BRITISH CHEMICAL ABSTRACTS

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

MARCH, 1937.

Nuclear spin and magnetic moment of ^{6}Li. J. H. MANLEY and S. MILLMAN (Physical Rev., 1937, [ii], **51**, 19—21; cf. A., 1936, 1175).—A detailed account of results previously reported. N. M. B.

Helium I like spectra. H. A. ROBINSON (Physical Rev., 1937, [ii], **51**, 14—18).—Using a new Siegbahn grazing-incidence spectrograph for the region <100 A., measurements of the $1s^2.^1S_0—1s.np^1P_1$ series of the He I isoelectronic sequence for Be III, B IV, and C V, with available data for He I, Li II, N VI, and O VII, are examined critically and vals. for the $1s^2.^1S_0$ terms are obtained. Corr. calc. vals. are in good agreement with experiment. N. M. B.

Lines of neutral oxygen and carbon in the spectra of novæ. D. B. McLAUGHLIN (Astrophys. J., 1936, **84**, 104—110).—Absorption lines of O I and C I are common in the spectra of novæ in their early stages. L. S. T.

Carbon arc in vacuum. F. H. NEWMAN (Phil. Mag., 1937, [vii], **23**, 181—186).—Low-voltage arcs between cold graphite electrodes in gases at very low pressure could be started by a momentary high-voltage discharge in the gas. The starting of the arc is attributed to a surge of positive ions to form a space-charge at the cathode. Spectra of the arc immediately after striking are due to the gas in the tube. A. J. E. W.

Active nitrogen. J. KAPLAN (Nature, 1937, **139**, 115).—Cario and Stille's failure to obtain certain N bands (A., 1936, 1309) is due to incomplete purification of the N_2 in their discharge tubes. L. S. T.

Fluorescence of N_2 and N_2^+. A. JAKOVLEVA (Physikal. Z. Sovietunion, 1936, **9**, 547—548).—Bands of the second positive group of N_2 and some bands of the N_2^+ ion between 3500 and 5000 A. were observed when N_2, air, NO, and C_2N_2 were illuminated through a fluorite window by light from a H_2 tube. The fluorescence spectrum is similar to that described by Oldenburg (A., 1926, 992). O. D. S.

Absorption spectrum of oxygen. A. PRICHOTKO (Physikal. Z. Sovietunion, Spec. no., June, 1936, 22—38).—The absorption spectra of solid α-, β-, and γ-O_2 comprise five similar series in the infra-red, visible, and near ultra-violet regions, and an ultra-violet band of different characteristics, and coincide closely with the bands of liquid O_2. Hence the first and second series are due to the $^3\Sigma_g^- \rightarrow {}^1\Delta_g$ and $^3\Sigma_g^- \rightarrow {}^3\Sigma_g^+$ transitions, respectively. The fine structure of the bands is probably due to vibrations in the O_2 lattice. J. W. S.

Isotope displacement in the neon spectrum. R. RITSCHL and H. SCHOBER (Physikal. Z., 1937, **38**, 6—9).—The isotope displacement in the Ne spectrum increases with the term val., being 0 for the $8s_5$ term, and 118×10^{-3} cm.$^{-1}$ for the $1s_2$ term (38,040 cm.$^{-1}$). A. J. M.

Spectroscopic study of the constitution of sulphur vapour. B. ROSEN and (MLLE.) N. MORGULEFF (Compt. rend., 1936, **203**, 1349—1351).—The effect of temp. (500°, 1000°) and pressure on the S absorption bands at λλ 3600—4600 A. is different from that on the S_2 bands at λλ 3200—3500 A. The former probably consist of part of the S_2 system with a superposed continuum. The temp. and pressure dependence of the intensity of the continuum is approx. the same as the dependence of the $[S_6]$ on these factors (cf. A., 1910, ii, 118). H. J. E.

Pressure broadening of the potassium resonance lines by argon and nitrogen. G. F. HULL, jun. (Physical Rev., 1936, [ii], **50**, 1148—1150; cf. Margenau, A., 1936, 3).—Broadening for 1—40 atm. was investigated. Half-widths and shifts plotted against " relative density " (r.d.) give straight lines up to about r.d.14, indicating predominance of Lorentz type broadening in this region, but thereafter the curves depart from linearity. Theoretical contours are in satisfactory agreement with experiment. The const. b (measure of Van der Waals forces), calc. by three independent methods, is 24×10^{-32} and 18×10^{-32} cm.^{6} sec.$^{-1}$ for A and N_2, respectively. N. M. B.

Electric explosion spectrum of metals. T. FUTAGAMI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 1—29).—The spectra of wires of Cu, Ag, Mg, Ca, Zn, Cd, Hg, Al, Tl, Sn, and Pb exploded electrically have been photographed, and show the presence of arc and spark lines. Pressures and temp. generated in the explosion are of the order of 30 atm. and 9000° abs., respectively. R. S. B.

Production of white light by electrical luminescence of gases. M. LAPORTE (Compt. rend., 1936, **203**, 1341—1342).—A condensed discharge through Xe, with a discharge frequency of 50—100 per sec. controlled by a thyratron, gave a white light. H. J. E.

Analysis of the spectrum of singly-ionised samarium. W. ALBERTSON (Astrophys. J., 1936, **84**, 26—72).—Tables of classified lines and of the energies, excitation potentials, and experimental g vals. of the terms are given. The ionisation potential of Sm II is approx. 11·4 volts. The close relation between Sm II and Eu II is shown, and the

types of rare-earth spectra and normal electron configurations are discussed. 88 lines of Sm II have been identified in the spectrum of the sun. L. S. T.

Field strength along the positive column in mercury vapour with very small current densities. G. MIERDEL and W. SCHMALENBERG (Wiss. Veröff. Siemens-Werken, 1936, **15**, No. 3, 60—74).— Measurements were made on the positive column of the glow discharge in Hg vapour between 0·76 and 17 mm. Hg, with c.d. down to 10^{-6} amp. per sq. cm., and various electrode distances. A. E. M.

Absorption in the mercury discharge. V. FABRIKANT (Physikal. Z. Sovietunion, 1936, **9**, 259—263).—The work of the author and Pulver on the absorption of the Hg lines in the Hg discharge (cf. A., 1934, 1280) is discussed in the light of the observations of Elenbaas (cf. A., 1935, 272). R. S. B.

Optical investigation of discharge in metallic vapours. II. Reabsorption of light in the mercury discharge. V. FABRIKANT [with F. BUTAEVA] (Physikal. Z. Sovietunion, 1936, **9**, 383—404).—The hypothesis that reabsorption can only affect the intensity ratios of Hg lines having a common higher energy level is discussed. It is shown that reabsorption accounts qualitatively for all observed intensity ratios. Results agree with the thermal theory of the Hg discharge at high pressures.
H. C. G.

Spectroscope and the atom. A. FOWLER (Nature, 1937, **139**, 95—98).—A lecture. L. S. T.

Multiplet strengths for transitions involving equivalent electrons. D. H. MENZEL and L. GOLDBERG (Astrophys. J., 1936, **84**, 1—10).—The parentages of terms arising from shells of equiv. electrons are tabulated. L. S. T.

Absolute multiplet strengths. L. GOLDBERG (Astrophys. J., 1936, **84**, 11—13).—Factors by means of which the relative multiplet strengths previously given (*ibid.*, 1935, **82**, 1) can be converted into abs. strengths are tabulated. L. S. T.

Term splitting of the hydrogen atom in high electric fields. G. GUREVITSCH (Physikal. Z. Sovietunion, 1936, **9**, 563—579; cf. A., 1931, 4).— Mathematical. O. D. S.

Intensities of forbidden transitions. M. BRONSTEIN (Physikal. Z. Sovietunion, 1936, 9, 542—545).— Mathematical. O. D. S.

Spectrum of the discharge of high-tension generators in air. J. JAFFRAY (Compt. rend., 1936, **203**, 1347—1349).—The principal features of the discharge in air at 1 atm. are recorded. H. J. E.

Sparking potentials at ultra-high frequencies. J. THOMSON (Phil. Mag., 1937, [vii], **23**, 1—24).— The variation with gas pressure (p) and frequency (ν) of sparking potentials (V_s) between parallel-plate electrodes in H_2 was investigated for ν vals. between 1 and 100 megacycles per sec. The V_s–p curves are straight lines when ν is high, but develop two minima successively as ν decreases. A theory of the discharge is developed. A. J. E. W.

Importance of collisions of the second kind in the glow of mixtures of sodium and mercury

vapours. A. FERCHMIN and S. FRISCH (Physikal. Z. Sovietunion, 1936, **9**, 466—476).—An increase in intensity of Na lines in a glow discharge was observed on the addition of Hg for those lines having excitation potentials within 0·02—0·04 volt of the excitation potential of the $^3P_0$ and $^3P_1$ levels of Hg.
O. D. S.

Rôle of collisions of the second kind in the luminescence of vapour mixtures Na–Mg, Na–Zn, and Na–Cd. V. KONOVALOV and S. FRISCH (Physikal. Z. Sovietunion, 1936, **10**, 111—114).—Light from vapours of the mixed metals in a discharge tube has been studied spectroscopically, and excitation potentials have been calc. Collisions of the second kind occur, with a probability which decreases rapidly with increase in p.d. between the levels $3p^2P$–$5s^2S$ of Na and $^3P_2$ of Zn, Cd, and Mg, and then remains approx. const. R. S. B.

Rôle of collisions of the second type in gaseous discharges. S. E. FRISCH (Bull. Acad. Sci. U.R.S.S., 1936, 431—440).—The rôle of collisions of the second type in luminescence of Na–Hg, –Mg, –Cd, and –Zn vapour (tubular cathode) has been investigated. The intensity of the Na λ 4423 doublet is increased 550-fold in presence of Hg, and that of the λ 6156 doublet 2-, 6·1-, and 44-fold in presence of Mg, Cd, and Zn vapours, respectively. R. T.

Discharge radiation in vapours of metals. V. A. FABRIKANT (Bull. Acad. Sci. U.R.S.S., 1936, 441—462).—The pressure–intensity radiation curves for discharges through Hg, Cd, and Zn vapours are of the same general type, and exhibit minima, the depth of which varies as the thermal conductivity of the vapours; the minima become less marked in presence of inert gases. The curves are interpreted on the basis of reabsorption, and of variations in the no. of collisions between atoms and electrons and in the efficiency of these collisions. R. T.

Electrodeless discharge. A. KRASSIN (Physikal. Z. Sovietunion, 1936, **9**, 449—460). O. D. S.

Rôle of positive ions in the initiation of a gaseous discharge. M. STEENBECK (Wiss. Veröff. Siemens-Werken, 1936, **15**, No. 3, 32—41).—The mechanism by which discharge commences in lamps containing metallic vapours or rare gases is discussed mathematically in relation to the field distortion caused by positive ions, and to the electron temp. and the no. of ions per unit vol. necessary to start the discharge. H. C. G.

Proof of the carrier laws for the mercury-vapour rectifier. A. VON ENGEL and M. STEENBECK (Wiss. Veröff. Siemens-Werken, 1936, **15**, No. 3, 42—59).—Measurements of the axial electron concn., field strength, and temp. and pressure in and out of the discharge were made in a Hg rectifying lamp over ranges of pressure and c.d. Results are discussed in relation to the theory of the discharge (see preceding abstract). H. C. G.

Electric discharge through open capillary tube. H. TAKÔ (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 30—41).—The spectrum of the discharge and the eroding effect on the walls have

been studied with an open capillary connected to a vac. pump.   R. S. B.

Mechanism of the static spark discharge. L. B. LOEB (Rev. Mod. Physics, 1936, 8, 267—293).— A review. There is no single secondary process of universal occurrence in discharge phenomena.
                                                A. J. M.

New dark space near the cathode glow in an arc discharge. M. J. DRUYVESTEYN and N. WARMOLTZ (Physica, 1937, 4, 51—68).—A new dark space around the oxide-coated cathode of an arc in the rare gases and Hg vapour is found at c.d. >0.1 amp. per sq. cm. and 10^{-2}—3 mm. pressure; its thickness is about 20 times that of the space-charge sheath at the cathode. At lower pressure it disappears and a bright sheath of the same dimensions is seen. Coming from the cathode, the fast electrons increase sharply in concn. and decrease in mean energy at the limit of the sheath. The electrical behaviour is explained by the scattering, increasing with arc current, of the group of fast electrons starting at the boundary of the space-charge layer on the cathode.   N. M. B.

Heat production in the positive column of discharges in monatomic gases. K. SOMMERMEYER (Ann. Physik, 1937, [v], 28, 240—244; cf. A., 1932, 551).—The heat production in the positive column of discharges in the rare gases and of the Hg high-pressure discharge can be accounted for by energy exchange on collision between electrons and neutral gas atoms.   O. D. S.

Fraunhofer's spectrum in the interval from 77,000 to 110,000 A. A. ADEL and V. M. SLIPHER (Astrophys. J., 1936, 84, 354—358).—Recent observations of 100 fine structure lines in the solar grating spectrum are described (cf. A., 1935, 806).
                                                L. S. T.

Variations of the spectrum of γ Cassiopeiæ. D. CHALONGE and H. SAFIR (Compt. rend., 1936, 203, 1329—1332).—Data are recorded.   H. J. E.

Spectra line intensities in O- and B-type stars. P. RUDNICK (Astrophys. J., 1936, 83, 439—475).— The behaviour of lines of H, He I, He II, Si II, Si III, Si IV, N II, N III, C II, and Mg II is described.
                                                L. S. T.

Spectrum of the solar corona in 1936. Wavelengths and intensities. B. LYOT (Compt. rend., 1936, 203, 1327—1329).   H. J. E.

Density of calcium and hydrogen at different levels in the sun. T. ROYDS and A. L. NARAYAN (Current Sci., 1936, 5, 294—295).—The change in the contour of some prominent solar lines, studied photometrically, is a combination of the opposing effects of an increase in the no. of absorbing atoms due to increased length of atm. path with inclination to the vertical, and a decrease in the no. of absorbing atoms as the effective level of the photosphere becomes higher. From contour change measurements estimates of the no. of atoms per c.c. at different levels over 0—600 km. are tabulated.   N. M. B.

Influence of temperature on the fine structure of the X-ray K absorption edge of iron. W. SJOERDSMA (Physica, 1937, 4, 29—32).—The changes in the fine structure of the X-ray K absorption edge of Fe, investigated up to 830°, are in agreement with Kronig's theory.   N. M. B.

Fine structure of the K absorption edges of copper at low temperatures. H. SWEDENBORG and M. CLAESSON (Ann. Physik, 1937, [v], 28, 159—168).—In agreement with the theory of Kronig (A., 1931, 993; 1932, 553), it is found that the fine structure of the K absorption edges of Cu is more definite at low temp. than at room temp., and that it extends further towards the short-wave side. At $-190°$ the intensity of the lines for Cu is about 50% $>$ at 20°.   A. J. M.

X-Ray scattering coefficients of gases. Y. H. WOO and C. P. SUN (Sci. Rep. Tsing Hua Univ., 1936, 3, 549—553).—Scattering coeffs. are calc. for O_2 from 0·4—1·5 A., and for Ne and A from 0·098—1·540 A. Vals. are in agreement with experiment.
                                                O. D. S.

Thermionic emission of platinum. L. V. WHITNEY (Physical Rev., 1936, [ii], 50, 1154—1157). —In view of divergent data, thermionic emission from round filaments and flat strips after rigorous high vac. and heat-treatment near 2000° abs. was measured. The vals. 5·32 volts for the work function and 32 amp./cm.^{2} deg.^{2} for the const. A were found.
                                                N. M. B.

Thermionic emission from barium-coated tungsten. L. N. DOBRETZOV and G. A. MOROZOV (Physikal. Z. Sovietunion, 1936, 9, 352—361).—A W filament was found to be free from Ba at temp. $>1800°$ abs. At lower temp. the W became coated with Ba and the electron current increased. The rate of evaporation of the Ba was measured at different temp. The heat of evaporation of Ba atoms is $151,000\pm10,000$ g.-cal. per mol.   A. E. M.

Absolute photo-electric yields of Mg, Be, and Na. M. M. MANN, jun., and L. A. DU BRIDGE (Physical Rev., 1937, [ii], 51, 120—124).—Vals. measured for the work function of distilled surfaces were Mg 3·68, Be, 3·92, and Na 2·29 volts. The corresponding vals. of α in Fowler's photo-electric equation are 3·2, 25, and 180×10^{-34}.   N. M. B.

Photo-electric effect of the deuteron. G. BREIT, J. R. STEHN, and E. U. CONDON (Physical Rev., 1937, [ii], 51, 56; cf. A., 1936, 1041).—Calculations and graphs are corr.   N. M. B.

Electron emission of an oxide-coated cathode in an arc discharge. M. J. DRUYVESTEYN and N. WARMOLTZ (Physica, 1937, 4, 41—50).—The emission is determined by measuring arc voltage as a function of arc current. Results can be explained on the hypothesis that an accelerating electric field for the electrons does not appear at the same arc current for all parts of the rough oxide surface.   N. M. B.

Velocity distribution of electrons in an electric field. II. B. DAVIDOV (Physikal. Z. Sovietunion, 1936, 9, 433—448; cf. A., 1936, 4).—Theoretical. The equations previously deduced are generalised to include the case in which the mean free path of the electron moving in a gas depends on its velocity. The order of magnitude of the exchange forces between the electrons is estimated.   O. D. S.

Interaction with matter of high-energy particles, electrons from various sources, and cosmic-ray particles. L. LEPRINCE-RINGUET (Ann. Physique, 1937, [xi], 7, 5—70).—The passage through matter of high-energy electrons and protons and the hard and soft components of cosmic radiation has been investigated by means of a large Wilson cloud chamber and magnetic field for the energy range 10^6—10^9 e.v. The loss of energy undergone by electrons by binding in the nuclear field and accompanying the emission of photons was studied as a function of electron energy. Results for 1×10^6—3×10^6 e.v. electrons through A are 10 times $>$ calc., and indicate a supplementary effect due to absorption. An absorption law for electrons of soft cosmic rays involves the square of the at. no. of the absorbing element. Ultra-penetrating cosmic rays traversing 7 cm. of Pb after passage through the cloud chamber had a min. energy of 9×10^8 e.v., and, for energies $> 2 \cdot 5 \times 10^9$ e.v., positively charged particles predominated, supporting the view that ultra-penetrating cosmic rays contain a group of high-energy protons as well as electrons capable of penetrating 7 cm. of Pb.   N. M. B.

Angular distribution of the electron–positron pairs liberated by the action of hard γ-rays on lead. H. ADAM (Naturwiss., 1937, 25, 13).—A max. in the angular distribution curve is found at 30°, in agreement with the theory of Dirac.   A. J. M.

Symmetry theorem in the positron theory. W. H. FURRY (Physical Rev., 1937, [ii], 51, 125—129).—Mathematical.   N. M. B.

Cross-sections of Cl_2 and N_2 for slow electrons. J. B. FISK (Physical Rev., 1937, [ii], 51, 25—28).—Measurements of total cross-sections for collision of slow electrons over 2—40 volts, using a Brode type apparatus, are, for N_2, in good agreement with available data (cf. Normand, A., 1930, 973) and with elastic scattering theory (cf. Fisk, A., 1936, 263). The val. for Cl_2 is of the order 2000 sq. at. units with a max. at $2 \cdot 65 \sqrt{V}$, the curve being similar to those for Na, K, Cs, and Rb. Only a small portion of these collisions is elastic.   N. M. B.

Anomalous scattering of electrons by protons. M. BRONSTEIN (Physikal. Z. Sovietunion, 1936, 9, 537—541).—Theoretical. The cross-sections for the scattering of electrons by protons with and without conservation of energy are calc.   O. D. S.

