii] **53**, 672). N. M. B.

Magnetic variation of the resistance of pure metals. M. KOHLER (Ann. Physik, 1938, [v], **32**, 211—218).—Theoretical. O. D. S.

Variation of the thermal resistance of pure metals in a transverse magnetic field. E. GRÜNEISEN (Ann. Physik, 1938, [v], **32**, 219—224).—Theoretical. The conclusions of Kohler (cf. preceding abstract) are valid also for the variation of the thermal resistance of metals in a magnetic field. O. D. S.

Electrical resistance of gold below 1° K. W. J. DE HAAS, H. B. G. CASIMIR, and G. J. VAN DEN BERG (Physica, 1938, **5**, 225—229; cf. A., 1937, I, 504).—A rapid increase in ρ occurs below 1° K., the results suggesting that ρ is infinite at 0° K.
A. J. E. W.

Influence of transverse magnetic field on the electrical and thermal conductivity of pure metals at low temperature. E. GRÜNEISEN and H. ADENSTEDT (Ann. Physik, 1938, [v], **31**, 714—744).—The electrical and thermal conductivities of pure, and in most cases single-crystal, Cu, Ag, Pt, W, and Be have been measured in magnetic fields up to 12×10^3 oersted at —253° and also at —195° for Be. Results are discussed. O. D. S.

Magnetic properties of small pieces of metal at low temperatures. F. HUND (Ann. Physik, 1938, [v], **32**, 102—114).—Theoretical. An intermediate state of strong diamagnetism bounded by states of magnetic instability is to be expected in metals at very low temp. (cf. A., 1934, 19). In ring-shaped pieces of metal such diamagnetism will be accompanied by a current around the ring (cf. London, A., 1938, I, 19). O. D. S.

Cooling by adiabatic demagnetisation. P. DEBYE (Ann. Physik, 1938, [v], **32**, 85—101).—Theoretical. A limit exists at some thousandths °K. to cooling by the adiabatic demagnetisation of compounds possessing electronic magnetism. The magnetic properties of the alums, and especially $(NH_4)_2Fe(SO_4)_2$, at low temp. are discussed. O. D. S.

Thermodynamics of superconductivity. M. VON LAUE (Ann. Physik, 1938, [v], **32**, 71—84).—Theoretical. O. D. S.

Intermediate state of superconductors. L. LANDAU (Nature, 1938, **141**, 688).—It is calc. that the laminæ (A., 1937, I, 404) of the intermediate state of superconductors become thinner towards the surface, and finally form a kind of mixed phase.
L. S. T.

Experiments at radio frequencies on superconductors. F. B. SILSBEE, F. B. BRICKWEDDE, and R. B. SCOTT (J. Res. Nat. Bur. Stand., 1938, **20**, 109—123).—A detailed account of work already noted (A., 1938, I, 129). J. A. D.

Magne-crystallic action. V. Paramagnetic salts of the rare-earth and iron groups. K. S. KRISHNAN and A. MOOKHERJI (Phil. Trans., 1938, **A**, **237**, 135—159; cf. A., 1936, 1057).—Crystallographic data and full data for measurements on the magnetic anisotropy and mean susceptibility of 53 paramagnetic crystals are tabulated. Results are discussed on the basis of the theory of Van Vleck, Penney, and Schlapp, in relation to the Stark splitting of the energy levels of the paramagnetic ions under the influence of the strong cryst. electric fields acting on the ions. The contrast in the magnetic behaviour of the six-co-ordinated and the four-co-ordinated Co compounds, predicted by theory, is verified experimentally. The former salts are strongly, and the latter feebly, anisotropic magnetically. All salts of the Fe group (except Co salts) have two of their principal susceptibilities nearly equal; the magnetic ellipsoids approximate to a spheroid. The consts. of the crystal field in Ni salts are calc. in detail. N. M. B.

Paramagnetism of cupritetrachlorides and organic cupritrichlorides. J. AMIEL (Compt. rend., 1938, **206**, 1113—1115; cf. A., 1938, I, 207).—Vals. of χ at 20° are recorded for 28 complexes formed by $CuCl_2$ with amines and other N bases. In most cases the paramagnetism is approx. that to be expected for the Cu·· ion. H. J. E.

Magnetic susceptibility of metallic cerium. R. JAANUS (Physikal. Z. Sovietunion, 1937, **12**, 729—735).—The magnetic behaviour of a weak magnetic material which has a ferromagnetic inclusion is discussed. A method of measurement is indicated which will allow the presence of the ferromagnetic impurity to be detected, and allowed for, in estimating the susceptibility of the sample. Previous measurements of the susceptibility of Ce at low temp. are considered untrustworthy. J. A. D.

Dispersion of acoustic velocity in liquids. B. V. R. RAO (Proc. Indian Acad. Sci., 1938, **7**, A, 163—176).—The results previously reported (cf. A., 1937, I, 353) have been amplified by a theoretical discussion and a description of experimental method. Dispersion of acoustic velocity with frequency has been established in the case of CCl_4 and $COMe_2$. The ultrasonic velocities for these liquids are re-

spectively 928 and 1205 m. per sec., and the hypersonic velocities 1070 and 978 m. per sec. Although the presence of similar dispersion in the case of C_6H_6 and PhMe is indicated, the data are not accurate enough for calculation of vals. for the supersonic and hypersonic velocities. C. R. H.

Absorption of untrasonic vibrations in solids and liquids. N. F. OTPUSCHTSCHENNIKOV (Physikal. Z. Sovietunion, 1937, **12**, 736—744).—A new method of measuring absorption of ultrasonic vibrations is described and is used to measure the absorption in Hg, H_2O, transformer oil, and vaseline oil. H_2O has the least, and petroleum oil the greatest, absorption. The results differ from the vals. calc. from Stokes' formula. Absorptions in steel, brass, NaCl, Cu, Sn, and glass were also measured. J. A. D.

Absorption of ultrasonic waves in liquids by an optical method. H. GROBE (Physikal. Z., 1938, **39**, 333—338).—An optical method for the investigation of the absorption of ultrasonic waves in liquids at various frequencies is described. The absorption in C_6H_6 for frequencies of 6—43 mHz., and in CCl_4, PhMe, EtOH, H_2O, and glycerol in the upper part of this range, was determined. The absorption in mixtures of C_6H_6 and $C_{10}H_8$, and of C_6H_6 and PhMe, was also determined as a function of concn. A. J. M.

Propagation of ultrasonic waves in liquids under pressure. P. BIQUARD (Compt. rend., 1938, **206**, 897—899; cf. A., 1934, 1299; 1938, I, 71).—The velocity of sound (V) in C_6H_6, PhMe, MeOAc, and CCl_4, at pressures (p) $\not> 700$ kg. per sq. cm., and for a frequency of 10,000 kc. per sec., has been measured. In this range V shows a linear relation to p, except for C_6H_6 at $p > 400$ kg. per sq. cm. (cf. A., 1929, 637). A. J. E. W.

Liquid jets with supersonic velocities. R. KLING and N. MANSON (Compt. rend., 1938, **206**, 892—894).—Shadow photographs of jets of gas oil, EtOH, H_2O, and glycerol, projected at high velocity into the atm., are discussed. A. J. E. W.

Influence of a magnetic field on the absorption of sound in oxygen gas. A. VAN ITTERBEEK and L. THYS (Physica, 1938, **5**, 298—304; cf. A., 1937, I, 230).—At 20° the absorption coeff. of sound in O_2 at 1 atm. pressure decreases by ~20% when a transverse magnetic field of 6000 gauss is applied. The effect disappears for pressures <0·3 atm. at 20°, and at lower pressures at 50°. The decrease is probably due to the effect of the magnetic field on the vibrational state of the O_2 mol. The velocity of sound in O_2 is unchanged by a magnetic field. The effect is not found with N_2, in which sound absorption varies with pressure in accordance with the Kirchhoff–Helmholtz formula. A. J. E. W.

Optical properties of very thin sheets of platinum. P. ROUARD (Compt. rend., 1938, **206**, 1106—1108; cf. A., 1937, I, 228).—Data are recorded for the transmission, reflexion, and phase change on reflexion of λ 5780 A. with Pt films of thickness 0·6—57·8 mμ. H. J. E.

Specific heats of zirconium and magnesium nitrides. S. SATOH (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, **34**, 399—405).—The mean sp. heats of Zr_3N_2 and Mg_3N_2 have been measured over three temp. ranges, and expressions derived for the true sp. heats over the total ranges (0—500° for Zr_3N_2 and 0—400° for Mg_3N_2). T. H. G.

Specific heat of βγ-butanediol. M. A. CHOCHLOVKIN and A. V. KALATSCHEVA (Sintet. Kautschuk, 1936, No. 1, 25—27).—Data for the pure and technical products at 26—140° are given. For the former the sp. heat, C, is given by $C = 0.5381 + 0.0010464t$, and for the latter by $C = 0.5568 + 0.001563t$, where t is the temp. CH. ABS. (e)

Specific heats of liquids in relation to Raman effect data. S. BHAGAVANTAM (Proc. Indian Acad. Sci., 1938, **7**, A, 245—250).—Vals. of C_v for liquid CCl_4 and CS_2 are midway between vals. calc. by two alternative methods. In one method, in evaluating the contribution of translational and rotational degrees of freedom, the substance is considered as a solid, and in the other as a gas. The observed val. for liquid C_6H_6 is closer to the val. calc. on the assumption of a solid than to the val. calc. on the assumption of a gas. It is concluded that in liquids thermal movements of mols. are partly in an organised manner constituting Debye elastic waves as in a solid, and partly in a random manner as in a gas. C. R. H.

Molecular heats of organic vapours. K. BENNEWITZ and W. ROSSNER (Z. physikal. Chem., 1938, B, **39**, 126—144).—Mol. heats C_p and heats of vaporisation have been determined by a new method for some 20 substances containing C, H, and O. A semi-theoretical expression has been derived by which C_p and dC_p/dT (for a limited temp. range) can be calc. for any temp. from the structural formula. Good agreement is obtained with recorded vals. T. H. G.

Thermodynamic treatment of stationary processes in multiphase systems. W. MEISSNER (Ann. Physik, 1938, [v], **32**, 115—127).—The thermodynamic equations necessary for the treatment of stationary processes in multiphase systems are derived and are applied to the technical manufacture of solid CO_2 and ice. The treatment of turbulent processes is discussed. O. D. S.

Restricted rotation in ethyl alcohol, acetone, and isopropyl alcohol. S. C. SCHUMANN and J. G. ASTON (J. Amer. Chem. Soc., 1938, **60**, 985—986).—Discrepancies between entropies calc. from mol. data assuming free rotation and experimental third-law entropies are traced to neglect of potentials restricting internal rotations. E. S. H.

Condensation and adsorption of mercury vapour. R. C. MASON (J. Appl. Physics, 1938, **9**, 131—134).—A study of the crit. temp. for condensation of Hg on a glass surface shows that a large nucleus is necessary for condensation to start. The heat of vaporisation of an atom from the nucleus is 13·2 kg.-cal. per mol. Hg atoms are adsorbed on glass rapidly at first and later slowly. E. M. W.

Vapour density of butadiene. M. A. CHOCHLOVKIN and A. V. KALATSCHEVA (Sintet. Kautschuk,

1936, No. 1, 28—30).—The wt. of 1 litre of butadiene at n.t. was 2·4787 g. The mol. vol. at n.t. was 21·81.   CH. ABS. (*e*)

Vapour pressure of corrosive substances. IV. K. ARII and M. KAWABATA (Bull. Inst. Phys. Chem. Res. Japan, 1938, **17**, 299—308).—Using Jackson's glass-spring manometer the v.p. of PBr_3 has been measured from 40° to its b.p. and of PCl_3 from —20° to 70°. Empirical equations connecting v.p. and temp. are given for each. The following consts. are recorded for PBr_3 and PCl_3, respectively : latent heat of evaporation at b.p. 9704 g.-cal., 7414 g.-cal. ; mean heat of evaporation over the range studied 9789 g.-cal., 7584 g.-cal. ; b.p./760 mm. 172·8°, 74·7°. Trouton's const. shows that both are normal liquids. The f.p. of PCl_3 is —93·6°.   T. H. G.

Thermal expansion of the alkalis. L. BALA-MUTH (Physical Rev., 1938, [ii], **53**, 669).—The combination of an equation due to Bardeen for the energies of the alkali metals with Debye's idea that the thermal expansion of a solid is determined by the anharmonic terms in the potential energy allows the expansions to be calc. Results for Na are in satis-factory agreement with observed vals.   N. M. B.

General definition of entropy and the bases of chemical thermodynamics. W. MUND (Ann. Soc. Sci. Bruxelles, 1938, **58**, [i], 65—86 ; cf. A., 1936, 681).—Non-uniform systems, for which a generalised Clausius theorem is required, are specially considered.   I. McA.

Thermodynamic properties of the hexyl alco-hols. II. Hexan-α-, -β-, and -γ-ol, and β-methylpentan-α- and -δ-ol. F. HOVORKA, H. P. LANKELMA, and S. C. STANFORD (J. Amer. Chem. Soc., 1938, **60**, 820—827 ; cf. A., 1934, 136).—Viscosity, surface tension, v.p., and d of the alcohols have been determined at temp. from 5° to the b.p. The b.p., heats of vaporisation, and Rankine equation consts. have been calc. from the v.-p. measurements, and the parachors, Eötvös consts., and crit. temp. from the surface tension data.   E. S. H.

Thermodynamic properties of substances as a function of reduced temperature. I. Latent heat. Vapour volume and vapour pressure of water. II. Vapour pressures of liquids and the principle of corresponding states. H. A. FALES and C. S. SHAPIRO (J. Amer. Chem. Soc., 1938, **60**, 784—794, 794—805).—I. Theoretical. Re-lations between latent heat, pressure, vol., and reduced temp. have been formulated and tested in respect of published data.

II. The equation for reduced pressure has been applied to published data for 30 substances. At equal reduced temp. the reduced v.p. of two substances are related. The relating coeffs. are exponential functions of temp., and become = 1 at the crit. point.   E. S. H.

Preparation for the formation of new phases. A. SMITS (Z. physikal. Chem., 1938, **B, 39**, 50—58).—Theoretical. The part played by " pseudo-associ-ation " in the appearance of new phases is discussed. New investigations of the X-ray and Raman spectra

of liquid H_2O confirm conclusions drawn from the author's theory of allotropy.   J. W. S.

Thermal conductivity of crystals at low tem-peratures. W. J. DE HAAS and T. BIERMASZ (Physica, 1938, **5**, 320—324).—Previous results (A., 1935, 1064 ; 1937, I, 506 ; 1938, I, 131) are sum-marised and discussed. The dependence of the con-ductivity of KCl and SiO_2 at temp. <20° K. on the size of the specimen crystal has been confirmed. This phenomenon is attributed to the reflexion of elastic waves at the crystal boundaries.   A. J. E. W.

Measurements on the heat-conductivity of liquid helium II. W. H. KEESOM, (MISS) A. P. KEESOM, and B. F. SARIS (Physica, 1938, **5**, 281—285 ; cf. A., 1936, 788).—k for liquid He II in a long capillary has been found to vary with the heat flow, k decreasing with increasing flow rate. Pronounced max. vals. of k, attaining 810 c.g.s. units, are observed at 1·7—2·0° K.   A. J. E. W.

Joule and Joule–Thomson effects. A. L. CLARK and L. KATZ (Canad. J. Res., 1938, **16, A**, 41—59).—The val. of the internal pressure (Joule effect) calc. from available data for the two-phase liquid–vapour state is an approx. linear function of the external pressure. The val. of the internal pressure has also been calc. for low pressure. The variation of c_v with temp. has been related to the behaviour of the internal pressure. At const. temp. the internal pressure rises to a max. with increase of pressure and probably falls to zero and becomes negative. For He the pressure for inversion is relatively low. The inversion curve for the Joule–Thomson effect has also been studied and it is shown that even for CO_2 an inversion may be expected. Calculation of the two effects is reliable as long as the vals. are large.   D. F. R.

Relativistic study of Joule–Thomson effect and adiabatic processes in a gas. I. D. V. GOGATE (Phil. Mag., 1938, [vii], **25**, 694—702).—Theoretical, deriving $p^r V^{4/3}$ = const.   H. J. E.

Determination of intermolecular forces from the Joule–Thomson coefficients. J. O. HIR-SCHFELDER, R. B. EWELL, and J. R. ROEBUCK (J. Chem. Physics, 1938, **6**, 205—218).—The energy of interaction between non-polar mols. is determined inductively from the experimental Joule–Thomson coeffs. He and A are studied in detail.   W. R. A.

Measurements on the viscosity of helium gas between 293° and 1·6° K. A. VAN ITTERBEEK and W. H. KEESOM (Physica, 1938, **5**, 257—269).—Vals. of η obtained by an oscillating-disc method are recorded ; the dependence of η on T is in agreement with Uehling's theory (A., 1933, 551 ; 1935, 157). At 423 and 20·38° K., η remains const. within 1% with change of pressure (p) down to approx. 2 mm. For lower pressures, $\eta = \eta_\infty p/(\eta_\infty a + p)$, a being a const. parameter and η_∞ the const. val. of η at higher pressures. The ratio of the vals. of a at 4·23 and 20·38° K. is in agreement with the val. calc. by assuming Maxwell velocity distribution.   A. J. E. W.

Viscosities of hydrocarbons. I—III. E. B. EVANS (J. Inst. Petroleum Tech., 1938, 24, 38—53).—Published data on the η of hydrocarbons are critically reviewed. In the measurement of η, a modified B.S.I. viscometer was used, designed to reduce kinetic energy effects and to render the instrument suitable for liquids of very low η. The errors met with in small viscometers are attributed entirely to drainage effects and not to γ. Abs. and kinematic η are tabulated for n-paraffins from C_4H_{10} to $C_{18}H_{38}$ and for dotriacontane.   C. C.

Internal friction in solids. IV. Relation between cold work and internal friction. C. ZENER (Physical Rev., 1938, [ii], 53, 582—586; cf. A., 1938, I, 131).—Mathematical. It is assumed that the effect of cold work on internal friction is due to residual internal stresses produced. These, during vibration, give rise to temp. fluctuations and thus to local heat currents associated with a rise in entropy or internal friction. A formula for this internal friction in terms of the energy associated with the residual stresses and the temp. variation of the modulus of rigidity is obtained; it gives the observed order of magnitude.   N. M. B.

Physico-chemical studies of dioxan–water mixtures. L. W. ÖHOLM (Finska Kem. Medd., 1938, 67, 19—39).—Measurements of d, η, n_D, and Δ have been made at 20°. For solutions of electrolytes Δ, α, and κ decrease rapidly with increasing dioxan concn.   M. H. M. A.

Viscosity of binary mixtures. B. M. GUGEL (J. Phys. Chem. Russ., 1938, 11, 105—108).—The empirical equations of Batschinski (1921), Meyer and Mylius (A., 1920, ii, 590), Ishikawa (A., 1929, 387), Weichherz and Gugel (A., 1937, I, 22), and Lutschinski (ibid., 295) can be shown to be mutually transformable.   J. J. B.

Diffusion and viscosity in binary liquid mixtures. H. LEMONDE (Ann. Physique, 1938, [xi], 9, 539—644).—A detailed account is given of results previously reported (cf. A., 1937, I, 295, 405). The relations are discussed in some detail.   N. M. B.

Nuclear formation in the separation of metallic mixed crystals. R. BECKER (Ann. Physik, 1938, [v], 32, 128—140).—Approx. vals. are calc. of the work of formation of a nucleus and of the probability of nuclear formation in a supersaturated binary mixed crystal. The derived temp. of max. velocity of separation is in agreement with experiment.   O. D. S.

Manganese–bismuth alloys. E. MONTIGNIE (Bull. Soc. chim., 1938, [v], 5, 343—344).—Microscopical observations show that alloys corresponding with $MnBi_2$ and $MnBi_3$ consist of crystals of Bi in a ground-mass of MnBi.   E. S. H.

Magnetic and X-ray investigations with nickel–platinum alloys. A. KUSSMANN and H. NITKA (Physikal. Z., 1938, 39, 373—375).—The magnetic properties of Ni–Pt alloys and their X-ray structure have been examined over the entire range. A phase with superstructure is found at Ni_3Pt. It is formed from the mixed-crystal phase by tempering at 450°. Its electrical conductivity is > that of the mixed-crystal phase owing to the ordered arrangement of atoms. It also has a smaller magnetic saturation and a lower Curie point.   A. J. M.

Electronic structure of alloys. T. MUTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, 34, 377—390).—Mathematical.   T. H. G.

Theory of order for the copper–gold alloy system. W. SHOCKLEY (J. Chem. Physics, 1938, 6, 130—144).—The order–disorder transformation for a wide range of composition has been determined on the basis of Bethe's assumption of nearest neighbour interaction. The connexion between the theories of Bethe and of Bragg and Williams is established.   W. R. A.

Solubility of silver in mercury. III. R. J. MAURER (J. Physical Chem., 1938, 42, 515—519).—The solubility or Ag in Hg at 5—20° shows only slight departures from the equation $\log N = -1105\cdot8/T + 0\cdot5894$ (A., 1933, 562). A sintered glass filter can be used to separate such amalgams. No evidence is obtained that Ag aggregates of various sizes are present.   J. W. S.

Solubility of gold in mercury. IV. G. MEES (J. Amer. Chem. Soc., 1938, 60, 870—871; cf. A., 1931, 794).—Data are recorded for the temp. range 190—300°. No max. occurs in this region.   E. S. H.

Influence of various factors on the solubility of copper–zinc alloy in acid. I, II. H. KUGE (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, 34, 417—433, 434—446).—I. The behaviour of Zn and of an alloy containing 90% Zn towards N-H_2SO_4 has been investigated between 30° and 80° and the results are discussed in relation to heat-treatment, surface area, grain size, and local galvanic action.
II. Pure Cu and alloys containing 10%, 20%, and 30% Zn have been examined after varying heat-treatment. Solubility appears to increase with grain size up to a limit and then remains const. An explanation is suggested.   T. H. G.

Solubility of lime in water at different temperatures. M. M. POLJATSCHENKO (Zapiski, 1937, 4, 44—45; Int. Sugar J., 1938, 40, 150).—Solutions saturated with $Ca(OH)_2$ contain 0·13% CaO at 10°, 0·124% at 20°, 0·107% at 40°, 0·088% at 60°, and 0·068% at 80°.   J. P. O.

Solubility of calcium carbonate in solutions of ammonium salts. G. EMSCHWILLER and G. CHARLOT (Compt. rend., 1938, 206, 1115—1117).—For a given p_H in the range 7·8—7·4, the solubility of $CaCO_3$ in aq. NH_4Cl is 2—3·5 times that in aq. HCl. The enhanced solubility is due mainly to hydrolysis, but partly, also, to salt action.   H. J. E.

Solubility of picric acid in water and aqueous electrolyte solutions. H. VON HALBAN and H. KORTSCHAK (Helv. Chim. Acta, 1938, 21, 392—401).—Data (at 20°) are recorded for picric acid in H_2O and in aq. NaCl, NaBr, $NaClO_4$, $NaNO_3$, $LiClO_4$, $LiNO_3$, $Sr(NO_3)_2$, LiCl, LiBr, $CaCl_2$, $Ca(NO_3)_2$, HCl, HNO_3, and $HClO_4$, respectively. A slow reaction was noted with >0·8N-HNO_3.   E. S. H.

Chemistry and electrochemistry of rhenium. VI. Solubility of potassium perrhenate in water between 10° and 518°. H. HÖLEMANN and W. KLEESE (Z. anorg. Chem., 1938, **237**, 172—176).—The m.p. of $KReO_4$ is 518°. The solubility in H_2O from 10° to 518°, and d for the saturated solution from 10° to 100°, have been determined.
F. J. G.

Physico-chemical properties of solutions in liquefied gases. XXI. Liquid sulphur dioxide as a solvent for inorganic substances. A. I. SCHATTENSTEIN and M. M. VICTOROV (J. Phys. Chem. Russ., 1938, **11**, 18—27).—Qual. solubility data are given for 87 substances. Quant. measurements are recorded for LiCl, LiBr, NaCl, NaBr, NaI, KCl, KBr, RbCl, CsCl, NH_4Cl, NH_4Br, CaI_2, and SrI_2.
J. J. B.

Thermodynamical calculation of the solubility of some important sulphides up to 400°. J. VERHOOGEN (Econ. Geol., 1938, **33**, 34—51).—Calc. vals. for ZnS, PbS, HgS, CuS, Ag_2S, and Cu_2S indicate a considerable increase of solubility with temp., the ratio of the solubility at 400° to that at 25° ranging from 10^2 to 10^4, and reaching 10^7 for ZnS. Except for a Ag_2S–CuS reversal, the order of increasing solubility is the same at 400° as at 25°. A relation expressing changes in solubility with p_H has been developed.
L. S. T.

Determination of reciprocal solubilities of water and an organic liquid by pyknometer and refractometer. A. NIINI (Suomen Kem., 1938, **11**, A, 19—20).—An expression connecting d and n for binary liquid mixtures with the composition has been used to determine the reciprocal solubilities of H_2O and a no. of org. liquids. The calc. and observed vals. are in good agreement.
M. H. M. A.

Adsorption of hydrogen on reduced nickel. Studies at low temperatures. S. IIJIMA (Bull. Inst. Phys. Chem. Res. Japan, 1938, **17**, 286—298).—Velocities of adsorption have been measured between —23° and —130°. Several activated processes occur simultaneously but can be represented by one equation. Velocity coeffs., heats of activation, and adsorption isotherms have been determined. The heat of adsorption is found to be 10,600 g.-cal.
T. H. G.

Activated adsorption of methane on reduced nickel. M. KUBOKAWA (Proc. Imp. Acad. Tokyo, 1938, **14**, 61—66).—Between —112° and 20° adsorption is of the van der Waals type. At 40—250° activated adsorption occurs and the rate of this has been measured. After activated adsorption the initially desorbed gas is CH_4, but at later stages of desorption it is accompanied by increasing amounts of H_2, indicating a dissociative adsorption severing the C–H linking.
E. S. H.

Adsorption of hydrogen by copper dispersed in magnesia. J. R. LEWIS and H. S. TAYLOR (J. Amer. Chem. Soc., 1938, **60**, 877—879).—The adsorption of H_2 by Cu, MgO, and Cu–MgO has been determined at 1 atm. and 80—717° K. Adsorption is increased by dispersing Cu in MgO and the product is less likely to sinter than is pure Cu. Physical and activated adsorption processes occur in each case; with MgO they are separated by a wide temp. interval.
E. S. H.