Scattering of electrons by atomic nuclei. R. T. COX and C. T. CHASE (Physical Rev., 1937, [ii], 51, 140—141).—A test, with rigorous exclusion of retarded electrons, confirms Mott's equation for single scattering.   N. M. B.

Kinetic energies of atomic ions formed by electron impact in nitric oxide and hydrogen chloride. E. E. HANSON (Physical Rev., 1937, [ii], 51, 86—94; cf. Lozier, A., 1934, 1159).—The energy distribution of the at. ions was measured as a function of the electron energies at impact, and ionisation potentials were determined. Probable vals. of heats of dissociation of the mols. and mol. ions are calc. Negative ions of energy up to $2 \cdot 5$

volts were observed in NO, leading to a calc. electron affinity of $2 \cdot 1 \pm 0 \cdot 5$ volts for O. Negative ions found in HCl had $< 0 \cdot 5$ volt energy. Probable processes are: $NO^+ \to N^+ + O$ ($^1D_2$); $NO^+ \to N + O^+$; $NO \to N + O$; $NO + e \to N + O^-$; $HCl^+ \to H^+ + Cl$ (^2P); $HCl^+ (^2\Pi) \to H + Cl^+$; $HCl^+ \to H^+ + Cl$; $HCl \to H + Cl$; $HCl \pm e \to H + Cl^-$.   N. M. B.

Electron and negative ion mobilities in oxygen, air, nitrous oxide, and ammonia. R. A. NIELSEN and N. E. BRADBURY (Physical Rev., 1937, [ii], 51, 69—75).—An extension of investigations using the electrical shutter method (cf. this vol., 56) is reported. Mobility measurements are discussed in relation to inelastic collision, electron drift velocity, character of the ions, and the predictions of Langevin's theory.   N. M. B.

Multiple acceleration of light ions to high speeds. E. O. LAWRENCE and D. COOKSEY (Physical Rev., 1936, [ii], 50, 1131—1140; cf. A., 1934, 712).—A detailed description of improvements in and use of the cyclotron apparatus.   N. M. B.

Anomalous scattering of protons in light elements. E. G. DYMOND (Proc. Roy. Soc., 1936, A, 157, 302—310).—The scattering of protons, 130—190 e.kv. in energy, from thin films of Ag, Al, B, and Be has been investigated. The scattering from Ag is regarded as classical, and that from other elements referred to it as standard. At 190 e.kv. in Al there is an excess scattering of $17 \cdot 6 \pm 1 \cdot 8\%$ at 150°, and $9 \cdot 7 \pm 1 \cdot 0\%$ at 110°; in Be, $4 \cdot 4 \pm 1 \cdot 6\%$ at 150° and $13 \cdot 5 \pm 1 \cdot 0\%$ at 110°. The scattering in B is normal. It is concluded that proton levels at about 200 e.kv. exist in the Al and Be nuclei.   L. L. B.

Separation of lithium isotopes. G. N. LEWIS and R. T. MACDONALD (J. Amer. Chem. Soc., 1936, 58, 2519—2524).—The isotopic ratio $^7Li : {}^6Li$ has been changed from $11 \cdot 6$ to $5 \cdot 1$ by allowing fine drops of Li amalgam to fall repeatedly through an 18-m. column containing LiCl in EtOH or LiBr in EtOH–dioxan, effecting exchange between Li in the two liquid phases. The electrode potential between amalgam and EtOH solution is $0 \cdot 0006$ volt greater for ^7Li than for ^6Li.   E. S. H.

Isotopic weights by the doublet method. F. W. ASTON (Nature, 1936, 138, 1094; cf. A., 1936, 657).—Comparisons of suitable doublets in the second-order focussing mass spectrograph gives the following vals. for isotopic wts. and packing fractions, respectively: ^{28}Si $27 \cdot 9863 \pm 0 \cdot 0007$, $-4 \cdot 90$; ^{31}P $30 \cdot 9836 \pm 0 \cdot 0006$, $-5 \cdot 30$; ^{32}S $31 \cdot 9823 \pm 0 \cdot 0003$, $-5 \cdot 53$; ^{35}Cl $34 \cdot 9800 \pm 0 \cdot 0008$, $-5 \cdot 71$; and ^{37}Cl $36 \cdot 9775 \pm 0 \cdot 0008$, $-6 \cdot 10$. The val. previously obtained for the difference of mass for the fundamental doublet O, CH_4 has been confirmed and the discrepancy between this val. and that obtained by Bainbridge and Jordan (Physical Rev., 1936, [ii], 49, 883) remains unexplained.   L. S. T.

Upper limit of atomic numbers. G. FOURNIER (Compt. rend., 1936, 203, 1495—1496).—A geometrical theory of nuclear structure (this vol., 60) gives a max. val. for the at. no. of 136, in accord with the Bohr and Dirac theories. The corresponding max. at. wt. is 360.   A. J. E. W.

β-Ray spectra of radium-*E* and radioactive phosphorus. E. M. LYMAN (Physical Rev., 1937, [ii], **51**, 1—7).—The end-points of the spectra, obtained by means of a high-resolution magnetic spectrometer, were 1·15 and 1·69 m.e.v. for Ra-*E* and ^{32}P, respectively; these vals. are about 17% < those obtained by extrapolating the Konopinski–Uhlenbeck curve.   N. M. B.

Theory of β-decay. A. TER-POGOSSIAN (Physikal. Z. Sovietunion, 1936, **10**, 115—116).—Wave-mechanical theory leads to a satisfactory form of the β-spectrum and to an interaction energy between proton and neutron of $5 \times 10^{-150}/r^{11}$ ergs, but the sign is wrong.   R. S. B.

Current difference in γ-ray ionisation measurements. E. F. COX (Physical Rev., 1937, [ii], **51**, 55—56).—Using the uniform field ionisation chamber (cf. A., 1934, 712), no difference between the no. of positive and negative ions collected per sec., as reported by Broxon (cf. Physical Rev., 1936, [ii], **49**, 415) and Clay (cf. Physica, 1935, **2**, 825), is found.   N. M. B.

Photographic action and absorption coefficients of γ-rays. J. S. ROGERS (Proc. Physical Soc., 1937, **49**, 1—11; cf. A., 1932, 671).—The photographic action of γ-rays is intensified by technical *X*-ray screens > by Pb foil, but these screens intensify the longer λλ > the shorter λλ. The heterochromatic γ-ray spectrum from Ra-*B* + *C* was analysed into two homogeneous components, the effective λ being the shorter the higher the at. no. of the absorber; absorption coeffs. in Al, Cu, Sn, and Pb were measured. An explanation discussed for the results suggests the presence of lines of moderate intensity of λ <5·6 X.   N. M. B.

Emission of neutrons from chlorine and argon under α-particle bombardment. E. POLLARD, H. L. SCHULTZ, and G. BRUBAKER (Physical Rev., 1937, [ii], **51**, 140; cf. this vol., 108).—A considerable yield of neutrons from ^{40}A is found on bombardment by Th-*C′* α-particles of range >5·6± 0·5 cm., the yield becoming ∝ thickness of A traversed at 6·9±0·5 cm. Similar emission was produced by Ra-*C′* α-particles. The neutron energy is approx. 0—1·5 m.e.v. Emission from ^{37}Cl began for α-particle range >5·3±0·5 cm., and yield was ∝ thickness at 7·2±0·5 cm. The suggested reactions are ^{40}A+ ^{4}He → ^{43}Ca+^{1}n, and ^{37}Cl+^{4}He → ^{40}K+^{1}n. Excitation curves suggest nuclear radii $6·1 \times 10^{-13}$ for ^{37}Cl and $7·3 \times 10^{-13}$ cm. for ^{40}A.   N. M. B.

Magnetic scattering of slow neutrons. L. J. LASLETT (Physical Rev., 1937, [ii], **51**, 22—24; cf. Mitchell, A., 1936, 1044).—Scattering by Fe and Ni at room temp. and above the Curie point shows no significant change, indicating that the largeness of these scattering cross-sections is not of magnetic origin.   N. M. B.

Magnetic properties of the neutron. J. R. DUNNING, P. N. POWERS, and H. G. BEYER (Physical Rev., 1937, [ii], **51**, 51; cf. Bloch, A., 1936, 1173).— A beam of thermal neutrons was passed normally and at angles through Fe sheets magnetised to saturation and scattering due to the plates alone and to the

pole face of a magnet was investigated. Small but consistent differences of counts on reversing the field give no conclusive evidence for the existence of a magnetic scattering effect.   N. M. B.

Change in the action of photo-neutrons on silver on passing through a layer of copper, lead, or beryllium. A. LEIPUNSKI and L. ROSENKEVITSCH (Physikal. Z. Sovietunion, 1936, **9**, 275— 278).—The transmission of neutrons formed by Ra γ-rays on Be has been studied through Cu, Pb, and Be. Retardation occurs due to inelastic scattering with the Cu and Be nuclei and it is suggested that energy levels of the order of 10^5 e.v. may be excited.   R. S. B.

Capture of slow neutrons. V. RAJEVSKI (Physikal. Z. Sovietunion, 1936, 9, 109—110).—The relation $Q_{ab.}/Q_s$ between between the absorption and the elastic scattering cross-section for slow neutrons is discussed.   R. S.

Activity of substances on bombardment by slow neutrons. L. I. RUSINOV and G. D. LATISCHEV (Physikal. Z. Sovietunion, 1936, 9, 287—301).— Results are given for ten elements. Max. activity was obtained in all cases with a 12·5-cm. H_2O filter interposed between source and target. Results do not corroborate Bethe's theory.   A. E. M.

Selective absorption of neutrons in silver. E. H. S. BURHOP, R. D. HILL, and A. A. TOWNSEND (Nature, 1936, **138**, 1094—1095).—A curve showing the absorption by different thicknesses of B of the neutrons which produce γ-ray activity in Ag is reproduced and discussed. There is an initial steep exponential decrease corresponding with an absorption coeff. of 8·1 g.$^{-1}$ cm.^{2}, and a region of slow, linear decrease corresponding with a coeff. of 0·24 g^{-1}. cm.^{2} The curve differs from those obtained from the absorption of neutrons which excite the 22 sec. and the 2·3 min. activities in Ag. The nucleus may possess two systems of energy levels corresponding with the emission of β- and γ-radiation.   L. S. T.

Activation of silver by neutrons. G. GUÉBEN (Nature, 1936, **138**, 1095—1096).—Irradiation of Ag with neutrons from a Ra–Be source, with and without interposition of paraffin, gives a radio-element, possibly $^{104}_{45}$Rh, of 50 sec. period produced by fast neutrons, another of 30 sec. period produced by slow neutrons, and a third of 2·5 min. period, produced by fast and slow neutrons, with an intensity enhanced by interposing paraffin between source and target.   L. S. T.

Scattering of neutrons in matter. IV. L. S. ORNSTEIN (Proc. K. Akad. Wetensch. Amsterdam, 1936, **39**, 1166—1170; cf. A., 1936, 1441).—Mathematical.   J. W. S.

Selective absorption of neutrons. I. KURTSCHATOV and G. SCHTSCHEPKIN (Physikal. Z. Sovietunion, 1936, 9, 102—105).—Neutrons of low energy are selectively absorbed by Cd whilst Ag absorbs in a high-energy band situated between 10^4 and 10^5 e.v.   R. S.

Elastic scattering of neutrons by protons. J. B. FISK and P. M. MORSE (Physical Rev., 1937, [ii], **51**, 54—55; cf. this vol., 6).—Results are plotted

based on the recomputations of elastic scattering formulæ with the help of the most recent data (cf. Breit, A., 1936, 1041; Harkins, this vol., 58; Amaldi, *ibid.*).   N. M. B.

Slowing down of neutrons in liquid hydrogen. V. FOMIN, F. G. HOUTERMANS, A. I. LEIPUNSKI, and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1936, 9, 696—698).—Preliminary. The intensities of radioactivity induced in Ag by a Ra + Be source in liquid H_2 and in H_2O have been compared. The saturation activity in liquid H_2 is about 30% of that in H_2O, and is reached at a low val. of the no. of H atoms between the source and detector. At low val. of the H atoms the increase in activity with increase in the no. is abnormally small.   O. D. S.

Deuteron–deuteron reaction. R. LADENBURG and R. B. ROBERTS (Physical Rev., 1936, [ii], 50, 1190).—An investigation of the yields of neutrons and protons produced by bombarding different D targets [ND_4Cl, KOD, $(ND_4)_2SO_4$, liquid D_3PO_4] with fast deuterons from ion beams and neutrons from a Ra–Be source is described.   N. M. B.

Spectroscopic identification and manometric measurement of artificially produced helium. F. A. PANETH, E. GLÜCKAUF, and H. LOLEIT (Proc. Roy. Soc., 1936, A, 157, 412—422).—The He produced from B under the impact of slow neutrons, $^{10}_5B + ^1_0n \rightarrow ^4_2He + ^7_3Li$, has been collected by a micro-method. The neutrons from 2·04 curie of Rn, mixed with Be, produced during its decay $2\cdot4 \times 10^{-7}$ c.c. of He.   L. L. B.

α-Particle bombardment of neon, calcium, and argon, and masses of light nuclei. E. POLLARD and C. J. BRASEFIELD (Physical Rev., 1937, [ii], 51, 8—11; cf. this vol., 58).—On bombardment by Th-*C''* α-particles Ne and Ca, but not A, emit protons. Absorption curves and max. energies were found. The nuclear energy changes $-2\cdot6_4$ for the Ne reaction and $-4\cdot2_3$ m.e.v. for Ca. In each case there is only one group. The calc. ^{23}Na mass is 22·9972. A table of isotopic masses for ^{20}Ne—^{40}A (omitting ^{21}Ne, ^{25}Mg, ^{33}S, and ^{39}K) is calc. N. M. B.

α-Particles from the radioactive disintegration of a light element. W. B. LEWIS, W. E. BURCHAM, and W. Y. CHANG (Nature, 1937, 139, 24).—The β-ray activity resulting from the bombardment of Li by deuterons (A., 1936, 1174) is accompanied by the emission of α-particles, which may result from the disintegration of excited ^8Be nuclei formed in the radioactive disintegration of ^8Li. The evidence indicates that ^8Be is formed in an excited state in a large proportion of the disintegrations of ^8Li.   L. S. T.

β-Ray spectrum of ^8Li. E. WIGNER and G. BREIT (Physical Rev., 1936, [ii], 50, 1191).—The mass discrepancy of ^8Li as obtained from $^7Li + ^2H \rightarrow ^8Li + ^1H$, and $^8Li \rightarrow ^8Be + e^-$ (cf. Rumbaugh, this vol., 5) is explained by supposing that the β-ray spectrum of ^8Li gives rise to an excited nucleus $(^8Be)'$, the reaction being $^8Li \rightarrow (^8Be)' + e^-$, and the energy difference $(^8Be)' - Be^8 > 0\cdot0035 \pm 0\cdot001$ mass units. Mechanisms and alternative explanations are discussed.   N. M. B.

γ-Radiation emitted from boron on bombardment with rapid protons. W. GENTNER (Naturwiss., 1937, 25, 12).—On bombardment of B with rapid protons γ-rays are emitted with a resonance potential of 180 kv. The excitation function of the rays shows a further increase at 360 kv. The curve is similar to that for the α-rays of range 4·5 cm. which are emitted at the same time as the γ-rays, indicating that both reactions are concerned with the same intermediate nucleus. The energy- and mass-balance of the reaction $^{11}_5B + ^1_1H \rightarrow ^8_4Be + ^4_2He$ does not permit the simultaneous emission of γ-rays. It is therefore assumed that the latter arise from an excited ^8_4Be nucleus, which is left after the emission of α-rays of range <4·5 cm., at present very difficult to detect.   A. J. M.

γ-Radiation from lithium bombarded with protons. E. R. GAERTTNER and H. R. CRANE (Physical Rev., 1937, [ii], 51, 49; cf. Hafstad, A., 1936, 1313).—Further measurements on pair and Compton electron distribution are reported. Strong components of the radiation are found at 14·5, 11, and 8·5, with a small group at 17·5 m.e.v. Conflicting evidence on the reaction mechanisms proposed for the experimental distribution is discussed.
     N. M. B.

γ-Radiation arising from positron destruction. G. RUMER (Physikal. Z. Sovietunion, 1936, 9, 317—327).—Theoretical.   L. G. G.

Angular distribution of the protons and neutrons emitted in some transmutations of deuterium. A. E. KEMPTON, B. C. BROWNE, and R. MAASDORP (Proc. Roy. Soc., 1936, A, 157, 386—399).—The angular distributions for the transmutations $^2D + ^2D \rightarrow ^3T + ^1H$, and $^2D + ^2D \rightarrow ^3He + ^1n$, have been studied. The proton and neutron distributions are very similar; in both cases the intensity of emission at angle 0° is about 1·5 times that at 90°.   L. L. B.

Transmutation of the lithium isotope of mass seven by deuterons. A. E. KEMPTON, B. C. BROWNE, and R. MAASDORP (Proc. Roy. Soc., 1936, A, 157, 372—385).—The continuous distribution of α-particles formed in the transmutation $^7Li + ^2D \rightarrow ^4He + ^4He + ^1n$ (i) has been investigated. No evidence has been obtained for the formation of a ^5He nucleus. The observed neutron energy distribution and the α-particle distribution are in qual. agreement if it is assumed that (i) takes place with the temporary formation and subsequent break-up of a ^9Be nucleus.   L. L. B.

Artificial radioactivity. A. I. ALICHANIAN, A. I. ALICHANOV, and B. S. DŽELEPOV (Physikal. Z. Sovietunion, 1936, 10, 78—102).—The β-ray spectra of radioactive P, Mn, Br I, II, and III, Rh I, Ag I, I, Ir, and Au formed by neutron bombardment have been studied. The relation between the decay consts. and the spectral limits cannot be expressed by Sargent's law or by Fermi's theory.   R. S. B.

Radioactivity induced in sulphur. R. SAGANE (Physical Rev., 1936, [ii], 50, 1141—1145).—Under bombardment with 4—6 m.e.v. deuterons, S became radioactive with emission of both positive and

negative electrons, of decay periods $3\pm0\cdot1$, 33 ± 1 min., and $14\pm0\cdot3$ days, having their origin in ^{30}P, ^{34}Cl (positron emitters), and ^{32}P (electron emitter). The energy distribution of positrons from Cl was studied by a cloud chamber. When bombarded by neutrons two radioactive substances which emit negative electrons were produced; the half-val. periods were $2\cdot6\pm0\cdot2$ hr. and 14 days, characteristic of ^{31}Si and ^{32}P. N. M. B.

Radioactivity in tantalum on neutron bombardment. V. FOMIN and F. G. HOUTERMANS (Physikal. Z. Sovietunion, 1936, **9**, 273—274).—The half period of the radioactivity induced in Ta by neutrons is 200 ± 100 days, and the β-radiation emitted is very soft. R. S. B.

Intermediate nucleus and atomic disintegration in steps. W. D. HARKINS (Physical Rev., 1937, [ii], **51**, 52—53).—The postulates of a theory that the first step in a nuclear reaction is the synthesis of an intermediate nucleus (cf. A., 1934, 1151) are developed in detail and experimental evidence is adduced. N. M. B.

Absolute intensity of cosmic radiation at sea-level. J. CLAY and H. F. JONGEN (Proc. K. Akad. Wetensch. Amsterdam, 1936, **39**, 1171—1173).—The ionisation by cosmic rays has been determined in a cylindrical vessel and with field strengths $\not>600$ volts per cm., and the saturation current for various pressures deduced. At 23—38 atm. the wall ionisation is const., and it is deduced that the ionisation at sea-level under 12 cm. of Fe is $1\cdot11$ ion per c.c. in air at 1 atm., and for an open vessel $1\cdot60$ ion per c.c. The ionisation produced by electrons ejected from Fe is 21 ions per sq. cm. J. W. S.

Hard component of cosmic rays. B. GROSS (Physical Rev., 1936, [ii], **50**, 1188—1189; cf. A., 1935, 278).—The range distribution obtained by extrapolation of the depth–ionisation curve is investigated. N. M. B.

Numerically consistent corpuscular theory of cosmic rays. W. F. G. SWANN (Physical Rev., 1936, [ii], **50**, 1103—1119).—A mathematical and theoretical survey. N. M. B.

Cosmic rays as electrical particles. A. H. COMPTON (Physical Rev., 1936, [ii], **50**, 1119—1130).—A general review of evidence for and against the electrical particle view. N. M. B.

Atomic synthesis and stellar energy. III. R. D'E. ATKINSON (Astrophys. J., 1936, **84**, 73—84).—The synthesis theory of stellar energy (A., 1931, 1104) is reviewed in the light of recent knowledge concerning neutrons, deuterons, and positrons. It is concluded that a star probably contains no large amount of free neutrons or deuterons, and it is likely that deuterons, but not neutrons, could be made directly from protons under stellar conditions. L. S. T.

Solid-body model of heavy nuclei. J. FRENKEL (Physikal. Z. Sovietunion, 1936, **9**, 533—536).—The theory of Bohr (A., 1936, 403) is applied to collision between a heavy nucleus and an electron or proton. O. D. S.

Collisions of slow neutrons with protons. V. I. MAMASACHLISOV (Physikal. Z. Sovietunion, 1936, **9**, 198—209).—The interaction of protons and neutrons has been studied by wave-mechanics, with good agreement with experiment for the dimensions of the potential barrier. R. S. B.

Capture of orbital electrons by nuclei. C. MØLLER (Physical Rev., 1937, [ii], **51**, 84—85).—The relative probabilities of the transformation of a nucleus of charge Z into one of charge $Z-1$ by the emission of a positron or by absorption of an orbital electron are examined. N. M. B.

Theoretical constitution of metallic potassium. E. GORIN (Physikal. Z. Sovietunion, 1936, **9**, 328—344).—A wave-mechanical calculation of the binding energies and lattice const. in metallic K. L. G. G.

Structure of the nuclei between helium and oxygen. E. FEENBERG and E. WIGNER (Physical Rev., 1937, [ii], **51**, 95—106).—Mathematical. Applications of nuclear forces are tested. N. M. B.

Relative stabilities of isotopes of the lighter elements. W. M. LATIMER (Physical Rev., 1937, [ii], **51**, 141).—A simple means of calculating, up to ^{37}Cl, which isotopes are stable is described. N. M. B.

Connexion between masses of light atoms. W. BOTHE and H. MAIER-LEIBNITZ (Naturwiss., 1937, **25**, 25—26).—The curves connecting mass excess (ΔM) with mass no. (A) obtained by Oliphant (A., 1936, 540) indicate that either $^5_2$He or $^5_3$Li should be a stable nucleus. It is shown that ΔM for light atoms can be expressed as a function of A and the nuclear charge Z, the simplest form of the function being obtained when $A-2Z$ is taken as parameter. For $A-2Z=-1$ or $+1$, the vals. of ΔM lie on smooth curves. For $A-2Z=0$ the atoms with an even no. of protons have smaller ΔM than those with an odd no. The points for the two types lie on two separate smooth curves. The same effect is found for $A-2Z=2$, but the difference in ΔM for the two types of atom is less. This is in agreement with the neutron–proton structure of the nucleus, and especially with Weizsäcker's theory (A., 1935, 1297). $^5_2$He and $^5_3$Li have very large ΔM and should therefore be extremely α-unstable. The same is probably true of $^9_4$Be. $^9_5$B should break down into $^8_4$B and $^1_1$H. $^1_1$H should be β-active, but of very short life. A. J. M.

Theory of complex atoms. D. R. H(ARTREE) (Nature, 1936, **138**, 1080—1082).—A review of papers to the British Association. L. S. T.

Relation between the action function and the force acting on the electron. (MME.) M. A. TONNELAT-BAUDOT (Compt. rend., 1936, **203**, 1332—1333).—Theoretical. H. J. E.

Dirac vector model for two non-equivalent electrons in the atom. I. SCHAPOSCHNIKOV (Physikal. Z. Sovietunion, 1936, **9**, 618—629).—Mathematical. O. D. S.

Exchange forces between elementary particles. V. F. WEISSKOPF (Physical Rev., 1936, [ii], **50**,

1187—1188).—Mathematical. The interaction term introduced by the Fermi theory of β-decay is examined.   N. M. B.

Is the momentum a sufficient description of a photon or an electron ? H. R. CRANE (Physical Rev., 1937, [ii], **51**, 50).—The photons responsible for the 17·5-m.e.v. electrons from Li (cf. this vol., 108) may differ in time of emission and in extreme shortness of wave train from those responsible for the lower groups. The consequences of this introduction of an additional variable in the description of the individual photon are discussed.   N. M. B.

Self-consistent field and Bohr's nuclear model. W. M. ELSASSER (Physical Rev., 1937, [ii], **51**, 55).— The relation between the Bohr semi-classical nuclear model (cf. A., 1936, 403) and the Hartree–Fock model of one-particle orbits is examined.   N. M. B.

Consequences of the symmetry of the nuclear Hamiltonian on the spectroscopy of nuclei. E. WIGNER (Physical Rev., 1937, [ii], **51**, 106—119; cf. Fernberg, this vol., 109).—Mathematical. The structure of the multiplets of nuclear terms is investigated.   N. M. B.

Wave mechanics of couples (neutron–neutrino). M. BORN (Nature, 1937, **139**, 68).—Theoretical. β-Decay is considered as a special case of processes in which a couple of particles (neutron–neutrino) are involved. The principal feature of these processes is that the rest-mass of the single particle is not conserved, but only that of a couple as a whole.   L. S. T.

Electronic nature of light. J. J. PLACINTEANU (Compt. rend., 1936, **203**, 1343—1345).—Theoretical.   H. J. E.

Neutrino theory of light. D. IVANENKO and A. SOKOLOV (Physikal. Z. Sovietunion, 1936, **9**, 692—695).—Mathematical.   O. D. S.

Spark discharge at the surface of an electrolyte connected to the negative pole. P. JOLIBOIS and R. BOSSUET (Compt. rend., 1936, **203**, 1497— 1498; cf. A., 1936, 655).—Spectral data are given; the luminous spot on the liquid surface gives lines due to H and O, the spark giving N bands and a line spectrum of the metal in solution. 1 mg. of Mn per litre could be detected in presence of NH_4Cl.   A. J. E. W.

Absorption spectra and photosensitising activity of white pigments. C. F. GOODEVE (Trans. Faraday Soc., 1937, **33**, 340—347).—The diffuse reflecting powers of TiO_2, ZnO, $PbCO_3$, $BaSO_4$, and white lead have been measured and the absorption spectra and threshold λλ deduced. The results are discussed with reference to the photosensitising action of these pigments.   J. W. S.

Low-dispersion of red stars. R. WILDT (Astrophys. J., 1936, **84**, 303—318).—Various absorption bands in the far ultra-violet are tentatively attributed to CN, CH, NH, OH, and CaH.   L. S. T.

Variations of the absorption coefficients of ozone and the temperature of the upper atmosphere. E. VASSY (Compt. rend., 1936, **203**, 1363— 1365; cf. A., 1936, 1208).—Measurements of the absorption coeffs. at the absorption min. (λλ 3359— 3110 A.) are recorded. The vals. diminish linearly with temp. (20° to —80°). The application of these facts in measuring the atm. temp. is discussed.   H. J. E.

Ultra-violet absorption spectrum of ozone. A. JAKOVLEVA and V. KONDRATEEV (Physikal. Z. Sovietunion, 1936, **9**, 106—108).—A formula for the heads of O_3 absorption bands between 3660 and 3080 A. is given. The dissociation energy of the excited O_3 is 0·55 volt. It is suggested that this, together with the normal state, are singlet states, and that O_3 is diamagnetic.   R. S.

Effect of hydrogen bond formation on fundamental frequencies of OH radical. A. M. BUSWELL, V. DEITZ, and W. H. RODEBUSH (J. Chem. Physics, 1937, **5**, 84).—H bond formation leads to the disappearance of the first harmonic of the OH group and appears to lead to a displacement of the fundamental to longer λ.   W. R. A.

Vibrational analysis of the emission bands of germanous oxide. R. W. SHAW (Physical Rev., 1937, [ii], **51**, 12—14).—An analysis for 21 bands degraded to the red is tabulated for the region λλ 2500—2900, and an expression for the band heads is given. The internuclear distance is $1·65 \pm 0·06$ A.   N. M. B.

Absorption spectrum of ruthenium tetroxide. S. E. KRASIKOV, A. N. FILIPPOV, and I. I. TSCHERNIAEV (Ann. Sect. Platine, 1936, **13**, 19—20).— Characteristic absorption bands of RuO_4 vapour occur at 2990, 3064, 3138, and 3212 A.   R. T.

Third absorption bands of co-ordination compounds. I. $[Co(NH_3)_4ClNO_2]Cl$ and $[Co(NO_2)_6]Na_3$. R. TSUCHIDA and S. KASHIMOTO (Bull. Chem. Soc. Japan, 1936, **11**, 785—790).— Extinction coeffs. of solutions of $[Co(NO_2)_6]Na_3$, $[Co(NH_3)_4ClNO_2]Cl$, $[Co(NH_3)_4(NO_2)_2^{(1)}_{(6)}]Cl$, and $[Co(NH_3)_2(NO_2)_4]NH_4$ have been determined. Three similarly situated absorption bands were found for each substance. The presence of the third band is attributed to a pair or pairs of negative radicals co-ordinated in *trans*-positions to each other. The results are discussed in conjunction with data for tetrammine and pentammine cobaltic salts.   J. G. A. G.

Spectrum and photochemistry of carbon suboxide. H. W. THOMPSON and N. HEALEY (Proc. Roy. Soc., 1936, **A, 157**, 331—347).—The ultra-violet absorption spectrum of C_3O_2 is composed of both banded and continuous regions. The frequencies of the normal valency vibrations of the mol. have been calc., on the basis of the force consts. of the linkings involved. A scheme of energy levels for the mol. is suggested. No fluorescence is observed. Illumination of C_3O_2 with the light of a Hg arc leads chiefly to a polymerisation and little decomp. Badger and Barton's data (A., 1934, 581) are not confirmed.   L. L. B.

Absorption spectra of salts of ytterbium in crystals and solutions compared with those of cerium. S. FREED and R. J. MESIROW (J. Chem. Physics, 1937, **5**, 22—25).—The absorption spectra of $YbCl_3$, $Yb(OAc)_3$, and $Yb(EtSO_4)_3$ closely resemble

those of the corresponding Ce salts especially in their diffuseness at low temp., in contrast to the sharp spectra of the other rare earths. Lattice forces do not introduce any modifying influences and the Pauli exclusion principle can be applied to the absorption spectra of crystals and solutions of salts in exactly the same way as it is applied to the spectra of gaseous ions. W. R. A.

Absorption spectra of samarium tungstate and molybdate at low temperatures. S. FREED and E. L. HAENISCH (J. Chem. Physics, 1937, **5**, 26—29).—The absorption spectra of single crystals of $Sm_2(WO_4)_3$ and $Sm_2(MoO_4)_3$ have been photographed at several temp. between 78° and 298° abs. The dissimilarity in the spectra indicates that the crystals belong to different space-groups, whilst crystallographic data suggest the same space-group. Evidence of dissociation into basic and acidic oxides within the crystals at the higher temp. is obtained.

W. R. A.

Line absorption spectrum of gadolinium ion in crystals. G. C. NUTTING and F. H. SPEDDING (J. Chem. Physics, 1937, **5**, 33—45; cf. A., 1933, 336).—Absorption spectra of the Gd^{+3} ion in hexagonal crystals of $(HCO_2)_3Gd$, $Gd(BrO_3)_3,9H_2O$, and $Gd(EtSO_4)_3,9H_2O$, in monoclinic crystals of $Gd_2(SO_4)_3,8H_2O$, $Gd_2(SeO_4)_3,8H_2O$, $(EtCO_2)_3Gd,3H_2O$, and $(PrCO_2)_3Gd,2H_2O$, in triclinic crystals of $Gd(OAc)_3,4H_2O$, and in $(CCl_3 \cdot CO_2)_3Gd,3H_2O$, $(CCl_3 \cdot CH_2 \cdot CH_2 \cdot CO_2)_3Gd,10H_2O$, and $(Pr^\beta CO_2)_3Gd,6H_2O$ have been investigated between 300° and 20° abs. Lattice symmetry, and not the negative ion, determines the splitting of multiplets or excited levels; H_2O of crystallisation does not affect the spectra. The results are interpreted to indicate that all the lines of the multiplets of the inorg. salts and most of the lines of the org. salts arise from the crystal Stark splitting of lines in the spectrum of gaseous Gd^{+3}. W. R. A.

Influence of electric field on the absorption spectrum of the acetylene flame. A. E. MALINOVSKI and V. S. ROSSICHIN (Physikal. Z. Sovietunion, 1936, **9**, 268—270; cf. A., 1936, 572).—The absorption spectrum of burning 25% C_2H_2 and 75% air in an electric field shows a missing line and the disappearance of the continuous region in the ultraviolet of the normal spectrum without field, using a C arc. The field removes the charged particles from the flame and hence decreases absorption.

R. S. B.

Absorption spectra of crystals at low temperatures. II. Absorption spectrum of phenanthrene at 20° abs. III. Spectrum of anthracene at 20° abs. I. V. OBREIMOV and A. PRICHOTKO (Physikal. Z. Sovietunion, 1936, **9**, 34—47, 48—56; cf. A., 1932, 674).—II. The absorption spectrum for polarised light depends on the direction of the electric vector. When this is parallel to the plane (010) the bands are narrower. Three regions are distinguished, viz., the near spectrum consisting of few lines and narrow weak bands extending from 26,000 to 28,000 cm.$^{-1}$, the main spectrum of two series of narrow bands between 28,000 and 33,000 cm.$^{-1}$, and the far spectrum of broad, diffuse bands beyond

33,000 cm.$^{-1}$. The intensity increases in the same order.

III. The near spectrum is absent in the case of anthracene and the main spectrum consists of some intense doublets and fainter bands slightly sharper than at —190° but otherwise the same. Broad, diffuse bands which shift with change of temp. are obtained in the far spectrum when the electric vector is normal to the plane (010) of symmetry. The absorption of cryst. anthracene is discussed in relation to that of the vapour. R. S.

Ultra-violet absorption spectra of maleonitrile. E. RUPPOL (Bull. Acad. roy. Belg., 1936, [v], **22**, 1166—1168).—Data and absorption curve for the nitrile in EtOH are given. Comparison of maleo- with fumaro-nitrile (A., 1935, 563) shows that in dil. solution the absorption spectra are similar but in conc. solution absorption of fumaro- is > that of maleo-nitrile. F. O. H.

Amino-acids, acylamino-acids, dipeptides, acyldipeptides, and derivatives of these compounds. I. Absorption spectra. M. A. MAGILL, R. E. STEIGER, and A. J. ALLEN (Biochem. J., 1937, **31**, 188—194).—Curves are given showing the absorption of many compounds between 2100 and 3000 A. at room temp. A dipeptide has greater absorption than an equimol. mixture of its constituents. Replacement of an NH_2-H by Ac shifts the absorption to longer $\lambda\lambda$. In six pairs of acetyldipeptides the compound with the NH_2-acid of higher mol. wt. acetylated has lower absorption than its position isomeride. R. M. M. O.

Spectra of helicorubin and oxyhelicorubin.— See A., III, 83.

Pressure broadening of the HCN band lines and intermolecular forces. G. HERZBERG, J. W. T. SPINKS, and W. W. WATSON (Physical Rev., 1936, [ii], **50**, 1186).—Photometric examinations of previous spectrograms in the near infra-red of HCN, C_2H_2, HCl, and CH_4 are discussed. Results do not support the views of Cornell (cf. A., 1936, 1179). The HCN line width is considerably the largest, and there is evidence of large van der Waals forces which perturb the absorbing mols.

N. M. B.

Pressure broadening in bands of dipole molecules. W. W. WATSON and H. MARGENAU (Physical Rev., 1937, [ii], **51**, 48).—The relatively large broadening of HCN band lines must be due to large perturbing forces. The contribution of dipole alignment effect to dipole interaction is discussed qualitatively. Conclusions indicate that such effect should, at least at low temp., produce an asymmetry to the blue in the line originating in the lowest level.

N. M. B.

Absorption spectrum of ammonia in the very near infra-red (6000—9500 A.). G. COSTEANU and P. BARCHEWITZ (Compt. rend., 1936, **203**, 1499—1501).—$\lambda\lambda$ for the liquid, gas, and aq. solutions are tabulated. Bands for the liquid are classified, and harmonics considered. A. J. E. W.

The 2·73 μ absorption band of fused silica. J. W. ELLIS and W. K. LYON (Nature, 1937, **139**,

70).—No trace of this band could be detected in manufactured quartz specimens, which probably contain CO_2 (cf. A., 1936, 1318). L. S. T.

The 2·73 μ absorption band of fused silica. D. G. DRUMMOND (Nature, 1937, **139**, 70).—The view that CO_2 impurity is the cause of the band appears to be no longer tenable · (cf. preceding abstract). In a specimen which showed the 2·73 μ band, the H_2O vapour bands near 1·36 and 1·87 μ were absent. The 2·73 μ band has been observed in emission from hot, fused SiO_2. L. S. T.

Infra-red absorption spectrum of hydrogen chloride in solution. W. WEST and R. T. EDWARDS (J. Chem. Physics, 1937, **5**, 14—22; cf. A., 1936, 545).—The infra-red absorption bands of HCl in non-ionising solvents near 3·5 μ and 1·8 μ show no rotational structure and have usually two components of unequal intensities, and the absorption region is displaced to frequencies < for the gas. The displacement is independent of concn., up to mol. fraction 0·1, increases with diminishing temp. in certain solvents, and is approx. the same for both bands. The interval between the two components in both bands varies directly with the dielectric const. of the solvent. W. R. A.

Infra-red absorption of formaldehyde vapour. E. S. EBERS and H. H. NIELSEN (J. Chem. Physics, 1937, **5**, 84).—Preliminary results on the infra-red spectrum of CH_2O vapour between 1 and 11 μ are reported. W. R. A.

Rotation–vibration spectrum of C_2H_6 and the question of internal rotation. J. B. HOWARD (Physical Rev., 1937, [ii], **51**, 53).—A dynamical study of a C_2H_6 model showing how the rotation–vibration spectrum will change in the transition from free to completely restricted internal rotation gives a lower limit of 2000 g.-cal. for the potential restricting internal rotation of Me groups about the symmetry axis. N. M. B.

Infra-red absorption of [methyl] alcohol–acetone mixtures. W. GORDY (Physical Rev., 1936, [ii], **50**, 1151—1153).—Transmission curves for various mixtures in the region 2·5—8·5 μ are given. $COMe_2$ shifts the OH vibrational band of MeOH to shorter λλ and appreciably increases its intensity; MeOH increases the intensity of the CO vibrational band of $COMe_2$ and shifts it to longer λλ. No other bands are affected. Results indicate association of MeOH and $COMe_2$ through interaction of OH and CO. Proton bond formation is suggested. N. M. B.