(A) Statistical mechanics of the adsorption of gases at solid surfaces. (B) Adsorption of argon, nitrogen, and oxygen on smooth platinum foil at low temperature and pressures. F. J. WILKINS (Proc. Roy. Soc., 1938, A, **164**, 496—509, 510—531).—(A) The adsorption isotherm is deduced in terms of the mol. concn. in the adsorbed and gaseous phases, the adsorption potential, and certain partition functions. These functions have been evaluated for (i) a three-dimensional gas, (ii) a gas of two-dimensional lateral mobility, and (iii) a Planck oscillator with three degrees of freedom. The relation between the adsorption potential and the differential heat of adsorption is discussed and the usual method of evaluating the latter is criticised.

(B) The adsorption of A, N_2, and O_2 on Pt foil is measured between 77° and 193° K. at pressures between 5×10^{-3} and 2×10^{-1} mm. Deviations from Langmuir's isotherm are found at the lower temp. The fraction of the surface covered at saturation is unity only for A at 77° K.; in all other cases it is $\ll$ unity, and is approx. $\propto \exp(-\beta/T)$. The failure of the Langmuir relation at low temp. is attributed to the intermol. forces which exert an influence on the amount of gas adsorbed. The adsorption potentials of A and N_2 are calc. from the results of the preceding paper and are compared with the vals. calc. from quantum mechanics.
G. D. P.

Influence of the p_H of the medium on the hydrolytic adsorption. R. BRUNS, R. BURSTEIN, N. FEDOTOV, and M. LIVSCHITZ (J. Phys. Chem. Russ., 1938, **11**, 7—17).—An acid solution has been titrated potentiometrically with NaOH both in absence and in presence of platinised charcoal in a H_2 atm.; the difference of [H·] with and without C is a measure of the NaOH adsorbed. The adsorption rises with p_H and is zero at $p_H < 0.4$. Adsorption of H_2SO_4 by platinised charcoal in O_2 becomes zero at $p_H > 8.8$. Adsorption of NaOH by sugar charcoal in O_2 is zero at $p_H < 1.8$, and by SiO_2 gel at $p_H < 8$. SiO_2 gel in H_2 does not accelerate the inversion of sucrose.
J. J. B.

Traube's rule in adsorption from solutions. K. A. POSPELOVA (J. Phys. Chem. Russ., 1938, **11**, 99—104).—The adsorption by quartz from aq. solutions rises in the series MeOH $<$ $Pr^\alpha OH$ $<$ $Bu^\alpha OH$ $<$ iso-C_5H_{11}·OH $<$ C_6H_{13}·OH and $Bu^\alpha CO_2H$ $<$ C_5H_{11}·CO_2H $<$ C_6H_{13}·CO_2H. From gasoline $EtCO_2H$ is more readily adsorbed than $Pr^\alpha CO_2H$; $Bu^\alpha CO_2H$ and C_5H_{11}·CO_2H are not adsorbed. This deviation from Traube's rule is explained by an inverse orientation of acid mols. at the quartz–gasoline interface.
J. J. B.

Adsorption on curved surfaces and emulsification. H. M. CASSEL (J. Physical Chem., 1938, **42**, 475—482).—The thermodynamic theory of adsorption on curved surfaces is developed. It is suggested that emulsions can be stable only if the interfacial density of the emulsifying films for surfaces of larger curvature is $>$ for those of less curvature. Deductions

from the theory are in qual. agreement with experiment.   J. W. S.

Adsorption of solvents by soluble substances. Heat evolved by adsorption preceding dissolution. E. CALVET (J. Chim. phys., 1938, **35**, 69—79).—The heats of adsorption of the vapours of H_2O, EtOH, $COMe_2$, C_6H_6, CCl_4, C_6H_{14}, and CS_2 on $CO(NH_2)_2$, NH_2Ac, NH_2Bz, sucrose, $C_{10}H_8$, and I are recorded. The heats of adsorption of H_2O on $CO(NH_2)_2$ and NH_2Ac are approx. equal to the heats of dissolution.   C. R. H.

Clay. I. Behaviour of dyes and of organic compounds capable of forming salts towards clay and related substances. II. Behaviour of essential oils and their components towards clay and related substances. H. CARLSOHN and G. MÜLLER (Ber., 1938, **71**, [*B*], 858—863, 863—870).—I. Adsorption of Sudan-red *B* (I) by substances which do not contain acidic groups (Al_2O_3, $CaCO_3$) occurs without change of colour and the dye can be removed by much solvent. Air-dried, natural bleaching earths and other clays afford red adsorbates. Artificial bleaching earths activated with mineral acids yield very stable adsorbates with formation of salts, production of which is not due to incompletely removed acid. In the region of loosely-bound H_2O absorption of the dye by artificial clays is a time reaction which proceeds more rapidly as the H_2O content diminishes. Action consists in the displacement of the H_2O by solvent and dye. The change occurs somewhat differently with clays which have been dehydrated at room temp. in a vac. and those which have been dried at 100—400°/atm. pressure. In the region of chemically united H_2O (>400°) the (I) reaction decreases with diminishing H_2O content and becomes negative at about 700°. The activity of the product is not restored by contact with H_2O. Floridin (II), after desiccation, gives a blue adsorbate with (I) in light petroleum; this is stable only in presence of the solvent. With benzanthrone (III) in C_6H_6, (II) yields an adsorbate with green fluorescence whereas artificial activated clays give red-orange to golden-yellow fluorescence colours according to their content of loosely-combined H_2O. Strongly adsorbed solvents displace the dye from the surface of the adsorbent. The dependence of the activity and stability of the clay complex on the H_2O content and thermal treatment of the adsorbent is similar with (I) and (III).

II. 1 c.c. of the substance is mixed with 0·5 g. of highly active franconit at 20° in a test-tube wrapped with cotton-wool and provided with a thermometer; the max. temp. attained are recorded. The temp. effects of many unsaturated alcohols and aldehydes are of the same order as those due to simple adsorption although the compounds are considerably altered. The greatest effects are observed with linalool and citronellal. Esters show somewhat greater effects than those of the corresponding alcohols. The behaviour of hydrocarbons appears to be governed by the nature and position of the double linkings in the mol. The effect of feebly adsorbed solvents on the catalytic reaction is scarcely noticeable. With EtOH, MeOH, and $COMe_2$ the catalytic change is completely inhibited and the temp. effects are solely those due to the action of the solvent on the particular clay. The importance of this protective action for the stabilisation of essential oils within the plant is discussed. The analysis of essential oils by treatment with natural franconit (devoid of catalytic properties) after the pattern of chromatographic analysis is described.   H. W.

Periodical sedimentation from solution during evaporation of the solvent. N. F. JERMOLENKO and K. I. BURANKOVA (J. Phys. Chem. Russ., 1938, **11**, 149—154).—Borax is deposited in rings from H_2O and alcohols. The distances between the rings increase with increasing surface tension of the solvent, with falling temp., falling concn. (down to 0·01%), and increasing bore of the capillary. This behaviour agrees with the theory that the rings are produced because the solution is suspended by capillary forces on the first ring until the wt. of the suspended liquid becomes too large; then the liquid suddenly drops to a new level where the formation of a second ring starts.   J. J. B.

Theory of surface tension of aqueous solutions. M. DOLE (J. Amer. Chem. Soc., 1938, **60**, 904—911).—A general equation for the surface tension of salt solutions has been derived, using a modified form of the Langmuir hyperbolic adsorption equation, and assuming that negative ions are adsorbed at the boundary at a limited no. of points and that at all other points positive and negative ions are excluded from the first adsorption layer. The theory explains certain anomalies in published data.   E. S. H.

Interfacial tensions of some mercury–hydrocarbon oil systems. II. J. L. CULBERTSON and K. D. LUEDTKE (J. Physical Chem., 1938, **42**, 469—473; A., 1937, I, 300).—The method of Bartell and Miller (A., 1928, 945) has been applied to interfaces between Hg and oils. The tensions are lowered by the presence of EtBr or PhBr, which are probably adsorbed in the surface.   J. W. S.

Measurement of very small surface pressures. J. GUASTALLA (Compt. rend., 1938, **206**, 993—995).—Small surface pressures in unimol. films are measured by the curvature of a silk fibre under known tension, which forms a boundary of the film. Isotherms connecting the pressure with the surface area per mol. are given for trioctoin (I), trihexoin, and oleic acid; only (I) obeys Boyle's law.   A. J. E. W.

Theoretical considerations relative to capillary rise, wetting phenomena, and Antonow's rule. F. J. NELLENSTEYN (Chem. Weekblad, 1938, **35**, 283—288).—It is suggested that Antonow's rule (the interfacial tension between two liquid phases = the difference of the surface tensions) is a special case of the general law, that in the systems liquid–liquid–gas, solid–liquid–liquid, and solid–liquid–gas, the surface energies of the mutually saturated phases are such that one of these quantities is always equal to the sum of the other two. Three equations are derived, giving the conditions which correspond with complete, partial, and non-wetting. Exceptions are to be expected if the surfaces contain oriented mols.   S. C.

Spreading of certain substances on a clean surface of water. I. L. A. RAMDAS and P. S. VAIDYANATHAN (Proc. Indian Acad. Sci., 1938, **7**, A, 186—195).—The rate of surface dissolution, R, of camphor (I) floating on H_2O is $>$ the rate of internal dissolution. R varies linearly with the perimeter of contact and appears to be independent of the surface area and depth of the H_2O. Evaporation from H_2O on the surface of which is a unimol. layer of (I) is $>$ from pure H_2O. This is possibly due to convection currents tending to equalise the temp. of H_2O at and below the surface, thereby increasing the surface temp.   C. R. H.

Influence of surface structure of a metal on the spreading and orientation of polar molecules. J. J. TRILLAT and R. FRITZ (J. Chim. phys., 1938, **35**, 45—57).—A polished Fe surface is not wetted by molten stearic acid, but when roughened the amount of wetting increases with the coarseness of the surface, and is greater when the roughening has been carried out transversely than when it has been done longitudinally. When the polished surface is oxidised, corroded by treatment with acid, or covered with a thin layer of graphite, the wetting power is increased.   C. R. H.

Dynamics of liquid movements in capillary systems (Lloyd effect). W. OSTWALD and H. ERBRING (Kolloid-Z., 1938, **83**, 13—19).—When a cylinder containing a solution is connected to one containing the solvent by a strip of filter-paper the ends of which dip into the respective liquids, the level of the solvent falls and that of the solution rises. The effect is increased by raising the concn. of the solution, by lengthening the connecting strip, and in other ways. It is not due to isothermal distillation or to differences of surface tension, but represents a siphon effect.   F. L. U.

Capillary systems. XX (1). Dynamics of the capillary siphon. XXI (1). Localised reactions in a field of diffusion or of flow. E. MANEGOLD and K. SOLF (Kolloid-Z., 1938, **83**, 19—23, 24—30).—XX. If a vessel containing H_2O is connected with one containing an aq. solution by a siphon filled with H_2O, transference of H_2O to the solution (cf. preceding abstract) occurs as a result of diffusion of the solute into one limb of the siphon causing a difference of density. By measuring the velocity of transference the diffusion coeff. of the solute may be calc. Examples are given.

XXI. Instances of reactions in which one reactant is fixed in position whilst the other is in process of flow or diffusion are discussed. A model of reactions of the type A (fixed) + (B + C) (moving) is given and treated mathematically.   F. L. U.

Capillary systems. XII (5). Cylindrical sphere-screws of any pitch. Torsion of sphere-screws. Sphere-screws as models for phyllotaxis. E. MANEGOLD and H. LINDEMANN. (6) **Characterisation of the screw linkage in interpenetrating cylindrical and elliptical screws.** E. MANEGOLD (Kolloid-Beih., 1938, **47**, 196—224, 225—253; cf. A., 1935, 443).—Mathematical.   F. L. U.

Drop phenomenon. W. RIEDEL (Kolloid-Z., 1938, **83**, 31—32).—Under certain conditions a drop of liquid falling into the same liquid in bulk can sink below the surface and slowly rise to the surface while maintaining its identity. In such a case the drop is separated from the bulk liquid by a layer of air, the thickness of which, for 0·5% Na oleate, is of the order 5×10^{-4} cm. The phenomenon is not observed with H_2O.   F. L. U.

Nature of sliding and the analysis of friction. F. P. BOWDEN and L. LEBEN (Nature, 1938, **141**, 691—692).—Experiments with an apparatus which records fluctuations in frictional force show that this force is not const. but fluctuates violently. Sliding is not a continuous process, but proceeds by an alternation of "stick and slip." Metallic and other surfaces, prepared and polished in different ways, show the phenomenon to be a general one. Behaviour may be essentially the same even after lubrication; certain long-chain fatty acids, however, cause continuous sliding. Surface temp. remains const. during "stick," but rises rapidly at the instant of "slip," and then falls.   L. S. T.

Application to flotation of Curie's law of the growth of crystal faces. F. BARILLET and (MLLE.) A. CHOISNARD (Compt. rend. XVII Cong. Chim. Ind., 1937, 525—529; cf. A., 1937, I, 359).—The parallelism shown by capillary consts. and degree of supersaturation in relation to the rate of crystal growth from solution (i) under equilibrium conditions (Curie), and (ii) with rapid growth but with negligible diffusion (Valeton), suggests that interfacial tension at all crystal faces is increased (unequally) by supersaturation. Experiments on the distribution of fine-grained salts between non-miscible solvents, and observations on crystal flotation, confirm this view; its technical scope is indicated.   I. McA.

Orientation of molecules and structure of fatty acid crystals. D. L. TALMUD (J. Phys. Chem. Russ., 1938, **11**, 158—159).—When palmitic acid crystallises on a H_2O surface it forms hydrated crystals of ρ 1·192. These crystals as well as the flakes pptd. by an acid from NH_4 palmitate solutions adsorb NH_3, electrolytes, etc. more readily than charcoal.   J. J. B.

Dilatancy. E. J. W. VERWEY and J. H. DE BOER (Rec. trav. chim., 1938, **57**, 383—389).—The "liquefaction" on the addition of traces of oleic acid, of pastes of Fe, Ni, SiO_2, talc, Fe_2O_3, $BaCO_3$, or glass powders to CCl_4, C_6H_6, n-C_6H_{14}, or ligroin has been investigated, and the liquid masses so obtained have been examined for dilatancy phenomena. There is a strong parallelism between "liquefaction" and dilatancy. It is supposed that in a paste the solid particles adhere at several points due to van der Waals–London attraction forces and that the liquid fills up the interstices, the liquid mols. also being bound by the solid particles so that they act as bridges and thus increase the adhesion energy. Addition of oleic acid expels the liquid mols. if the polar forces between CO_2H groups and the surface of the solid particles are sufficiently large. The non-polar ends of the acid mols. are weakly bound to

the liquid mols. and to oriented acid mols. on adjacent particles, thus permitting sliding of the particles against each other, resulting in " liquefaction."
　　　　　　　　　　　　　　　　C. R. H.

Solvent effect in dielectric polarisation. III. Behaviour of ethyl alcohol in certain ethers. G. Thomson (J.C.S., 1938, 460—464; cf. A., 1937, I, 507).—The variation of polarisation of EtOH in Pr^β_2O, Bu^α_2O, amyl ether, and dioxan with [EtOH] has been determined. The solutions in Pr^β_2O and dioxan show definite max. in the polarisation-concn. curves. The vals. of the polarisation at infinite dilution are high (in Pr^β_2O 91·9, Bu^α_2O 99·5, amyl ether 112, dioxan 79·2). These results can be explained by supposing that a H bond is formed between the ether and the alcohol, i.e., $R_2O\cdots HOR$. Evidence for the formation of such bonds between ethers and alcohols is obtained from cryoscopic determinations with solutions of $C_{10}H_8$ and $C_6H_4(NO_2)_2$ in dioxan, C_6H_6 and C_6H_{14} in Et cetyl ether, and $C_{10}H_8$ in Ph_2O.
　　　　　　　　　　　　　　　　A. J. M.

Variation with concentration of the density and refractive index of very dilute aqueous solutions of strong electrolytes. Differential method for the determination of small differences in density. W. Prang (Ann. Physik, 1938, [v], 31, 681—713).—Measurements of d have been made, by the method described, for solutions of NaCl, KCl, Na_2SO_4, $MgSO_4$, Na_2CO_3, and K_2CO_3 at concns. from 0·0007n to 0·1n. The square-root law of Redlich and Rosenfeld (A., 1931, 905) is only approx. obeyed. Better agreement is obtained by treating separately results above and below ~0·01n. Deviations for Na_2CO_3 and K_2CO_3 are ascribed to hydrolysis and the degree of hydrolysis is calc. The variation of n for aq. solutions of Na_2CO_3 and K_2CO_3 with concn. from 0·003n to 0·09n has been investigated and equiv. refractivities have been calc. No anomalies were observed.
　　　　　　　　　　　　　　　　O. D. S.

Falkenhagen's theory of viscosity of dilute aqueous solutions of strong electrolytes. E. Asmus (Z. Physik, 1938, 108, 491—499).—Viscosities of $MgSO_4$, $CuSO_4$, and $ZnSO_4$ in dil. aq. solution are related to molar concn. Results for $CuSO_4$ and $ZnSO_4$ are in agreement with Falkenhagen's theory. In the case of $MgSO_4$, the discrepancy first noted by Cox and Wolfenden (A., 1934, 959) is confirmed.
　　　　　　　　　　　　　　　　L. G. G.

Experimental proof of Falkenhagen's theory of the viscosity of aqueous solutions of strong electrolytes. E. Asmus (Naturwiss., 1938, 26, 200).—The plot of $\psi = (\eta/\eta_0) - 1$ against $c^{\frac{1}{2}}$ for $MnSO_4$ is a straight line except at very low dilutions. The extrapolated val. of A in the expression $\psi = A + Bc^{\frac{1}{2}} + Dc^{\frac{3}{2}}$ is 0·023. Similar results are given by $MgSO_4$.
　　　　　　　　　　　　　　　　A. J. M.

Viscosity and particle form. A. Peterlin (Naturwiss., 1938, 26, 168—169).—Theoretical. A method of calculating the sp. viscosity of dil. suspensions of solid, ellipsoidal, rotation-symmetrical particles is given for particles of diameter $<10^{-4}$ cm. but large with respect to solvent mols.
　　　　　　　　　　　　　　　　A. J. M.

Influence of a magnetic field on Brownian movement. C. Schaefer (Ann. Physik, 1938,

[v], 32, 190—194).—Theoretical. The influence of a magnetic field on Brownian rotation is discussed. It is shown to increase with increasing electrical conductivity and increasing radius of the particles. For Cu spheres of radius 6 μ. the effect of a magnetic field of 2×10^4 oersted would be equiv. to an increase of $>10\%$ in the viscosity of the supporting medium.
　　　　　　　　　　　　　　　　O. D. S.

Modification of the hydrogen-ion activity of metallic salt solutions by suspended substances. F. Reiff, R. Neumann, and R. A. J. Schulz (Z. anorg. Chem., 1938, 237, 145—159).—The rate of inversion of sucrose in conc. salt solutions is much increased by suspended clays which have previously been treated with acids. The effect is not caused by acid absorbed by the clay, and only a part of it is caused by ion-exchange. The suggestion that it is due to the presence of an active surface is confirmed by the observation that a marked rise in temp. occurs when the clays are suspended in turpentine. Possible mechanisms are discussed.
　　　　　　　　　　　　　　　　F. J. G.

X-Ray diagram, double refraction, and viscosity of streaming sols. K. Hess, H. Kiessig, and W. Philippoff (Naturwiss., 1938, 26, 184—186).—The results of the investigation of the double refraction, η, and X-ray diagrams of sols containing cryst. anisodiametrical particles are discussed. The double refraction of streaming sols indicates the form of streaming and the direction of orientation of the particles. Similar information is afforded by η, whilst X-ray data are determined by the structure and form of the particles and their no. as well as by the angle of orientation.
　　　　　　　　　　　　　　　　A. J. M.

Effect of ultrasonic waves on solutions of highly polymerised substances. E. Thieme (Physikal. Z., 1938, 39, 384—390).—The effect of ultrasonic waves on the viscosity of solutions of gelatin, agar, and gum arabic has been investigated. The viscosity is decreased, the decrease being the greater the greater is the amplitude of the waves. The effect depends on concn. and reaches a max. which moves towards smaller concn. as the mol. wt. increases, and the amplitude of the waves decreases. The effect is the greater the higher is the mol. wt. The decrease in viscosity is not exponential in relation to the period during which the solution is submitted to the action of the waves, although the curve becomes more nearly exponential as the period of exposure is lengthened.
　　　　　　　　　　　　　　　　A. J. M.

Light-scattering in emulsions. I. Dilute simple emulsions. R. S. Krishnan (Proc. Indian Acad. Sci., 1938, 7, A, 98—103; cf. A., 1935, 821).—Measurements of ρ_u, ρ_v, and ρ_h are made for dilute aq. emulsions, prepared by (i) dispersion, (ii) condensation methods, of castor, paraffin, bergamot, lavender, and lemon oil. For castor oil, ρ_u increases, ρ_v and ρ_h decrease, with decreasing λ, in contrast with dispersion in sols (A., 1937, I, 514). The spherical droplets of (ii) are smaller than in (i) with $d \sim 0\cdot1—0\cdot5$ μ. The small vals. of ρ_v and ρ_h, which are greater in (ii) than in (i), are due to depolarised secondary scattering.
　　　　　　　　　　　　　　　　I. McA.

Reciprocity theorem in colloid optics. **(Oriented particles.)** R. S. KRISHNAN (Proc. Indian Acad. Sci., 1938, **7**, A, 91—97; cf. A., 1937, I, 614; 1938, I, 247).—Measurements are recorded of the intensities of the scattering components and of the depolarisation factors ρ_u, ρ_v, and ρ_h, for white light transversely scattered from graphite sols subject to a magnetic field (0—8000 gauss) applied (i) parallel to the incident beam, (ii) parallel to the observed scattered beam, and (iii) perpendicular to the plane (P) of incident and observed beams. The marked changes are due to orientation (near saturation at the upper field limit) of the planes of the disc-like particles, parallel to the field. In confirmation of theory, only in (iii), where orientation is random in P, is the reciprocity relation $\rho_u = (1 + 1/\rho_h)/(1 + 1/\rho_v)$ satisfied for non-zero fields. The crystal analogy is discussed.   I. McA.

Separation of emulsions [demulsification]. D. F. CHEESMAN and A. KING (Kolloid-Z., 1938, **83**, 33—37).—The rate of separation of the disperse phase in H_2O–C_5H_{11}·OH emulsions containing KCl or KI is in accord with Lederer's theory (A., 1935, 701) only when they are neutral or alkaline and of slight stability. Large divergences occur both with more stable systems and with the less stable emulsions containing acid.   F. L. U.

Conditions of formation of hydrosols. I. N. N. ANDREEV (J. Gen. Chem. Russ., 1937, **7**, 2926—2929).—When org. compounds are dissolved in EtOH or $COMe_2$ and the solutions shaken with H_2O, stable emulsions are obtained only in the case of polar compounds (alcohols, acids, esters, $CHCl_3$, azoxycompounds).   R. T.

Stability of colloidal gold under hydrothermal conditions. C. FRONDEL (Econ. Geol., 1938, **33**, 1—20).—The stability of unprotected Au sols (from $HAuCl_4$ and H_2O_2) towards NaCl increases with rise in temp. and with increase in dilution of the sol. Unprotected sols containing no added electrolyte coagulate spontaneously between 150° and 250°. Colloidal SiO_2 protects colloidal Au both against NaCl and against spontaneous coagulation when the temp. is raised. Protection is accompanied by a reversal of charge of the sol. The protective action of SiO_2 against electrolyte increases with increasing dilution of the Au sol. Protected sols containing no added electrolyte are stable at 350°, but coagulate spontaneously at 410°. In the negative zone of stability protected sols are inert towards NaOH and sensitive to HCl; in the positive zone, the reverse is true. Unprotected sols behave similarly to negative protected sols, but the tolerance towards NaOH is less, and the sensitivity to HCl is greater. SiO_2 sols are colloidal at 25° and 100°, and probably up to 350°, in dilutions ⩽ the solubilities reported by Hitchen (A., 1935, 292) and by Gruner (Econ. Geol., 1930, **25**, 700), who probably were dealing with a peptisation equilibrium which simulates a true solubility. The conditions of transportation and deposition of Au in acid and alkaline hydrothermal solutions are discussed.   L. S. T.

Effect of X-radiation on the ζ-potential of colloidal graphite. (A) I. KEMP. (B) J. A. CROWTHER (Nature, 1938, **141**, 609).—(A) Since most living cells contain surface-active substances it is unlikely that the effect of X-rays on the surface charge of a colloid reported previously (A., 1937, I, 461, 614) can occur during the irradiation of cancerous animal tissue.
(B) A reply to the above.   L. S. T.

Effect of ethyl alcohol on the viscosity of solutions of osogenic colloids. J. CLUZET and P. PONTHUS (Compt. rend. Soc. Biol., 1938, **127**, 1125—1127).—The addition of EtOH to agar solutions causes an increase in η due to dehydration of the agar micelle.   H. G. R.

Effect of the concentration of ethyl alcohol on the stability of osogenic colloids. J. CLUZET and P. PONTHUS (Compt. rend. Soc. Biol., 1938, **127**, 1127—1129).—Up to 2% EtOH decreases the stability of agar solutions and produces partial flocculation, but an increase in the no. of dispersed granules, probably due to a suppression of the forces of hydration, occurs between 3 and 40%. Above 40% the no. of dispersed granules decreases.   H. G. R.

Influence of surface-active anions and cations on silver halide sols and photographic emulsions. II. Absorption of surface-active alkylpyridinium cations by silver iodide. A. LOTTERMOSER and R. STEUDEL (Kolloid-Z., 1938, **83**, 37—51; cf. A., 1938, I, 261).—A method of analysing very dil. solutions of alkylpyridinium chlorides is described. The absorption of the dodecyl compound (I) by AgI sols was determined by analysis of the ultrafiltrate. At very low concns. of (I) complete absorption occurs up to a point where the total cross-sectional area of the absorbed (I) mols. is of the same order of magnitude as the surface area of the AgI particles. Beyond this point there is a slow linear rise, attributed to aggregation of (I) mols. The absorption is not represented by the usual adsorption isotherm, but consists in the formation of a complete unimol. layer by virtue of the capillary-active character of the (I) cations. The results are discussed in connexion with the behaviour of photographic emulsions which have been treated with surface-active ions.   F. L. U.