Infra-red absorption spectra and modes of vibration of organic compounds containing an ethylenic linking. J. LECOMTE (Compt. rend., 1936, **203**, 1501—1503).—Observed data for compounds of the type $R \cdot CH:CH \cdot CH_2 \cdot X$ (X = OH, CN, Br) are considered to arise from the existence of two forms of mol. (cf. A., 1935, 1053). Vibrational frequencies are given. A. J. E. W.

Structure of liquids studied in the infra-red. J. ERRERA (Trans. Faraday Soc., 1937, **33**, 120—129).—Very pronounced absorption bands in the infra-red between λ 52 and 152 μ are observed in dipolar substances, and the abs. val. of the extinction coeff. is ≫ that deduced from the relaxation time measured in the hertzian region by the Debye dispersion formula. Intra- or inter-mol. movements are considered responsible for the observed deviations from theory. F. L. U.

Dependence of the scattering of light on wavelength. L. V. SMIRNOV and N. M. BASHENOV (Kolloid. Shur., 1935, **1**, No. 2, 89—97; cf. A., 1935, 932).—The power to which λ is raised in the Rayleigh formula is calc. for non-metallic spheres; it is > 3·95 when the radius r of the particle is < 30 mμ, but becomes negative when r is > 170 mμ. J. J. B.

Raman spectra and constitution of liquids. M. MAGAT (Trans. Faraday Soc., 1937, **33**, 114—120; cf. A., 1936, 1179).—The Raman effect in liquids leads to a quasi-cryst. (as opposed to a micro-cryst.) hypothesis of structure. It also shows that liquids may possess intervals of transformation associated with free rotation. F. L. U.

Raman effect in solutions in [liquid] ammonia. I. M. V. VOLKENSTEIN (Acta Physicochim. U.R.S.S., 1936, **5**, 627—644; cf. A., 1936, 137, 1449).—Raman spectra of solutions of NH_4NO_3, NH_4CNS, $NH_4NO_3 + 3NH_4CNS$, and AgCl in liquid NH_3 have been measured. Frequencies due to liquid NH_3 differ from those observed with the gas. Lines characteristic of NO_3' and CNS', but not NH_4·, were observed. The absence of NH_4· frequencies is explained as due to the formation of $[H(NH_3)_n]$·. F. L. U.

Raman spectrum of an aqueous solution of KSeCN. V. KONDRATEEV and O. SETKINA (Physikal. Z. Sovietunion, 1936, **9**, 279—286).—The Raman spectrum of aq. KSeCN shows two lines $\nu_1 = 2051 \cdot 5$ cm.$^{-1}$ and $\nu_2 = 575$ cm.$^{-1}$, attributed to the ion NCSe$^-$. Force consts. (C:N) for the ions NCS$^-$ and NCSe$^-$ are calc. by the usual equations and found to be 13% < in the case of the isosteric mols. NCCl and NCBr. This anomalous result is discussed. H. C. G.

Intensity and depolarisation of Raman lines emitted by sulphuric acid–nitric acid mixtures. J. CHÉDIN (Compt. rend., 1936, **203**, 1509—1511).—The proportions of free N_2O_5 present in H_2SO_4–HNO_3–H_2O mixtures with low H_2O content (0—15%) were investigated by observing the intensity of a Raman line due to N_2O_5. A. J. E. W.

Raman spectra of some simple molecules in solution. W. WEST and P. ARTHUR (J. Chem. Physics, 1937, **5**, 10—13).—Raman spectra of HCl, HBr, SO_2, and NH_3 in various non-ionising solvents indicate that the vibration frequencies in the solute mol. are < in the gas state. The shift for the H halides is > for the other two, and a definite relation between the frequency shift and the dielectric const. of the solvent appears to exist for the halides. Conc. solutions of HCl and HBr in several ionising solvents have no lines identifiable as vibrations in HCl or HBr mols. The bearing of these results on the dissociation process of HCl in solvents is discussed. W. R. A.

Vibrations of the ethylene molecule. S. BHAGAVANTAM (Nature, 1936, **138**, 1096—1097).— Depolarisation factors of 0·10 and 0·17, respectively, have been obtained for the Raman lines 3019·0 and 1343·9, and are in accord with theory. The two weak lines at 2880 and 1656 which are not fundamentals have now been observed in the Raman spectrum of the gas as well as in the liquid (cf. A., 1936, 269). L. S. T.

Absolute measurement of light diffused by liquid benzene. P. PEYROT (Compt. rend., 1936, **203**, 1512—1514).—Rayleigh's ratio, R, for C_6H_6 is $(34·8\pm2·3) \times 10^{-6}$ cm.$^{-1}$, for light of λ 4358 A., and at 24°. Vals. of R obtained for H_2O and 10 aliphatic compounds agree with vals. deduced from the Vessot–King formula. R for C_6H_6, PhMe, and m-xylene is abnormally high. A. J. E. W.

Raman spectrum of benzene vapour. S. BHAGAVANTAM and A. V. RAO (Nature, 1937, **139**, 114—115).—The principal line at 992 shows no change, but the line at 3061 in the liquid shifts to 3069 in the vapour, and 3047 is either considerably weakened or has disappeared. Alterations which occur in the structure and intensity of the " rotation wings " accompanying the Rayleigh lines are described. L. S. T.

Effect of an electric field on the polarisation of the Raman lines. R. LANGENBERG (Ann. Physik, 1937, [v], **28**, 132—136).—The degree of depolarisation of the Raman lines of C_6H_6 and PhMe when electric fields of different strengths are applied has been determined. The changes observed in the degree of depolarisation on applying the field are within experimental error, and the effect noted by Sirkar (A., 1934, 942) is not real. A. J. M.

Raman effect. LXI. Raman spectra of organic substances. Benzene derivatives. XI. L. KAHOVEC and A. W. REITZ (Monatsh., 1936, **69**, 363—376).—Data are recorded for PhSH, PhSMe, PhSEt, NHPhMe, NHPhEt, NPhMe$_2$, NPhEt$_2$, NHPhPr$^\beta$, PhOEt, $CH_2Ph\cdot OMe$, PhPr^a, PhPr$^\beta$, $(SPh\cdot)_2$ and $C_6H_3Br_3$, and certain anomalies discussed. J. W. S.

Raman effect of some organic sulphur compounds. L. MÉDARD and F. DÉGUILLON (Compt. rend., 1936, **203**, 1518—1521).—$\lambda\lambda$ for Me_2S, Me_2S_2, PhSH, $MeSO_4^-$, and $EtSO_4^-$ are given and discussed, particularly in regard to the ions involved. A. J. E. W.

Raman effect and the concept of odour.—See A., III, 93.

Decay of phosphorescence in boric acid and aluminium sulphate preparations. V. L. LEVSCHIN and L. A. VINOKUROV (Physikal. Z. Sovietunion, 1936, **10**, 10—33).—The phosphorescence of boric acid and $Al_2(SO_4)_3$, activated by uranin, eosin, æsculin, naphthionic acid, and erythrosin, decays exponentially. The mean life of the excited state is independent of λ at 330—620 mμ and decreases with increasing concn. (c) of activator. Initial intensity decreases with increasing c. Fluorescence and phosphorescence spectra are similar. The dyes are active in the order given. The results resemble those with solid solutions of the dyes and differ from those with crystals activated by metals. The mechanism of quenching is discussed. R. S. B.

Fluorescence of platinocyanides. J. A. CHVOSTIKOV (Physikal. Z. Sovietunion, 1936, **9**, 210—236).—The emission and absorption fluorescence spectra of K, Ba, and Mg platinocyanides has been studied in aq. solution, mainly with the K salt up to $5·1 \times 10^{-2}$ g. per c.c. The polarisation of the fluorescence depends on η in presence of glycerol, according to Perrin's formula. The life of the excited state is $2·5 \times 10^{-10}$ sec., and the fluorescence yield for the K salt 4·5%. The temp. coeff. is negative. The dependence of fluorescence and polarisation on λ has been studied at λ 230—350 mμ. R. S. B.

Weak phosphorescence in the ultra-violet by the light–counting tube method. M. L. KATZ (Physikal. Z. Sovietunion, 1936, **9**, 254—258).— The phosphorescence of blue fluorspar in light of 4047 and 4078 A. has been studied by means of the light-counting tube and lies in the region 2400—2950 A. R. S. B.

Absolute efficiency of fluorescence of potassium uranyl sulphate. M. M. GUREVITSCH and L. TSCHACHROV (Bull. Acad. Sci. U.R.S.S., 1936, 509—513).—The light efficiency of $K_2UO_2(SO_4)_2$ screens amounts to about 200 lumens per watt of incident ultra-violet light energy. The use of such screens increases the illuminating efficiency of a black body at 3000° by 20%, and of high- and low-pressure Hg-vapour lamps by 50 and 200%, respectively. R. T.

Fluorescence of aqueous diacetyl solutions. K. KALLE (Naturwiss., 1937, **25**, 61).—When aq. Ac_2 is irradiated with ultra-violet light a yellowish-green fluorescence is observed after a short time (a few sec. to 1 min. according to the concn. of the solution). It starts from one or more centres and travels slowly over the part of the liquid irradiated. If the liquid is shaken so that the reaction occurs uniformly throughout the liquid, and it is then placed in the dark, the whole process may be repeated after about 15 min. After 10 repetitions the intensity of the fluorescence decreases to about one third. Addition of dil. acid has no effect, but addition of alkali prevents the reaction, and destroys any fluorescence centres already formed. A. J. M.

Invisible radiation in gaseous reactions. I. K. JABŁCZYŃSKI and W. ORŁOWSKI (Rocz. Chem., 1936, **16**, 406—410).—Radiation is detected photographically in the reactions between O_3 and S or H_2S, H_2S and NH_3 or SO_2, and NH_3 and SO_2, but not between Br and SO_2 or NH_3, and O_3 and MnO_2 or Pt–asbestos. R. T.

" Specific action " of ultra-short wireless waves. W. E. CURTIS, F. DICKENS, and S. F. EVANS (Nature, 1936, **138**, 1100—1101; cf. ibid., 63).— A reply to criticism. L. S. T.

Time lag of the vacuum photo-cell. R. A. HOUSTOUN (Nature, 1937, **138**, 29—30).—The lag for a G.E.C. cell, KV6, is found to be 5×10^{-10} sec. The KMV6 cell shows no lag. L. S. T.

Velocity distribution of photo-electrons on composite cæsium electrodes. A. I. PIATNITZKI and P. V. TIMOFEEV (Physikal. Z. Sovietunion, 1936, 9, 187—197).—The distribution of velocity (v) of photo-electrons formed by Cs–S and Cs–O cathodes has been studied with λ 4358—5790 A. at 20°. With increasing λ the max. of the distribution curves is displaced towards greater v. The curves are dependent on the nature of the cathode. R. S. B.

Fatigue of oxygen–cæsium photo-cathodes. P. V. TIMOFEEV and N. S. KONDORSKAJA (Physikal. Z. Sovietunion, 1936, 9, 683—691).—The fatigue in a vac. photo-cell with cathode formed by condensation of Cs vapour on a Ag_2O layer increases with increasing illumination and with increase in applied voltage at const. current. The fatigue at room temp. is partly, and at liquid N_2 temp. completely, reversible. The spectral distribution of sensitivity is altered by fatigue. Fatigue is due to the loss of free Cs atoms from the surface by their diffusion as positive ions into the body of the cathode. O. D. S.

Origin of uni-polar electrical conductivity of carborundum. S. R. KHASTGIR (Nature, 1937, 139, 28—29). L. S. T.

Electroresistive effect and a rectifying property of carborundum crystals. H. OSTERBERG (Physical Rev., 1936, [ii], 50, 1187).—The electrical resistances of single homogeneous crystals of carborundum and zincite vary rapidly with applied voltage even under isothermal conditions and for uniform voltage gradients. The isothermal variation of resistance with voltage, or electroresistive effect, is examined mathematically. N. M. B.

Absorption of light and the trapping of electrons and positive holes in crystalline dielectrics. J. FRENKEL (Physikal. Z. Sovietunion, 1936, 9, 158—186).—Theoretical. The production of "excitons" by the absorption of light by a cryst. dielectric is studied. The theory explains the trapping characteristics of dielectrics and semi-conductors without recourse to impurities or inhomogeneities. R. S. B.

Variation with temperature of the reverse photo-electric effect in cuprite crystals. N. J. BARBAUMOV and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 345—351).—Measurements were made with natural crystals between −55° and 84°. In the region > 6600 A. the temp. behaviour is different from the normal effect. For the region < 6100 A. the variation with temp. is the same as with the normal effect. A. E. M.

Influence of supplementary light on the crystal photo-effect in cuprous oxide. N. O. BARBAUMOV and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 94—96).—The influence on the photo-effect–λ curve of a supplementary beam perpendicular to the principal beam has been studied. When the supplementary λ is > that corresponding with the curve max., the photo-effect is increased at shorter λλ to an extent > the additive val. for both λλ and *vice versa*. R. S.

Influence of double illumination on the crystal photo-effect of cuprous oxide. N. J. BARBAUMOV and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 551—562; see preceding abstract).—The spectral distribution between 4500 and 7600 A. of the photo-effect in a Cu_2O single crystal has been investigated with and without simultaneous illumination in directions parallel, opposite, or perpendicular to the primary by λλ 5400, 6200, and 7200 A., the photo-effect of the secondary beam alone being compensated. A dependence on the direction of the secondary beam was observed for λλ 5400 and 6200 A. combined with a primary λ > 5800 A. The variation with intensity of the secondary beam has been investigated for the primary–secondary pairs : 6800-5400, 5400-6200, 6800-6200, and 7600-7200 A. Saturation at high intensities was observed when the secondary λ was < that of the primary. O. D. S.

Effect of X-rays on cuprous oxide barrier-layer photo-cells *in vacuo*. A. N. KRONHAUS (Physikal. Z. Sovietunion, 1936, 9, 461—465).—The sensitivity of a Cu_2O barrier-layer photo-cell to X-rays is decreased by placing the cell in vac. The sensitivity in vac. does not alter with time. O. D. S.

Building up the active layer of a cuprous oxide rectifier. F. WAIBEL (Wiss. Veröff. Siemens-Werken, 1936, 15, No. 3, 75—86).—A layer of Cu_2O on Cu was reduced in steps from original thickness of 300 μ to 35 μ, and the electrical properties of the steps were investigated. The sp. resistance of the Cu_2O decreased linearly from 10^{12} ohms at 300 μ to 10^9 ohms at 50 μ and then remained const. for smaller thicknesses to 35 μ. Voltage–current curves are given (−400 to 400 volts) for different thicknesses of Cu_2O. A. E. M.

Theory of the photo-electromotive force in semiconductors. L. LANDAU and E. LIFSCHITZ (Physikal. Z. Sovietunion, 1936, 9, 477—503).—The e.m.f. appearing in a circuit containing a semiconductor illuminated from one side is calc. for the two cases : (a) that conduction in the semiconductor is due to electrons, (b) that conduction is due to electrons and to holes behaving as positive electrons. O. D. S.

Effect of plastic deformation on the inner photo-effect in silver chloride single crystals. E. A. KIRILOV and A. M. POLONSKI (Physikal. Z. Sovietunion, 1936, 9, 100—101).—The photo-current increases by 5—7% with stretching forces of 80—100 g. per sq. mm. but decreases sharply to 30—50% of the original val. with forces > 300 g. per sq. mm. R. S.

Photo-electric conduction in rock-salt crystals under ultra-violet illumination. P. TARTAKOVSKI and V. PODDUBNI (Physikal. Z. Sovietunion, 1936, 9, 407—412; cf. A., 1936, 137).—The depolarisation current has been investigated of an NaCl crystal containing U centres and polarised by illumination by an Al spark. After the depolarisation current in ultra-violet light has fallen to a small val. a large current is again observed on illumination with visible light. The depolarisation current with visible light shows max. at 4550 and 4750 A. It is deduced that the electrons forming the space charge are bound in two levels, the higher of which coincides with the I' level. O. D. S.

Photoconductivity in crystals. A. L. HUGHES (Rev. Mod. Physics, 1936, **8**, 294—315).—A review, dealing chiefly with the production and properties of F and U centres in crystals.　　A. J. M.

Application of the Raman–Krishnan theory to dipole moment measurements by the dilute solution method. H. O. JENKINS and S. H. BAUER (J. Amer. Chem. Soc., 1936, **58**, 2435—2438).—Theoretical objections to the theory are raised.

E. S. H.

Dipole moments of vapours. III. Homologous series. L. G. GROVES and S. SUGDEN (J.C.S., 1937, 158—162).—By combining the measurements on the vapours of 20 substances with recorded data, the moments of the first four or five members of different homologous series have been obtained. Induction along the hydrocarbon chain does not completely explain changes in the val. of the moment on ascending a homologous series. New dielectric matter introduced into the mol. may alter the distribution of the electric field around the dipole, and may influence the changes in moment $>$ induction. A comparison of some normal and branched-chain compounds supports this view.　　W. R. A.

Dielectric polarisation. XXI. Effect of solvent and temperature on the polarisation and apparent moments of bromides. E. G. COWLEY and J. R. PARTINGTON (J.C.S., 1937, 130—138).—The polarisations of EtBr and PhBr have been measured in various solvents at different temp. The vals. of the moment are $<$ those for the vapours, and for a given temp. the polarisations decrease as the dielectric const. of the solvent increases. Experimental data have been examined by solvent-effect equations and the agreement between calc. and observed vals. for the vapours is generally satisfactory.　　W. R. A.

Measurement of dielectric constants and absorption coefficients with short waves. V. I. ROMANOV (Physikal. Z. Sovietunion, 1936, **9**, 362—382).—The determination of ε for liquids, using a condenser sealed into a small glass vessel and bridging a Lecher wire system, is described with special reference to errors arising from the relative positions of condenser and wire.　　L. G. G.

Accurate representation of refractive index of distilled water as a function of wave-length. L. W. TILTON (J. Res. Nat. Bur. Stand., 1936, **17**, 639—650).—Mathematical. A crit. examination of Ketteler–Helmholtz dispersion equations for H_2O, and consideration of n to six decimal places.

C. R. H.

Dispersion in ether vapour. M. LOMBERT (Physikal. Z. Sovietunion, 1936, **10**, 1—9).—The refractive index of Et_2O vapour is shown to vary with the λ according to $n - 1 = 15,036 \times 10^{-7}\lambda^2/(\lambda^2 - 915^2)$.　　R. S. B.

Rotatory dispersion of organic compounds. First oxidation product of ascorbic acid. W. C. G. BALDWIN (J.C.S., 1937, 125—127).—The rotatory dispersion and speed of mutarotation of the lactone (2 : 3-diketogulonolactone) formed as the first oxidation product of ascorbic acid and the rotatory dispersion of the corresponding Na salt have been determined.　　W. R. A.

Solvent action. XII. Optical rotatory powers of *l*-benzoin and *l*-benzoin methyl ether in solution. H. G. RULE and J. CRAWFORD. **XIII. Optical rotatory power and the refractive index of the medium.** H. G. RULE and A. R. CHAMBERS (J.C.S., 1937, 138—145, 145—153).—I. *l*-Benzoin and *l*-benzoin Me ether were chosen for detailed study of optical properties, the former because it shows a marked tendency to associate and the latter because it exhibits very contrasted rotatory power in different solvents. α appears to depend to some extent on the n of the solvent but the effect may be masked by more pronounced polar effects. Low lævo-rotation of *l*-benzoin, characteristic of solutions in polar solvents, is sometimes observed in non-polar solvents and is attributed to self-association of the active mols. The temp. effect has been examined in polar solvents and with rising temp. vals. of α are displaced towards vals. usually found in non-polar solvents, in agreement with the association hypothesis. II. For solutions of *d*-pinane the effect of solvent depends mainly on the n of the solvent; experimental data for non-polar solvents are in good agreement with calc. vals., but for polar solvents experimental vals. are $<$ calc. *d*-Pinene behaves like a polar compound and exhibits characteristic temp. effects in polar solvents. *d*-Limonene reveals anomalous behaviour in solvents of different n, and concn. changes in non-polar media suggest that this is attributable to association effects.　　W. R. A.

Optical studies with liquid helium II. L. V. SCHUBNIKOV and A. K. KIKOIN (Physikal. Z. Sovietunion, 1936, **10**, 119—120).—The Kerr effect at 1·72° abs. and the effect on polarised light at 1·72—4·22° abs. have been studied with He II, with a view of determining whether liquid crystals are present. Results were negative, showing that the anisotropy of n is $< 7 \times 10^{-8}$.　　R. S. B.

Structure, energy content, and other properties of active substances. XIII. Structure of active substances. R. FRICKE (Ber., 1937, **70**, [B], 138—146).—The relationship between energy content, lattice disturbance, and particle size is developed in the cases of cryst. α-FeO·OH, ZnO, BeO, MgO, and varieties of α-Fe_2O_3 and Hahn's emanation method is applied to the problem. It is shown that the structure and energy content of active oxides depend not only on the mode of prep. but also largely on the nature of the initial material.　　H. W.

Dissociation energy of carbon monoxide and the abundance of elements in stellar atmospheres. M. NICOLET (Nature, 1936, **138**, 1097).—Of the many vals. recently proposed for the heat of dissociation of CO, only the val. $D(CO) = 9·1$ e.v. agrees with theory and observation concerning the composition of the atm. of late-type stars.

L. S. T.

ψ-Halogens. XXXIII. Electro-affinity of the hydroxyl group. J. GOUBEAU (Z. physikal. Chem., 1936, **B, 34**, 432—442; cf. A., 1936, 704).—From the lattice structure of LiOH the lattice energy has

been calc. to be 205, giving 76 kg.-cal. per mol. for the electro-affinity of OH. This latter val. gives for the lattice energies of NaOH, KOH, RbOH, and CsOH 176, 153, 147, and 136, respectively, and for the hydration energies of OH′ and H˙ 88 and 260 kg.-cal. per mol., respectively. R. C.

Certain geometrical properties of the carbon tetrahedron. V. S. GUTIRIA (J. Gen. Chem. Russ., 1936, 6, 1488—1495).—Theoretical. R. T.

Predissociation of polyatomic molecules. F. DUSCHINSKI (Acta Physicochim. U.R.S.S., 1936, 5, 651—654).—A theoretical discussion. F. L. U.

Recombination velocity of free atoms. E. RABINOWITCH (Trans. Faraday Soc., 1937, 33, 283—293).—The high efficiency of triple collisions in the recombination of H, Br, and I atoms is pointed out, and it is suggested that no " statistical factor " should be applied to restrict the possible no. of successful triple collisions. The no. of triple collisions is shown to depend on the sum $2\tau_{AA} + \tau_{AX}$ where τ_{AA} and τ_{AX} are the periods of the collisions AA and $A + X$, respectively, A being the recombining atom and X a third body. These sums are estimated by comparing " uncorr." mol. diameters with those calc. by Sutherland's formula. Comparison of the calc. and experimental recombination velocities shows that in presence of N_2, O_2, CH_4, or CO_2 as third body every three-particle collision leads to reaction, but the efficiency is smaller in presence of H_2, He, or A, whilst it is > expected in presence of C_6H_6. Combination with sound dispersion and resonance fluorescence data shows easy conversion of vibrational energy into translational energy by collision when strongly vibrating mols. are involved. The long life of active N does not demand that the recombination of N atoms is much slower than that of H, Br, and I atoms. J. W. S.

Transfer of energy in molecular systems. H. GERSHINOWITZ (J. Chem. Physics, 1937, 5, 54—59).— Problems of energy transfer in mol. systems are discussed with the aid of the potential energy surface previously described (A., 1936, 162). The probability of energy transfer (reactivity) is now shown to be related to the bending of the equipotential lines and consequently is dependent on the state of excitation of the reacting bodies. The inverted order of efficiencies of the rare gases in energy transfer processes, determined by sound dispersion methods and by kinetic measurements, respectively, is similarly explained. W. R. A.

Effect of ionic forces shown by the liquid structure of alkali halides and their aqueous solutions. G. W. STEWART (Trans. Faraday Soc., 1937, 33, 238—247; cf. A., 1934, 721).—Consideration of the densities of solid and liquid alkali halides, and of their m.p. and b.p., leads to the conclusion that the forces responsible for the cryst. state are still to some extent effective in the liquids. Data concerning the apparent mol. vols. in aq. solution are interpreted in the sense that the ions, particularly the alkali-metal ions, affect the structure of H_2O at distances ≫ the ionic radii. F. L. U.

Theory of molecular forces. F. LONDON (Trans. Faraday Soc., 1937, 33, 8—26).—Recent theoretical developments are discussed and deductions from them are compared with experimental results. F. L. U.

Molecular theory of liquid structure. J. D. BERNAL (Trans. Faraday Soc., 1937, 33, 27—40).— Some fundamental properties of liquids are shown to be deducible from a theory based on the possibility of expressing the state of a liquid under any conditions in terms of three variables only. F. L. U.

Energy bands for the face-centred lattice. W. SHOCKLEY (Physical Rev., 1937, [ii], 51, 129—135).— Detailed solutions, using the Slater method of obtaining wave functions (cf. A., 1934, 828), are obtained. N. M. B.

Determination of the activity of the solid phase. N. F. LASCHKO and B. G. PETRENKO (Ukrain. Chem. J., 1936, 11, 342—347).—The free energies of oscillating atoms in a given and a standard state are calc.; their relation is the activity coeff. J. J. B.

Determination of the electrical and geometrical structure of molecules. P. DEBYE (Angew. Chem., 1937, 50, 3—10).—Nobel lecture. Available methods and the data so obtained are discussed and compared. C. R. H.

Atomic forces of the solid state. IV. W. WEN-PO (Phil. Mag., 1937, [vii], 23, 33—49; cf. A., 1936, 1052, 1185).—Theoretical. The thermal properties of solids are dealt with, and the theory is extended to the liquid state. A. J. E. W.

Intensity of orbital interaction in salts. Ion factor. R. FORRER (Compt. rend., 1936, 203, 1530—1532).—Previous theory (this vol., 71) is extended to consideration of the ions in a crystal lattice. Vals. of the const. F for the ions considered are equal to extrapolated vals. for the metals with no electrons in the incomplete outer electronic shells. A. J. E. W.

Parachor expression independent of surface tension. J. F. DURAND and R. LAUTIÉ (Bull. Soc. chim., 1937, [v], 4, 72—78).—The parachor of a liquid of mol. wt. M and abs. density D_c at its abs. b.p. T_c can be expressed by $(M/D_c)^{\frac{1}{4}}T_c^{\frac{1}{4}} \times 10^{-4}(388 \log T_c + 12{,}982 + 633T_c \times 10^{-2} - 588T_c^2 \times 10^{-5})$. For 27 substances the formula gives results concordant with those obtained using Sugden's relation. The formula is useful when the determination of surface tension is difficult. E. S. H.

Surface tensions, densities, free surface energies, and parachors of derivatives of benzylated phenols. D. T. EWING and F. W. LAMB (J. Amer. Chem. Soc., 1936, 58, 2454—2456).—Data for 13 compounds are recorded. E. S. H.

Elimination of systematic errors in powder photographs. M. V. COHEN (Z. Krist., 1936, 94, 288—298).—A method is described whereby in precise powder measurements systematic errors can be eliminated, giving a result depending only on the λ val. adopted for the X-rays. B. W. R.

Calculation of precise lattice constants from X-ray photographs. M. V. COHEN (Z. Krist., 1936, 94, 306—310).—A discussion of the best methods of

calculation for the elimination of systematic error (cf. preceding abstract). B. W. R.

Strengthening of weak, and spurious appearance of forbidden, X-ray reflexions by "indirect" excitation. M. RENNINGER (Naturwiss., 1937, **25**, 43).—The intensity of the forbidden (222) reflexion for diamond depends on the incidence azimuth. Max. occur at such azimuths where a subsidiary accompanies the principal reflexion. This is due to an "indirect" excitation, and it is possible to explain the occurrence of a no. of "forbidden" reflexions for the diamond in this way. A. J. M.

Scattering of X-rays at neon-like molecules and at benzene. G. THOMER (Physikal. Z., 1937, **38**, 48—57).—The scattering of Cu $K\alpha$ rays in Ne, H_2O, NH_3, and CH_4 has been examined. In this series there is an increasing loosening of the close Ne electron configuration with increasing no. of H. The charge distribution of the above hydride mols. may be explained by assuming them to be centre-symmetrical like Ne. The scattering in C_6H_6 vapour was investigated, and the effect of H atoms and the change in the charge distribution due to C·C linkings on the scattering curve are discussed. A. J. M.

What X-rays can do for industry. V. HICKS (Physics, 1936, **7**, 79—84).—A survey of the application of X-ray diffraction in industrial analysis. L. G. G.

Surface temperature of rubbing solids and the formation of the Beilby layer. F. P. BOWDEN and T. P. HUGHES (Nature, 1937, **139**, 152).—Examples in which surface flow, polish, and formation of the Beilby layer readily occur on metals, crystals, and glasses, if the m.p. of the polisher is > that of the solid polished, are described. The relative hardness as normally measured at room temp. is comparatively unimportant. Intense local heating at the points of contact is an important part of the process of polishing. L. S. T.

Crystallisation of thin layers of supercooled liquids. F. K. GORSKI (Physikal. Z. Sovietunion, 1936, **9**, 89—93).—The rate of formation of crystallisation centres N_{max} in supercooled piperine and o-nitrophenol is given by $N_{max.} = 0.710 \sqrt[3]{(c/w)^2}$ where c is the probability of formation of centres and w is the linear rate of crystallisation. N_{max} is a max. at $0°$ and at $20°$ whilst c is the same in each case. The max. is displaced towards lower temp. by the application of an electric field. This effect, and the influence of impurities, are attributed to a change in the interfacial energy. R. S.

Statistical investigation of the structure [of metals]. II. **Measurement of the volume of crystals.** E. SCHEIL and H. WURST (Z. Metallk., 1936, **28**, 340—343).—The area of a no. of individual grains in a polished section of the metal is measured and the measurements are repeated on the same crystals after polishing away 3—4 thicknesses of about 0·008 mm. From these results frequency curves of grain-size are constructed from which the mean grain-size can be deduced. A. R. P.

Crystallisation of supercooled sulphur in an electric field. V. V. KONDOGURI (Physikal. Z.

Sovietunion, 1936, **9**, 603—612).—The variation with temp. from $20°$ to $100°$ of the no. of crystallisation centres formed in supercooled S has been investigated. A max. val. was observed at $55°$ and a min. at $30°$. The no. of centres formed is increased by the application of an electric field perpendicular to the glass surface confining the drop, and decreased by a field parallel to the surface. O. D. S.

Development of crystal analysis. (SIR) W. BRAGG (J. Soc. Arts, 1937, **85**, 228—241).—A lecture.

Determination of structure in liquids by X-ray methods. J. T. RANDALL (Trans. Faraday Soc., 1937, **33**, 105—109).—A discussion of recent work. F. L. U.

Debye–Scherrer exposures of liquid helium. W. H. KEESOM and K. W. TACONIS (Physica, 1937, **4**, 28).—He I and He II gave a liquid-type ring, that of He II being the wider. The deviation angles are : He II $27·5°$, He I $24°$ (Cu K rays). N. M. B.

Structure of crystalline bromine. B. VONNEGUT and B. E. WARREN (J. Amer. Chem. Soc., 1936, **58**, 2459—2461).—X-Ray evidence at $-150°$ gives a 4·48, b 6·67, c 8·72 A. The structure is isomorphous with that of I and shows a Br_2 mol. with Br–Br distance $2·27 \pm 0·10$ A. E. S. H.

Crystal structure of β-titanium. W. G. BURGERS and F. M. JACOBS (Z. Krist., 1936, **94**, 299—300).—Above $900°$ Ti has a cubic body-centred structure, 2 atoms in cell, a_0 3·32 A. B. W. R.

Identity of structure in liquid lead and bismuth. J. T. RANDALL and H. P. ROOKSBY (Trans. Faraday Soc., 1937, **33**, 109—110).—The X-ray patterns of liquid Pb and Bi are identical. The calc. "spacings" are 2·95 A. for each. F. L. U.

Laue patterns from bent sodium chloride crystals. A. P. KOMAR (Physikal. Z. Sovietunion, 1936, **9**, 97—99).—The theoretical and experimental Laue patterns coincide and it is inferred that the crystal behaves as a mosaic aggregate of blocks which change their orientation nearly independently. R. S.

Structure of plastically deformed crystals according to Laue patterns. I. A. P. KOMAR. II. **Plastically extended single crystals of magnesium.** A. P. KOMAR and M. MOCHALOV (Physikal. Z. Sovietunion, 1936, **9**, 413—432, 613—617).—I. Theoretical. Laue patterns constructed for circularly bent NaCl crystals by a graphical-analytical method are in agreement with those obtained experimentally. II. The Bragg reflexions of the Mo $K\alpha$ radiation from the (0001) plane of a single crystal of Mg plastically extended by 10% have an angular width of $3°$. The experimental Laue diagram for the same crystal is identical with that calc. on the assumption that this angular width corresponds with a macroscopic curvature of the gliding plane of the deformed crystal. O. D. S.

Structure, heat content, and special properties of active substances. XII. **Structure and heat content of γ-ferric oxide prepared in different ways, and the heat of formation of lepidocrocite (γ-FeO·OH).** R. FRICKE and W. ZERRWECK (Z. Elektrochem., 1937, **43**, 52—65).—The heat content

K (A., I.)

of Fe_2O_3 varies considerably with the source from which it is prepared; that from synthetic γ-FeO·OH is > that from mineral γ-FeO·OH, which is > that from Fe_3O_4. The structure of Fe_2O_3, as shown by X-rays, also varies with the method of prep., although there is no essential change in the lattice. The particle size of the product is influenced by that of the parent substance. E. S. H.

X-Ray investigations with manganous oxide. (MME.) B. RUHEMANN (Physikal. Z. Sovietunion, Spec. no., June, 1936, 91—106).—The lattice const. a of MnO varies from $4·4345\pm0·0005$ A. at 290° abs. to $4·4260\pm0·0005$ A. at 95° abs. The coeff. of expansion is const. at $-1·45 \times 10^{-5}$ between room temp. and 175° abs. and then decreases. Below the λ-point (115·9° abs.) a second lattice const., a', appears of magnitude 10 X $< a$; it is in equilibrium with a over a wide temp. range. At 77° abs. only the a' lattice exists, and this is not strictly cubic. J. W. S.

Crystal structure of Mn_5Si_3. K. AAMARK, B. BORÉN, and A. WESTGREN (Svensk Kem. Tidskr., 1936, 48, 273—276; cf. A., 1935, 23).—The results of Vogel and Bedarff (A., 1934, 482) have been confirmed. M. H. M. A.

Valency angle of bivalent lead. Crystal structure of ammonium, rubidium, and potassium pentabromodiplumbites. H. M. POWELL and H. S. TASKER (J.C.S., 1937, 119—123).—The constitution of compounds of the type MPb_2Br_5 (M = NH_4, K, Rb) determined by X-ray analysis shows them to be isomorphous. The space-group is $I4/mcm$. The structures consist of vertical chains of MBr separated by $PbBr_2$ mols. which are arranged around them. $PbBr_2$ is a bent mol. with a valency angle of about $85\frac{1}{2}°$. W. R. A.

Stereochemistry of bivalent tin and lead. E. G. COX, A. J. SHORTER, and W. WARDLAW (Nature, 1937, 139, 71—72).—X-Ray examination of several derivatives of Sn·· and Pb··, such as $K_2[SnCl_4],2H_2O$, a 12·02, b 9·11, c 8·23 A., space-group $Pnma$, 4 mols. per unit cell; $PbCl_2,2CS(NH_2)_2$, a 20·67, b 3·99, c 11·98 A., space-group Pna; and Pb bisbenzoylacetone, a 23·41, b 7·77, c 9·96 A., space-group Pcn, shows that the configuration is planar, and since Sn···· and Pb···· are known to possess a tetrahedral disposition of bonds, the results support the view that the principal valency determines the arrangement of the atoms. L. S. T.

Structure of uranium pyrophosphate, UP_2O_7. G. PEYRONEL (Z. Krist., 1936, 94, 311—312).— This substance has the same structure type as the corresponding Si, Ti, etc. compounds. Space-group $Pa3$, a_0 8·61 A. B. W. R.

Crystal structure of $Zn(NH_3)_2Cl_2$ and $Zn(NH_3)_2Br_2$. C. H. MACGILLAVRY and J. M. BIJVOET (Z. Krist., 1936, 94, 249—255).—The cell consts. are a_0 7·78, b_0 8·50, c_0 8·08 A., and a_0 8·12, b_0 8·81, c_0 8·41 A., respectively; space-group is $Imam$ for both. At. parameters are determined, and as with the diammine compounds previously investigated, the lattice resembles the $CsCl_2$ pattern. B. W. R.

Crystal lattice of heteropoly-acids and their salts. III. Isomorphy and structural relations among the higher hydrates of heteropolycompounds. O. KRAUS (Z. Krist., 1936, 94, 256—279).—An X-ray investigation is made of the following compounds: $ThSiW_{12}O_{40},27$ and $30H_2O$, $Ca_2SiW_{12}O_{40},26H_2O$, $Ba_2SiW_{12}O_{40},24H_2O$, $Zn_2SiW_{12}O_{40},27H_2O$, $Cu_2SiW_{12}O_{40},27H_2O$, $Li_2SiW_{12}O_{39},27$ and $24H_2O$ (some doubt about the exact formula), $K_4SiW_{12}O_{40},18H_2O$, $K_5BW_{12}O_{40},18H_2O$, $H_3PW_{12}O_{40},nH_2O$, the lattice consts. and space-groups being determined. Optical anomalies in the behaviour of the first compound are related to the structure. A general summary and comparison of the lattices and structures of compounds of these types is made, and their isomorphy discussed in detail; the size of the cation is often the determining factor in the structure class to which the substance belongs. B. W. R.

Constitution of lead oxide–silica glasses. I. Atomic arrangement. G. J. BAIR (J. Amer. Ceram. Soc., 1936, 19, 339—347).—X-Ray examination of a series of glasses (28—85% PbO) showed their structure to be a random orientation of Si–O tetrahedra and Pb atoms. There is no crystallite formation and increase in PbO content causes no sudden change in at. arrangement. J. A. S.

Crystal structure of the paraffin–carboxylic choleic acids. O. KRATKY and G. GIACOMELLO (Monatsh., 1936, 69, 427—436).—A model is suggested which explains the stepwise increase in co-ordination no. of the acids $C_nH_{2n}O_2$ with increasing length of the hydrocarbon chain. J. W. S.

Structure of glycine. A. KITAIGORODSKI (Acta Physicochim. U.R.S.S., 1936, 5, 749—755).—X-Ray examination of glycine confirms the conclusions of Hengstenberg and Lenel (A., 1931, 790) with regard to the form and dimensions of the unit cell, but not with regard to the at. co-ordinates. A revised structure is proposed. F. L. N.

Scattering of X-rays in halogenated benzenes. R. SCHOPPE (Z. physikal. Chem., 1936, B, 34, 461—470).—Scattering measurements have been used to determine interat. distances in di- and tri-halogenobenzenes. In Cl-derivatives the distance between Cl in the o-position is > corresponds with a regular arrangement, apparently owing to deformation of the electron envelopes. R. C.