Chemical properties of aërosols. R. E. LIESEGANG (Kolloid-Z., 1938, **83**, 217—221).—A review.

Investigation of periodic reactions by methods of physico-chemical analysis. XIII. F. M. SCHEMJAKIN and V. E. KRAUZE (J. Gen. Chem. Russ., 1938, **8**, 83—92).—The method of Ostwald (A., 1926, 1202) gives more exact results than does that of Morse (A., 1930, 1117) in the periodic pptn. of neutral-red with $K_2Cr_2O_7$, or of methylene-blue with $HgCl_2$ or $K_4Fe(CN)_6$, in H_2O.   R. T.

Gel formed by grinding together ferrous and ferric salts. T. KATSURAI (Kolloid-Z., 1938, **83**, 37).—By grinding 1 part of $FeSO_4,7H_2O$ with 2 parts of $FeCl_3,6H_2O$ a gel is formed which is ferromagnetic and sol. in H_2O.   F. L. U.

Distribution of solutes in silica gel. S. REDFERN and W. A. PATRICK (J. Physical Chem., 1938, **42**, 497—505)—The distribution of KCl, KBr, NaCl, NaBr, LiCl, $MgCl_2$, $CaCl_2$, $SrCl_2$, $BaCl_2$, and glucose

between SiO_2 gel (85%, 70%, and 50% H_2O) and H_2O has been studied at 25°. The molal concn. of solute in the gel is < that in the solution, and, assuming that part of the H_2O is bound by the SiO_2, it would appear that the amount of bound H_2O decreases with increasing SiO_2 content of the gel. The results cannot be explained satisfactorily on the basis of bound H_2O, adsorption, or the Donnan equilibrium.
                                                    J. W. S.

Thixotropic behaviour of silica gels. H. FREUNDLICH and D. W. GILLINGS (J.C.S., 1938, 546).—SiO_2 sols yield thixotropic gels over the range p_H 8·5—9·5. This is also the range in which the sols can be coagulated by electrolytes (cf. A., 1926, 677).
                                                    F. L. U.

Variations in viscosity of cellulose nitrate sols. II. A. A. MOROZOV and A. V. PAMFILOV (J. Gen. Chem. Russ., 1938, 8, 175—181; cf. A., 1938, I, 138).—The progressive fall in the η of solutions of cellulose nitrate in PhMe–$COMe_2$ is ascribed to destruction of structure, and is associated with a gel → sol transformation.
                                                    R. T.

Diffusion of hydrogen through regenerated cellulose and some cellulose derivatives. J. H. DE BOER and J. D. FAST (Rec. trav. chim., 1938, 57, 317—332).—The permeabilities of celluloid, cellulose nitrate and triacetate (I) for H_2 are of the same order of magnitude and are 200—300 times the permeability of regenerated cellulose (II). The activation energies of the four types are of the same order of magnitude, the vals. for (I) and (II) being approx. equal. The greater permeability of (I) is probably due to diffusion taking place between the micelles and to the no. of paths available per cross-section being > in (II), rather than to a smaller combining energy between the main chains of micelles with a correspondingly smaller energy necessary for H_2 displacement.
                                                    C. R. H.

Mechanism of deformation and fine structure of hydrous cellulose. IV. Micellar structure of hydrous cellulose fibres and processes involved in their deformation. P. H. HERMANS (Kolloid-Z., 1938, 83, 71—83; cf. A., 1938, I, 139).—The data presented in the previous papers of the series are discussed and a comprehensive theory is put forward.
                                                    F. L. U.

Micellar structure of cellulose. O. KRATKY and F. SCHOSZBERGER (Z. physikal. Chem., 1938, B, 39, 145—154).—X-Ray work on ramie fibres, in which finely divided Au has been deposited, shows increases of 100—200% in the intensities of the reflexions occurring at the smallest glancing angle and of 100% for other reflected rays. The Au particles are deposited in the very small holes in the individual micelles as distinct from the large empty spaces of the micellar structure. After dissolving out the Au, all the intensities are approx. the same as before impregnation.
                                                    T. H. G.

Influence of inorganic and organic substances on the viscosity of solutions of pectins. T. K. GAPONENKOV (J. Gen. Chem. Russ., 1937, 7, 2906—2908).—The η of aq. araban is raised by addition of alkalis [KOH, $Ca(OH)_2$, $Ba(OH)_2$], as a result of salt formation, and is lowered by EtOH, $COMe_2$, or EtOH–Et_2O, owing to dehydration of the araban particles; KCl or sucrose has no effect.   R. T.

Hydration and denaturation of proteins. D. M. WRINCH (Phil. Mag., 1938, [vii], 25, 705—740).—The cyclol hypothesis of protein structure is developed with reference to hydration and denaturation of globular proteins. It is suggested that hydration consists of intra- and inter-mol. H_2O and also H_2O which is directly associated with the fabric of the mol., whilst denaturation, particularly of films, consists in breaking down the cyclol cage structures. Experimental results relating to the structures of films are compared with deductions based on this theory.
                                                    T. H. G.

Electrokinetic aspects of surface chemistry. V. Electric mobility and titration curves of proteins and their relationship to the calculation of radius and mol. wt. L. S. MOYER and H. A. ABRAMSON (J. Biol. Chem., 1938, 123, 391—403).—Electric mobility and titration curves for collodion particles in solutions of horse serum-albumin (I) and total globulin have been obtained over a wide p_H range and at const. ionic strength, and have been compared with earlier data for pseudoglobulin (II) (cf. A., 1938, I, 191). The mobilities of (I) and (II) are ∝ the bound H˙. Semiempirical equations derived for the radii and mol. wt. of protein mols. give vals. in good agreement with vals. calc. from other data.
                                                    C. R. H.

Negative non-amphoteric biocolloids as macromolecular electrolytes. I. Reciprocal hexol number and electrochemical equivalent weight. Charge density and stability of sols. H. G. B. DE JONG and P. H. TEUNISSEN (Kolloid-Beih., 1938, 47, 254—320).—The substances investigated were Na arabate, pectinate, pectate, and oleate ("carboxyl colloids"), Na agar, Na carragheen, K chondroitinsulphate ("sulphate colloids"), and Na nucleate and phosphatides from soya bean and ovolecithin ("phosphate colloids"). Electrophoresis measurements in presence of salts with uni-, bi-, and ter-valent cations are said to show reversal of the sign of charge, and concns. corresponding with the iso-electric points are given. Similar experiments with hexol nitrate permit the calculation of the equiv. wt. of the respective substances. The equiv. wt. thus calc. is about 85% of that determined by chemical analysis, and the agreement supports the view that the behaviour of the substances towards electrolytes, and their negative charge and stability, are due to the no. and kind of ionising groups present.
                                                    F. L. U.

Physico-chemical states of equilibrium. J. L. FINCK (J. Franklin Inst., 1938, 225, 411—435).—Mathematical. The assumptions involved in the thermodynamic theory of equilibrium states are discussed. A theory is developed which postulates that all reactions require a catalyst and that individual atoms and mols. can be constrained by a catalyst to take and retain any associated or dissociated form. It is shown that a single gas phase is analogous thermodynamically to a liquid–vapour system, and the Clapeyron–Clausius equation is generalised, the

van't Hoff isochore being deduced as a special case. Explanations are given for endothermic and exothermic reactions and the crit. point. J. W. S.

Principles of the thermodynamics of solutions and the van't Hoff model. (MISS) J. JAŹWIŃSKA (Przemysł Chem., 1938, **22**, 49—66).—Mathematical. Expressions are derived for the external work of diffusion of one liquid in another, and for the heat of mixing of two liquids. Thermodynamic derivations of the equations of Duhem, Wrewsky, and Kirchhoff, and of Doroschevski's rule, are given. R. T.

Cyclic process differing from that of Carnot. The cyclic process considered qualitatively. A. K. VLČEK (Chem. Obzor, 1937, **12**, 206—210). F. R.

Strength of picric acid. H. VON HALBAN and M. SEILER (Helv. Chim. Acta, 1938, **21**, 385—392).— The thermodynamic dissociation const. of picric acid in H_2O at 20°, derived from photo-electric measurements, is 0·381. Data are also recorded for picric acid in aq. KCl, NaCl, HCl, and EtOH, respectively. E. S. H.

Effect of temperature on the dissociation of sulphuric acid. P. KOTESWARAM (Current Sci., 1938, **6**, 445—446).—Changes in the structure, intensity, and frequencies of the Raman lines 416, 558, 928, 1048, 1178 at 30° and 200° are recorded. The similarity between the effects produced by a rise in temp. and by dilution indicates that H_2SO_4 dissociates into H' and HSO_4' at higher temp. There is some evidence of the formation of SO_4'' ions at 200°. L. S. T.

Physicochemical properties of ascorbic acid.— See A., 1938, II, 217.

Heteropolar molecules. S. KILPI (Z. physikal. Chem., 1938, **181**, 473—474).—An error in Kern's application of the Michaëlis equation for the degree of dissociation of acids is pointed out (cf. A., 1938, I, 192). The titration curve of the polyacrylic acids cannot be followed by stepwise neutralisation. H. J. E.

Sugar alcohols. X. Effect of certain sugar alcohols and their anhydrides on the dissociation of boric acid. F. K. BELL, C. J. CARR, W. E. EVANS, and J. C. KRANTZ, jun. (J. Physical Chem., 1938, **42**, 507—513; cf. A., 1936, 289, 1463).—The electrometric curve of H_3BO_3, titrated with 0·1N-NaOH, has been studied in presence of styracitol (I), polygalitol (II), l-arabitol (III), β-d-mannoheptitol (IV), pinitol (V), and hydroxypyruvaldehyde (VI). The displacement by (IV) is ≯ that of mannitol and sorbitol, whilst the effects of (I), (II), and (V) are approx. equal. (VI) forms a complex which requires > the theoretical amount of NaOH for neutralisation. This is attributed to enolisation. The effect of (III) is < that of mannitol and sorbitol, and ≪ that of α-mannitan. The results with syrupy and α-mannitan differ quantitatively and evidence is given that they have different structures. The conductivities of 0·5M-H_3BO_3 containing the alcohols are recorded. J. W. S.

Rational unit for the p_H value. J. GERSTLE (Trans. Electrochem. Soc., 1938, **73**, Preprint 28, 391—399).—A new unit of acidity, the " decihydron," represented by 10 log $(aH')_1/(aH')_2$ where $(aH')_1$ is the H-ion activity of the solution under examination and $(aH')_2$ that of some comparison standard, is suggested. J. W. C.

Base strengths and absorption spectra of p-methylacetophenone and p-bromoacetophenone. L. A. FLEXSER and L. P. HAMMETT (J. Amer. Chem. Soc., 1938, **60**, 885—886).—Base strengths have been calc. from measurements of the ultraviolet absorption of solutions of the compounds in H_2SO_4–H_2O. The effect of substituents on the free energy change for the basic ionisation of COPhMe is about 2·56 times that for the acid ionisation of BzOH. E. S. H.

Extent of dissociation of salts in water. VII. Conductivity of mixtures. C. W. DAVIES (J.C.S., 1938, 448—453; cf. A., 1938, I, 196).—Available data for the conductivities of aq. salt mixtures are discussed. In every recorded case the conductivity change on mixing two salt solutions, so far as it is not accounted for by mobility changes, is of the sign and magnitude predicted on the basis of the known dissociation consts. Deviations from additivity cannot, however, be taken as evidence of complete dissociation. F. L. U.

Slow hydrolysis of ferric chloride in dilute solution. I. Change in conductance, colour, and chloride-ion concentration. A. B. LAMB and A. G. JACQUES (J. Amer. Chem. Soc., 1938, **60**, 967—981).—The results of conductometric, colorimetric, and electrometric investigations over a wide range of concn. and temp., with and without addition of acids, confirm the increased rate of hydrolysis with increasing dilution or rise of temp., the induction period in conc. solutions, and the retarding effect of HCl or HNO_3. H_2SO_4 exerts an initial acceleration due to adsorption of SO_4'' by the colloidal $Fe(OH)_3$, but the subsequent influence is retarding. The extent of the final conversion into $Fe(OH)_3$ and HCl has been calc. for a range of concns. and temp.; conversion is the more nearly complete the higher is the temp. and the lower the initial [FeCl₃]. The final state is a heterogeneous equilibrium, which adjusts itself slowly at low temp. The amount of adsorption of HCl and $FeCl_3$ by colloidal $Fe(OH)_3$ is slight. E. S. H.

Oxides of thiocarbamide.—See A., 1938, II, 176.

Application of the Raman effect to the study of complexes in solutions containing mercuric bromide and an alkali bromide. (MLLE.) M. L. DELWAULLE, F. FRANÇOIS, and J. WIEMANN (Compt. rend., 1938, **206**, 1108—1110).—For vals. of the mol. ratio (R) of $HgBr_2$ to alkali bromide >1, new Raman frequencies of 179—183 and <38 cm.⁻¹ are observed in aq. or EtOH solution which are attributed to the presence of the $(HgBr_3)'$ complex. For R <½ frequencies of 167—171 and 42—46 cm.⁻¹ are observed, which are attributed to the $(HgBr_4)'$ complex. The $(HgBr_4)'$ ion is tetrahedral with the Hg at the

centre. In $(HgBr_3)'$ the Hg atom is at a corner of the tetrahedron. H. J. E.

Buffer intensities of milk and milk constituents. III. Buffer action of calcium citrate.—See A., 1938, III, 408.

Transition temperature of sodium sulphate heptahydrate. E. R. WASHBURN and W. J. CLEM (J. Amer. Chem. Soc., 1938, 60, 754—757).—The transition point for $Na_2SO_4,7H_2O \rightleftharpoons Na_2SO_4$ is $23.465 \pm 0.004°$. This point is proposed as a secondary standard in calibrating thermometers. E. S. H.

Transition temperatures of lithium chloride hydrates. M. P. APPLEBEY and R. P. COOK (J.C.S., 1938, 547; cf. A., 1935, 35).—Transition temp. for $LiCl \rightleftharpoons LiCl,H_2O$, and $LiCl,H_2O \rightleftharpoons LiCl,2H_2O$ have been determined dilatometrically. The most probable vals. are $93.55 \pm 0.05°$ and $19.1 \pm 0.05°$, respectively. F. L. U.

Melting diagrams of binary mixtures of the halides of sulphur, phosphorus, arsenic, antimony, bismuth, tin, and aluminium. N. A. PUSHIN and J. MAKUC (Z. anorg. Chem., 1938, 237, 177—182).—Equilibrium diagrams for the following systems are given : $AsBr_3$–PBr_3, $AlCl_3$–$AlBr_3$, $BiBr_3$–$AsBr_3$, $BiBr_3$–$SbBr_3$, $AsBr_3$–PBr_5, $SbBr_3$–PBr_3, $SbBr_3$–S_2Br_2, $SbBr_3$–$SnBr_4$, $SbBr_3$–Br, S_2Br_2–PBr_5, $SnBr_4$–$AlBr_3$, $SnBr_4$–S_2Br_2, $AlBr_3$–Br, $AlBr_3$–PBr_3, $SnBr_4$–PBr_3, $SnCl_4$–PCl_3, $AsBr_3$–Br, $AsBr_3$–S_2Br_2, $AlBr_3$–$AsBr_3$, $SnBr_4$–$AsBr_3$, and $BiBr_3$–$SnBr_4$. $AsBr_3$ and PBr_3 form a complete range of solid solutions, and $AlBr_3$ forms solid solutions with $AlCl_3$ up to 30 mol.-% of the latter. In other cases solid solutions are not formed. No compounds are formed in any of the systems. $BiBr_3$ and $SnBr_4$ form two liquid layers. F. J. G.

Affinity. LXXVIII. Nickel phosphides. W. BILTZ and M. HEIMBRECHT (Z. anorg. Chem., 1938, 237, 132—144).—The system Ni–P has been studied by means of tensimeter curves and X-rays. The existence of NiP_3, NiP_2, and Ni_2P is confirmed and a new *phosphide* of composition approx. Ni_6P_5 is indicated. F. J. G.

Dissociation pressures of the hydrides and deuterides of rubidium and cæsium. A. BOROCCO (Compt. rend., 1938, 206, 1117—1118; cf. A., 1937, I, 420).—Data are recorded for the range 190—330°. The dissociation pressures of the deuterides are approx. double those of the hydrides.

H. J. E.

Thermal dissociation of manganese dioxide and barium manganate. Entropy and heat of formation of manganese oxide. A. F. KAPUSTINSKI and K. S. BAJUSCHKINA (J. Phys. Chem. Russ., 1938, 11, 77—83).—For the O_2 pressure above MnO_2 the equation $\log p = -31,540/4.573T + 8.126$ (p in atm.) is found. For $BaMnO_4$ $\log p = -61,516/4.573T + 15.546$. The dissociation pressure of MnO_2 is not affected by admixture with $BaMnO_4$ but that of BaO_2 is increased in the same circumstances.

J. J. B.

Reflexion and absorption of visible radiation in the system potassium chloride–cupric chloride. G. GLOCKER and R. E. DIETMEIER (J.

Amer. Chem. Soc., 1938, 60, 753—754).—Anhyd. $CuCl_2$ and its mixtures with KCl show a max. of reflexion at 6404 a. An absorption max. in the mixtures at 5387 a. is ascribed to $CuCl_3'$.

E. S. H.

Mutual solubilities of hydrocarbons. II. F.-p. curves of dotriacontane (dicetyl) in dodecane, decane, octane, hexane, cyclohexane, and benzene. W. F. SEYER (J. Amer. Chem. Soc., 1938, 60, 827—830; cf. A., 1936, 1456).—F.-p. data are recorded. The curves are almost coincident for mixtures containing >40 mol.-% of dicetyl.

E. S. H.

Liquid–vapour equilibria of binary systems of nitrotoluenes. E. LEVIN and I. SCHTERN (J. Appl. Chem. Russ., 1938, 11, 426—441).—The fusion diagrams given by previous workers for the systems o- + m-, o- + p-, and m- + p-$C_6H_4Me \cdot NO_2$ are in the main confirmed; a 3 : 2 compound, m.p. 24.4°, is found in the first system. B.p. and vapour phase composition curves are given for the systems at 120 mm. pressure. Varying the pressure does not affect the results of fractional distillation of the mixtures.

R. T.

Ternary system KF–HF–H_2O. I. TANANAEV (J. Appl. Chem. Russ., 1938, 11, 214—222).—The solid phases at 0°, 20°, and 40° are KF,1, 2, 3, and 4HF, together with 2KF,5HF. R. T.

Complex of lead and lithium iodides. L. ROGER (Compt. rend., 1938, 206, 1181—1183; cf. A., 1937, I, 412).—PbI_2, $LiI,3H_2O$, and $PbI_2,LiI,4H_2O$ (I), but not $PbI_2,2LiI,4H_2O$ (cf. A., 1899, ii, 222) occur as solid phases in the system PbI_2–LiI–H_2O at 0—60°; an equilibrium diagram is given. The region of stability of (I) becomes smaller at higher temp., and another solid phase containing less H_2O than (I) ultimately occurs. A. J. E. W.

Liquidus surface of the system sodium, lithium, and calcium nitrates. A. LEHRMAN and D. BRESLOW (J. Amer. Chem. Soc., 1938, 60, 873—876).—Recorded m.p. are : $LiNO_3$ 251.4°, $NaNO_3$ 305.5°. The system has a ternary eutectic at 170.3°, with $NaNO_3$ 40, $LiNO_3$ 30.5, $Ca(NO_3)_2$ 29.5%.

E. S. H.

Polytherms of the ternary system KH_2PO_4–$NH_4H_2PO_4$–H_2O from −4.45° to 40°. V. A. POLOSIN and R. K. OZOLIN (Kalii, 1937, No. 10, 31—34).—Data relating to the 0°, 10°, 20°, 25°, 30°, and 40° isotherms and the invariant points are recorded. KH_2PO_4 and $NH_4H_2PO_4$ form a continuous series of solid solutions. The binary systems KH_2PO_4–H_2O and $NH_4H_2PO_4$–H_2O have simple eutectics and do not form hydrates. D. G.

Ternary system selenium dioxide–barium selenite–water at 0°, 25°, and 50°. J. L. NEAL, jun., and C. R. McCROSKY (J. Amer. Chem. Soc., 1938, 60, 911—914).—At each temp. the stable, solid phases are H_2SeO_3, $BaSe_2O_5$, and $BaSeO_3$. The reported existence of $BaSeO_3,H_2O$ cannot be confirmed. E. S. H.

Intersection of nodes in diagrams of ternary systems. D. N. TARASENKOV and I. A. PAULSEN (J. Gen. Chem. Russ., 1938, 8, 76—82).—The nodes

of the ternary liquid systems EtOH–H_2O–C_6H_6, –PhMe, or –*cyclo*hexane, AcOH–H_2O–C_6H_6 or –$CHCl_3$, and $COMe_2$–H_2O–$CHCl_3$ are shown, when produced, to intersect in a single point. R. T.

Three-component systems. I. Systems composed of sulphuric acid, water, and either zinc sulphate or magnesium sulphate. II. The system : zinc sulphate, magnesium sulphate, and water. N. K. JOSHI and S. C. DEVA-DATTA (Proc. Indian Acad. Sci., 1938, **7, A**, 130—138, 139—143).—I. Solubility data are recorded for 30° and 45°. At 30°, with increasing [H_2SO_4], the hepta-, hexa-, and mono-hydrates appear successively in the case of both salts ; at 45° $ZnSO_4,7H_2O$ is not stable. There is no evidence of intermediate hydrates.

II. The system has been studied at 30° and 45°. No double salts are formed but solid solution formation is indicated. I. McA.

Influence of ammonium sulphate on the physical and chemical processes taking place during fusion of soda–lime–silica glass. M. A. BEZBORODOV and N. O. ABELTSCHUK (J. Appl. Chem. Russ., 1938, **11**, 234—252).—Dry ($NH_4)_2SO_4$ fuses, and simultaneously dissociates, at 250°, forming a film covering the particles of $CaCO_3$, Na_2CO_3, and SiO_2. It then reacts chiefly with Na_2CO_3 to yield Na_2SO_4, which, again, acts as a solvent for Na_2CO_3. In this way the surface of contact of the constituents of the mixture SiO_2–$CaCO_3$–Na_2CO_3 is greatly increased, so facilitating silicate formation at >300°. R. T.

Heat capacity of silver sulphide. A. F. KAPUS-TINSKI and B. K. VESELOVSKI (J. Phys. Chem. Russ., 1938, **11**, 68—76).—The heat of transition of β- into γ-Ag_2S is 1050±20 g.-cal. per mol. The heat capacity of γ-Ag_2S between 179° and 570° is 22·0 g.-cal. per mol. J. J. B.

Heat capacities of nickel suboxide. Free energy of formation of nickel suboxide. A. F. KAPUSTINSKI and K. A. NOVOSELTZEV (J. Phys. Chem. Russ., 1938, **11**, 61—67).—For NiO $C_p = 14·1 + 3·1 \times 10^{-4}T - 4·6 \times 10^4 T^{-2}$ g.-cal. per mol. between 25° and 1123°. J. J. B.

Energy of isomerisation of normal pentane into tetramethylmethane. F. D. ROSSINI and J. W. KNOWLTON (J. Chem. Physics, 1938, **6**, 168).—At 25° and 1 atm. the heat of combustion of CMe_4 is $\Delta H = 840·58\pm0·23$ kg.-cal. per mol. Combining this with the recorded val. for the heat of combustion of n-C_5H_{12} yields for the heat of isomerisation $-4·68\pm 0·30$ kg.-cal. per mol. W. R. A.

Heats of combustion, refraction data, and the alkaline hydrolysis of ethyl β-vinylacrylate and the three pentinenoic acids. E. SCHJÅNBERG (Z. physikal. Chem., 1938, **181**, 430—440).—The strength of the C:C bond is calc., and is shown to depend on its position in the mol. relative to the CO_2H. The max. strength is observed in the α-β position, and the min. in the γ-δ position. The refraction and dispersion increments of the C:C bond are calc. and the constitutional influence is discussed. The temp. dependence (0—40°) of the alkaline hydrolysis of the

esters has been studied. The rate of hydrolysis of the esters of $\Delta^α$-pentinenoic acid is > that of the isomeric acids ; this is attributed to a greater val. of the const. A in the equation $k = A.e^{-q/RT}$. H. J. E.

Heat content of various states of division of gold. R. FRICKE and F. R. MEYER (Z. physikal. Chem., 1938, **181**, 409—429).—The heat of dissolution in aq. ICl_3 at 40° of unprotected colloidal Au, and of Au protected by gelatin, has been measured. The Au was pptd. by H_2O_2 in alkaline solution. The heat content of protected Au (particle size 60—80 A., measured by X-rays and by the Hahn emanation method) is 1·1 kg.-cal. per g.-atom > that of massive Au. The increase in heat content is inversely $\propto$ the particle size, and is very small for particle sizes >150 A. The increase is due to increased surface and not to lattice defects or lattice strain. The calc. surface energy (670 ergs per cm.²) is < that found by other methods, the difference being attributed to partial aggregation. H. J. E.

Direct-current conductances of potassium chloride solutions. L. V. ANDREWS and W. E. MARTIN (J. Amer. Chem. Soc., 1938, **60**, 871—873).—Procedure is described and results are recorded for 0·01—0·0005N-KCl at 25°. E. S. H.

Amalgam activities and standard electrode potentials. I. Tin. M. M. HARING and J. C. WHITE (Trans. Electrochem. Soc., 1938, **73**, Preprint 27, 379—389).—For the electrode $Sn``|Sn$ at 25°, $E_h = -0·1406\pm0·0002$ v. Sn is 1 mv. more negative than saturated Hg–Sn amalgam. The activity at 25° of Sn in amalgams of increasing concn. up to saturation, and the solubility of Sn in Hg, have been determined. J. W. C.

Potentials of platinum electrodes in photographic developers. A. E. CAMERON (J. Physical Chem., 1938, **42**, 521—530).—The potentials of Pt electrodes in elon and quinol developer solutions vary with the [O_2] as well as the concn. of reducing agent. The principal effect of Na_2SO_3 is to destroy the reversible oxidation–reduction system which might mask the O_2 electrode potential. J. W. S.