X-Ray crystallography and the chemistry of sterols and sex hormones. D. CROWFOOT and J. D. BERNAL (Chem. Weekblad, 1937, 34, 19—22).— A lecture. S. C.

X-Ray investigation of sericin. Y. MATSUNAGA (J. Soc. Chem. Ind. Japan, 1936, 39, 465B).— Various samples of sericin gave similar X-ray photographs indicating a cryst. structure, except Mosher's sericin-A which had a different pattern. The H_2O content had little effect on the positions of the rings. A. G.

Intensity distribution in Debye rings due to various fibre structures. I. General theory. II. Spiral fibre structures of cellulose and fibroin fibres. C. MATANO (J. Soc. Chem. Ind. Japan, 1936, 39, 478—481B, 481—483B).—I. A

general equation is worked out for the intensity distribution of reflected X-rays, and applied to a random orientation of micelles and to simple, spiral, and ring fibre structures.

II. The equation is applied to cellulose and fibroin for simple, spiral, and ring fibre structures and the results are compared with photographs of ramie and of degummed silk.   A. G.

Determination of the inner potential of crystals from electron diffraction. S. KALASCH-NIKOV (Physikal. Z. Sovietunion, 1936, **9**, 81—88).—The Bragg formula has been modified, taking account of the phase-jump of the ψ-wave. The asymptotic increase of the equiv. potential can be accounted for on this basis.   R. S.

Electron diffraction by gas molecules. L. O. BROCKWAY (Rev. Mod. Physics, 1936, **8**, 231—266).— A review of the theory and technique of electron diffraction by gas mols. with a summary of results.   A. J. M.

Diffraction by amorphous substances. J. A. PRINS (Trans. Faraday Soc., 1937, **33**, 110—112).— Spacings for liquid Wood's metal, Sn, Bi, Se, and S are given. The general interpretation of diffraction patterns of amorphous substances is discussed, and it is emphasised that the only information obtainable from them is the distribution law for intermol. distance.   F. L. U.

Electron diffraction photograph of a random arrangement of "cross-grating crystallites." W. G. BURGERS (Z. Krist., 1936, **94**, 301—305).—An electron diffraction photograph of a rolled and etched Ni–Fe sample is shown to correspond with a random cross-grating lattice of the type discussed by von Laue (A., 1932, 681).   B. W. R.

Electron-optical observation of metal surfaces. I. Iron: formation of the crystal pattern on activation. II. Phenomena observed on transition of α– into γ–iron. W. G. BURGERS and J. J. A. P. VAN AMSTEL (Physica, 1937, **4**, 5—14, 15—22).—I. Emission photographs are given for the evaporation, diffusion, disactivation, and reactivation stages of Fe activated by a layer of Sr + SrO deposited in the evacuated electron microscope from a W spiral covered with $SrCO_3$ suspension. Crystal patterns and process mechanism over a temp. range 800—1500° are discussed.

II. Photographs for the changes in the emission patterns of Fe for α ⇌ γ transitions are given, and are discussed in relation to metallography and electron emission. A zone of temporarily abnormal emission in front of a growing crystallite indicates that the transition process is accompanied by a migration of activating atoms in the growing zone.   N. M. B.

Examination of passive iron by electron diffraction. I. IITAKA, S. MIYAKE, and T. IIMORI (Nature, 1937, **139**, 156).—Films detached from the surface of electrolytic Fe made passive by immersion in K_2CrO_4 solution are composed of γ-Fe_2O_3 or Fe_3O_4. The films are ferro-magnetic and chemical tests indicate γ-Fe_2O_3 in preference to Fe_3O_4. Films detached from non-passive Fe polished in air are also γ-Fe_2O_3. No diffraction rings were observed

and no film could be detached from Fe made passive in conc. HNO_3.   L. S. T.

Diffraction of slow electrons by zinc single crystals. S. G. KALASCHNIKOV and I. A. JAKOVLEV (Physikal. Z. Sovietunion, 1936, **9**, 13—26).—8 diffraction max. are recorded for electron velocities between 6 and 140 volts at a const. angle of incidence of 15°. Changes in surface conditions with rise of temp. do not affect the position of the max., which arise from the lattice structure, but the intensity diminishes.   R. S.

Surface structure of silicon carbide. G. I. FINCH and H. WILMAN (Trans. Faraday Soc., 1937, **33**, 337—339).—The electron diffraction halo pattern obtained with carborundum crystals is due to a surface film, probably amorphous SiO_2. After removal of the film by abrasion or etching, brilliant single-crystal patterns are obtained. The film, reformed by heating in an oxidising flame, may be so thin as to be semi-transparent to 50-kv. electrons. This fact, and the observation that a unimol. film of $C_{32}H_{66}$ is not penetrated by these electrons at grazing incidence, indicate that the thickness of the semi-transparent film is < 43 A.   J. W. S.

Structure of pentaborane, B_5H_9. S. H. BAUER and L. PAULING (J. Amer. Chem. Soc., 1936, **58**, 2403—2407).—Election diffraction data indicate the structure $BH_2{<}{BH_2 \atop BH_2}{>}B{\cdot}BH_3$, the last B atom being coplanar with the four-membered ring. Measured interat. distances are: B–B 1·76±0·02 A., B–H 1·17±0·04 A.   E. S. H.

Adjacent charge rule and the structure of methyl azide, methyl nitrate, and fluorine nitrate. L. PAULING and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, **59**, 13—20).—In accordance with the rule (A., 1933, 1222), electron-diffraction investigation leads to configurations of the mols. corresponding in each case with resonance between two important valency-linking structures. The differences between chemical properties of covalent and ionic azides and nitrates are correlated with differences in structure.   E. S. H.

Molecular structures of the Δ^β-butenes and the $\beta\gamma$-epoxybutanes. L. O. BROCKWAY and P. C. CROSS (J. Amer. Chem. Soc., 1936, **58**, 2407—1409).— Electron diffraction data give the following identification of the isomeric forms and mol. sizes: Δ^β-butene, cis (b.p. 3·0°) C·C 1·54±0·03 A., C:C 1·38±0·03 A., trans (b.p. 0·3°) C·C 1·56±0·04 A., C:C 1·40±0·04 A.; $\beta\gamma$-epoxybutane, cis (b.p. 54°) C·C 1·54±0·03 A., C·O 1·43±0·03 A., trans C·C 1·54±0·03 A., C·O 1·43±0·03 A.   E. S. H.

C·N linking in methyl cyanide [acetonitrile] and methyl isocyanide. L. O. BROCKWAY (J. Amer. Chem. Soc., 1936, **58**, 2516—2518).—Electron diffraction data give the following interat. distances (in A.): Me·C 1·54±0·02, C·N 1·16±0·02; Me·N 1·48±0·03, N·C 1·17±0·02. A triple linking exists in the CN group of each compound. Both compounds are linear, except for H.   E. S. H.

Hall effect in nickel in the neighbourhood of the Curie point. I. K. KIKOIN (Physikal. Z.

Sovietunion, 1936, **9**, 1—12).—The Hall effect e.m.f. varies linearly with the magnetisation at different temp. and becomes very small at the Curie point, but the Hall coeff. R_I shows no sharp change here.   R. S.

Definition of the Curie point. A. KUSSMANN and A. SCHULZE (Physikal. Z., 1937, **38**, 42—47).—A comparison of the magnetisation–temp. curves for small fields with the resistance–temp. curves of ferromagnetic substances (Ni, and its alloys with Cu, Cr, Si, Al, W, Co, and Fe) shows that the Curie point obtained from the max. of the temp. coeff. of resistance does not correspond with the temp. at which ferromagnetism disappears. This discrepancy is due to inhomogeneity. The Curie point is a sharply defined temp. for a homogeneous substance, and not a " region."   A. J. M.

Ferromagnetic anisotropy in nickel–cobalt–iron crystals at various temperatures. L. W. McKEEHAN (Physical Rev., 1936, [ii], **51**, 136—139).—Results of investigations at room temp., 200°, and 400° on single crystals of ternary alloys, all face-centred cubic, containing $\ll 40\%$ Ni are reported and discussed in relation to composition. Data for binary alloys and single components are recalc.   N. M. B.

Ferromagnetic anisotropy at various temperatures of (A) iron crystals. R. G. PIETY. **(B) Nickel–iron crystals.** J. D. KLEIS (Physical Rev., 1936, [ii], **50**, 1173—1177, 1178—1181).—(A) Magnetisation curves in important crystallographic directions are obtained for small oblate spheroids cut from H-free Fe crystals, and ferromagnetic anisotropy is compared with available data.

(B) Similar curves at temp. up to near the Curie point are obtained for Ni–10—50% Fe annealed face-centred cubic crystals. A change in ferromagnetic anisotropy at about 24% Fe is found.   N. M. B.

Heat effect in the magnetic transformation of nickel. H. VON STEINWEHR and A. SCHULZE (Z. Metallk., 1936, **28**, 347—349).—Measurements made on a 26·7 kg. mass of 99·1% Ni showed that a heat evolution of 0·65 g.-cal. per g. occurs during the magnetic transformation at 333—362°. A small evolution of heat was also found at about 100° below the Curie point.   A. R. P.

Variation of the internal friction and elastic constants with magnetisation in iron. I. W. T. COOKE. II. W. F. BROWN, jun. (Physical Rev., 1936, [ii], **50**, 1158—1164, 1165—1172).—I. A new precision method is used for measuring the variation of Young's modulus and the longitudinal coeff. of internal friction of annealed and unannealed Armco Fe with magnetisation at room temp. Data describing the behaviour of the Fe in three different magnetic states are obtained.

II. Observed coeffs. of internal friction are corr., and the variation of torsional decrement with magnetisation is measured. Formulæ for contributions to the moduli and decrements arising from eddy currents are deduced. Magnetostriction and Wiedemann effect coeffs. are obtained, and all eddy

current effects are eliminated from final data. Interpretations are discussed.   N. M. B.

Latent energy and residual tension of plastic deformed rock-salt. A. I. GARBER (Physikal. Z. Sovietunion, 1936, **9**, 111—131).—The latent energy of deformed rock-salt has been studied by means of temp. measurements, and the residual tension by means of polarised light.   R. S. B.

Dependence on temperature of cathode sputtering. N. D. MORGULIS, M. P. BERNADINER, and A. M. PATIOCHA (Physikal. Z. Sovietunion, 1936, **9**, 302—316).—Measurements were made with thoriated W in Hg vapour between 1350° and 1750° abs., and with W in Hg vapour between 800° and 2000° abs. Sputtering varied little with temp. of cathode.   A. E. M.

Kinetic basis of crystal polymorphism. M. J. BUERGER (Proc. Nat. Acad. Sci., 1936, **22**, 682—685).—A kinetic explanation of polymorphism is sought in the relations between the symmetry of the possible vibration modes of the structure units, or " clusters," and the geometrical symmetry of the structure itself. For a given kinetic energy input, i.e., temp., there will be a preferred cluster vibration mode and the crystal will tend to adjust its symmetry to include the dynamic symmetry of this mode. Possible tests of this idea are (1) comparison of thermodynamic and crystal data for polymorphous substances, (2) correlation of emitted frequencies at high temp. with Raman and absorption frequencies.   B. W. R.

General rôle of composition in polymorphism. M. J. BUERGER (Proc. Nat. Acad. Sci., 1936, **22**, 685—689).—The polymorphism of a phase A is affected by a change of its composition, e.g., the formation of a solid solution of a contained impurity B. The direction of migration of the transformation point is indicated by an appropriate form of Le Chatelier's rule, the most important criterion being the room required or provided by the atoms of B as they form one or other of the possible types of solid solution.   B. W. R.

Influence of mechanical deformation on the velocity of transition of polymorphic metals. III. Influence of metallic impurities. II. E. COHEN and A. K. W. A. VAN LIESHOUT (Proc. K. Akad. Wetensch. Amsterdam, 1936, **39**, 1174—1179; cf. A., 1936, 672).—Presence of 0·1% of Zu, Co, Mn, Al, or Te greatly increases the velocity of transition of white Sn. Fe, Ni, and Cu have practically no effect, whilst Bi, Sb, Pb, Cd, Au, and Ag diminish it. Simultaneous addition of traces of Al and Bi leads to compensation of the respective effects of the two metals.   J. W. S.

Inorganic complex compounds of boron trifluoride. L. J. KLINKENBERG (Chem. Weekblad, 1937, **34**, 23—25).—A discussion of isomorphism of various derivatives of BF_3 with compounds in adjacent groups of the periodic system and its bearing on the Seifert diagonal relation. Alkali and Tl borofluorides are isomorphous with the corresponding salts of $HClO_4$, K, Rb, Cs, NH_4, and Tl borofluoride having a " baryta " structure, and $NaBF_4$ and

the isomeric $NaClO_4$ an "anhydrite" structure. X-Ray examination and measurement of the dissociation pressures at 400—700° show that $NaOH,BF_3$ is a compound distinct from $NaBF_4$.   S. C.

Polymorphism of Rochelle salt. H. von R. JAFFE (Physical Rev., 1937, [ii], **51**, 43—47; cf. Mueller, A., 1935, 288).—An analysis of physical properties indicates that the crystal belongs to the monoclinic hemimorphic class between the Curie points 23·7° and —18°, regarded as crystallographic inversion points. Observed dielectric anomalies must be expected near inversions from pyroelectric to non-pyroelectric form. At other temp. the crystal is orthorhombic hemihedric. Electro-optic effect, converse and direct piezo-electric effect, and sp. heat are discussed in the light of the new classification.
N. M. B.

Electrical resistivity of single crystals of some dilute solid solutions in zinc. H. E. WAY (Physical Rev., 1936, [ii], **50**, 1181—1185).—Sets of single crystals were grown of binary alloys consisting of dil. solid solutions of Cd, Cu, Ag, Au, Ni, and Fe, each in Zn. Electrical resistivities at 20° are expressed in terms of principal resistivities ρ_0 and ρ_{90}. The resistance increases non-linearly, in a given series of alloys, with increasing concn. The initial increase above that of pure Zn in micro-ohm-cm. per at.-% of solute is : Cd 0·94, Cu 0·4, Ag 1·1, Au 2·3, Ni 51·0, Fe 300·0. This is correlated with the nearness of solute metal to Zn in the periodic table. Temp. coeffs. decrease in agreement with Mathiessen's law.
N. M. B.

Resistance of palladium and palladium–gold alloys. J. G. G. CONYBEARE (Proc. Physical Soc., 1937, **49**, 29—37).—Measurements of resistances, tabulated over 90—1250° abs. for Pd and four Pd–Au alloys, show that the variation of resistance with temp. resembles that of constantan for alloys up to about 60 at.-% Au, where there is a change to the normal type of curve. Results agree with Mott's application to the transition metals of the quantum mechanical theory of conductivity.   N. M. B.

Electrical conductivity of thin metallic films. I. Rubidium on Pyrex glass surfaces. A. C. B. LOVELL (Proc. Roy. Soc., 1936, A, **157**, 311—330).— The resistivity of thin films of Rb deposited on cooled Pyrex surfaces by a defined at. beam has been measured. Results consistent to 2 or 3% have been obtained. The presence of traces of impurity on the substrate leads to anomalous results. Conductivity has been observed with films 1 A. thick. The decay of conductivity with time after cessation of the deposition decreased with increasing film thickness and with decreasing deposition temp. At 64° abs. the decay was negligible at a thickness of 25 A. Films of thickness >40 A. were so stable that their temp. coeffs. could be determined. Films 90 A. thick were still invisible, but obeyed Ohm's law up to c.d. of 10^6 amp. per cm.² The results are explained by a modification of Thomson's theory of the increase in resistance to be expected when the film thickness is < the normal electronic mean free path in the bulk metal.   L. L. B.

Bismuth crystals. III. Thermal and electrical conductivity in the transition from transverse to longitudinal magnetic field. E. GRÜN-EISEN and J. GIELESSEN (Ann. Physik, 1937, [v], **28**, 225—239 : cf. A., 1936, 1329).—The heat (k) and electrical conductivity (κ) of Bi⊥ and Bi∥ crystals have been measured in transverse and longitudinal magnetic fields from 650 to 6100 oersted. For Bi∥ the effect of magnetic field in transverse field is > in longitudinal. For Bi⊥ at low field strengths the effect is a min. in transverse and a max. in longitudinal field ; at high field strengths the effect is a min. in longitudinal field and a max. between transverse and longitudinal fields. The change in k is < that in κ for both crystals. k is affected by field reversal.   O. D. S.

Measurement of the resistance of boron and of silicon carbide. F. P. HENNIGER (Ann. Physik, 1937, [v], **28**, 245—263).—The resistance of B (99·7% pure) is very high at low p.d. and decreases with increasing p.d., the heating current through the crystal being kept const. By application of p.d. up to 20 kv. at temp. from 20° to 400° the resistance is reduced from 30,000 to 200 ohms. It then remains const. from 2 to 20 volts and decreases at higher p.d. The temp. coeff. of the resistance of untreated B is very high but becomes small after treatment. The sp. resistance of one sample with const. resistance from 26 to 37 kv. is 0·25 ohm-cm. in this region. Si carbide shows similar variations in resistance which are due to the presence of badly conducting layers in the crystal.   O. D. S.

Thermomagnetic properties of nickel wire. III. W. BAND (Proc. Physical Soc., 1937, **49**, 14—16).—Results previously reported (cf. A., 1936, 277) are analysed in detail.   N. M. B.

Magnetic moment of the proton. B. G. LASA-REV and L. V. SCHUBNIKOV (Physikal. Z. Soviet-union, 1936, **10**, 117—118).—The magnetic susceptibility (χ) of H_2 has been studied at 1·78°, 2·18°, and 4·22° abs., giving the vals. $\chi_{1·78}/\chi_{2·18} = 0·941$, $\chi_{1·78}/\chi_{4·22} = 0·886$, and $\chi_{2·18}/\chi_{4·22} = 0·942$. The magnetic moment of the proton is calc. to be $2·3 \pm 0·2$ nuclear magnetons.   R. S. B.

Particle size and magnetic susceptibility. S. S. BHATNAGAR, M. R. VERMA, and M. ANWAR-UL-HAQ (Kolloid-Z., 1937, **78**, 9—18; cf. A., 1935, 1063).—The susceptibility (χ) of Pb, Cu, S, Se, Te, Sb, and Bi of particle size about 0·4 μ does not differ from that of the respective elements in a compact form, contrary to the conclusions of Rao (A., 1936, 1190). Differences may be observed due to change of microcryst. form, or to the presence of included impurities.
F. L. U.

Magnetic properties of superconducting metals and alloys. L. V. SCHUBNIKOV, V. I. CHOTKEVITSCH, J. D. SCHEPELOV, and J. N. RJABININ (Physikal. Z. Sovietunion, Spec. no., June, 1936, 39—66).—The intensity of field required to destroy the superconductivity of polycryst. and monocryst. Pb, monocryst. Sn, polycryst. Hg, and Pb–Bi, Pb–Tl, Pb–In, and Hg–Cd alloys has been determined for various temp.   J. W. S.

Rare-earth elements in a metal lattice. V. I. DROSHINA and R. I. JAANUS (Physikal. Z. Sovietunion, 1936, **9**, 72—80).—The relation between the reciprocal of the magnetic susceptibility of Ce and Pr and abs. temp. is linear. The Curie temp. are 6° and 2° abs. and the magnetic moments 11·4 and 16·0 M_W, respectively. Magnetic moments have been calc. for Ce and Pr in different degrees of ionisation and comparison shows that the metal lattices consist of Ce^{III} and Pr^{III}.   R. S.

Magnetic susceptibility of metallic cerium. L. F. VERESCHTSCHAGIN, L. V. SCHUBNIKOV, and B. G. LASAREV (Physikal. Z. Sovietunion, Spec. no., June, 1936, 107—110).—The magnetic susceptibility (χ) of Ce has been measured at 2815, 4545, and 6195 gauss, and between 20·4° and 290° abs. χ does not follow the Curie–Weiss law, especially at lower temp. Divergencies from the results of Droshina and Jaanus (see preceding abstract) are explained by the latter applying to weak fields and probably to material containing ferromagnetic impurities.   J. W. S.

Magnetic properties of silver difluoride. E. GRUNER and W. KLEMM (Naturwiss., 1937, **25**, 59—60).—Redetermination of the mol. susceptibility of AgF_2 prepared in various ways confirms the low val. obtained by Ruff *et al.* (A., 1934, 1080). At 20° the mol. susceptibility independent of the field strength is $440 \pm 30 \times 10^{-6}$. At −183° very high vals. of the susceptibility were found, showing that at this temp. AgF_2 is weakly ferromagnetic. The Curie temp. is approx. −110°. These facts lead to the view that the compound contains Ag·Ag linkings. At higher temp. the spin moments are practically anti-parallel, whereas below the Curie temp. they are partly parallel.   A. J. M.

Magnetic anisotropy of molluscan shells.— See A., III, 86.

Detection of ultrasonic waves in liquids. L. BERGMANN and H. J. GOEHLICH (Physikal. Z., 1937, **38**, 9—13).—A divergent beam of light is passed through a liquid through which ultrasonic waves are being transmitted perpendicular to the direction of the light. Bright and dark bands are produced on a screen placed on the far side of the vessel containing the liquid. With stationary waves a set of bands is seen, but with progressive waves a single sharply-defined band is produced.   A. J. M.

High-frequency vibrations and ultrasonics. L. BERGMANN (Chem.-Ztg., 1937, **61**, 47—48).—A review of their production, investigation, and application.   R. C. M.

Diffusion and absorption of ultrasonics in liquids. R. LUCAS and P. BIQUARD (Trans. Faraday Soc., 1937, **33**, 130—135; cf. A., 1936, 1330).—The diffusion of ultrasonic waves by liquids is $\gg$ that predicted by theory, and is explained by the existence of vol. elements (mol. aggregates) having a compressibility $\ll$ that of the liquid in bulk. Heterogeneity of a similar kind can also account for the anomalously large absorption of ultrasonics.   F. L. U.

Absorption of ultrasonic waves in liquids. J. CLAEYS, J. ERRERA, and H. SACK (Trans. Faraday Soc., 1937, **33**, 136—141).—A detailed account of work already noted (A., 1936, 787).   F. L. U.

Latent heat of evaporation of liquid helium. J. N. FRIEND (Nature, 1936, **138**, 1102).—With Burton's data for η (A., 1935, 438), the author's equation (*ibid.*, 575) gives 36·2 for the molar latent heat of evaporation. With Onnes' data, the Clausius–Clapeyron equation gives 31·3. In view of the slightly greater temp. range in the latter case and the experimental difficulties the agreement is satisfactory.   L. S. T.

Nature of space occupation of organic molecules as decisive factor for the magnitude of the molecular latent heat of fusion. J. PIRSCH (Ber., 1937, **70**, [*B*], 12—23).—The nature of the atoms concerned in the structure of a dicyclic compound has little influence on the magnitude of the mol. latent heat of fusion if the mol. structure is almost equally developed in all three directions. The decisive factor is the mode of space occupation and not the extent. Structural moments due to the cyclic nature are not answerable since compounds which do not contain rings but having mols. characterised by equal development in all three directions have also very small mol. latent heats of fusion (CBr_4, C_2Cl_6, $Bu^\gamma CO_2H$). Strongly marked spherical space occupation of a mol. is here the dominating influence as in the incidence of isomorphism and the formation of mixed crystals. Every group of substances, characterised by its mode of space occupation, shows in itself, apart from the region of very low m.p., a linear relationship between mol. latent heat of fusion and position of m.p. and differs from compounds with other types of space occupation. The first type with very pronouncedly spherical space occupation includes *dicyclo*-[1 : 2 : 2]-heptane and -[2 : 2 : 2]-octane and their derivatives, ketones of the α-*dicyclo*pentadiene series, C_2Cl_6, CBr_4, CCl_4, CH_4, C_2Me_6, $CCl_3\cdot CO_2H$, $Bu^\gamma CO_2H$, and $Bu^\gamma OH$. The second type includes more or less flattened mols. and is illustrated by iso- and hetero-cyclic compounds and their differing stages of hydrogenation. Here the nature of at. groups and the no. of substituents have somewhat greater influence on the mol. latent heat of fusion. The extent of the flattening appears unimportant. In the third type, consisting of thread-like mols., the mol. latent heat of fusion increases markedly with each additional member and so regularly that mathematical expressions can be derived for *n*-paraffins and fatty acids. The at. latent heats of fusion of the rare gases are of the same order as the mol. heat of the spherically-formed CH_4. Certain compounds, chiefly monocyclic polymethylenes, do not fit in with this classification and an unknown factor is involved.   H. W.

Ebulliometric and tonometric study of normal aliphatic alcohols. M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, **17**, 721—726).—Using Swientoslawski's technique, the following b.p. and vals. for dt/dp, expressed in °C. per mm. Hg, have been obtained. MeOH, 64·509°, 0·0331; EtOH, 78·325°, 0·0334; Pr^aOH, 97·209°, 0·0344; Bu^aOH,

117·726°, 0·0372 ; n-C_5H_{11}·OH, 138·06°, 0·0402. Beginning with Pr^aOH, the introduction of CH_2 into the chain of a n-aliphatic alcohol increases dt/dp by the same amount, viz., 0·0029, as does its introduction into an aliphatic hydrocarbon. C. R. H.

Calculation of b.p. K. BILLIG (Ber., 1937, 70, [B], 157—162).—The calculation of the b.p. of a substance from those of initial or final substances or from the b.p. of comparative substances is effected with mathematical accuracy according to $T_A = x . T_A \times f_l A_x \times V_l A_x / f_{lA} \times v_{lA}$, where T_A and T_{A_x} are the b.p. of the monomeric and polymeric compounds, f_{lA} and $f_l A_x$ the association factors, and V_{lA} and V_{lA_x} the sp. vols., and $T = T'Mf_l v_l / M'f_l' v_l'$. Since, however, the association factors are calc. from the b.p. the correctness of these equations can be established by comparison between the calc. and observed vals. but other physical magnitudes which are parallel to the association factors must be involved ; for these mathematical expressions are developed. Since these are approximations the b.p. calc. therefrom are also approx. In view of these conditions the agreement of calc. and observed vals. is satisfactory and proof is afforded that the b.p. of a given substance is the arithmetical mean of those of the initial or produced substances when association and d are also taken into account. · H. W.

Range of stability of the fluid state. F. SIMON (Trans. Faraday Soc., 1937, 33, 65—73).—Along the m.p. curve the entropies of the solid and liquid phases approach an intermediate val., indicating a growing similarity between the phases with rising melting temp. Experimental data do not preclude the existence of continuity between the cryst. and liquid state. F. L. U.

Theoretical metallurgy. V. Heats of fusion of inorganic substances. VI. Revision of the entropies of inorganic substances—1935. K. K. KELLEY (U.S. Bur. Mines, 1936, Bull. 393, 166 pp., Bull. 394, 55 pp.).—V. A crit. survey is given of fusion and v.p. data for elements, anhyd. inorg. compounds, and their binary mixtures. The m.p., heat and entropy of fusion of 56 elements and many of their inorg. compounds are tabulated.

VI. Sp. heats at low temp. and spectroscopic data for inorg. substances are critically surveyed. Entropies of 72 elements and many inorg. compounds are tabulated. J. G. A. G.

Carbonyl sulphide. Heat capacity, vapour pressure, heats of fusion and vaporisation. Third law of thermodynamics and orientation equilibrium in the solid. J. D. KEMP and W. F. GIAUQUE (J. Amer. Chem. Soc., 1937, 59, 79—84).—COS has m.p. 134·31° abs., b.p. 222·87° abs., heat of fusion 1129·8 g.-cal. per mol., heat of vaporisation at b.p. 4423 g.-cal. per mol., v.p. of liquid (161·8—223·8° abs.) $\log_{10} P = - (1318\cdot260/T) + 10\cdot15309 - 0\cdot0147784T + 0\cdot000018838T^2$, d (of gas at 25° and 1 atm.) 2·4849±0·0005 g. per litre. Data for heat capacities of solid and liquid COS from 15° abs. to the b.p. are recorded. The calc. entropy from the above data is 52·56 g.-cal. per degree per mol. for the ideal gas at the b.p., which agrees with that (52·66)

calc. from electron-diffraction and spectroscopic data. The agreement shows that the difference in size between the O and S ends of the mol. suffices to prevent random orientation of the type found in CO, N_2O, and NO at low temp. E. S. H.

Molecular heat, entropy, and chemical constant of phosphine. K. CLUSIUS and A. FRANK (Z. physikal. Chem., 1936, B, 34, 405—419).—Mol. heats of the solid at 11—140° and liquid at 140—186° abs. have been determined. Owing apparently to restricted rotation in the lattice, solid PH_3 exists in three forms (cf. A., 1933, 1000) with the following temp. and mol. heats of transition : III $\rightarrow$ II, $30\cdot3_2$°, 19·6 ; II $\rightarrow$ I, $88\cdot5_3$°, 114·3 ; I $\rightarrow$ liquid, $139\cdot6_6$° abs., (m.p.) 267·9 g.-cal. (mol. heat of fusion). There are " humps " in the mol. heat curve at 35° and 51° abs. The thermal entropy derived from the experimental data and the statistical entropy, neglecting the contribution of the nuclear spin, are at the b.p./1 atm. ($185\cdot7_2$° abs.) for the ideal gas 46·39 and 46·43, respectively The agreement between these vals. shows that the occurrence of o- and p-forms does not affect the caloric entropy val., that Nernst's heat theorem is applicable to PH_3, and that the moment of inertia about the axis of the figure is about $8\cdot26 \times 10^{-40}$ g. per cm.^{2} (cf. A., 1934, 1289). The chemical const. is i_p (v.p.) $-0\cdot66_6 \pm 0\cdot02$, i_k (statistical) $-0\cdot66_2$. Initial mol. heat measurements and a transition point observed at 37·0° abs. were not reproducible, a phenomenon probably connected with the formation of " frozen-in " phases. R. C.

Molecular heat, entropy, and chemical constant of hydrogen sulphide. K. CLUSIUS and A. FRANK (Z. physikal. Chem., 1936, B, 34, 420—431 ; cf. A., 1936, 278).—The three forms of solid H_2S have the following temp. and mol. heats of transition : III $\rightarrow$ II, $103\cdot5_7$°, 362·1 ; II $\rightarrow$ I, $126\cdot2_4$°, 108·7 ; I $\rightarrow$ liquid, $187\cdot6_0$° abs. (m.p.), 568·3 g.-cal. (mol. heat of fusion). The statistically and thermally derived entropies for the gas at 212·8° abs./1 atm. are 46·42 and 46·33±0·10, respectively. Mol. heats of the solid and liquid have been measured at 11—209° abs. The chemical const. is i_p (v.p.) $-0\cdot91 \pm 0\cdot03$, i_k (statistical) $-0\cdot89_7$. An index to the purity of a gas is the effect on its triple-point pressure of variation in the relative amounts of solid and liquid phases.
  R. C.

Dependence on temperature of specific heat (C_v) of monatomic liquids. E. BARTHOLOMÉ and E. EUCKEN (Trans. Faraday Soc., 1937, 33, 45—54 ; cf. A., 1936, 1057).—The Teller–Pöschl potential is employed to calculate C_v curves of liquids. The calc. curves agree qualitatively with experiment for H_2 and He throughout the whole temp. range.
  F. L. U.

Heat capacity and vapour pressure of solid carbon dioxide. Heat of sublimation and thermodynamic and spectroscopic values of the entropy of carbon dioxide. W. F. GIAUQUE and C. J. EGAN (J. Chem. Physics, 1937, 5, 45—54).—An apparatus for low-temp. calorimetric and v.p. measurements on condensed gases is described and the heat capacity of solid CO_2 has been measured from 15° to 195° abs. The heat of vaporisation at the

sublimation point is 6030 g.-cal. per mol. Thermodynamic and spectroscopic vals. for the entropy of gaseous CO_2 at 298·1° abs. are respectively 51·11 and 51·07 g.-cal. per degree per mol. W. R. A.

Heat capacity and entropy of rhombic and monoclinic sulphur. E. D. EASTMAN and W. C. McGAVOCK (J. Amer. Chem. Soc., 1937, **59**, 145—151). —Heat capacities of rhombic and monoclinic S are recorded for 15—375° abs. The calc. entropies at 298·1° abs. are 7·624±0·05 and 7·78±0·1 e.u., respectively. The entropy difference agrees with that obtained from the heat of transformation. E. S. H.

Elastic constants and specific heats of the alkali metals. K. FUCHS (Proc. Roy. Soc., 1936, **A, 157**, 444—450).—Mistakes in the recent calculation of the elastic consts. of the alkali metals (A., 1936, 672) are corr. L. L. B.

Heat capacity of tin sulphide at high temperatures. A. N. KRESTOVNIKOV and E. I. FEJGINA (J. Phys. Chem. Russ., 1936, **8**, 74—76).—The heat capacity of SnS has been determined at $t = 15$—700° by a H_2O calorimeter. The mean molar heat capacities are 12·51 (0—100°), 12·36 (0—300°), 12·96 (0—500°), 14·02 (0—700°). The true heat as a function of temp. is given by : $c = 0·0850 - 4·730 \times 10^{-5}t + 1·465 \times 10^{-7}t^2$. E. R.

Specific heat of copper, zinc, and lead sulphate at high temperatures. A. N. KRESTOVNIKOV and E. I. FEJGINA (J. Gen. Chem. Russ., 1936, **6**, 1481—1487).—Sp. heat data are recorded, at 300—800°. R. T.

Anomalous specific heats of the anhydrous salts $FeCl_2$, $CrCl_3$, $CoCl_2$, and $NiCl_2$. O. N. TRAPEZNIKOVA and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, Spec. no., June, 1936, 6—21).—The heat capacities of $FeCl_2$, $CrCl_3$, and $CoCl_2$ show max. at about 23·5°, 16·8°, and 24·9° abs., respectively. $NiCl_2$ shows two max. at about 49·55° and 57—58° abs., respectively, the exact position of both max. being the higher the lower is the temp. to which the salt is cooled before the measurement. J. W. S.

Anomaly of the specific heat of anhydrous chromic chloride, cobaltous chloride, and nickel chloride. O. TRAPEZNIKOVA, L. V. SCHUBNIKOV, and G. MILJUTIN (Physikal. Z. Sovietunion, 1936, **9**, 237—253).—The sp. heat of $CrCl_3$, $CoCl_2$, and $NiCl_2$ has been measured at 14—130° abs. Abrupt changes occur at 16·8° abs. ($CrCl_3$), 24·9° abs. ($CoCl_2$), and 49·6° and 57·0° abs. ($NiCl_2$). With $NiCl_2$ the lower is the temp. to which the salt is cooled the higher is the temp. of the two max., the temp. interval between the max. remaining the same. R. S. B.

Heat capacities and entropies of organic compounds. II. Thermal and vapour-pressure data for tetramethylmethane from 13·22° abs. to the b.p. Entropy from its Raman spectrum. J. G. ASTON and G. H. MESSERLY (J. Amer. Chem. Soc., 1936, **58**, 2354—2361; cf. A., 1936, 937).—CMe₄ has m.p. —16·63°, b.p. 9·45°; there is an energy absorption at —133·14°, which is preceded by an abnormal rise in heat capacity. Heat capacity data between 13° abs. and the b.p. are

recorded. The v.p. of the liquid is given by $\log_{10} P_{mm} = - 1525·0/T - 2·16979 \log_{10} T + 13·59527$. The calc. mol. entropy of the ideal gas at the b.p. is 71·71±0·3 e.u.; the calc. "spectroscopic" entropy is 80·12 e.u. per mol. at 298·16° abs. and 1 atm. E. S. H.

Thermal data on organic compounds. XVII. Heat capacity, entropy, and free energy data for five higher olefines. G. S. PARKS, S. S. TODD, and C. H. SHOMATE (J. Amer. Chem. Soc., 1936, **58**, 2505—2508).—The sp. heats of Δ^{a}-n-heptene, $\Delta^{a\delta}$-pentadiene, C_2Me_4, and the two isomeric isobutenes have been measured between 80° and 298° abs. The corresponding heats of fusion have been determined, and the entropies at 298·1° abs. calc. The corresponding free energies have been calc. (excepting C_2Me_4). For Δ^{a}-olefines the free energy difference between the olefine and the corresponding paraffin is about 21,000 g.-cal. With increasing no. of radicals attached to the C atoms of the double linking this val. falls progressively to a limit of about 17,000 g.-cal. E. S. H.

Virial theorem and the theory of fusion. V. HELLMAN (Physikal. Z. Sovietunion, 1936, **9**, 522—528; cf. Hill, A., 1936, 551).—The virial theorem has as yet no practical importance for the investigation of at. systems since the potential and kinetic energy of these systems cannot be determined separately except by means of the theorem itself. O. D. S.

Orthobaric densities of substances as a function of reduced temperatures. H. A. FALES and C. S. SHAPIRO (J. Amer. Chem. Soc., 1936, **58**, 2418—2428).—The ratio of orthobaric densities is a function of reduced temp. τ; consequently the vapour vol. can be expressed as a function of τ and liquid vol. along the saturation line, namely, $\log_e v_g/v_l = k(1 - \tau^2)^m/\tau^n$, where v_g and v_l are the orthobaric vols., and k, m, and n are consts. characteristic for a given liquid. A similarity in the mechanism of evaporation of substances is shown by the fact that the respective expansion curves can be expressed by the same equation, the consts. of which have closely similar vals. for substances of diverse chemical and physical properties. E. S. H.

Absolute temperature T, and the principal thermodynamic relationships. F. ODONE (Atti R. Accad. Lincei, 1936, [vi], **23**, 865—870).—Theoretical. O. J. W.

Quantum theory of the second virial coefficient. L. GROPPER (Physical Rev., 1937, [ii], **51**, 50; cf. this vol., 71).—A comparison of the rigorous and approx. formulæ previously deduced. N. M. B.

Molecular state of the vapour of acetic acid at low pressure at 25°, 30°, 35°, and 40°. F. H. MacDOUGALL (J. Amer. Chem. Soc., 1936, **58**, 2585—2591).—Vals. of pV for AcOH vapour have been determined at pressures down to 3 mm. The equilibrium const. for the reaction $(AcOH)_2 \rightleftharpoons 2AcOH$ has been determined. The calc. heat of dissociation is 16,400 g.-cal. The v.p. of AcOH has been determined and the heat of vaporisation calc. E. S. H.

Reduced temperature and general properties of pure liquids. E. Bauer, M. Magat, and M. Surdin (Trans. Faraday Soc., 1937, **33**, 81—86).— Using a reduced temp. $\theta = (T - T_c)/(T_c - T_f)$, where T_c and T_f denote the abs. crit. and triple point, respectively, it is shown that P_T/P_f is the same function of θ for all liquids when P denotes sp. vol. or compressibility. The same relation holds for the surface tension of normal liquids, whilst abnormal liquids follow another curve. Two separate curves represent the sp. heat (C_v) of monat. and diat. liquids. The generalisation does not extend to dynamic properties. F. L. U.

Thermal agitation in liquids. L. Brillouin (Trans. Faraday Soc., 1937, **33**, 54—55).—Theoretical. F. L. U.