Potentials developed by certain metals in ethereal solutions of magnesium iodide. N. V. KONDIREV and V. I. JURIEV (J. Gen. Chem. Russ., 1937, **7**, 2903—2905).—The potentials obtained when the following electrodes are combined with a Pt electrode in 0·117—0·125N-MgI_2 in Et_2O increase in the order Ni, Sb, Sn, Al, Hg, Zn, Ag, Cu, Pb, Cd, Mg, Na ; the potential is zero with Au. In certain cases the potentials rise with increasing [MgI_2]. R. T.

Equations for the thermodynamic calculation of the e.m.f. of gas cells. O. SCARPA (Atti R. Accad. Lincei, 1938, [vi], **27**, 3—5).—The e.m.f. at const. vol. is derived from the Gibbs–Helmholtz equation. O. J. W.

Thermodynamics of the lead accumulator. B. KABANOV (J. Phys. Chem. Russ., 1938, **11**, 155—157).—The theory of Harned and Hamer (A., 1935, 305) is supported by the actual behaviour of the cell. J. J. B.

Volta effect in solid metallic alloys. I. O. SCARPA (Atti R. Accad. Lincei, 1938, [vi], **27**, 6—11).

—For Cu–Ni alloys the Volta effect with respect to pure Cu increases almost linearly with the % of Ni in the alloy. In the Sn–Zn system small amounts of Zn are sufficient to destroy almost completely the Volta effect of pure Sn with respect to Zn.

O. J. W.

Electrification by bubbling. G. LOVERA and A. POCHETTINO (Nuovo Cim., 1937, **14**, 393—410).— Experiments on the electrification of N_2 produced by bubbling it through solutions of quinine H sulphate, methylene-blue, uranine, and gelatin are described. The results are discussed in relation to Lenard's theory (cf. A., 1915, ii, 507).

O. J. W.

Decomposition potentials of molten potassium and sodium fluorides. V. S. MOLTSCHANOV (Legk. Met., 1935, **4**, No. 5, 28—31).—The following vals. are recorded for a special form of graphite cell : KF, 900°, 2·13 v. ; 940° 2·00 v.; 980° 1·70 v.; NaF, 860° 2·95 v.; 920°, 2·80 v.; 968°, 2·63 v., and 1022°, 2·45 v.

CH. ABS. (*e*)

Non-equilibrium oxidation–reduction potential. N. I. NEKRASSOV (J. Phys. Chem. Russ., 1938, **11**, 84—98).—In the absence of equilibrium or when the equilibrium establishes itself very slowly, the potential is determined by the concns. and by the rates of formation of the oxidising and reducing agents in the solution. A change of $[O_2]$ in the gas may affect a non-equilibrium potential more strongly than equilibrium potentials.

J. J. B.

Reducing effect of Röntgen rays on reduction–oxidation potential of indicator dyes. W. SEITZ (Strahlenther., 1938, **61**, 140—154).—Since *X*-rays in their passage through materials liberate electrons, there must be an increase in the reduction potential of the material. The response of reduction–oxidation potential indicator dyes at p_H 7 in dil. solution to *X*-rays was investigated under anaërobic conditions with controls. It was found possible to reduce indicators ranging from 2 : 6-dichlorphenol-indophenol (E_h +217 mv.) to phenosafranine (E_h −525 mv.) to the leuco-base, the time required being $\propto$ the quantity of dye present. The reaction is reversible.

S. H.

Overvoltage and the mechanism of electrolytic evolution of hydrogen. K. WIRTZ (Z. Elektrochem., 1938, **44**, 303—326).—A review.

Electrode polarisation in the course of cathodic deposition of heavy metals from fused electrolytes. S. KARPATSCHEV and S. REMPEL (J. Phys. Chem. Russ., 1938, **11**, 144—148).—The cathode potentials of Cd in $CdCl_2$, Pb in $PbCl_2$, and Tl in TlCl (all molten) are independent of the c.d. between 0 and 300 amp. per sq. dm. An explanation is advanced for the absence of polarisation.

J. J. B.

Activation of passive chromium. W. J. MÜLLER (Z. physikal. Chem., 1938, **181**, 469—472).—Polemical against E. Müller (cf. A., 1938, I, 144).

H. J. E.

Dependence of the height of the polarographic wave on the concentration of the ion being determined. E. N. VARASOVA (J. Gen. Chem. Russ., 1938, **8**, 93—96).—Polemical, against Pavlov (A., 1938, I, 143).

R. T.

Does the decomposition of chloride monoxide begin as a homogeneous bimolecular reaction ? M. BODENSTEIN and Z. SZABÓ (Z. physikal. Chem., 1938, **B**, **39**, 44—49).—The decomp. of Cl_2O begins with almost const. velocity before rising to a max., but the actual val. of this velocity depends on the area and nature of the surface in contact with it. Hence the initiation of the reaction cannot be homogeneous, as would be inferred from other characteristics of the change.

J. W. S.

Oxidation of methane [and other hydrocarbons].—See A., 1938, II, 167.

Kinetics of thermal polymerisation of butadiene. S. V. LEBEDEV, and M. A. CHOCHLOVKIN, L. I. KUIBINA, and A. P. BEGETOVA (Sintet. Kautschuk, 1936, No. 1, 2—4).—The thermal polymerisation of liquid butadiene at 110°, 120°, 130°, 150°, 175°, and 200° was studied. The energy of activation was 13,000 g.-cal. in the liquid phase and 25,000 g.-cal. in the gaseous phase. O_2 accelerated the thermal polymerisation. The liquid-phase reaction was homogeneous.

CH. ABS. (*e*)

Decomposition of gaseous ethyl bromide. P. FUGASSI and F. DANIELS (J. Amer. Chem. Soc., 1938, **60**, 771—778).—The rate of decomp. at 395° and the nature of the products have been determined, using special precautions to eliminate traces of O_2. Decomp. is of the first order, and the consts. agree with published data (A., 1932, 815, 1002; 1933, 469). The influence of increased surface, and of H_2, N_2, Br, and Hg has been investigated. The mechanism discussed is based on primary decomp. into free Et radicals and Br atoms without involving a chain reaction.

E. S. H.

Unimolecular decomposition of gaseous chloropicrin. E. W. R. STEACIE and W. McF. SMITH (J. Chem. Physics, 1938, **6**, 145—149).—The decomp. of gaseous $CCl_3 \cdot NO_2$ has been investigated from 138° to 170° at pressures from 6 to 20 cm. The reaction is homogeneous and unimol. and the rate coeff. is $k = 4·90 \times 10^{15} e^{-37670/RT}$ sec.$^{-1}$ $CCl_3 \cdot NO_2$ gives initially $COCl_2$ and NOCl; the NOCl gives $NO + 0·5Cl_2$. In addition NO and Cl_2 are formed by other means, which are qualitatively discussed.

W. R. A.

Rapid exchange between deuteroammonia and hydrazine. P. C. CROSS and P. A. LEIGHTON (J. Amer. Chem. Soc., 1938, **60**, 981—982).—Exchange between ND_3 and N_2H_4 occurs in a few sec. at room temp., and evidence of exchange is shown at −70°. The mechanism is discussed.

E. S. H.

Exchange of hydrogen atoms between nitrophenols and water. I. Exchange reaction and hydrogen linkage. M. KOIZUMI and T. TITANI (Bull. Chem. Soc. Japan, 1938, **13**, 318—328).—Very rapid exchange occurs between the hydroxylic H atoms of *o*-, *m*-, and *p*-$OH \cdot C_6H_4 \cdot NO_2$ and H_2O at 100° in alkaline solution. This is followed by exchange of 2 nuclear H of the *o*- and *p*- and 3 of the *m*-compound. The velocities of the nuclear exchange with *m*- and *p*- are nearly equal, and $\gg$ that with *o*-$OH \cdot C_6H_4 \cdot NO_2$. The difference in the no. of exchangeable nuclear H is accounted for by the enhance-

ment and depression of reactivity of H situated o- and p- to the OH and NO_2 groups, respectively. The relatively small velocity shown by the o-compound is attributed to chelation.   F. L. U.

Rate of hydrolysis of enol ethers. A. SKRABAL and R. SKRABAL (Z. physikal. Chem., 1938, **181**, 449—468).—Dilatometric and analytical measurements of the rate of acid hydrolysis at 25° of divinyl ether (I), 2 : 2-dimethylfuran, furan, $(CH_2)_2O$, and dioxan are recorded. Vals. of the acid hydrolysis const. of 41 ethers are tabulated. The relative amounts of acid- and alkali-catalysed hydrolysis and of uncatalysed hydrolysis are discussed. The presence of free partial valencies increases the acid hydrolysis const. Owing to this factor the const. for vinyl Et ether is > that for (I). The presence of double bonds and of rings in the mol. also tends to raise the const. The temp.-dependence of the hydrolysis const. is discussed.   H. J. E.

Effect of groups on reaction rate. Reaction of αβ-dibromides with sodium iodide.—See A., 1938, II, 214.

Dehydration products of lactic acid.—See A., 1938, II, 169.

Kinetics of the formation of the Grignard reagent.—See A., 1938, II, 224.

Corrosion of rotating discs. II. A. URMÁNCZY (Z. anorg. Chem., 1928, **237**, 183—186).—The velocity of dissolution of a rotating disc of $Na_2S_2O_3$ in 73% EtOH increases linearly with the square root of the speed of rotation. At high speeds the disc develops markings resembling those formed on Ag discs rotated in HNO_3 (A., 1938, I, 257). They are caused by the expulsion of air bubbles which increase the rate of dissolution by disturbing the diffusion layer.   F. J. G.

Determination of kinetics of dissolution of metals.—See B., 1938, 526.

Combustion and detonation of solid explosives. —See B., 1938, 592.

Shock wave and explosion products from detonating solid explosives.—See B., 1938, 593.

Impulse and conservation causality in nature. A. MITTASCH (Naturwiss., 1938, **26**, 177—183).   A. J. M.

Catalysis and the theory of multiplets. A. A. BALANDIN (Uspech. Chim., 1935, **4**, 1004—1057).—A discussion.   CH. ABS. (e)

Catalytic toxicity and chemical structure. III. Influence of various factors on the toxicity of sulphur compounds. E. B. MAXTED and H. C. EVANS (J.C.S., 1938, 455—458).—By restricting mobility, the addition of a second terminal S atom to a hydrocarbon chain of given length decreases the toxicity per g.-mol.; e.g., $SH \cdot [CH_2]_3 \cdot SH$ is less toxic than $Pr^{\alpha}SH$ or $Bu^{\alpha}SH$. On the other hand, if the two S are adjacent, little change in toxicity is observed; e.g., Et_2S_2 and Et_2S have approx. equal toxicity. The introduction of a branched chain or a double bond has only a slight effect. The toxic effects of compounds containing a hydrocarbon ring

in place of a chain and of substituted thiocarbamides have also been investigated.   C. R. H.

Reactivity of formaldehyde in presence of various bases. A. KUZIN (J. Gen. Chem. Russ., 1937, **7**, 2954—2963).—Reduction of Cu^{II} by CH_2O in presence of $Ca(OH)_2$ is > with NaOH. The velocity of the reaction $2CH_2O \rightarrow MeOH + HCO_2H$ is greater in presence of 2N-NaOH than of 2N-$Ca(OH)_2$, for 4—20%, but not 40%, CH_2O. The reaction $CH_2O + MOH \rightarrow HCO_2M + H_2$, in presence of $CuSO_4$ or Cu_2O, is greater when $M = 0.5Ca$ than when $M = Na$; this is due to the more rapid formation of Cu, which catalyses the reaction, in the former case. In the system $CH_2O–H_2O$–alkali–Cu the reaction proceeds at the same rate with $Ca(OH)_2$ as with NaOH. It is supposed that CH_2O reacts with NaOH to yield $OH \cdot CH_2 \cdot ONa$, dissociating into $OH \cdot CH_2 \cdot O'$ and $Na^{\cdot}$, whilst with $Ca(OH)_2$ the reaction is $OH \cdot CH_2 \cdot O \cdot CaOH \rightarrow OH \cdot CH: + Ca(OH)_2$.   R. T.

Influence of neutral salts on the inversion of sucrose. J. N. PEARCE and M. E. THOMAS (J. Physical Chem., 1938, **42**, 455—467).—The inversion of sucrose by HCl at 25° and 35° is accelerated by the presence of neutral salts, the effects of which are in the order $Al(NO_3)_3 > BaCl_2 > LiCl > NaCl > KCl$. The temp. coeff. of the reaction and hence its heat of activation is almost independent of the nature of the added salt and its concn. The results are explained on the theory that the sucrose mols. are hydrated through addition of H_2O to tetrahedral O atoms, the accelerating effect of the salt on the inversion being attributed to decrease in the thickness of the envelope of H_2O mols. round the reactants, owing to ionic hydration. The mechanism of the reaction is considered to comprise complex formation between the $H_3O^{\cdot}$ ion and the sucrose, the rate of decomp. of the complex determining the rate of reaction.   J. W. S.

Inhibition in the inversion of sucrose. E. BAUR and H. PREIS (Helv. Chim. Acta, 1938, **21**, 437—441).—The reaction at 50° in 0.001N-H_2SO_4 is retarded by the addition of 0.001—0.01N-K_2SO_4, -$MnSO_4$, or -$CoSO_4$. The degree of inhibition is discussed with reference to $H^{\cdot}$ activity.   E. S. H.

Inhibition of peroxidase action on guaiacum resin. E. BAUR (Helv. Chim. Acta, 1938, **21**, 441—445).—The influence of small amounts of $Co^{\cdot \cdot}$, urethane, veronal, cysteine, and barbituric acid on the rate of reaction has been determined.   E. S. H.

Effect of sodium glycocholate on the saponification of glycerides by pancreatic extract.—See A., 1938, III, 529.

Rôle of the surface in processes of oxidation of aqueous sulphur dioxide by oxygen and ozone. L. I. KASCHTANOV and O. N. OLESCHTSCHUK (J. Gen. Chem. Russ., 1938, **8**, 182—187).—The velocity of oxidation of SO_2 in H_2O by O_2 or O_3 is twice as great at the surface as in the bulk of the solution; the surface reaction only is inhibited by PhOH. With low $[O_2]$ or $[O_3]$ in the gaseous phase the velocity of the reaction $\propto$ rate of diffusion of O_2 or O_3 to the active surface.   R. T.

Poisoning of catalysts from the point of view of specificity of active centres. VI. Temperature-dependence of the relative life of molecules of water and ethyl alcohol on a copper catalyst. A. C. BORK (J. Phys. Chem. Russ., 1938, 11, 109—111).—The relative life of H_2O on a Cu catalyst is independent of temp. between 240° and 267°.
J. J. B.

Solvent factor in catalytic hydrogenation. E. B. MAXTED and V. STONE (J.C.S., 1938, 454—455).—The velocity of hydrogenation of $CHMe:CH \cdot CO_2H$ in EtOH, Et_2O, EtOAc, AcOH, cyclohexane, and $CHCl_3$ appears to show no simple relation to the η or solvent power for H_2 of the solution, even if the partial pressure of H_2 is corr. for that due to the v.p. of the solvent.
C. R. H.

Oxidation of litharge to minium. K. E. KRAUZE and O. K. KRAUZE (J. Appl. Chem. Russ., 1938, 11, 403—408).—The reaction of oxidation of rhombic PbO to Pb_3O_4 is accelerated by addition of PbO_2; this effect is not observed in the oxidation of tetragonal PbO. Addition of tetragonal PbO to rhombic PbO has little effect on the oxidation of the latter.
R. T.

Catalytic oxidation of ammonia on platinum at low pressures. W. KRAUSS (Z. physikal. Chem., 1938, B, 39, 83—100).—NH_2OH and HNO_2 are the principal products, no N_2O or NO appearing. HNO_2 is formed in the gas space as well as on the surface of the Pt. NH is not the first product of the reaction since NH_2OH is not first formed on the walls of the vessel.
T. H. G.

[Catalytic oxidation of ammonia.] L. ANDRUSSOV (Ber., 1938, 71, [B], 776—778; cf. A., 1935, 1329). —A reply to Adadurov (A., 1937, I, 90). In spite of the thermal instability of NH_3 and CH_4 it is unnecessary to assume the intermediate formation of C, N, and H in the synthesis of HCN since the duration of reaction is almost immeasurably small. The postulated intermediate formation of NOH is upheld.
H. W.

Velocity of hydrogenation of aromatic hydrocarbons. I. A. V. LOZOVOI and M. K. DJAKOVA (J. Gen. Chem. Russ., 1937, 7, 2964—2977).—The reactions of hydrogenation of PhMe, o-, m-, and p-xylene, durene, s-$C_6H_3Me_3$, C_6HMe_5, PhEt, $PhPr^a$, and p-$C_6H_4MePr^\beta$ (Ni–Al_2O_3 catalyst) proceed at const. velocity at 75—230°. At <110° the velocity of hydrogenation of PhMe is independent of the pressure, whilst at 190—200° it is $\propto$ pressure, over the range 20—140 atm.
R. T.

Velocity of hydrogenation of aromatic hydrocarbons. II. Velocity of reaction and structure of hydrocarbons. M. K. DJAKOVA and A. V. LOZOVOI (J. Gen. Chem. Russ., 1938, 8, 105—115).— The velocity v of hydrogenation of C_6H_6 homologues at a Ni–Al_2O_3 catalyst (15—230°/35—200 atm.) is expressed by $v = v_0/2^n$, where n is the velocity for C_6H_6. For xylenes, v falls in the order p- > o- > m-xylene. The same val. of v is obtained for PhMe, PhEt, and $PhPr^a$, but v for $PhPr^a$ is > for $PhPr^\beta$.
R. T.

Regeneration of copper–nickel catalyst [from hardening of fats].—See B., 1938, 543.

Effect of a high-tension electrical discharge on contact catalytic reactions. III. Hydrogenation of soya-bean oil.—See B., 1938, 544.

Catalytic dehydrogenation of cyclohexane in presence of oxides of chromium and vanadium.— See A., 1938, II, 224.

Rôle of catalysis in textile chemistry.—See B., 1938, 505.

Electrodeposition of manganese from aqueous solutions.—See B., 1938, 535.

Alkaline [copper] plating baths containing organic amines.—See B., 1938, 534.

Rochelle salt–copper cyanide plating bath.— See B., 1938, 534.

Electrolytic manufacture of white lead.—See B., 1938, 551.

Enrichment of deuterium oxide by electroosmosis. S. V. THYSSEN (Naturwiss., 1938, 26, 198).—Since the dielectric const. of D_2O (80·5) is < that of H_2O (82), and the viscosity of D_2O is > that of H_2O, D_2O must pass more slowly than H_2O through a diaphragm by electro-osmosis. An enrichment of D_2O in H_2O has been effected by this method.
A. J. M.

Activation process in reactions in electric discharges. II. N. I. KOBOSEV, S. S. VASSILIEV, and E. N. EREMIN (J. Phys. Chem. Russ., 1938, 11, 45—60; cf. A., 1938, I, 205).—Oxidation of N_2 is discussed. The electric energy supplied to the discharge apparatus is chiefly spent in (a) heating the electrodes, (b) light emission by excited mols., (c) ineffective excitation of O_2, and in (d) deactivation of active N_2 mols.; the remaining energy (e) is used for NO synthesis. The energy loss (a) explains the increase of the yield of NO per erg supplied with increasing distance between the electrodes. The loss (c) is partly responsible for the dependence of the NO yield on the ratio $[O_2] : [N_2]$, the yield increasing with that ratio at high c.d. and high pressures and decreasing with it at low c.d. and low pressures. Calculation of the energy (e) shows that the activation energy has a normal val.; hence the active mols. in the discharge are of the same kind as those in thermal reactions.
J. J. B.

Chemical effect of electrical discharge in gaseous hydrocarbons. IX. Condensation of ethane, propane, butane, and propylene as a function of time, and comparison of rates of condensation of lower members of the paraffin, olefine, and acetylene series. S. C. LIND and G. R. SCHULTZE (J. Physical Chem., 1938, 42, 547—558; cf. A., 1931, 60, 1249).—Each gas shows a relatively long induction period but reaction occurs more readily with larger mols. and with unsaturated mols. The product of mol. ionisation and chemical yield under α-radiation is considered to be the controlling factor in electrical decomp. and leads to vals. approx. in accord with experiment.
J. W. S.

Chemical action of electric discharges. XV. Production of ammonia by the electric arc at different frequencies. E. BRINER and J. DESBAILLETS (Helv. Chim. Acta, 1938, **21**, 478—485; cf. A., 1938, I, 150).—The best yield of NH_3 is obtained at reduced pressure, with the ratio $N_2 : 3H_2$, using Pt or Cu electrodes, and at high frequency. A yield of 25 g. of NH_3 per kw.-hr. is reported.

E. S. H.

Description in terms of atomic physics of the action of light on photographic emulsions. N. F. MOTT (Phot. J., 1938, **78**, 286—292; cf. A., 1938, I, 260).—From experiments on electrolytic conductivity and photoconductivity, considered in relation to the quantum and other modern theories, it is argued that electrons released on absorption of light will wander until trapped by Ag or Ag_2S specks, the conduction levels of which are lower than those of AgBr; such centres are then negatively charged, and will discharge by attracting to themselves Ag ions which have wandered to interstitial positions in the AgBr lattice. Solarisation is considered as recombination of excess of halogen with latent image Ag. Temp. effects are discussed, especially in relation to reciprocity failure (cf. Webb, A., 1937, I, 254). The crit. exposure necessary for developability of a grain is regarded as a crit. electron density, which is dependent on the equilibrium of the tendency of a speck to collect electrons and the tendency to lose electrons owing to thermal agitation. J. L.

Solarisation and development. A. P. H. TRIVELLI (Z. wiss. Phot., 1938, **37**, 98).—Arens' discovery (A., 1934, 1184) that solarisation effects disappear with prolonged development was anticipated by Trivelli in work recorded by Wilsey and Pritchard (cf. B., 1927, 157), who confirmed the results for X-rays also. J. L.

Theory of photodichroism. S. NIKITINE (Compt. rend., 1938, **206**, 1219—1222; cf. A., 1937, I, 317). A. J. E. W.

Mechanism of the photodecomposition of methyl and ethyl iodides. W. WEST and L. SCHLESSINGER (J. Amer. Chem. Soc., 1938, **60**, 961—966).—The gaseous decomp. products of MeI vapour at $\lambda 2537$ A., 25°, and 300 mm. are chiefly CH_4 with small amounts of C_2H_6 and C_2H_4; about 33% is converted into CH_2I_2. In presence of Ag foil the rate of decomp. is greatly increased, the main product is C_2H_6 with some CH_4 and C_2H_4, and all the I appears as AgI. EtI at $\lambda 2537$ A., 25°, and 100 mm. yields C_2H_6 and C_2H_4, and at $\lambda 2026$ A. small amounts of CH_4 and H_2 in addition; Ag foil increases the rate of reaction but has little influence on the nature of the products. In presence of inert gas up to 40 atm. the photolysis of EtI has an I yield increasing approx. linearly with the d of inert gas to vals. approaching 33% of the yield in inert liquid solvents. A mechanism of reaction is proposed. E. S. H.

Photochemical oxidation of methylene iodide; production of iodic anhydride. G. EMSCHWILLER (Compt. rend., 1938, **206**, 746—748; cf. A., 1935, 48; 1936, 572).—In a closed system, I_2O_5 is formed during irradiation of CH_2I_2-O_2 mixtures, afterwards reacting slowly with CH_2O formed in the reaction; this change is accelerated by light or the presence of HCO_2H. I_2O_5 is apparently not formed after all the CH_2I_2 has decomposed, although the photo-oxidation of CH_2O or HCO_2H in presence of I also gives I_2O_5 in small quantity. In a streaming system the amounts of I_2O_5 and HCO_2H formed are much less, suggesting a relation between the production of I_2O_5 and the oxidation of CH_2O. If the reaction products are removed by an O_2 stream from the illuminated zone, the reaction is much slower, showing that the products catalyse the reaction. The possibility of a peroxide mechanism is discussed.

A. J. E. W.

Photolysis of acetone in the presence of hydrogen. H. S. TAYLOR and C. ROSENBLUM (J. Chem. Physics, 1938, **6**, 119—123).—The photodecomp. of $COMe_2$ in the presence and absence of H_2 by light of $\lambda 2500$ A. has been studied between 70° and 300°. When H_2 is absent $COMe_2$ up to 160° yields practically no CH_4, and C_2H_6 predominates. With H_2 there is no CH_4 at 70° but an appreciable amount at 160°. Under both conditions the yield of CH_4 increases rapidly with temp. C_2H_6 formation is either a wall reaction with zero activation energy or a bimol. association process with small activation energy. The activation energy of the reaction $CH_3 + H_2 = CH_4 + H$ is 11 ± 2 kg.-cal. Suitable reaction mechanisms are discussed. W. R. A.

Mechanism of decomposition. III. Vapour-phase photolysis of propionic acid. H. HENKIN and M. BURTON (J. Amer. Chem. Soc., 1938, **60**, 831—836; cf. A., 1936, 1349).—The photolysis of $EtCO_2H$ or AcOH may proceed either by a rupture involving the formation of at. H or by a rearrangement mechanism yielding ultimate mols. in the primary act. Per einstein absorbed, rupture is at least 2·3 times as frequent for $EtCO_2H$ as for AcOH; in both cases rearrangement mechanisms are possibly predominant. The energy of activation of the reaction by which H atoms disappear in AcOH has been re-determined as 8·5—9·9 kg.-cal.; that for the similar reaction in $EtCO_2H$ is about 0·8 kg.-cal. less, which may indicate a weakening in the C–C linking at the CO_2H radical with increase in length of the C chain. Alkyl or RCO radicals do not appear to be formed during photolysis. E. S. H.

Photochemical reactions of cellulose.—See B., 1938, 496.

Exchange of hydrogen atoms between water and pyrrole, indole, and their methyl derivatives. IV. Exchange of hydrogen atoms between indole and water. M. KOIZUMI and T. TITANI (Bull. Chem. Soc. Japan, 1938, **13**, 307—318; cf. A., 1938, I, 255; II, 244).—Exchange occurs in three stages, viz., (1) of the imino-H between p_H 7 and 2·5, (2) of the β-H at p_H 2·5—0·5, and (3) of the α-H in more acid solutions. The exchanges were followed by using aq. D_2O. Polymerisation of the indole occurs simultaneously with the H exchange, especially at higher acid concns., but always much more slowly than the exchange reactions. The latter are explained on the assumption of a tautomeric change. F. L. U.

Sodium polyphosphates. K. R. ANDRESS and K. WÜST (Z. anorg. Chem., 1938, **237**, 113—131).—The formation of Na polyphosphates by fusing $NaPO_3$ and $Na_4P_2O_7$ together has been studied. Of the compounds described in the older lit. only $Na_5P_3O_{10}$ exists. The aq. solutions of the two substances having this formula are identical. F. J. G.

Dehydration of acid sodium pyrophosphate. A. BOULLÉ (Compt. rend., 1938, **206**, 915—917).—When heated at $<300°$ in air or in a vac., $Na_2H_2P_2O_7$ gives $\div 80\%$ of Na trimetaphosphate (A), sol. in H_2O, with two insol. metaphosphates B and D; these give A at 550° and 485°, respectively. Dehydration in H_2O vapour at $>300°$ gives pure B. A is converted into a glassy metaphosphate, C, at 640°. A. J. E. W.

Calcium alkali phosphates. H. H. FRANCK. **II. Calcium potassium phosphates.** M. A. BREDIG and E. KANERT (Z. anorg. Chem., 1938, **237**, 49—78).—By heating Ca phosphates with K_2CO_3, KNO_3, or K_2HPO_4 the following *compounds* have been obtained : $CaKPO_4$ (I), $Ca_8K_2(PO_4)_6$ (II), $CaK_2P_2O_7$. (I) exists in two modifications with a transition temp. at 705°. They are denoted as α- and β-K rhenanite. (II) has the apatite structure. The equilibrium diagram for the ternary system $CaO–K_2O–P_2O_5$ is discussed in the light of these results. When the reactants are heated in a CO_2 atm. α-(I) takes up $CaCO_3$ and K_2CO_3 without change of structure, and does not then change over to the β-form on tempering at 600°. A *di-calcium carbonate-apatite*, $Ca_{11}(PO_4)_6(CO_3)_2$, is also formed. F. J. G.

Hydration of the aluminates, silicates, and double salts of calcium. J. LEFOL (Compt. rend. XVII Cong. Chim. Ind., 1937, 562—571).—Experiments on progressive dehydration give evidence that hydrated $4CaO,Al_2O_3$ contains 6 mols. of H_2O chemically bound, and compounds containing 6—12 mols. of H_2O are zeolitic in character. The following formulæ indicate similar conclusions in regard to other compounds : $2CaO,Al_2O_3,5H_2O + 0—4H_2O$; $3CaO,Al_2O_3,3CaSO_4,6\cdot5H_2O + 1\cdot5—23\cdot5H_2O$; $3CaO,Al_2O_3,CaCl_2,6H_2O + 0—4H_2O$; $CaO,SiO_2,H_2O + 1—nH_2O$. G. H. C.

Reactions between calcium oxide and chromic oxide during heating. I. F. I. VASENIN (Trans. Union Res. Inst. Cements, U.R.S.S., 1937, No. 17, 40—51).—Homogeneous crystal structures, *i.e.*, definite chemical compounds, are produced when 1 : 1 and 3 : 1 mixtures of CaO and Cr_2O_3 are heated above 1020° in air. The 1 : 1 mixture gives well-defined green prismatic crystals of CaO,Cr_2O_3, whilst the 3 : 1 mixture gives anisotropic irregular crystals of Ca_3 oxychromite of varying composition. Chromates are formed at 600—800°, but are reduced to chromites above 1020°. D. G.

Calcium cyanide, and especially the reaction calcium cyanide ⇌ calcium cyanamide. G. PETERSEN and H. H. FRANCK (Z. anorg. Chem., 1938, **237**, 1—37).—When $Ca(CN)_2$ is exposed to atm. H_2O a *basic cyanide* $Ca(OH)\cdot CN$ is formed. It forms mixed crystals with $Ca(CN)_2$, and it is the end-product of the action of HCN on $Ca(OH)_2$. When $Ca(OH)\cdot CN$ is strongly heated in vac. it decomposes to CaO and HCN, but when heated in presence of CaC_2 at 450° some $Ca(CN)_2$ is formed. When heated above 450° under its own dissociation pressure it forms $CaCN_2$, CaO, and C. The m.p. of $Ca(CN)_2$ is 640°. The equilibrium $Ca(CN)_2 \rightleftharpoons CaCN_2 + C$ has been studied. It is not influenced by the presence of CaF_2, CaO, or $CaCl_2$ but is shifted to the left by NaCl. F. J. G.

Oxidation of difficultly oxidised substances in superheated systems. I. G. SCHAFRAN (J. Appl. Chem. Russ., 1938, **11**, 561—563).—B and W carbides are oxidised by boiling with 8 : 1 $H_2SO_4–HNO_3$ in a special apparatus. R. T.

Reducibility of earth chlorides by hydrogen. L. HOLLECK (Angew. Chem., 1938, **51**, 243—251).—The mixed trichlorides, dehydrated and heated in a Au boat in H_2 at 800° for 14 hr., are partly reduced to the metals, which alloy with the Au, whilst the remaining salt is partly reduced to dichlorides. The distribution of the several metals in the initial material and in the final salt and metallic products has been determined by X-ray methods. The readiness of reduction to metal increases with increasing at. no. for La to Lu and also follows the order La < Y < Sc. Sm, Eu, and Yb are exceptional, being more difficult to reduce to metal and being the only metals which remain in the product as dichloride. The relative ease of reduction to metal of the other chlorides is ascribed to the high temp. coeff. of the free energy of the reduction reaction, and the exothermic reaction with Au. The kinetics of the reactions are discussed. J. W. S.

Formaldehyde from percarbonate. E. BAUR (Helv. Chim. Acta, 1938, **21**, 433—437).—CH_2O is produced when cold aq. $K_2C_2O_6$ or $KHCO_3–H_2O_2$ is treated with peroxidase or catalase. The yield $\propto [H_2O_2]$. E. S. H.

Evaporation of silicon as a lower oxide. W. BILTZ and P. EHRLICH (Naturwiss., 1938, **26**, 188).—A mixture of Si and SiO_2 in equal proportions was heated in an evacuated vessel to 1250—1400°. The mixture evaporated almost completely, and a yellowish-brown, vitreous sublimate was obtained. This is probably due to the formation of SiO. A. J. M.

Titanium. X. Lead metatitanate. A. V. PAMFILOV, E. G. IVANTSCHEVA, and M. A. RABKIN (J. Appl. Chem. Russ., 1938, **11**, 398—402).—The prep. of $PbTiO_3$ is described, and its X-ray spectrum is determined. The stability of oil paints containing $PbTiO_3$ to atm. factors is determined. R. T.

Preparation of pure metals. A. E. VAN ARKEL (Mét. et Corros., 1937, **12**, 219—226).—Difficulties underlying the production of metals free from O_2 or dissolved oxides which markedly affect their chemical and physical properties, and the effect of the O_2 and N_2 content on the properties of V and Th, are discussed. The prep. of pure metals by the thermal dissociation of their volatile halides is described. The properties of Zr, Ti, V, Th, and Ta so prepared are compared with those of samples prepared by other methods. R. B. C.

Corrosion of tin in carbonate solutions.—See B., 1938, 528.

Basic phosphates of bivalent metals. II. Lead hydroxyapatite. R. KLEMENT (Z. anorg. Chem., 1938, **237**, 161—171).—When $PbHPO_4$ is shaken with $0.01N$-NaOH *Pb hydroxyapatite*, $Pb_{10}(PO_4)_6(OH)_2$ (I), is formed. It has a 9·90, c 7·29 A, c/a 0·736. (I), and not $Pb_3(PO_4)_2$ (cf. A., 1909, ii, 670), is the product when $Pb(OAc)_2$ is pptd. with Na_2HPO_4, and the substance described by Zamboni and Ferrari (A., 1928, 694) as $Pb_3(PO_4)_2$ was actually (I). Pure $Pb_3(PO_4)_2$ is formed by the prolonged action of H_2O or of an acetate buffer (p_H 4·6) on $PbHPO_4$. It exists in two forms, monoclinic and rhombic, the latter being stable at room temp. F. J. G.

Reaction of ammonium chloride with nitric acid. B. B. VASSILIEV, J. A. RAVDIN, and E. I. LUKJANOVA (J. Gen. Chem. Russ., 1937, **7**, 2913—2918).—NH_4NO_3 is not formed from aq. NH_4Cl and HNO_3 at 100°; the reactions are $2HNO_3 \rightarrow N_2O_4 + H_2O + O$; $N_2O_4 + H_2O \rightarrow HNO_2 + HNO_3$; $HNO_2 + NH_4Cl \rightarrow HCl + NH_4NO_2$; $NH_4NO_2 \rightarrow 2H_2O + N_2$; $3HCl + HNO_3 \rightarrow NOCl + Cl_2 + 2H_2O$. At lower temp., or in presence of nitrates (KNO_3, NH_4NO_3), the reaction $NH_4Cl + HNO_3 \rightarrow NH_4NO_3 + HCl$ predominates. R. T.

Reduction of nitrous acid by cysteine and glutathione.—See A., 1938, II, 222.

Thiophosphoryl fluoride and a salt of thiodifluorophosphoric acid $H[PSF_2O]$. W. LANGE and K. ASKITOPOULOS (Ber., 1938, **71**, [*B*], 801—807).—PSF_3, obtained by heating P_2S_5 with PbF_2 in N_2, has b.p. $-52.6°/760$ mm., mol. heat of evaporation 4·73 kg.-cal. It is unimol. in the gaseous state. Hydrolysis with aq. alkali is not instantaneous; the various intermediate phases cannot be quantitatively determined. The solution gives the reaction for S″ whilst addition of Ag_2SO_4 causes loss of S (as Ag_2S) from $(PSOF_2)'$ which thus passes into $(PSO_2F)''$ isolated as the nitron salt. Addition of nitron acetate to the freshly obtained solution of PSF_3 in H_2O leads to *nitron thiodifluorophosphate*, $C_{20}H_{16}N_4,HSPO_2F$, m.p. 225·8°. H. W.

Magnesium ammonium arsenate and alkaline-earth arsenates. V. AUGER and (MLLE.) N. IVANOFF (Compt. rend., 1938, **206**, 754—756).—The prep. of the *salts* $MgNH_4AsO_4,H_2O$, $M^{II}NH_4AsO_4,7H_2O$ (M^{II} = Ca, Sr, Ba), and $Sr(NH_4)_4(AsO_4)_2,10H_2O$ is described; the loss of NH_3 and H_2O from these salts, and from $MgNH_4AsO_4,6H_2O$, on heating in air or NH_3 has been investigated. The prep. of the *salts* $CaNH_4(nAsO_4mPO_4),7H_2O$ (containing 41% of arsenate), $Ba_3(AsO_4)_2,18H_2O$, $Sr_3(AsO_4)_2,18H_2O$, and $Ca_3(AsO_4)_2,6—7H_2O$ is also described. A. J. E. W.

Exchange reaction of oxygen atoms between carbonate ion and water. T. TITANI, N. MORITA, and K. GOTO (Bull. Chem. Soc. Japan, 1938, **13**, 329—330).—Preliminary experiments with K_2CO_3 and aq. $H_2^{18}O$ indicate the absence of an exchange between the O atoms of CO_3'' and H_2O. F. L. U.

Simultaneous oxidation of β-naphthol and sodium sulphite.—See A., 1938, II, 230.

Action of sulphuric acid on metals and alloys. —See B., 1938, 530, 531.

Precipitation of chromates. P. E. PELLETIER, L. CLOUTIER, and P. E. GAGNON (Canad. J. Res., 1938, **16**, B, 37—45).—In the pptn. of Cu, Cd, Co, Zn, and Fe chromates at room temp. the concn. of the metallic salt solutions was kept const. and that of the $KCrO_4$ varied. Solutions were mixed in <0·1 sec., the rate of mixing being accurately determined. By analysis of the ppt. for CrO_3 and metal, the ratio of oxide to CrO_3 was determined; if this ratio remained const. with varying concn. of reactants, a definite compound was indicated. Cd and Co always gave normal chromates, whilst Zn and Fe^{III} gave only basic mixtures. The Cu ppt. approached that of the normal chromate. D. F. R.

The molybdic acid H_4MoO_5. V. AUGER (Compt. rend., 1938, **206**, 913—915).—The yellow deposits obtained on keeping aq. $(NH_4)_6Mo_7O_{24}$ containing HNO_3 are not pure H_4MoO_5 (I), and usually contain NH_3. Pure (I) is pptd. from dil. H_2SO_4 solutions of MoO_3 on long keeping, and from conc. HCl solutions of MoO_3 in 2—3 days. (I) gives MoO_3,H_2O when heated at 50—55°. The supposed yellow colour and oxidising action of aq. (I) are due to silicomolybdic acid formed by attack of the glass container. Aq. (I) deposits amorphous scales on evaporation; these are readily sol. in H_2O, and give NH_4 octamolybdate on treatment with $(NH_4)_2SO_4$. A. J. E. W.

Peroxy-compounds. I. Crystalline peroxy-tungstates. II. Mode of union of active oxygen in the alkali tetraperoxy-(1 : 2)-tungstates. Evaluation of the "Riesenfeld test." K. F. JAHR and E. LUTHER (Ber., 1938, **71**, [*B*], 894—903, 903—907).—I. A crit. survey of the lit. combined with experiment shows that a homogeneous salt of type $R_2O,WO_3,4O_{Act.},aq.$, the yellow alkali tetraperoxy-(1 : 1)-tungstates, separates from neutral or slightly alkaline solutions rich in H_2O_2. In strongly alkaline solution these pass into colourless compounds, probably by addition of Na_2O_2. A second homogeneous type, the alkali tetraperoxy-(1 : 2)-tungstates, $R_2O,2WO_3,4O_{Act.},aq.$, separates from feebly acidic solutions rich in H_2O_2. These compounds are all colourless and much more stable than the yellow compounds when solid. In both types all the O is in peroxidic union. There is no certain evidence of the existence of cryst. peroxyhexatungstates or other peroxypolytungstates richer in O. Certain observations in solutions of alkali polytungstates poor in H_2O_2 compel the conclusion that peroxidised polytungstic acids exist in these solutions. The constitution of the peroxytungstates has not been elucidated with certainty but the following working hypothesis is advanced. The alkali peroxy-(1 : 1)-tungstates are regarded as derivatives of monotungstic acid, thus having the structure A. All the O of the acid are thus peroxidised and the yellow colour of the salt can be ascribed to ·O·O· combined
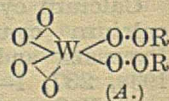
at either end with W. The conception that the salts are derived from a tetraperoxymonotungstic acid involves the assumption that they exist in H_2O in simple mol. distribution. The assumption that the alkali tetraperoxy-(1 : 2)-tungstates are salts of a diperoxymonotungstic acid is adequate to explain their behaviour. The total active O in them is in peroxidic union. Since the salts are colourless it may possibly be assumed that the " per-oxygen " is present in perhydroxy-, not peroxy-, groups. This type is most simply formulated $R'[HWO_6]$,aq., or

$$O{\gg}W{<}^{O\cdot OH}_{O\cdot OR}.$$ If these salts are derived from a monobasic diperoxytungstic acid they must be in simple mol. distribution in H_2O. This conclusion is confirmed by Brintzinger's dialysis method.

II. Treatment of K_2 tetraperoxy-(1 : 2)-tungstate with KI at p_H 6·15 and 7·00 indicates the presence of 89·4% and 85·0% of the O in true peroxidic form, whereas at p_H 8·25 only 49·7% of such O is indicated. At suitable [H'] Riesenfeld's test confirms Kellner's conclusion that the total active O is in peroxidic union. In general the method is not very suitable since almost unavoidable changes of p_H in the solution may completely alter the results.   H. W.

Alleged existence of compounds of bivalent uranium. R. FLATT and W. HESS (Helv. Chim. Acta, 1938, **21**, 525—529).—Attempts to produce US are described. No evidence for the existence of U^{II} compounds was found (cf. Alibegoff, A., 1886, 855).   E. S. H.

Fluoronitrites and fluoronitrates. E. ZINTL and W. HAUCKE (Z. anorg. Chem., 1938, **237**, 45—46).—The compound described by Beck (A., 1938, I, 93) as Na_3NF_6 is actually $NaHF_2$ with small amounts of impurities.   F. J. G.

Risk of explosion in the use of perchloric acid. —See A., 1938, II, 252.

Recovery of iodine and cadmium from cadmium sulphide titration solutions. G. FICKER (Chem.-Ztg., 1938, **62**, 288).—The solutions containing $CdCl_2$, HI, and S are filtered to remove S. I is pptd. by excess of saturated aq. $NaNO_2$. After nearly neutralising the decanted liquid with NaOH, and boiling, $CdCO_3$ is pptd. by addition of solid K_2CO_3.   I. C. R.

Formation of hydrogen peroxide by the action of iodine on water. D. I. SAPOSHNIKOV (J. Gen. Chem. Russ., 1937, **7**, 2879—2883).—Small amounts of H_2O_2 are formed when I is added to Ag_2SO_4 in dil. H_2SO_4, the reactions being probably : $H_2O + I_2 \rightarrow HI + HOI$; $2HOI + Ag_2SO_4 \rightarrow 2AgOI + H_2SO_4$; $AgOI + H_2O \rightarrow AgI + H_2O_2$.   R. T.

Artificial manganese metasilicate. N. L. DI-LAKTORSKI (Trav. Inst. Pétrol. Acad. Sci. Leningrad, 1934, **6**, 369—379).—Rose-coloured synthetic rhodonite ($MnSiO_3$) with 3·8% of tephroite and SiO_2 was obtained (m.p. 1310°, d 3·766).   CH. ABS. (e)

Production of spectroscopically pure iron. A. GATTERER and J. JUNKES (Naturwiss., 1938, **26**, 187). —Fe showing spectroscopically only traces of Si and about 0·0002% Cu is manufactured by the Molybden-

um Co. Spectroscopically pure Fe_2O_3 can also be obtained.   A. J. M.

Magnetic calcination residues. C. COURTY (Compt. rend., 1938, **206**, 911—913; cf. A., 1936, 1190; 1937, I, 199).—The strongly magnetic residue obtained on heating the ferric cupferron complex, in presence of a large excess of cupferron (I), has been shown by X-ray analysis to be rhombohedral Fe_2O_3. The val. of χ obtained for the residue is independent of the excess of (I), provided that all the C is burned away on ignition; traces of Fe can thus be determined magnetically after conversion into the (I) complex. The presence of Cu vitiates the results.   A. J. E. W.

Corrosion of alloys by solutions of ammonium salts in liquid ammonia.—See B., 1938, 531.

Constitution of the green peroxo-cobalt-ammines. K. GLEU and K. REHM (Z. anorg. Chem., 1938, **237**, 79—88).—An improved method for the prep. of the acid sulphate of the green μ-peroxo-decammino-cobaltic series is described. The degree of oxidation of the Co has been determined by reduction with As_2O_3 in presence of OsO_4 as a catalyst. The results indicate that one of the Co atoms is quadrivalent, and the formula of the salt is $[(NH_3)_5Co^{III}\cdot(O\cdot O)\cdot Co^{IV}(NH_3)_5](SO_4)_2(SO_4H),3H_2O$. It is paramagnetic, and measurements of χ at a series of temp. give a magneton no. in approx. agreement with theory (1·73) for one Co^{IV} atom.   F. J. G.

Ruthenium ammines. V. Further luteo- and purpureo-salts of ruthenium [and of cobalt and chromium]. K. GLEU, W. CUNTZE, and K. REHM. **VI. Roseo-salts of ruthenium.** K. GLEU and W. CUNTZE. **VII. Praseo-salts of ruthenium. Dichloro-series.** K. GLEU and W. BREUEL (Z. anorg. Chem., 1938, **237**, 89—100, 187—196, 197—208).—V. The following salts are described : $[Ru(NH_3)_6]Cl_3$, $[Ru(NH_3)_6]Br_3$, $[Ru(NH_3)_6](NO_3)_3$, $[Ru(NH_3)_6](NO_3)_3,HNO_3$, $[Ru(NH_3)_6]_2(S_2O_6)_3,4H_2O$, $[Ru(NH_3)_6](S_2O_6)Cl,H_2O$, $[Ru(NH_3)_6](S_2O_6)Br,H_2O$, $[Ru(NH_3)_6](SO_4)Br$, $[Ru(NH_3)_5Cl](NO_3)_2$, $[Ru(NH_3)_5Cl]SO_4,2H_2O$, (also anhyd.), $\{[Ru(NH_3)_5Cl]SO_4\}_4,3H_2SO_4$, $[Ru(NH_3)_5Cl]S_2O_6$. For comparison the following new cobalti- and chromi-ammine salts have been prepared : $[Co(NH_3)_6]_2(S_2O_6)_3,4H_2O$, $[Cr(NH_3)_6]_2(S_2O_6)_3,4H_2O$, $[Co(NH_3)_6](S_2O_6)Cl,H_2O$, $[Cr(NH_3)_6](S_2O_6)Cl,H_2O$, $[Co(NH_3)_6](S_2O_6)Br,H_2O$, $[Cr(NH_3)_6](S_2O_6)Br,H_2O$. In all cases the Ru salts are completely analogous to the Co and Cr salts.

VI. When $[Ru(NH_3)_5Cl]Cl_2$ (I) is dissolved in warm aq. NH_3 and the cooled solution treated with $(NH_4)_2S_2O_6$, hydroxopentamminoruthenium dithionate, $[Ru(NH_3)_5(OH)](S_2O_6)$ (II), is pptd. With aq. $H_2S_2O_6$ this affords the aquopentamminodithionate, $[Ru(NH_3)_5(H_2O)]_2(S_2O_6)_3,2H_2O$ (III). The corresponding Co salt, $[Co(NH_3)_5(H_2O)]_2(S_2O_6)_3,2H_2O$, has been prepared by treating $[Co(NH_3)_5(OH)]S_2O_6,2H_2O$ with AcOH. From the ammoniacal solution of (I) conc. HNO_3 ppts. the aquopentammino-nitrate, $[Ru(NH_3)_5(H_2O)](NO_3)_3$, and this in vac. over P_2O_5 affords the nitrato-nitrate, $[Ru(NH_3)_5(NO_3)](NO_3)_2$. Solutions of the aquopentammino-salts of Ru are

more acidic than those of Ir, Rh, Co, or Cr, and can be titrated as monobasic acids using phenolphthalein. (II) and (III) are paramagnetic and have mol. moments of approx. 2 Bohr magnetons.

VII. When $[Ru^{II}(NH_3)_4(SO_2)Cl]Cl$ is oxidised with ICl in aq. HCl, *dichlorotetramminoruthenium iodochloride*, $[Ru^{III}(NH_3)_4Cl_2](ICl_2)$, is pptd. With H_2SO_3 in presence of dil. HCl this affords the *dichlorotetrammino-chloride*, $[Ru(NH_3)_4Cl_2]Cl,H_2O$ (IV), and from this by double decomp. other *dichlorotetrammino salts* may be prepared, viz., $[Ru(NH_3)_4Cl_2]Br$, $[Ru(NH_3)_4Cl_2](NO_3),H_2O$, $[Ru(NH_3)_4Cl_2](SO_4H)$ (V), $[Ru(NH_3)_4Cl_2](SO_4Ag)$, $[Ru(NH_3)_4Cl_2]_2(SO_4)$, $[Ru(NH_3)_4Cl_2]_2(S_2O_6)$. They are orange-coloured salts in which Ru is tervalent. Their analogy with the *praseo*-cobaltic salts establishes their configuration as *trans*, but the Cl is more firmly bound. They are paramagnetic, and (IV) and (V) have mol. moments of approx. 2 Bohr magnetons. F. J. G.

Complex compounds of platinum metals with thio-, seleno-, and telluro-ethers. I. cis-trans-Groupings. E. FRITZMAN and V. KRINITZKI (J. Appl. Chem. Russ., 1938, **11**, 195—213).—Theoretical. The concepts of org. chemistry are applicable to the isomerism of Pt complexes, the orientation of which may be predicted from a knowledge of the orienting, polarising, and steric effects of the substituents. R. T.

Corrosion of metals.—See B., 1938, 524, 525, 531.

Metal carbonyls. V. Physiological properties. VI. Derivatives. W. E. TROUT, jun. (J. Chem. Educ., 1938, **15**, 77—83, 145; cf. A., 1938, I, 208).—A summary. L. S. T.

Reactions of methylene-blue with metallic salts.—See A., 1938, II, 249.

Choice of coloured indicators for acidimetry and alkalimetry. L. MALAPRADE (Ann. Chim. Analyt., 1938, [iii], **20**, 89—94).—The graph constructed enables the correct indicator to be chosen for a titration, when the ionisation const. of acid or base is known, of an acid by a strong base and vice versa, and for that of the salt of a weak base (or acid) by a strong acid (or base). It indicates the jump in p_H that occurs at the end of the reaction, and the indicator is chosen so that its zone of colour change falls within this range. L. S. T.

Ammonium phosphate test, a useful aid in qualitative analysis. G. BÄHR (Z. anal. Chem., 1938, **112**, 169—171).—The presence of Cl′, Br′, SO_4'', S″, etc. in insol. salts and minerals can often be detected by heating the dry salt with 3—4 times its wt. of $(NH_4)_2HPO_4$, when the NH_4 salt of the anion sublimes, and can be dissolved and tested. Heating is conveniently carried out in a small tube, the lipped end of which rests inside the constricted end of a wider tube, open at both ends. The sublimate collects in the larger tube and can be obtained free from the melt. J. W. S.

Colorimetric determination of fluorides in water.—See B., 1938, 597.

Rapid determination of sulphur in inorganic substances. A. SCHÖBERL and H. SENF (Z. anal. Chem., 1938, **112**, 171—174).—A modified and cheapened form of combustion and absorption apparatus for use in the determination of S in sulphates, pyrites, etc. by Grote and Krekeler's method (B., 1933, 290) is described. S in $CaSO_4$ cannot be determined by this method. J. W. S.

Determination of sulphur in pyrites.—See B., 1938, 510.

Determination of sulphur in combustible materials.—See B., 1938, 478.

Determination of traces of hydrogen sulphide and carbon oxysulphide in soil air.—See B., 1938, 510.

Determination of hydrogen sulphide in coke-oven gas.—See B., 1938, 474.

Potentiometric determination of water-soluble sulphates. A. B. SCHACHKELDIAN (J. Appl. Chem. Russ., 1938, **11**, 546—549).—Excess of $0.1N-Pb(NO_3)_2$ is added to the solution (previously freed from Ni, Fe, or Cd, by methods given), and the excess of $Pb(NO_3)_2$ is electro-titrated with standard Na_3PO_4 $[Pt-K_3Fe(CN)_6-Pb_2Fe(CN)_6$ electrode]. R. T.

Determination of sulphuric acid in concentrated nitric acid.—See B., 1938, 508.

Iodometric determination of sulphates in water.—See B., 1938, 597.

Determination of total sulphates in soils and irrigation water.—See B., 1938, 559.

Colorimetric determination of nitrate in presence of nitrite. G. V. L. N. MURTY (Proc. Indian Acad. Sci., 1938, **7**, A, 108—112; cf. A., 1937, I, 261). —Removal of NO_2' by addition of $CO(NH_2)_2$ permits the accurate colorimetric determination of aq. NO_3' with $OH·C_6H_4·SO_3H$ (I) or preferably α-$OH·C_{10}H_6·SO_3H$ (II). Initial quant. oxidation of NO_2' to NO_3' by H_2O_2 (aided by a trace of $Fe^{···}$) involves a determination of NO_2', and for total NO_3' results are progressively high, equally with (I) or (II), if $[NO_2']$ is >0.33 mg. I. McA.

Colorimetric determination of nitric acid in spent sulphuric acid.—See B., 1938, 508.

Determination of nitrates in water by means of diphenylamine.—See B., 1938, 597.

Determination of nitrate-nitrogen in fertilisers. —See B., 1938, 560.

Titrimetric determination of phosphoric acid. W. RATHJE (Angew. Chem., 1938, **51**, 256—258).— The phosphate solution, acidified with $HClO_4$ and containing 1 c.c. of 1% KI, is boiled and titrated, while boiling, with $BiOClO_4$. The end-point is reached when red BiOI, which is slightly more sol. than $BiPO_4$, is pptd. The influence of salts and org. substances is discussed, and methods for their removal are indicated. C. R. H.

Titrimetric determination of phosphoric acid in yeast.—See B., 1938, 571.

Micro-determination of arsenic. A. E. HOW (Ind. Eng. Chem. [Anal.], 1938, **10**, 226—232).—A modified Gutzeit procedure, sensitive to 0.01 µg. of As and capable of determining 0.1 µg. with a probable

error of 5%, is described. Optimum conditions have been found for each variable in the determination.
L. S. T.

Determination of arsenic in metallurgical agglomerates.—See B., 1938, 528.

Volumetric determination of small amounts of boron in natural waters.—See B., 1938, 597.

Micro-analysis of silicates. F. HECHT (Mikrochim. Acta, 1937, 2, 188—208).—Eight samples, each of 10—20 mg., are taken for the determination of SiO_2; Al_2O_3, total Fe, CaO, MgO, TiO_2, and MnO; H_2O ($<110°$) and P_2O_5; H_2O ($>110°$); total S; Na_2O and K_2O; FeO; CO_2. Full details of analysis, which is based on recognised microchemical methods, are given. C. R. H.

Determination of soluble silica in drinking and natural waters.—See B., 1938, 597.

Spectrum analysis of glass.—See B., 1938, 512.

Determination of carbon monoxide.—See B., 1938, 474, 510.

Determination of cyanide by Liebig's method. V. V. MALGIN (Plant Protection, U.S.S.R., 1935, No. 6, 23—28).—In determining HCN in the atm., 2% KOH should be used as absorbent and KI should be added to sharpen the end-point of the $AgNO_3$ titration. CH. ABS. (e)

Potassium and other salts of dinitro-β-naphtholsulphonic acid, and the application of the anion of this acid to the determination of potassium ions. E. P. VOLOTSCHNEVA (J. Appl. Chem. Russ., 1938, 11, 369—373).—The solubility of $1:5:2:7\text{-}(NO_2)_2C_{10}H_5(OH)\cdot SO_3K$ rises from 0·0673% at 0° to 0·493% at 55°, and that of the Ca salt from 1·35% at 16% to 11·71% at 55°. The K salt is readily sol. in alkaline solutions, less so in acid ones. Solutions of the Ca and K salts give ppts. with a no. of cations, substitution of the OH-H taking place. K is determined by heating the ppt. of K salt with H_2SO_4, and weighing the residue of K_2SO_4; this method is inapplicable in presence of Rb, NH_4, Li, Co^{II}, Ni^{II}, Cu^{II}, or Fe^{II}, or in presence of considerable excess of Zn, Mg, Mn^{II}, Pb^{II}, Na, or C_2O_4''. R. T.

Determination of potassium in silicates with a cobalt nitrite complex containing silver. G. V. TANANOIJES (Trans. Ukrain. Sci. Res. Inst. Bldg. Mat., U.S.S.R., 1931, 10).—K is pptd. as $K_2PbCo(NO_2)_6$ by means of a Na cobaltinitrite solution containing Pb. The ppt. is impure and a correction factor must be determined by experiment. A 2% accuracy is obtained. CH. ABS. (e)

Determination of small amounts of potassium in aluminium and magnesium.—See B., 1938, 532.

Determination of sodium in aluminium and aluminium–silicon alloys.—See B., 1938, 532.

Sulphide–iodometric determination of small amounts of silver. A. G. BOSIN and S. C. GINTZBURG (J. Appl. Chem. Russ., 1938, 11, 528—529).—10—12 drops of conc. aq. Na_2S are added to the solution (in absence of ions precipitable by Na_2S,

other than Ag·), the solution is centrifuged, and the ppt. is washed, suspended in 5 ml. of $1:1$ HCl, and shaken with 0·01N-I in KI, excess of which is titrated. 0·1—80 mg. of Ag may thus be determined, with an error of 0·01—2·3 mg. R. T.

Iodometric determination of silver. C. K. DEISCHER and W. M. McNABB (J. Chem. Educ., 1938, 15, 86—87; cf. A., 1936, 951).—The Ag· is titrated in acid solution with standard aq. KI, using starch and Ce^{IV} NH_4 sulphate as indicators, until a permanent blue-green colour is obtained. The indicator correction must be determined. The method is applicable in presence of Cu··. Comparisons with the Volhard and the gravimetric AgCl method are satisfactory. L. S. T.

Electrolytic determination of silver from potassium cyanide solution. D. TSCHAVDAROV (Z. anal. Chem., 1938, 112, 258—265).—The method is more accurate if the solution is hot, and if KOH and CH_2O are present. Details of an improved procedure are given. F. J. G.

Determination of calcium nitride in calcium cyanamide.—See B., 1938, 509.

Titrimetric determination of gypsum in cement.—See B., 1938, 517.

Determination of hardness of waters containing phosphates.—See B., 1938, 596.

Analytical chemistry of beryllium. R. GADEAU (Compt. rend. XVII Cong. Chim. Ind., 1937, 702—707).—Methods in use for the analysis of beryl, Be salts, and alloys of Fe, or Cu, or Al with Be, are described. In general, these involve elimination of SiO_2, removal of Fe and heavy metals by means of H_2S in ammoniacal tartrate solution, pptn. of Al with 8-hydroxyquinoline in presence of AcOH, and pptn. of Be as phosphate in the dil. AcOH solution.
L. S. T.

Separation of magnesium from potassium and sodium with "Triton B." T. KROKOWSKI (Z. anal. Chem., 1938, 112, 183—186).—In the absence of NH_4·, Mg·· can be pptd. quantitatively as $Mg(OH)_2$ by the addition of 50% excess of the base "Triton B" (I), thus permitting its separation from Na· and K·. Addition of a further 9 c.c. of 2·5N-(I) per 1 g. of NH_4Cl present causes quant. pptn. of $Mg(OH)_2$ even in presence of NH_4·. J. W. S.

Rapid determination of magnesium in magnesites and dolomites.—See B., 1938, 508.

Determination of magnesium in presence of metals of the third and fourth groups.—See B., 1938, 533.

Precipitation of zinc as zinc salicylaldoxime. T. G. PEARSON (Z. anal. Chem., 1938, 112, 179—182).—At p_H 6·5 Ni·· is pptd. completely by salicylaldoxime (I), whereas Zn·· is pptd. only at p_H 7—8. To ppt. Zn, 50% excess of 1% aq. (I) is added to the slightly acid solution with a drop of phenol-red, and 0·1N-NaOH is added until the indicator is pale red. After being kept overnight the ppt. is collected, washed with cold H_2O, and dried for 5 hr. at 80°.
J. W. S.

Postprecipitation of zinc sulphide with bismuth sulphide. I. M. KOLTHOFF and F. S. GRIFFITH (J. Physical Chem., 1938, **42**, 531—539; cf. A., 1932, 481; 1936, 1194).—ZnS is postpptd. with Bi_2S_3, but Zn can be separated quantitatively from Bi with H_2S provided that the [HCl] after pptn. is $\not< 0.3N$ and the solution is filtered within a few min. The rate of postpptn. with Bi_2S_3, like that with CuS, is small initially and increases with increasing time of contact. The efficiencies of HgS and ZnS in promoting pptn. of ZnS are > those of Bi_2S_3. Brief periods of ageing increase the efficiency of Bi_2S_3, but after longer periods it becomes less effective. ZnS can be extracted with $2N$-HCl from mixtures with Bi_2S_3 and CuS, but not from HgS, since in the latter case it is incorporated as mixed crystals. Addition of NaCl to a solution inhibits postpptn. of ZnS with Bi_2S_3 and CuS.
J. W. S.

Co-precipitation and p_H value in precipitations with 8-hydroxyquinoline. H. V. MOYER and W. J. REMINGTON (Ind. Eng. Chem. [Anal.], 1938, **10**, 212—213).—Zn is completely pptd. between p_H 4·6 and 9·3, and co-pptn. of Mg with the Zn begins at p_H 5·5, 2 units lower than reported (A., 1933, 922) for pptn. of Mg alone. Zn and Mg can be separated only if the p_H is kept between 4·6 and 5·5. Fe and Al can be separated if the p_H of the solution is kept between 3·5 and 4·0. Al is not pptd. at p_H 4·10 in absence of the Fe. Co-pptn. of Mg on the Zn salt of 8-hydroxyquinoline at p_H 5·95 and of Al on the Fe^{III} salt of 8-hydroxyquinoline increases in accordance with the Freundlich adsorption equation up to a limiting concn., above which the amount carried down remains const. Co-pptn. is probably adsorption on the surface of the ppt.
L. S. T.

Rapid determination of zinc in zinc–copper sulphide ores and their concentrates.—See B., 1938, 527.

Crystallisations carried out on a glass slide by evaporation of the solvent. II. Case of two substances without mutual action, or of two substances which form mixed crystals. J. SEIGLE (Chim. et Ind., 1938, **39**, 627—636; cf. A., 1938, I, 157).—The appearances resulting from the mode of distribution of the solutes relative to one another when aq. solutions of two salts, or of a salt and a dye, or alcoholic solutions of $C_{10}H_8$ and a dye, are evaporated on a glass slide, are described.
F. J. G.

Galvano-electric determination of metals. II. Determination of lead. P. S. TUTUNDŽIĆ (Z. anorg. Chem., 1938, **237**, 38—44).—Pb can be determined by the method already described (A., 1930, 882) if gelatin and an excess of NaOAc are present.
F. J. G.

Determination of thionalide complexes of lead, bismuth, and antimony. R. BERG and E. S. FAHRENKAMP (Z. anal. Chem., 1938, **112**, 161—169; cf. A., 1937, I, 476).—Pb can be separated from Ag, Cu, Zn, Co, Ni, Al, Fe^{III}, As^{III}, Cd, Cr^{III}, and Ti^{IV} by pptn. with 3—4 times the theoretical quantity of thionalide (I) (2% in EtOH) from cold SO_4''-free solutions containing 1—3 g. of Na tartrate and 3—5 g. of KCN per 100 c.c., and " N in OH'." The ppt. is

washed with H_2O till free from CN' and with 50% aq. $COMe_2$ till free from (I), and is dried at 105°. Bi can be separated from the same metals and also from Hg^{II}, Pt, Pd, and V, whilst Sn can be separated from Ag, Fe^{II}, Co, Cr^{III}, Ti^{IV}, and Ce^{III}, both by the same process, excepting that the final washing is made with 10% aq. EtOH instead of aq. $COMe_2$. J. W. S.

Azo-dyes as adsorptional indicators. C. G. RAICHINSCHTEIN and N. KOROBOV (J. Appl. Chem. Russ., 1938, **11**, 550—554).—Benzopurpurin 4B, benzoazurin, Congo-corinth, and diamine-blue, -bengal blue, -fast bright blue, -brown, -bright red, -heliotrope, and -vermillion 6BS and 4B may be used as indicators in the titration of $Pb^{\cdot\cdot}$ with $(NH_4)_2MoO_4$. R. T.

Determination of lead in solders.—See B., 1938, 528.

Rapid determination of lead tetraethyl in motor fuels.—See B., 1938, 478.

Detection of copper, cobalt, and nickel. T. A. THOMSON (Mikrochim. Acta, 1938, **2**, 280—282).—By carrying out the pptn. with NH_4 mercurithiocyanate in a capillary 0·2—0·6 mm. in diameter and centrifuging, 1 p.p.m. of Cu and Co and 2 p.p.m. of Ni can be detected in a solution containing excess of Zn. K mercuriselenocyanate offers no advantage over the thiocyanate and is less stable. J. W. S.

Microchemical reactions of the mercurous ion. A. MARTINI (Mikrochim. Acta, 1938, **2**, 296—298).—$Hg^{\cdot}$ and $Hg^{\cdot\cdot}$ are both pptd. by $K_2Co(CNS)_4$ or $K_2Zn(CNS)_4$, which are sensitive reagents for the detection of Hg but do not distinguish between its ionic states. Picrolonic acid yields ppts. only with $Hg^{\cdot}$ and permits detection of quantities $\not< 0.01$ μg. J. W. S.

Action and distribution of mercury. XXVII. Microanalytical determination of mercury. A. STOCK and N. NEUENSCHWANDER-LEMMER (Ber., 1938, **71**, [B], 550—562).—The following points arise from a re-examination of the author's method of detecting traces of Hg (A., 1934, 270). Treatment of urine with Cl_2 is necessary and adequate. Similar treatment of solid org. matter is inadequate and $KClO_3$–HCl should be used for this reason and for the more complete destruction of org. matter, the presence of which can render the subsequent electrolysis incomplete by reason of complex formation. Volatilisation of $HgCl_2$ during evaporation of the aq. solution is prevented by the presence of HCl. Dil. solutions of $HgCl_2$ should be kept for as short a time as possible in glass or SiO_2 flasks since Hg is thereby adsorbed. In the electrolysis the amount of Cu can be advisedly reduced from 20 and 10 mg. to 5 mg., whereby the thinner cathodic Cu deposit is more resistant than that produced with larger amounts of Cu. The surface of the cathode is enlarged by use of a spiral; etching with HNO_3 has little effect. The Pt anode is placed immediately below the vertical cathode, which is thus always immersed in a dil. solution of Cl_2. An e.m.f. of 4 v. is suitable. The presence of 1% of HCl is very advantageous. $(NH_4)_2C_2O_4$ causes smoother and denser deposits of Cu but its amount requires very careful control and its presence may hinder the subsequent formation of a clean Hg

globule. Treatment of the distillation tube with alkali is unnecessary.   H. W.

Microanalytical utilisation of diarylcarbazones. P. Krumholz and F. Hönel (Mikrochim. Acta, 1937, **2**, 177—183).—Reactions between Hg^{II}, Cu^{II}, Fe^{III}, and Cd salts, chromates, and molybdates and diphenyl-, di-α- and -β-naphthyl-, and di-o-, -m-, and -p-nitrophenyl-carbazones and -carbazides have been investigated. The sensitivity of the substituted diphenylcarbazones is > that of the unsubstituted compound. For Hg, Cu, and Fe the sensitivity in neutral solution is > in acid solution. In the case of Cd, alkaline solutions are used, and the reaction between Cd and di-β-naphthylcarbazone can be utilised in presence of large quantities of Cu, the Cu being retained in solution by means of KCN. Chromates are better detected by carbazides than by carbazones, the unsubstituted compound being the most sensitive.   C. R. H.

Colour reactions between quadrivalent cerium and salts of aromatic acids. F. M. Schemjakin and A. N. Belokon (Compt. rend. Acad. Sci., U.R.S.S., 1938, **18**, 275—276).—Ce˙˙˙˙ gives dark-coloured ppts., lilac-black, reddish-brown, almost black, and bluish-green, respectively, with the NH$_4$ salts of naphthoic, anthranilic, and salicylic acids, and with phenylalanine (I). Except with (I), the ppts. are insol. in HCl. The reactions can be used on paper, but the sensitivity is not favourable. Ce˙˙˙, Th, Pr, Nd, and Zr do not give coloured ppts. with these substances.   L. S. T.

Cerate oxidimetry. Theoretical considerations and determination of approximate electrode reference potentials. G. F. Smith and C. A. Getz (Ind. Eng. Chem. [Anal.], 1938, **10**, 191—195).—The theory of the mechanism of ceric oxidimetry based on the assumption of a simple Ce˙˙˙˙ : Ce˙˙˙ ratio is faulty as a guide to the interpretation of experimental results. In 1 to 8N-HNO$_3$ Ce˙˙˙˙ has a potential of 1·61—1·56 v. and in 1 to 8N-HClO$_4$ 1·70—1·87 v. as compared with 1·44 v. in dil. H$_2$SO$_4$. These variations are best explained by assuming the formation of a complex cerate ion. Potentiometric titrations of Fe˙˙ in different concns. of HClO$_4$, HNO$_3$, H$_2$SO$_4$, and HCl are represented graphically. Proposed new procedures in HClO$_4$ include the simultaneous differential oxidation of Fe˙˙ and vanadyl salts, the determination of oxalate (including Ca˙˙) with ferroin as indicator, and the titration of AsO$_3'''$ to AsO$_4'''$.   L. S. T.

Determination of small quantities of cerium in copper welding wires.—See B., 1938, 527.

Rare earths. Determination of the rare earths by means of their arc spectra. C. N. McCarty, L. R. Scribner, and M. Lawrenz, with B. S. Hopkins (Ind. Eng. Chem. [Anal.], 1938, **10**, 184—187).—The spectrographic determination of individual rare earths in their complex mixtures using an internal standard has been investigated. Zr oxide is better than MgO or Ce oxide as an internal standard, and the region 2500—3300 A. is the most suitable in no. and intensity of lines and in dispersion. The effects of other rare earths on the

line intensities of a single rare earth is the same. The arc spectra of the rare earth oxides from numerous typical ores have been photographed, and the % of rare earth estimated by interpolation. Data given for the composition of 20 ores indicate that similar ores from different localities show marked variation in the % of the individual rare earths which they contain. Xenotime and allanite also appear to be better sources of Nd than is gadolinite. When applied to the determination of individual rare earths in an artificial mixture of rare earths of known composition the max. error of the method was found to be ±15%.   L. S. T.

Quantitative spectrochemical analysis with the microphotometer. F. Twyman, G. F. Lothian, and E. S. Dreblow (J.S.C.I., 1938, **57**, 75—79; cf. A., 1930, 445).—Methods of quant. spectrochemical analysis are reviewed, and details are given of a rapid method of determining a minor constituent of an alloy by microphotometric comparison of the intensities of one of its spectrum lines and a line due to a suitable major constituent. The plot of log p_2/p_1 against log D_2/D_1 (p_1, p_2 being the percentages of the minor and major constituents, and D_1, D_2 being the corresponding microphotometer galvanometer deflexions) is independent of the exposure, and is in many cases a straight line. Changes in the plate and in development affect the vals. of log D_2/D_1 by a const. factor, which is determined by standard exposures on each plate. A const. slit width is used to minimise changes in the continuous background. The technique of the method, and its application to Al alloys, are described.   A. J. E. W.

Detection and colorimetric determination of aluminium in water in presence of fluorides.—See B., 1937, 597.

Direct determination of aluminium in aluminium earths.—See B., 1938, 509.

Determination of aluminium oxide in steel.—See B., 1938, 522.

Determination of aluminium oxide in aluminium.—See B., 1938, 532.

Detection of indium with morin and of some heavy metals with cacothelin. G. Beck (Mikrochim. Acta, 1938, **2**, 287—290; cf. A., 1936, 1221).—Al, Ga, Sc, and In salts all show an intense green fluorescence in daylight when treated with an EtOH solution of morin. If this fluorescence is suppressed by NaF it is due to Al or Sc, if not suppressed by (NH$_4$)$_2$CO$_3$ it is due to Sc, and if not suppressed by ammoniacal tartrate solution it is due to Al. If the fluorescence is not suppressed by NaF and remains in the solution after saturation with H$_2$S it is due to Ga. 0·02 μg. of In can be detected in 1 c.c. of solution if the fluorescence is examined in ultra-violet light. Cacothelin is reduced to a violet dye by Sn^{II}, U^{IV}, Ti^{III}, Re^{III}, Nb^{III}, and lower oxides of Mo and W, enabling about 1 μg. of these metals to be detected.   J. W. S.

Determination of manganese in silicate rocks. IV. New method of oxidation of manganese. O. Hackl (Z. anal. Chem., 1938, **112**, 174—179; cf. A., 1936, 813, 952).—Pt foil, but not Pt-black,

-sponge, or gauze, or platinised SiO_2, can be used to catalyse the oxidation of $Mn^{..}$ to MnO_4' by $(NH_4)_2S_2O_8$ and H_2SO_4. The solution must be quite free from Cl', traces of which cause incomplete oxidation. It is suggested that this method could be applied to the colorimetric determination of traces of Cl'. The reaction is much less sensitive to the presence of F'. Any Ti present is oxidised with the $Mn^{..}$, interfering with the colorimetric test. Addition of sufficient H_2SO_4 to suppress this oxidation also prevents complete oxidation of $Mn^{..}$.   J. W. S.

Determination of traces of manganese in natural waters, applying coagulation for its separation. V. T. TSCHUIKO (J. Appl. Chem. Russ., 1938, **11**, 530—533).—The p_H of the H_2O is adjusted to 11, and aq. $MgSO_4$ is added. The ppt. is collected, and Mn is determined in it by Marshall's method. Should the Mn content of the H_2O be <0.2 p.p.m., it is evaporated down to this concn.; concns. of 0·0003 p.p.m. may thus be determined. $Mn^{..}$ is not pptd. together with $Al(OH)_3$ at p_H 8·5; the Mn found in the ppt. under these conditions represents colloidal Mn.   R. T.

Determination of manganese in steel and cast iron.—See B., 1938, 522.

Drop method of detection of rhenium. N. S. POLUEKTOV (J. Appl. Chem. Russ., 1938, **11**, 534—538).—Three drops of conc. H_2SO_4 and 1 drop of 10% Br in conc. HBr are added to a drop of the solution, and the mixture is distilled. 1 ml. of conc. HBr is added to the distillate, the mixture is evaporated to dryness at 100° (to eliminate As, Se, and Ge), and the residue is warmed with H_2O_2, to convert $ReOBr_2$ into $HReO_4$. This is dissolved in a drop of H_2O, and 2N-tartaric acid and $SnCl_2$ are added, followed by 1% Na_2TeO_4, when a black ppt. or turbidity due to liberation of Te is obtained in presence of <0.5 μg. Re; other metals do not interfere. Re is quantitatively pptd. by adding OsO_4 to the distillate, and saturating with H_2S; the solution is centrifuged, and the ppt. of Re_2S_7 is dissolved in 10% H_2O_2. Re is detected in the solution as above.   R. T.

Principles and applications of absolute colorimetry. XVII. Absolute colorimetry of iron. A. THIEL, H. HEINRICH, and E. VAN HENGEL (Ber., 1938, **71**, [B], 756—758).—The presence of Mn does not interfere with the determination of $Fe^{..}$ by 4 : 4'-dipyridyl (A., 1938, I, 97). Under certain conditions the reduction of $Fe^{...}$ to $Fe^{..}$ can be advantageously effected by SO_3'' or quinol in place of $Na_2S_2O_4$. The phenanthroline method is somewhat cheaper than the dipyridyl process. It is not affected by the presence of SiO_2, H_3PO_4, Ti, Al, Zn, Pb, Ag, Mg, Mn, Ni, and Cu but is sensitive to Co. The thiocyanate method is considered inferior in convenience.   H. W.

Detection of ferro- and ferri-cyanide by catalysis. L. SZEBELLÉDY and M. AJTAI (Mikrochim. Acta, 1938, **2**, 299—305).—The fact that the oxidation of p-phenetidine (I) by H_2O_2 is catalysed by $Fe(CN)_6'''$ [or $Fe(CN)_6'''' + H_2O_2$] can be utilised for the detection of $Fe(CN)_6'''$ and $Fe(CN)_6''''$. 4 c.c. of the sample are treated with 0·5 c.c. of 0·025% solution of

(I) in HCl and 0·5 c.c. of 0·2% H_2O_2, the colour produced after 1—10 min. being compared with that in a blank test carried out simultaneously.   J. W. S.

Carborundum and silicon electrodes. II. Application of silicon and silicon carbide electrodes to titration of redox systems. J. A. BOLTUNOV and Z. P. KOZMINA (J. Gen. Chem. Russ., 1937, **7**, 2899—2902).—Electrotitration of $FeSO_4$, $K_4Fe(CN)_6$, Na_2SO_3, or Na_2S by $KMnO_4$, or of $FeSO_4$ by $K_2Cr_2O_7$, may be effected with a SiC indicator electrode, or of $FeSO_4$ by $KMnO_4$ or $K_2Cr_2O_7$, with a Si electrode.   R. T.

Serial method of determining small amounts of iron in water.—See B., 1938, 597.

Determination of ferrous oxide in chromite.— See B., 1938, 520.

Micro-detection of cobalt. T. A. THOMSON and E. M. THOMSON (J. New Zealand Inst. Chem., 1937, **2**, 39—41).—Crystallographic and spot tests and quant. analysis are reviewed.   S. M.

Postprecipitation of nickel sulphide with copper, mercuric, and zinc sulphides. I. M. KOLTHOFF and F. S. GRIFFITH (J. Physical Chem., 1938, **42**, 541—545).—NiS is postpptd. with CuS, HgS, and ZnS. The effect of HgS is $>$ that of CuS, whilst that of ZnS depends greatly on the p_H at which it is separated. The rate of postpptn. with CuS increases with rise of temp. NiS also catalyses its own pptn.   J. W. S.

Photometric determination of molybdenum in steel.—See B., 1938, 523.

Colorimetric determination of minute amounts of tin in organic matter. N. STRAFFORD (Mikrochim. Acta, 1938, **2**, 306—313).—Most of the org. matter is removed from the sample by oxidation with HNO_3 and H_2SO_4, after which Sn is pptd. with H_2S from slightly acid solution containing $CS(NH_2)_2$ to prevent pptn. of Cu. The ppt. is redissolved in HNO_3 and H_2SO_4, and all org. matter removed with the aid of periodic additions of H_2O_2. The resulting solution is reduced by Al in presence of HCl in an atm. of CO_2, and phosphomolybdate reagent is added. After mixing well, the Mo-blue formed is extracted with $C_5H_{11}\cdot OH$, the colour of the extract being measured. The concn. of Sn is deduced from the results of calibration tests with the same tintometer. The phosphomolybdate reagent comprises solutions of (a) 2·5 g. of H_2MoO_4 dissolved in 50 ml. of N-NaOH and diluted to 100 ml. with $2N-H_2SO_4$; and (b) 0·44 g. of NaH_2PO_4,H_2O in 100 ml. of H_2O. For use, 10 ml. of (a) are mixed with 4 ml. of (b) and diluted to 100 ml. In presence of Ti, tartaric acid is added before pptn. with H_2S.   J. W. S.

Fractional detection of titanium and uranium. N. A. TANANAEV and A. GINTZBURG (J. Appl. Chem. Russ., 1938, **11**, 364—366).—The solution is boiled with $SnCl_2$, filtered, and a solution of chromotropic acid is added, when a red or brown coloration indicates Ti. For detection of U the solution is boiled with excess of NH_3, and filtered. The residue is extracted with AcOH, and aq. $K_4Fe(CN)_6$ is added to the extract, when a brown coloration or ppt. indicates U. Should

Fe or Cr be present the filtrate is made acid with HCl, excess of KI is added, the I liberated is reduced with $Na_2S_2O_3$, and $K_4Fe(CN)_6$ is added.   R. T.

Reaction of zirconium methylarsinate. Separation of zirconium from titanium, copper, and tin. R. CHANDELLE (Bull. Soc. chim. Belg., 1938, 47, 172—193).—The separation of Zr and Ti by the Na_3AsMeO_3 method (A., 1937, I, 634) has been investigated. Direct addition of the reagent to a solution containing Zr and Ti ppts. the Zr, but the ppt. contains some Ti. To avoid this Zr is first pptd. by addition of aq. NH_3 and excess of H_2O_2. Ti remains in solution. The ppt. is collected and dissolved in HCl, after which Zr is pptd. as $Zr(AsMeO_3)_2$. Zr and Cu can be separated directly by the methylarsinate method. Sn^{IV} in 0·5N-HCl is not pptd. by Na_2AsMeO_3, but it is not possible to use the reaction for the separation of Zr and Sn as the ppt. of Zr carries down much Sn.   A. J. M.

Drop reactions of vanadates and molybdates with 1-nitroso-β-naphthol. F. M. SCHEMJAKIN and A. N. BELOKON (Compt. rend. Acad. Sci. U.R.S.S., 1938, 18, 277—278).—A saturated EtOH solution of $1 : 2\text{-}NO\cdot C_{10}H_6\cdot OH$ (I) gives a dark-green ppt. with an alkaline solution of NH_4 vanadate, and a brownish-red ppt. from a solution acidified with HCl. In neutral solution, there is no pptn. The brownish-red ppt. is sol. in KOH, conc. HNO_3, conc. H_2SO_4, and conc. HCl (incompletely). In dil. HCl solution the sensitivity is $\sim 5 \times 10^{-6}$ g. per ml. Pptn. in AcOH solution is less complete. For a drop reaction on paper the sensitivity is $\sim 1 \times 10^{-5}$ g. per ml. AcOH and EtOH solutions of (I) form a red ppt. with an acid solution of NH_4 molybdate (cf. A., 1924, ii, 788). The action of acids and bases is similar to that with the V ppts. Used as a drop reaction on paper four rings, (inner) orange, lilac, yellow, blue, may appear; sensitivity, 10^{-4} g. Mo per ml. In a solution acidified with HCl, AsO_3''' (?) gives a slight orange-red ppt. with (I).   L. S. T.

Rapid potentiometric determination of vanadium in alloy steels etc.—See B., 1938, 523.

Detection of tervalent antimony. M. J. SCHAPIRO (J. Appl. Chem. Russ., 1938, 11, 355).—0·5 ml. of 1% KI, 1 ml. of 20% NaOH, and 5 ml. of 0·01% $AuCl_3$ are added to 1 ml. of the solution, and the mixture is shaken, when a red colour appears in presence of $< 0·01$ mg. Sb^{III}. Cu, Sn, As, Cd, Hg^{II}, Fe^{III}, Mn^{III}, Co^{II}, Ag, and Os interfere.   R. T.

Micro-gravimetric determination of arsenic and antimony. F. HECHT and M. VON MACK (Mikrochim. Acta, 1937, 2, 218—226).—As is pptd. as $MgNH_4AsO_4,6H_2O$ by means of MgO mixture in presence of NH_4Cl, and washed with aq. NH_3, EtOH, and Et_2O. Sb is determined as Sb_2S_3, use being made of a microfilter beaker surrounded by a two-piece Al block which can be heated for subliming the excess of S. The two methods have been combined in order to separate and determine As and Sb.   C. R. H.

Micro-gravimetric separation of tin and antimony. M. VON MACK and F. HECHT (Mikrochim. Acta, 1937, 2, 227—241).—The pptn. of Sn with $PhAsO_3H_2$ followed by ignition of the ppt. is not applicable to micro-determinations. Pptn. by means of aq. NH_3 and NH_4NO_3 and ignition of the ppt. is applicable only in absence of other metals. A method is outlined for pptg. Sn by means of cupferron, and if this is done in presence of tartaric acid and in absence of all but traces of alkali salts, Sn can be separated from Sb. Sb can be determined in the filtrate by the authors' method (cf. preceding abstract) if the cupferron is first oxidised by H_2O_2 in presence of NH_3. The application of the method to the analysis of alloys is discussed.   C. R. H.

Determination of antimony in aluminium alloys.—See B., 1938, 533.

Colour reaction for the bismuth ion. N. V. VAVILOV (J. Appl. Chem. Russ., 1938, 11, 356—363).—$MeCS\cdot NH_2$ gives a yellow coloration with dil. solutions of Bi salts, serving for the detection of $< 0·07$ mg. Bi in 0·1 ml. of solution; group IV metals do not interfere. Characteristic effects are obtained when the tests are made on filter-paper, according to the other cations present.   R. T.

Detection of small amounts of gold, palladium, and platinum. M. J. SCHAPIRO (J. Appl. Chem. Russ., 1938, 11, 367—368).—5—6 drops of starch solution and 5—6 drops of aq. 0·02% I are added to each of two test-tubes containing respectively 2 ml. of H_2O and of solution; a faint blue coloration is obtained in the former, but not the latter, solution, should it contain Au^{III}, Pd^{II}, Pt^{IV}, or Hg^{II} $< 0·4$ μg., Hg^I 0·25, or Ag 0·05 μg. Co, Ni, Mn, Zn, Fe, Al, UO_2, Cd, Cu, Pb, As, Sb, Bi, Ce, Ta, Nb, Zr, La, Th, W, V, Mo, Te, Se, Os, and Tl do not interfere.   R. T.

Ice point as a standard of reference. E. E. ROPER (J. Amer. Chem. Soc., 1938, 60, 866—869).—A temp. of 0·000° can be maintained with an accuracy of $\pm 0·001°$ by means of crushed ice in a Dewar tube, adopting White's washing technique (A., 1934, 246).   E. S. H.

Micro-melting point and sublimation apparatus with completely built-in thermometer. L. FUCHS (Mikrochim. Acta, 1938, 2, 317—328).—The apparatus comprises a metal box closed at the top by an electrically heated metal plate, on which is laid a glass plate to protect it from the air. A circular thermometer is fixed in a groove on the heating table. The crystals to be fused are enclosed between cover-slips on a highly polished and blackened metal plate. For evaporation of solutions and sublimation of the residues the table contains two pits to carry small glass sublimation cups. The heating plate is so arranged that any portion can be brought into the field of a microscope. The max. m.p. deviations observed are $\pm 1°$ at $<200°$ and $\pm 2°$ at $>200°$.   J. W. S.

Applications of high frequency in chemistry. H. LEDUC (Compt. rend. XVII Cong. Chim. Ind., 1937, 798—802).—The use of high-frequency heating in chemistry and industry is reviewed.   A. J. M.

Grating monochromator for the Schumann region. R. F. BAKER (J. Opt. Soc. Amer., 1938, 28, 55—60).—The instrument described is suitable for photoelectric investigations at 500—3000 A. A H_2-tube light source, and a K photo-cell used in conjunction with a Compton electrometer for λλ < 1000 A.,

are also described.   Data for the photo-electric yield of Cd from the threshold to 1000 A. are recorded.
                                                        A. J. E. W.

Electron-optical theory of present-day precision mass spectrographs. R. HERZOG and V. HAUK (Z. Physik, 1938, **108**, 609—634).—An examination of the theoretical aspect of the geometry and functioning of mass spectrographs with particular reference to those of Bainbridge and Jordan, Dempster, and Aston.   L. G. G.

Calibration wave-lengths for infra-red spectrometers. P. E. SHEARIN and E. K. PLYLER (J. Opt. Soc. Amer., 1938, **28**, 61—62).—Suitable lines and bands in the range 2—24 μ. for HCl, H_2O, and CO_2 are tabulated. $\lambda\lambda$ of 11 sharp absorption maxima in EtOH and $C_5H_{11}\cdot OH$, at 7—13 μ., suitable for calibration purposes, have been measured.   A. J. E. W.

Infra-red and Raman spectra of polyatomic molecules. I. Automatic prism spectrometer for the infra-red. H. GERSHINOWITZ and E. B. WILSON, jun. (J. Chem. Physics, 1938, **6**, 197—200).—Construction and operation of a spectrometer which contains two prisms, one of NaCl and the other of KBr, are described.   The two prisms may be interchanged without opening the spectrometer housing or disturbing the calibration.   A non-continuous, step-wise method of recording has been employed.   W. R. A.

Quantitative spectrographic analysis.   Treatment of graphite electrodes for evaporation of aqueous solutions. H. A. WILHELM (Ind. Eng. Chem. [Anal.], 1938, **10**, 211—212).—A method of testing and reducing the penetration of solutions evaporated in the cup of a graphite electrode is described.   L. S. T.

Vacuum spectrograph for region 2000—1000 A. B. K. JOHNSON (J. Sci. Instr., 1938, **15**, 126—128).—A vac. spectrograph with optical systems of CaF_2 and LiF is described.   The most suitable illumination is the Sn spectrum.   J. A. D.

Purification of graphite electrodes for spectrochemical analysis. G. W. STANDEN and L. KOVACH, jun. (Proc. Amer. Soc. Test. Mat., 1935, **35**, II, 79—86).—Two methods of eliminating impurities other than Si and B are described.   The first entails treatment with boiling HNO_3–HCl and conc. aq. NH_3, followed by heating in NH_3 and then in Cl_2 at 1000—1100°.   The second method entails prolonged treatment with conc. HNO_3–HCl and with aq. NH_3.   After either treatment the electrodes are burned with 10—15 amp. for 1·75 min.   CH. ABS. (e)

Colorimetry. E. K. NIKITIN and V. I. TICHONOVA (J. Appl. Chem. Russ., 1938, **11**, 347—351).—The accuracy with which red colours may be compared is $>$ that of yellow ones.   The concn. of CrO_4'' may be determined by adding a ml. of fuchsin solution to the standard (concn. C), and then adding the same solution from a microburette to the unknown (concn. x) until the tone (but not intensity) of the colorations matches. The val. of x is then Cb/a, where b is the vol. of fuchsin added to the unknown.   R. T.

Rapid photomicrography. W. MUTCHLER and H. O. WILLIER (Trans. Amer. Soc. Met., 1938, **26**, 279—288).—A method for making photomicrographs

on a metallographic microscope is described.   A special apparatus for holding roll film or photostat negative paper is substituted for the usual individually loaded film-holders.   Focussing is carried out without removing the negative holder by means of a split light beam and an auxiliary eyepiece.   A great saving in time is effected when large no. of specimens are to be photographed.   R. B. C.

Construction and power of the ultra-microscope. B. VON BORRIES and E. RUSKA (Wiss. Veröff. Siemens-Werken, 1938, **17**, 99—106).—An instrument is described which in two stages yields magnifications up to 30,000 diameters, a beam of 80-kv. electrons being used as source of radiation. The definition obtained is $\gg$ can be obtained with light.   It is suggested that the magnification could be increased still further by using improved magnetic lenses.   J. W. S.

High-pressure mercury lamp as light source for ultramicroscopy. K. HOFFMANN (Kolloid-Z., 1938, **83**, 9—13).—By greatly overloading an Osram high-pressure Hg lamp for short periods (about 0·1 sec.) the surface brightness can be increased to $>250,000$ candles.   Experimental arrangements are described.   Since this source is brighter than the sun and richer in small $\lambda\lambda$, it is of special val. for making photo-ultramicrographs of liquid sols containing small particles in active Brownian movement, the optimum exposure time being 0·1 sec.   Photographs are reproduced.   F. L. U.

Micro-refractometer of simple design. A. E. EDWARDS and C. E. OTTO (Ind. Eng. Chem. [Anal.], 1938, **10**, 225—226).—Details of construction are given.   The instrument requires a vol. $\sim 0·01$ ml., and gives vals. of n agreeing with those given by a Pulfrich refractometer to within 0·3%.   L. S. T.

New type of polarimeter. H. TAKÔ (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, **34**, 391—398).—The Nicol prisms of the ordinary polarimeter are replaced by Wollaston double prisms of quartz. Ordinary and extraordinary rays are separated by slits.   The use of the instrument to investigate photo-elasticity and to measure optical rotations is described.   T. H. G.

High resolving power tenfold thyratron counter. D. W. KERST (Rev. Sci. Instr., 1938, **9**, 131—133).—The construction and calibration of a counter having a resolving time of 0·0005 sec. and using one pair of thyratrons to give the desired scale factor are described.   N. M. B.

Radial expanding cloud chamber. F. TREY (Physikal. Z., 1938, **39**, 343—344).—The apparatus is described.   A. J. M.

Demonstration electron diffraction tube. J. A. DARBYSHIRE (J. Sci. Instr., 1938, **15**, 138).—A sealed-off cathode-ray tube has been constructed to give visible electron diffraction patterns at 7000 v.
                                                        J. A. D.

Dew-point potentiometer for determining moisture content of gases.—See B., 1938, 467.

The differential dynamometer as an instrument for conductometric methods of analysis. I.   Design and calibration. J. D. PARENT and

C. A. Crowley. **II. Operational characteristics, technique, and use with certain reactions.** J. D. Parent and R. J. Melchione (Trans. Electrochem. Soc., 1938, **73**, Preprint 25, 353—365; Preprint 26, 367—378).—I. The a.c. instrument comprises a crossed moving-coil system and a pair of separately excited field coils. The two moving coils are respectively coupled to a variable rheostat and through a tapped transformer to the conductivity cell. The chief use of the instrument is in following the course of potentiometric titrations.

II. The direct-reading instrument is particularly adaptable to the conductometric titration of solutions the nature of which renders indicator methods unreliable. The accuracy normally attainable is approx. 1%. J. W. C.

Investigation of the lanthanum amalgam electrode for precise electromotive force measurements. W. G. Parks and R. W. Kingerley (J. Physical Chem., 1938, **42**, 483—496).—The electrode potentials of saturated La amalgam in aq. $LaCl_3$ and $La_2(SO_4)_3$ and in solutions of $LaCl_3$ in EtOH, measured against a Ag–AgCl electrode, are irregular owing to changes in the p_H of the solution and H_2 overpotential. In C_5H_5N solutions AgCl was dissolved from the reference electrode and reacted with the Hg of the amalgam. Hence it is concluded that La amalgams are unsuitable for precise e.m.f. measurements.
J. W. S.

Glass electrode. (Mme.) C. Roy-Pochon (Compt. rend. XVII Cong. Chim. Ind., 1937, 445—447).— 3 or 4 bulbs, each ~ 3 cm. in diameter, are blown in line in Corning 015 glass, and filled with the reference solution. Three of these units are fitted near to each other in the vessel containing the solution under examination. The surface of the electrode is thus increased, and the resistance reduced to 1 or 2 $M\Omega$. The apparatus required for measurement can then be greatly simplified. L. S. T.

Cathode-ray oscillograph applied to the dropping mercury electrode. L. A. Matheson and N. Nichols (Trans. Electrochem. Soc., 1938, **73**, Preprint 32, 433—447).—Good polarographic curves are obtained on the cathode-ray oscillograph by applying a relatively fast and rapidly recurrent voltage sweep (30 voltage sweeps per sec. from 0 to 2·5 v.) to the dropping Hg cathode (1 Hg drop per voltage sweep) in a solution. The sensitivity is almost equal to that of the slower Heyrovsky polarograph; advantages over the polarograph are discussed. E. S. H.

Absolute measurement of alternating currents and the calibration of thermocouples in the decimeter-wave range up to 500 megacycles per second. M. J. O. Strutt and K. S. Knol (Physica, 1938, **5**, 205—214).—An apparatus for calibrating thermocouples at frequencies $\succ 60$ megacycles per sec., consisting of a diode voltmeter measuring the a.c. voltage developed across a known impedance, is described. Thermocouples calibrated with d.c. are accurate within 2% for these frequencies. A Scheibe hot-wire gas thermometer for use at frequencies up to 500 megacycles is also described; specially constructed d.c.-calibrated thermocouples are accurate to within 5% at 500 megacycles. A. J. E. W.

Measurements of small photo-electric currents by photo-conductive cells. M. Kato and C. Asai (Bull. Inst. Phys. Chem. Res. Japan, 1938, **17**, 278—285).—Photo-conductive cells have certain advantages over Cs_2O photo-emissive cells, e.g., in infra-red sensitivity. Amplification of small photo-currents is considered, and a suitable amplifier and several photo-cells are described. Various uses of the cells are discussed. T. H. G.

Distance recorder for firedamp [in mine air]. —See B., 1938, 471.

Apparatus for micro-analysis of gases. T. C. Sutton (J. Sci. Instr., 1938, **15**, 133—135).—An apparatus applicable to samples of 0·1 c.c. to 0·3 c.c. at n.t.p., and enabling all the reactions of macro-analysis to be applied to micro-analysis, is described. J. A. D.

Self-adjusting burette. L. A. Ynalvez (Philippine Agric., 1937, **25**, 865—866).—A simple form of automatic adjustment of the zero meniscus is described. A. G. P.

Mechanised gas analysis apparatus. C. F. Winchester (Rev. Sci. Instr., 1938, **9**, 134—138).— Mechanical devices for carrying out part of the routine work of gas analysis normally done by hand are described. Two sets each of CO_2 and O_2 apparatus are so arranged that duplicate determinations can be conducted simultaneously. N. M. B.

Study of chemical systems by measurement of variations of weight with regularly varying temperature. M. Guichard (Ann. Chim., 1938, [xi], **9**, 323—356).—Work previously published (A., 1925, ii, 427, 559; 1934, 1058; 1935, 599) is summarised and discussed. F. L. U.

Appliance for filtration, fractional crystallisation, and extraction at different temperatures. A. G. Kulman (J. Appl. Chem. Russ., 1938, **11**, 557—560).—Apparatus is described. R. T.

Small portable air compressor for laboratory use. G. F. Flemons (Ind. Eng. Chem. [Anal.], 1938, **10**, 214). L. S. T.

Pump for circulation of gas. G. Arditti (Compt. rend. XVII Cong. Chim. Ind., 1937, 647—648).—An all-glass apparatus for the circulation of gases which do not attack Hg is described. The gas is circulated by means of Hg which, in turn, is operated by a piston. L. S. T.

Laboratory gas generator. V. S. Tvertzin (J. Appl. Chem. Russ., 1938, **11**, 555—556).—Apparatus for generation of C_2H_4 from EtOH, which is dehydrated by passing over kaolin at 360—400°, is described.
R. T.

Static method of determining vapour pressure. G. N. Evetzki (J. Appl. Chem. Russ., 1938, **11**, 523—527).—A method is described. R. T.

Pendulum micro-manometer. R. Masek (Z. Instrumkde., 1938, **58**, 121—122).—The portable micro-manometer described comprises a relatively wide reservoir and a narrow capillary tube of uniform bore bent into zig-zag form so as to give open-scale readings over the ranges 0·0—1, 1—10, 10—20, 20—40, and 40—100 mm. The manometer is suspended in a metal framework, and can be clamped and fitted

into a metal carrying case, through a window in which observations can be made. The instrument is suitable for use as a portable flowmeter. J. W. S.

Determination of the cross-section of molecules of soluble amphipathic substances. K. S. G. Doss (Current Sci., 1938, **6**, 446).—The method described gives 30×10^{-16} sq. cm. for the approx. cross-section of benzopurpurin 10B. L. S. T.

Procedure for micro-fusions. C. VAN BRUNT (Ind. Eng. Chem. [Anal.], 1938, **10**, 224).—A technique for the carbonate fusion of 0·1-mg. samples without loss by creeping employs Pt wire and ribbon. The method is unsuitable for pyrosulphate fusions.
L. S. T.

Reflux bath agitator for low-temperature fractional distillation analysis columns. J. W. TOOKE (Ind. Eng. Chem. [Anal.], 1938, **10**, 214).
L. S. T.

Distillation column. E. H. PARKE (J. Chem. Educ., 1938, **15**, 83). L. S. T.

Micro-separating apparatus. F. FABIAN (Mikrochim. Acta, 1938, **2**, 332).—The micro-separating funnel comprises a tube with its lower end terminating in a capillary tube (diameter 0·05—0·1 mm.) which is bent into an S-shape. The end of the capillary is drawn to a fine jet. The upper end of the tube is fitted with a ground jointed cap, through which air pressure may be applied to control the flow of liquid. No tap is used and hence losses are negligible.
J. W. S.

Determination of azeotropic concentrations by the twin pyknometers method. M. WOJCIECHOWSKI (Nature, 1938, **141**, 691). L. S. T.

Approximate specific gravity determination. J. G. WAUGH (Ind. Eng. Chem. [Anal.], 1938, **10**, 209—211).—The method involves weighing the small object and determining its bouyancy by means of an apparatus resembling a hydrometer. For objects weighing 3 to 15 g. and d 0·33 to 0·95 the method is accurate to 0·01 unit. L. S. T.

Relative surface tension measuring device. F. B. QUINLAN (Rev. Sci. Instr., 1938, **9**, 140).—The improved capillary is prepared by spacing two glass rods or tubes with a wire wrapping around one of them, fusing the ends together, and removing the wire. The capillary is strong, easily cleaned, and offers an easy control of temp. of the capillary column. N. M. B.

Apparatus for etching Wollaston wire. B. F. BOARDMAN (Rev. Sci. Instr., 1938, **9**, 139—140).—An arrangement of tubes and three-way valves allows the lower soldered end of the wire to be surrounded by a protective liquid (CCl_4) on to which HNO_3 is run. Filling and washing can be carried out without disturbing the wire and normal difficulties are eliminated.
N. M. B.

Platinisation of Nichrome and Nichrome-palladium. I. Method of preparation and applications. M. S. GERSCHENOVITSCH and N. Z. KOTELKOV (J. Appl. Chem. Russ., 1938, **11**, 253—256).—Ni–Cr wire or ribbon is oxidised at 800°, and covered with a layer of tincture consisting of 1 g. of $PtCl_2$ or $PdCl_2$ in 3 ml. of EtOH, 10 ml. of a saturated solution of H_3BO_3 in EtOH, and 20 ml. of a

1 : 1 turpentine–lavender oil mixture. After drying, the wire is heated at 800°, and the operation is repeated 2—3 times. The products thus obtained are highly active and stable catalysts, which may replace Pt– or Pd-asbestos, –porcelain, or –SiO_2, Pt- or Pd-black, or smooth Pt- or Pd-plated wires. R. T.

Automatic dipping mechanism for making built-up films. R. W. MATTOON and S. BERNSTEIN (Rev. Sci. Instr., 1938, **9**, 125—126).—The adjustable motor-driven mechanism described is used to build up films of 1000 or more mol. layers of Ba–Cu stearate by the Langmuir–Blodgett dipping technique (cf. A., 1937, I, 458). N. M. B.

Laboratory aids for analytical work. F. VON VIDITZ (Mikrochem. Acta, 1937, **2**, 209—213).—A const.-level device, a wash-bottle which limits the amount of liquid delivered, a soda-lime tube, and a Jena glass indicator bottle which minimises indicator changes due to alkali content of the glass and the action of light, are described and illustrated.
C. R. H.

Ammonia-synthesis column for testing of catalysts.—See B., 1938, 508.

Apparatus for volumetric determination of carbon in ferrochromium and other alloys.—See B., 1938, 522.

Sodium press. E. H. PARKE (J. Chem. Educ., 1938, **15**, 93).—Details of a press constructed from steel and brass are given. L. S. T.

Conversion from weight- to mol-fraction. J. S. BAKER (Chem. Met. Eng., 1938, **45**, 155).—A graphical method for the conversion is described.
D. K. M.

Gas absorber. P. S. CHEN (J. Chem. Educ., 1938, **15**, 145). L. S. T.

Method of research on the kinetics and mechanism of decomposition of individual hydrocarbons. A. DINTZES (J. Gen. Chem. Russ., 1938, **8**, 190).—Gas passed through a Cu tube immersed in molten Pb attains the temp. of the bath more rapidly than when a glass tube is used. R. T.

Dispersive liquids. G. AMIER (Compt. rend., 1938, **206**, 903—904).—Supercooled liquid mixtures of antipyrine with phenols possess high dispersive power (0·025—0·03) with low vals. of n_D (1·58—1·64), and a small variation of n with temp.; they are transparent to $\lambda\lambda \measuredangle 3300$—3600 A. Ba bromomercurate, Li iodoplumbate, and K iodobismuthate possess high dispersive power and low coeffs. of thermal expansion, and may be used for $\lambda\lambda \measuredangle 3800$, 4800, and 5800 A., respectively. A. J. E. W.

[Laboratory] experiment on heterogeneous equilibrium. A. A. VERNON (J. Chem. Educ., 1938, **15**, 88—89).—Details of the method for determining the phase diagram of the system p-$C_6H_4Me\cdot NH_2$–α-$C_{10}H_7\cdot OH$ are given. L. S. T.

Vestium. S. PLEŚNIEWICZ and K. SARNECKI (Przemysł Chem., 1938, **22**, 88—92).—Vestium, described by Śniadecki in 1808, is supposed to be identical with Ru. R. T.

"Nitre" and "natron." F. W. GIBBS (Ann. Sci., 1938, **3**, 213—216).—Historical.

Geochemistry.

Sulphur dioxide content of air at Boyce Thompson Institute. C. SETTERSTROM and P. W. ZIMMERMAN (Contr. Boyce Thompson Inst., 1938, 9, 171—178).—For the year Nov. 1913—Nov. 1937 the average SO_2 content, including zero readings, was 0·033 p.p.m. (max. 0·75 p.p.m.).   AUTHOR.

Variations in the amount of water vapour in the air in the neighbourhood of Shanghai. P. LEJAY (Compt. rend., 1938, 206, 1065—1068).—Data, based on measurements of the transmission of the bands at $\lambda\lambda$ 1·469, 1·119, and 0·933 μ. in the solar spectrum, are recorded.   H. J. E.

Measurements on the radon content of tap-water. G. J. SIZOO and C. P. KOENE (Physica, 1938, 5, 215—219).—With the apparatus described the Rn is boiled out from the H_2O, and transferred to one of two symmetrical ionisation chambers, the second of which provides compensation for background ionisation; the ionisation produced by the Rn is compared with that due to a standard source. Rn contents of 0·07—1·50 $\times$ 10⁻¹⁰ Curie per l. have been observed in 15 samples of tap-H_2O from different sources.
                              A. J. E. W.

Physical and chemical studies in lakes of the Prince Albert Park, Saskatchewan. D. S. RAWSON (J. Biol. Board Can., 1936, 2, 227—284).—Data are recorded.   CH. ABS. (e)

Pink oil-well waters of the Ordzhonikidze oil field. N. A. VOLODIN (Azer. Neft. Choz., 1935, No. 6, 20—26).—Certain wells produce pink water, the colour of which is due to S bacteria.   CH. ABS. (e)

Oil-well waters of Cheleken Island. S. M. LISITSCHKIN (Neft, 1935, 6, No. 19, 13—14).—Analytical data are given.   CH. ABS. (e)

Hydrogen sulphide and ferrous sulphide in the bottom deposits of the brackish water lake Hamanako, Sizuoka Prefecture. S. YOSHIMURA and T. WADA (Proc. Imp. Acad. Tokyo, 1938, 14, 115—120).—The H_2S and FeS contents of the mud collected from places of different depths have been determined and correlated with the H_2S or O_2 content of the H_2O at the same level. Explanations of the observed variations with depth, temp., and with the time of the year are suggested as well as of the origin of the H_2S.   T. H. G.

Ecology of the Tamar estuary. III. Salinity and temperature conditions in the lower estuary. A. MILNE (J. Marine Biol. Assoc., 1938, 22, 529—542).—Data showing the range and rate of fluctuation of salinity and temp. at various points on the bed of the lower Tamar estuary and in the overlying H_2O are recorded.   L. S. T.

Geochemistry and total amount of sediments. P. H. KUENEN (Proc. K. Akad. Wetensch. Amsterdam, 1938, 41, 302—303).—The formation of sediments is discussed. The total amount of weathered sediments is estimated at 8 $\times$ 10⁸ cu. km., and the sediment from other causes >2 $\times$ 10⁸ cu. km. The rate of sedimentation is : pre-Silurian 1 cm. in 5000 years; later, 1 cm. in 10,000 years; Globigerina ooze after the Tertiary, 1 cm. in 5000 years.   A. J. E. W.

Gas evolution in the Tian-schan and Pamirs (geochemical characteristics). N. PROKOPENKO (Abh. Pamir Expedition 1930, Akad. Wiss. Leningrad, 1932, 1, 15—35).—Analytical data for four types of gases recognised are recorded.   CH. ABS. (e)

Present trends in mineralogy. C. PALACHE (Bull. Geol. Soc. Amer., 1938, 49, 447—460).
                              L. S. T.

Leightonite, a new sulphate of copper from Chile. C. PALACHE (Amer. Min., 1938, 23, 34—37).—*Leightonite* (I), $CuO,2CaO,K_2O,4SO_3,2H_2O$, triclinic, pseudo-orthorhombic, $a : b : c$ 0·7043 : 1 : 0·4578, α, β, γ near 90°, hardness 3, d 2·95, n_x 1·578, n_y 1·587, n_z 1·595, all $\pm0\cdot002$, occurs in pale blue prismatic crystals and in fibres filling cross-fibre veins at Chuquicamata. Chemical analyses are recorded. The chief associates are atacamite and kröhnkite, but never antlerite. (I) was formed only under conditions of low acidity.   L. S. T.

Oxidised copper ores of the United Verde Extension mine. G. M. SCHWARTZ (Econ. Geol., 1938, 33, 21—33).—The ores of this deposit show an unusual amount of oxidation and secondary enrichment. The ore minerals and their paragenesis are described in detail.   L. S. T.

Antofagastite and bandylite, two new copper minerals from Chile. C. PALACHE and W. F. FOSHAG (Amer. Min., 1938, 23, 85—90).—*Antofagastite* (I), $2[CuCl_2,2H_2O]$, orthorhombic dipyramidal, space-group *Pbmn*, a_0 7·38, b_0 8·04, c_0 3·72 A., hardness 2·5, d 2·4, vitreous lustre, bluish-green, ω 1·646, β 1·685, γ 1·745, occurs in Calama, Antofagasta, Chile, as a crust on the surface of rock and quartz, with bandylite and atacamite (II). *Bandylite* (III), $CuB_2O_4,CuCl_2,4H_2O$, tetragonal holohedral, space-group *P4/nmm*, a_0 6·13, c_0 5·54 A., thick tabular, deep blue crystals, hardness 2·5, d 2·810, ω 1·692, ϵ 1·640, occurs in Calama, with (I) and (II) as a crust on rock joints. (III) is decomposed by H_2O leaving Cu borate as a residue. Chemical analyses of (I) and (III) are recorded.   L. S. T.

Yttrialite from Iisaka, Japan. S. HATA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, 34, 455—459).—The olive-green mineral, d 4·31 (analysis : MgO 0·56, CaO 0·90, MnO 0·39, PbO 0·10, FeO 2·77, Al_2O_3 1·91, Ce earths 6·42, Y earths 44·70, TiO_2 0·05, ZrO_2 0·53, ThO_2 5·25, UO_2 3·72, SiO_2 29·91, H_2O+ 0·72, H_2O − 0·45, CO_2 0·50, F nil), is a Y diorthosilicate, $Y_2Si_2O_7$, with the Y partly replaced by Fe, Ca, Th, and U. Its age is 131 $\times$ 10⁶ years.   T. H. G.

Japanese thorogummite and its parent mineral. S. IIMORI and S. HATA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1938, 34, 447—454).—A mineral, SiO_2 21·10, P_2O_5 1·77, $(Nb,Ta)_2O_5$ 0·40, ThO_2 25·05, Y earths 12·19, Ce earths 0·57, UO_2 7·91, ZrO_2 4·78, Fe_2O_3 8·67, Al_2O_3 2·22, BeO 0·40, CaO 0·95, MnO 0·35, $(As,Sb)_2O_3$ 0·32, H_2O 10·80, CO_2 3·01, PbO trace, approx. formula $(Th,U,Y,Fe)O_{2-1\cdot5},SiO_2,2H_2O$, is described; it is considered to be a thorogummite.

Its radioactivity is 6 times that of Indian monazite. Enclosed in the thorogummite samples are cores of yttrialite and other minerals, the compositions of which change progressively. Hence it appears that yttrialite is the parent mineral of thorogummite.
<div align="right">T. H. G.</div>

Primary peridotite magma. H. H. HESS (Amer. J. Sci., 1938, [v], **35**, 321—344).—Field evidence showing that certain ultramafic rocks are the product of an ultramafic magma is presented. The origin of this magma is discussed. Such a magma is not incompatible with present knowledge of the system MgO-FeO-SiO_2. Numerous analyses are given.
<div align="right">L. S. T.</div>

Quartz monzonite and related rocks of the Libby Quadrangle, Montana, and the effects on them of deuteric processes. R. GIBSON, I. CAMPBELL, and W. F. JENKS (Amer. J. Sci., 1938, [v], **35**, 345—369).—The rocks described are mainly stocks intrusive into sedimentary formations of the Belt series in N.W. Montana. The chemical analysis of the principal stock, a quartz monzonite on Dry Creek, is recorded. Contact metamorphism and deuteric effects are described.
<div align="right">L. S. T.</div>

Occurrence of cristobalite in a sedimentary rock. D. S. BELJANKIN and V. P. PETROV (Amer. Min., 1938, **23**, 153—155).—An argillaceous sandstone from Nomanevi, Western Georgia, contains a considerable amount of cristobalite together with quartz. The mode of occurrence indicates its secondary origin by means of a gradual cristobalitisation of the primary quartz grains, a possibility that is discussed.
<div align="right">L. S. T.</div>

Gneiss and granites containing cordierite in the French Massif Central. H. LONGCHAMBON (Compt. rend., 1938, **206**, 846—849).—The relation of the deposits to neighbouring regions of granite and of gneiss containing sillimanite is discussed.
<div align="right">A. J. E. W.</div>

Genesis of the Quercy phosphorites. B. GÈZE (Compt. rend., 1938, **206**, 759—761).—The nature and origin of the deposits are discussed.   A. J. E. W.

Multiplicity of sulphide minerals and its causes. R. SCHENCK (Compt. rend. XVII Cong. Chim. Ind., 1937, 619—629).—The action of H_2 at const. temp. in the range 400—510° on mixtures of $Bi_2S_3 + Sb_2S_3$, $Ag_2S + Cu_2S$, $Ag_2S + PbS$, $Bi_2S_3 + Ag_2S$, $Ag_2S + BaS$, $Sb_2S_3 + Cu_2S$ in different proportions has been investigated, and the equilibria determined by a modification of Pélabon's method (A., 1902, ii, 253). The fractional desulphuration has revealed new condensed phases, either as complex combinations of the sulphides or as isomorphous mixtures. Many of these phases exist as minerals in nature. The multiplicity of these sulphide minerals is explained by chemical forces which have the nature of intermetallic forces; there is a strong analogy between certain of these sulphides and metallic alloys. The action of H_2 on the system Sb_2S_3-Ag_2S has given, besides the known phases, a new *compound*, $Ag_2Sb_4S_4$, which can form mixed crystals with Ag.
<div align="right">L. S. T.</div>

Iodine and bromine content of Solikhamsk carnallite, sylvinite, sylvine, and halite. S. K.

TSCHIRKOV (Kalii, 1937, No. 9, 21—28).—The relationship between the I and Br contents of sylvine and of halite in sylvinite is expressed by empirical mathematical equations. The distribution of Br in carnallite seams varies, but increases with the purity of the mineral. The quantity of Br present depends on the sequence of the carnallite layers. A curve is given showing the variation with depth of the Br content (0·15—0·25%) of Solikhamsk carnallites. With sylvinites the Br present increases with the sylvine content and falls progressively with the depth of the deposit.
<div align="right">D. G.</div>

Diffusion of iodine ions in the crystal structure of sylvine. S. K. TSCHIRKOV (Kalii, 1937, No. 10, 35—38).—The distribution of I′ in a mass of sylvine crystals extracted from sylvinite is uneven, the [I′] increasing continuously from the centres of the crystals to the periphery. Apparently no diffusion of ions takes place in the crystal structure of an isomorphous mixture if the components of the latter have a crystal structure similar to that of NaCl.
<div align="right">D. G.</div>

Nitrate-free salt rocks from a Chilean salt-pan. W. WETZEL (Chem. Erde, 1938, **11**, 448—456).—Material from the Tarapacá desert consists of NaCl and sulphates (glauberite, thenardite, blödite, etc.). The suggestion is that these were deposited before the nitrates of the same region.
<div align="right">L. J. S.</div>

Analyses of rocks and minerals from the laboratory of the U.S. Geological Survey, 1914—1936. R. C. WELLS (U.S. Geol. Survey, 1937, Bull. 878, pp. 134).
<div align="right">L. S. T.</div>

Economic geology of the northern Punjab, with notes on adjoining portions of the N.-W. Frontier Province. E. R. GEE (Trans. Min. Geol. Met. Inst. India, 1938, **33**, 263—354).—The occurrence, production, analyses, etc. of minerals of economic importance are described.
<div align="right">L. S. T.</div>

Recent mineral developments in the Copper River region, Alaska. F. H. MOFFIT (U.S. Geol. Survey 1937, Bull. 880-B, 97—107).—Production of Au from veins in the Bremner River Valley and the Nabesna mine, and placer operations in the Chistochina district and in Ahtell Creek are described.
<div align="right">L. S. T.</div>

Mineralogy of the granite-pegmatite along the river Lailjak. B. GAVRUSEVITSCH (Abh. Pamir Expedition 1930, Petrol. Min. Akad. Wiss. Leningrad, 1932, **4**, 131—143).—The pegmatites are characterised by felspars, quartz, biotite, muscovite, lepidolite, gilbertite, almandite, tourmaline, pyrite, andalusite, dumortierite, and beryl (13·74% BeO).   CH. ABS. (e)

Geochemical-genetic types of pegmatite of the " Rechtsufers " (Pravobereschje) in the Ukraine. B. GAVRUSEVITSCH (Trav. Inst. Lomonoss. Geochem. Acad. Sci. Leningrad, 1933, **2**, 23—69). CH. ABS. (e)

New rare metal deposits in N.E. Kazakstan. I. JAGOVKIN and V. GRUZA (Probl. Soviet Geol., Moscow, 1934, **9**, 62—72).—Quartz veins containing wolframite, scheelite, arsenopyrite, molybdenite, and Au accompany granite intrusions.   CH. ABS. (e)

Genesis of secondary mica in N. Karelia. S. KURBATOV (Trav. Inst. Lomonoss. Geochem. Acad. Sci. Leningrad, 1933, **2**, 89—101).—Secondary mica is

formed by the action of hydrothermal solutions rich in K_2O on plagioclase. The approx. formula of the secondary mica is $K_2O,4Al_2O_3,8SiO_2,3H_2O$.

Ch. Abs. (e)

Olivine fourchites from Raymond Fosdick Mountains, Antarctica. C. N. Fenner (Bull. Geol. Soc. Amer., 1938, **49**, 367—400).—The actual course of crystallisation of the magma has been compared with that indicated by the theory of crystal fractionation, from chemical analyses (recorded) of the groundmass, the phenocrysts from the groundmass, and the constituent minerals of each, which in the case of these particular rocks have been able to be separated. The mineralogical make-up, structure, and texture of the specimens, which represent surface flows of basic lavas, together with fragmental tuffs, are described. The groundmass, freed from phenocrysts, has an ultrabasic composition, which leads to the conclusion that, contrary to inferences reached in the theory of crystal fractionation, wholly liquid magmas of ultrabasic composition exist. In passing from phenocrystic pyroxene to groundmass pyroxene there is a decrease of SiO_2 and MgO, large increases of Al_2O_3 and CaO, and a moderate increase of Fe oxides. These results are not in accord with those deduced from experimental work on silicate systems, the conditions of which are comparatively too simple to be applied to conditions obtaining in natural magmas.   L. S. T.

Introduction of potash during regional metamorphism in W. New Hampshire. M. Billings (Bull. Geol. Soc. Amer., 1938, **49**, 289—301).—Field observations and the chemical analyses recorded show that argillaceous sediments in this locality first recryst. to sillimanite schists without significant change in chemical composition, except loss of H_2O. In a later, metasomatic phase, K_2O was introduced, with a consequent increase in the K_2O–Al_2O_3 ratio. The chemical changes in this area are less extensive than, and differ in certain respects from, similar changes in the Stavanger region of Norway and in Dutchess Co., New York.   L. S. T.

New exposures of Ordovician bentonite in S.W. Virginia. R. L. Bates (Science, 1938, **87**, 300).—Beds have been exposed at Turkey Cove, Lee County, Virginia.   L. S. T.

Gold in the N.-W. Frontier Province. A. L. Coulson (Trans. Min. Geol. Met. Inst. India, 1937, **33**, 191—206).—Au washing operations with Indus sands and gravels in the Peshawar and Mardan districts and in Chitral are described and discussed. Sources of the Au are also discussed.   L. S. T.

Late gold and some of its implications. J. B. Mawdsley (Econ. Geol., 1938, **33**, 194—210).—Examples of the late deposition of Au in Canadian deposits are described, and it is shown that, in some cases, deposition is much later than, and not closely related to, the associated minerals. The general tendency of valuable Au ore to occur in shoots within a vein can be explained by assuming that it is later than the bulk of the vein minerals and that its localisation is due to its following channels formed by late stresses after consolidation of the bulk of the vein. The Au may have its origin in liquid solutions derived directly from the magma residuum after long crystallisation.   L. S. T.

Vein-filling at Nevada City, California. W. D. Johnston, jun. (Bull. Geol. Soc. Amer., 1938, **49**, 23—33).—Complex veins in which deposition of quartz has alternated with movements of the vein walls are described. The four types of quartz structure are described and illustrated. The sulphide minerals present are enumerated. Altaite was the only telluride identified.   L. S. T.

Weathering of Taunus quartzite. R. Melville (Chem. Erde, 1938, **11**, 498—524).—Chemical analyses are given of the quartzite (SiO_2 92·66—98·16%) and derived sands and clay from several localities in the Taunus Mts., and of the portions sol. in HCl.

L. J. S.

Laramide igneous sequence and differentiation in the Front Range, Colorado. T. S. Lovering and E. N. Goddard (Bull. Geol. Soc. Amer., 1938, **49**, 35—68).—The general character and age relations of the Laramide igneous rocks are discussed. The magmatic differentiation of the porphyries is dealt with on physico-chemical lines.   L. S. T.

New Zealand ironsand in relation to overseas deposits of titaniferous magnetite. A. W. Wylie (New Zealand J. Sci. Tech., 1938, **19**, 572—584).—The composition of titaniferous Fe ores occurring in New Zealand is compared with those from various parts of the world. The extraction of V and Ti from such ores is described.   A. G. P.

Mineral resources of the region around Boulder Dam. D. F. Hewett, E. Callagan, B. N. Moore, T. B. Nolan, W. W. Rubey, and W. T. Schaller (U.S. Geol. Survey, 1936, Bull. 871, 197 pp.).—A summary of non-ferrous metal deposits (Au, Ag, Cu, Pb, and Zn); ferrous metal deposits of Fe ore, Mn, Co and Ni, Mo, W, and V; non-metalliferous resources, including salines*, borates, magnesite*, brucite, alunite*, alum, S, barytes, celestite* and strontianite, and beryl; constructional materials such as limestone, dolomite*, cement rock, and gypsum*; refractory and ceramic materials; fuels; and water. Analyses are recorded for minerals marked *.

L. S. T.

Geology and mineral resources of the Butler and Zelienople Quadrangles, Pennsylvania. G. B. Richardson (U.S. Geol. Survey, 1936, Bull. 873, 93 pp.).—Stratigraphy and structure of the rocks, the coal (analyses given), oil and gas, shale and clay, sandstone, and limestone resources are described. Analyses of ground-H_2O and petroleum are recorded.

L. S. T.

Non-metallic mineral resources of eastern Oregon. B. N. Moore (U.S. Geol. Survey, 1937, Bull. 875, 180 pp.).—The amphibole asbestos deposit on Pine Creek, Baker Co., and numerous deposits of diatomite, limestone, and pumice are described.

L. S. T.

Geology and mineral resources of the Baker Quadrangle, Oregon. J. Gilluly (U.S. Geol. Survey, 1937, Bull. 879, 119 pp.).—Numerous rocks, and the mineral resources of the area, which include deposits of Au, Ag, Cu, Mn, W, asbestos, coal, diatomite, and building stone, are described.   L. S. T.

Regularities and anomalies in idocrase and some other lime silicates. R. GÄDEKE (Chem. Erde, 1938, **11**, 592—636).—New chemical analyses (19 in all) with optical data and ρ are given of idocrase (both normal and optically anomalous), prehnite, axinite, and garnet, and many others are tabulated from the literature. The results are plotted to show the variation of the physical characters with replacements Al–Fe^{III}, Si–Ti, H$_2$O–F, Mg–Fe^{II}, Fe^{II}–Mn, Ca–Mn, and Ca–Na. L. J. S.

Colouring of artificial and natural apatites. J. HOFFMANN (Chem. Erde, 1938, **11**, 552—575).—Fe^{III} and Fe^{II} together produce a green colour; Mn green or blue (not red). Some other colours are due to rare earths (cerapatite). Changes in colour produced by heat, light, and various radiations are described. L. J. S.

Influence of rare earths and other constituents on the physical-optical properties of the epidote group. H. G. TEMPEL (Chem. Erde, 1938, **11**, 525—551).—Several new chemical analyses and optical data of epidote and orthite from various localities are given, and some earlier results are tabulated and plotted. In epidote there is a linear increase in *n*, birefringence, and ρ with increasing Fe. In orthite, *n* and ρ increase, but less regularly, with increasing Fe and rare earths, and decrease with increasing H$_2$O. L. J. S.

Icelandic rocks. H. J. HOPPE (Chem. Erde, 1938, **11**, 457—479).—Petrographical descriptions with chemical analyses of basalts, tuffs, and obsidian collected in 1910 from the central part of Iceland are given. L. J. S.

Upper Cretaceous volcanicity in eastern Bulgaria. K. H. SCHEUMANN and A. SCHÜLLER (Tsch. Min. Petr. Mitt., 1938, **50**, 29—80).—Petrographical descriptions are given of rocks ranging from pyroxene-andesites to trachytes and latites. As all material collected is much propylitised, no chemical analyses were made. L. J. S.

Tafoni-weathering phenomenon. Petrographic contributions to the elucidation of Tafoni problems. I. KVELBERG (Latvij. Univ. Raksti, 1938, **4**, 129—370).—Numerous examples of a unique type of weathering, known as tafoni-weathering, occurring in Corsican granites, are described and discussed. The weathering is due not to chemical changes, but mainly to physical causes such as alterations in val. arising from temp. fluctuations. L. S. T.

Weathering of igneous rocks. V. Clay from basalt beds. M. HARADA (J. Agric. Chem. Soc. Japan, 1938, **14**, 450—458; cf. A., 1937, I, 538).—Analytical data for the clays (<0·002 mm.) from olivine basalt in Tottori and from nepheline and trachybasalt in Limane together with data for the HCl and H$_2$SO$_4$ extracts are given. 77—90% of the total Fe$_2$O$_3$ or 96—100% of the Fe$_2$O$_3$ sol. in HCl is present in the free form. SiO$_2$ is for the most part united with Al$_2$O$_3$. Clay from the upper earth is poorer in halloysite and richer in kaolin than that from lower earth. In comparison with fine earth (<2 mm.) clay from olivine basalt contains more kaolin, and that from nepheline basalt more halloysite. The ratio limonite-Fe$_2$O$_3$: hæmatite-Fe$_2$O$_3$ for clay is > for fine soil. J. N. A.

Clay mineral (dickite) from Schmiedefeld, Thuringia. H. JUNG (Chem. Erde, 1938, **11**, 445—447).—Analysis of a compact white crust on Fe ore agrees with Al$_2$O$_3$,2SiO$_2$,2H$_2$O; ρ 2·600. The optical characters are not distinctive, but the low loss of H$_2$O (2·14%) at 500° and the *X*-ray pattern suggest dickite rather than kaolinite or nacrite. L. J. S.

Estonian blue clay. W. PRALOW (Chem. Erde, 1938, **11**, 480—497).—This is the oldest known clay (pre-Cambrian to Lower Cambrian). Mechanical and chemical analyses with microscopical and *X*-ray examination show it to consist of quartz, mica, montmorillonite, limonite, etc. The blue and green colour is attributed to pyrite (0·05—1·53%) and glauconite. L. J. S.

Geochemistry of the petroleum deposits of Forstort Brand at Nienhagen, Hannover. F. E. KLINGNER (Kali, 1938, **32**, 71—72).—The natural gas contains olefines 0·3—4·3, C$_2$H$_6$ etc. 2·2—17·1, CH$_4$ 69·4—96·12, N$_2$ 1·07—4·2%, and, in two analyses, traces of He. Analyses of the petroleum are represented on a triangular diagram. The brine-H$_2$O is poor in O$_2$ and contains 150 to 190 g. of salts per l., with 0·02 g. of I per kg. of residue. L. S. T.

Origins of petroleums; chemical and geochemical aspects. B. T. BROOKS (Bull. Amer. Soc. Petroleum Geol., 1936, **20**, 280—300).—A discussion. CH. ABS. (*e*)

Proportion of organic matter converted into oil in Santa Fe Springs field, California. P. D. TRASK (Bull. Amer. Assoc. Petroleum Geol., 1936, **20**, 245—257).—The oil is equiv. to a 1·8% yield of the org. content of the prism of sediments from which the oil is probably derived. CH. ABS. (*e*)

Eska Creek coal deposits, Matanuska Valley, Alaska. R. TUCK (U.S. Geol. Survey, 1937, Bull. 880-D, 185—211).—General occurrence of the deposits, character and analyses of the coal, mining operations, and coal exposures are described. L. S. T.

Geology and fuel resources of the southern part of the Oklahoma coal field. II. The Lehigh district, Coal, Atoka, and Pittsburg counties. M. M. KNECHTEL (U.S. Geol. Survey, 1937, Bull., 874-B, 91—149).—The occurrence of coal, analyses, and mining are described, and data concerning wells drilled for oil and gas in the Lehigh district are included. L. S. T.

Coal deposits of Pike County, Kentucky. C. B. HUNT, G. H. BRIGGS, jun., A. C. MUNYAN, and G. R. WESLEY (U.S. Geol. Survey, 1937, Bull. 876, 92 pp.).—Coal beds are described and analyses are recorded. L. S. T.

Thioelaterite. B. L. DUNICZ (Chem. Erde, 1938, **11**, 576—589).—A variety of elaterite with combined S from Bolivia contains C 82·27, H 12·35, N + O 1·69, S 2·96, ash 0·73%; ρ 0·989. Analyses are also given of the distillate, and portions extracted by various solvents. L. J. S.