Partition function for liquids. R. F. Newton and H. Eyring (Trans. Faraday Soc., 1937, **33**, 73—78).—A partition function involving the coeff. of expansion and the sp. heats leads to reasonable results for the v.p. of most of the liquids examined. F. L. U.

Intermolecular forces of normal liquids. L. J. Hudleston (Trans. Faraday Soc., 1937, **33**, 97—103). —Making probable assumptions with regard to statistical consequences in an assemblage of mols., a general relation is found between a term $\propto$ the abs. temp. and one $\propto$ the thermal expansion. This relation, with only one arbitrary const., agrees with experimental data for Et_2O and *iso*pentane very accurately from the m.p. to about 50° below the crit. temp. The theory also gives rise to a law similar to Trouton's rule. F. L. U.

Temperature drop effect in relation to the determination of the molecular heat of gases. H. S. Gregory and R. W. B. Stephens (Nature, 1937, **139**, 28).—An equation for determining the mol. heat of a gas at a known pressure from the loss of energy of an electrically heated wire is given. Alternatively, when the mol. heat of a monat. gas is known, the pressure readings of a McLeod gauge in the region of rarefied pressures can be checked. L. S. T.

Absolute determination of thermal conductivity of gases. W. Nothdurft (Ann. Physik, 1937, [v], **28**, 137—156).—The method of Schleiermacher has been improved and gives the following results for the abs. thermal conductivity of gases at 0° : O_2, $588.9 \pm 0.4 \times 10^{-7}$; dry CO_2-free air, $577.7 \pm 1.2 \times 10^{-7}$; H_2, $424.5 \pm 2.9 \times 10^{-6}$ g.-cal. per cm. degree sec. A. J. M.

Thermal conductivity of heavy hydrogen. W. Nothdurft (Ann. Physik, 1937, [v], **28**, 157—158).—The apparatus previously described (see preceding abstract) gives $303.1 \pm 1.3 \times 10^{-6}$ g.-cal. per cm. degree sec. for the thermal conductivity of D_2 at 0°. A. J. M.

Thermal conductivity of saturated gaseous hydrocarbons at low pressure. R. Delaplace (Compt. rend., 1936, **203**, 1505—1507).—Comparative data are given for H_2, CH_4, C_2H_6, C_3H_8, n- and *iso*-C_4H_{10} in the pressure range 0·001—0·3 mm.

The conductivity of the hydrocarbons approaches a const. val. at pressures > approx. 0·15 mm. A. J. E. W.

Viscosity of liquified gases. N. S. Rudenko and L. V. Schubnikov (Physikal. Z. Sovietunion, Spec. no., June, 1936, 83—90).—η of N_2, CO, A, CH_4, and C_2H_4 have been determined at various low temp. In each case η increases rapidly with decrease in temp., but remains < that for H_2O. J. W. S.

Viscosity of liquid sodium and potassium. Y. S. Chiong (Proc. Roy. Soc., 1936, **A**, **157**, 264—277).—η of Na and K have been determined by the oscillating-sphere method from temp. near the m.p. to 360°. The data suggest that a crystal structure of these metals persists for a few degrees above the m.p. Results obtained for both Na and K are in agreement with Andrade's two η formulæ (A., 1934, 356). L. L. B.

Motion of a viscous fluid under a surface load. II. N. A. Haskell (Physics, 1936, **7**, 56—61; cf. *ibid.*, 1935, **6**, 265).—Mathematical. F. L. U.

Mechanism of the viscosity of liquids. S. Chaikin (Physikal. Z. Sovietunion, 1936, **9**, 504—521).—Theoretical. It is supposed that a liquid consists of a no. of small groups of mols., and that η of the liquid is due to tangential forces acting between these groups identical with those opposing slipping between the planes of the crystal. By comparison of η with the forces of slipping in the crystal it is calc. that the linear dimensions of the groups are of the order of 3×10^{-7} to 1.5×10^{-6} cm. O. D. S.

Viscosity of pure liquids. A. G. Ward (Trans. Faraday Soc., 1937, **33**, 88—97).—In the relation $\eta = Ae^{B/RT}$, the magnitude of B (energy associated with configurative changes produced by shearing) depends on the co-ordination, and on interionic, interat., or intermol. forces, being, e.g., large for ionic and small for non-polar liquids. When these factors do not change with temp., the relation between η and $1/T$ is linear. There is close resemblance between the configurative changes involved in melting and in viscous flow, and for liquids of the same structural type in which melting corresponds only with a transition from order to disorder the ratio B/(heat of fusion) is const. F. L. U.

Flow of liquids in an electric field. II. Influence of electric field on the viscosity of liquids. P. Sokolov and S. Sosinski (Acta Physicochim. U.R.S.S., 1936, **5**, 691—726; cf. A., 1936, 418).— The viscosity (η) of liquids has been measured in a capillary viscosimeter of square section in which two opposite walls were of Pt. On applying a direct or alternating (50 and 1000 cycles) electric field, a considerable increase of η is observed with Et_2O, $CHCl_3$, EtI, $COMe_2$, $PhNO_2$, and NH_2Ph, and no change with C_6H_6, PhMe, C_6H_{14}, or CCl_4. Addition of small amounts of polar impurities (HCl, $COMe_2$) to C_6H_6, PhMe, of C_6H_{14} gives rise to a positive effect. The magnitude of the effect with pure liquids depends on the conductivity (λ), and with Et_2O and $CHCl_3$ is $\propto \sqrt{\lambda}$. The effect is considered to depend on the passage of current through the

liquid rather than on orientation of the mols. It cannot be attributed either to electrolytes or to the movement of solvated ions. F. L. U.

Effect of an electric field on the viscosity of liquids. E. D. ALCOCK (Physics, 1936, 7, 126—129).—Measurements were made with a no. of common liquids for fields up to 2000 volts per cm. Changes in η up to 200% occurred and the following points were disclosed : (1) liquids with no dipole moment (e.g., C_6H_6) show no effect ; (2) in general the greater is the dipole moment the greater is the effect ; (3) the greater is the viscous force in the liquid the smaller is the effect ; (4) little or no change in η occurs until a crit. field strength is reached. A. E. M.

Mobility of copper ions in rock-salt. S. A. ARZIBISCHEV and N. B. BORISSOV (Physikal. Z. Sovietunion, 1936, 10, 44—55).—The mobility of Cu ions in NaCl under the influence of a p.d. is given at 540—750° by $5 \cdot 98 \times e^{-12600/T}$ cm.^{2} per sec. per volt, and is independent of [Cu$^{\cdot\cdot}$]. With NaCl crystals containing centres due to electron bombardment the mobility is less. The smallest [Cu] which can be detected by the method of electron coloration is 2×10^{-7} g. per g. of NaCl. R. S. B.

Diffusion of copper in rock-salt. S. A. ARZI-BISCHEV (Physikal. Z. Sovietunion, 1936, 10, 56—66 ; cf. preceding abstract).—The diffusion coeff. (D) of Cu in rock-salt has been studied by the method of electron coloration, and is given by $D = 1 \cdot 07 \times e^{-13100/T}$ sq. cm. per sec. Vals. obtained for D are in approx. agreement with those calc. from $D = kTU$, where U is the ionic mobility under the force of 1 dyne. R. S. B.

Theory of binary solutions. K. FREDENHAGEN (Z. Elektrochem., 1937, 43, 28—42).—Theoretical (cf. A., 1936, 1463). E. S. H.

Change of volume on mixing and equations for non-electrolyte mixtures. G. SCATCHARD (Trans. Faraday Soc., 1937, 33, 160—166).—The vol. change on mixing may be calc. approx. from the change in free energy or heat content, or from energies of vaporisation of the components. The excess entropy of mixing is expressed as the product of the vol. change and the ratio of the coeffs. of thermal expansion and compressibility. F. L. U.

Apparent volumes and thermal expansions of salts in aqueous solution between 20° and 40°. R. E. GIBSON and J. F. KINCAID (J. Amer. Chem. Soc., 1937, 59, 25—32).—Thermal expansions of aq. $BaCl_2$, KBr, KNO_3, NaI, and LiBr and sp. vols. (at 25°) of aq. KNO_3, NaI, and LiBr have been determined throughout the range of possible concns. The results are expressed as functions of temp. and concn. A linear relation between apparent expansibility and concn.$^{\frac{1}{2}}$ is fortuitous ; the complete curve is sigmoid. E. S. H.

Thermal expansion of binary systems in the fused state. A. LEONTEEVA (J. Phys. Chem. Russ., 1936, 8, 68—73).—Sp. vol. data for fused mixtures of $NaPO_3$ and $NaBO_2$ at 600—1000° afford evidence for the formation of the compound $NaBO_2,NaPO_3$.

Corresponding data for mixtures of KPO_3 and $Na_2B_4O_7$ afford no clear evidence of compound formation. E. R.

Surface of the liquid in the phase diagram, and thermal expansion and viscosity of alcohol–water solutions of lithium chloride. II. N. A. SCHALBEROV and N. M. OSTROUMOVA (J. Phys. Chem. Russ., 1936, 8, 117—123).—Measurements of d, thermal expansion (α), and viscosity (η) have been made for 7 ternary mixtures of H_2O, EtOH, and LiCl, of m.p. —35°. The data for α and η suggest the formation of $EtOH,5H_2O$ (I). The singularities are more pronounced in the presence of Li than in binary $EtOH–H_2O$ mixtures. This may indicate that (I) plays a part in the solvation of Li^+ ions. E. R.

Viscosity of binary mixtures. E. L. LEDERER (Nature, 1937, 139, 27—28).—The author's equation (A., 1932, 116) as well as that of Arrhenius is preferable to that of van der Wyk (this vol., 72). L. S. T.

Viscosity of aqueous solutions of electrolytes as a function of the concentration. IV. Potassium ferrocyanide. G. JONES and R. E. STAUFFER (J. Amer. Chem. Soc., 1936, 58, 2558—2560; cf. A., 1936, 678).—Vals. of d and η at 0° and 25° are recorded for a wide concn. range. The results confirm approx. the equation of Falkenhagen for the computation of the influence of interionic attraction on η. E. S. H.

Viscosity of aqueous solutions of various salts. V. F. POSTNIKOV and I. P. KIRILLOV (J. Appl. Chem. Russ., 1936, 9, 1926—1928).—Vals. of η and d for 0·5—10M-$NaNO_2$, -$(NH_4)_2CO_3$, and -NH_4HSO_4 at 0—100° are recorded. R. T.

The viscosity-concentration formula. E. M. BRUINS (Chem. Weekblad, 1937, 34, 78—79).—On the assumption that viscosity is associated with min. energy dissipation, the formula $\eta_r = ac + \cosh bc$ is derived ; this is shown to be in agreement with other formulæ which have previously been put forward. S. C.

Combination of fatty acids with nitrogen bases. II. Piperidine and lower fatty acids : conductivities and viscosities of liquid anhydrous salts. E. B. R. PRIDEAUX and R. N. COLEMAN (J.C.S., 1937, 4—10 ; cf. A., 1936, 1449).—Conductivities, κ, and mol. conductivities, Λ, of the liquid piperidine salts decrease with increase of mol. wt. of the fatty acid (propionic to octoic). From the magnitude of κ and its temp. coeff. it appears that the salts are weak electrolytes. The curve relating the composition of piperidine–hexoic acid mixtures and Λ has two max., but there is one max. each in the composition–viscosity (η) curve and the composition–$\Lambda\eta$ curve. The results indicate a higher degree of mol. and electrolytic combination than has been found previously in such systems. J. G. A. G.

Surface tension of solutions of electrolytes as a function of concentration. I. Differential method for measuring relative surface tension. G. JONES and W. A. RAY (J. Amer. Chem. Soc., 1937, 59, 187—198).—A differential method of

measuring the surface tension (σ) of solutions relatively to that of the solvent by a modified capillary apparatus is described. Results for aq. KCl, K$_2$SO$_4$, and CsNO$_3$, respectively, at 25° over a wide concn. range show that at concns. >0·01N, σ increases with concn. in a way that is typical of capillary-inactive, strong electrolytes, which are negatively adsorbed at the surface. A min. σ is observed about 0·001N, below which the solute is positively adsorbed at the surface. Sucrose gives a linear σ-concn. curve without change in the sign of the slope at extreme dilutions. The behaviour at extreme dilutions is ascribed to interaction between ions and polarised H$_2$O mols.   E. S. H.

Structure of molecular complexes in the liquid phase. S. GLASSTONE (Trans. Faraday Soc., 1937, **33**, 200—206).—Dielectric polarisations have been determined for mixtures of CHCl$_3$ with Et$_2$O, (CH$_2$Cl·CH$_2$)$_2$O, Pr$^β_2$O, COMe$_2$, quinoline; Et$_2$O with CHBr$_3$, CMeCl$_3$, CCl$_4$, CBr$_4$, C$_2$HCl$_5$, C$_2$Cl$_6$; Pr$^β_2$O with CHBr$_3$, CCl$_4$, CBr$_4$. In all cases complexes are formed in the liquid phase, and the mass-action consts. are calc. There is no necessary relation between the structure of a complex in the liquid phase and that of a solid compound of the same components.   F. L. U.

Dipole interaction in mixtures of benzene with its polar derivatives. A. R. MARTIN (Trans. Faraday Soc., 1937, **33**, 191—198; cf. A., 1934, 1063).—Vals. of the dielectric const. (D) are given for mixtures of C$_6$H$_6$ with CH$_2$Ph·OH, PhOH, PhCN, PhNO$_2$, PhCl, PhBr, NH$_2$Ph, and PhOMe. A linear relation is found between $-\log a/N$ and $(D-1)/(2D+1)$, where a is the activity (cf. A., 1934, 21) and N the mol. fraction of the polar constituent, except for mixtures of low D in which dispersion forces are considered to be comparable in influence with dipole interaction.   F. L. U.

Dipole solvation. W. H. BANKS (Trans. Faraday Soc., 1937, **33**, 215—224).—Existing data are used to test the equations derived by Martin (A., 1929, 1389), Bell (A., 1931, 901), and Kirkwood (A., 1934, 962), expressing the free energy of solvation of a dipole solute in terms of its dipole moment and the dielectric const. of the medium. After correction for interaction energy, Martin's equation is in better agreement with experiment than either of the others. Lack of agreement with a purely electrostatic model in many cases is due to the magnitude of the interaction energy contribution.   F. L. U.

Heat of fusion of mixtures of heavy and ordinary water. O. REDLICH and J. ZENTNER (Monatsh., 1936, **68**, 407—414).—The heat of fusion (L) of D$_2$O is 1508 g.-cal. per mol. For mixtures of H$_2$O and D$_2$O, $L = 79·670 - 4·383M_2$ g.-cal. per g., where M_2 is the mol. fraction of D$_2$O present.
                      J. W. S.

X-Ray investigation of pure iron–nickel alloys. I. Thermal expansion of alloys rich in nickel. E. A. OWEN and E. L. YATES (Proc. Physical Soc., 1937, **49**, 17—28).—Measurements for alloys containing 97—73 at.-% Ni show that the expansion of the crystal lattices agrees closely with that of

composite masses of crystals. The addition of Fe to the Ni lattice causes the latter to expand in proportion to the amount of Fe added, and raises, but not proportionately, the discontinuity temp. in the thermal expansion curve. The face-centred structure persists from room temp. through the transformation temp. up to 600°. No ageing effect was observed in a 94 at.-% Ni alloy over 15 months.   N. M. B.

Paramagnetism of copper–nickel alloys. G. GUSTAFSSON (Ann. Physik, 1937, [v], **28**, 121—31).—The at. susceptibility of the entire range of Ni–Cu alloys has been determined at a series of temp.
                      A. J. M.

Thermal expansion of lead–antimony alloys. P. HIDNERT (J. Res. Nat. Bur. Stand., 1936, **17**, 697—708).—The linear expansion of Pb–Sb alloys containing 2·9—98·0% Sb has been measured between −12° and 200°. The coeff. of expansion and the d of the alloys decrease linearly with increase in the at.-% of Sb.   C. R. H.

Gold–sodium alloys. W. HAUCKE (Naturwiss., 1937, **25**, 61).—X-Ray analysis of Au–Na alloys shows that the range of homogeneity of the Au$_2$Na phase is approx. 32—42 at.-% Na. Debye–Scherrer diagrams of this phase give cubic indices with a 7·79 A., and 24 atoms in the unit cell. Melts rich in Na give a phase showing tetragonal symmetry with 6 atoms in the unit cell; this is probably AuNa$_2$.
                      A. J. M.

Gold–manganese alloys. V. A. NEMILOV and A. A. RUDNITSKI (Ann. Sect. Platine, 1936, **13**, 129—143).—The compounds AuMn, AuMn$_2$, and AuMn$_3$ are suggested by m.p., hardness, conductivity, and metallographic data. AuMn forms solid solutions with Au and Mn, which break down on cooling to yield AuMn$_2$ and AuMn$_3$.   R. T.

Anomaly in the expansion of platinum–iron alloys. A. KUSSMANN (Physikal. Z., 1937, **38**, 41—42).—The coeff. of expansion of Pt–Fe alloys between 20° and 70° suddenly becomes negative at 50—60 wt.-% Pt.   A. J. M.

Palladium–silver alloys. E. J. RODE (Ann. Sect. Platine, 1936, **13**, 167—175).—Thermal, hardness, and metallographic data indicate the formation of an unbroken series of solid solutions.   R. T.

System platinum–silicon. N. M. VORONOV (Ann. Sect. Platine, 1936, **13**, 145—166).—M.p., hardness, conductivity, and metallographic data confirm the existence of PtSi and Pt$_2$Si, and suggest the formation of Pt$_5$Si$_2$, m.p. 983° (decomp.); evidence of the existence of Pt$_9$Si, Pt$_3$Si$_2$, or PtSi$_8$ is not obtained. Brittle and fusible Pt–Si alloys are formed when Pt is heated in contact with material containing Si in a reducing atm., and may lead to loss of Pt and to damage of laboratory equipment.
                      R. T.

Spectral emissivities, resistivity, and thermal expansion of tungsten–molybdenum alloys. P. N. BOSSART (Physics, 1936, **7**, 50—54).—Spectral emissivities of W–Mo alloys (W 25, 62·5, and 87·5 wt.-%) have been found to exceed the vals. calc. from the mixture rule by 20 and 10% at 1300° and 2200° abs., respectively. In the case of the 62·5%

alloy the resistivity exceeds the calc. val. by 48% in the range 1300—2200° abs., whilst the thermal expansion at 2000° abs. is approx. that calc. from the vol. composition. F. L. U.

Recognition of crystal symmetry [in alloys] by observations of the polarisation colours between crossed nicols. M. von Schwarz and H. Daschner (Z. Metallk., 1936, **28**, 343—346).— The orientation of the crystallites in Si–Cu and Cu– Al alloys can be determined from observations of the polarisation colours in reflected light if there is no sudden colour change on rotating the stage through 22·5°. Methods of calculating the symmetry are given. A. R. P.

Existence-range of the β Hume-Rothery phases. M. Hara (Nature, 1937, **139**, 195).— Concn. ranges in which Hume-Rothery phases are formed in binary alloys of Zn, Cu, Ag, Au, Cd, and Al are tabulated and attention is directed to certain relationships. L. S. T.

Surface tension of amalgams. V. K. Sement-schenko, B. P. Bering, and N. L. Pokrovski (Kolloid. Shur., 1935, **1**, 205—215).—γ of Hg is reduced by $K > Na > Ba > Cd = Ag$, and slightly raised by Zn. The results agree with the theory of generalised moments (cf. A., 1935, 1315). The significance of γ in the study of alloys is discussed. J. J. B.

Physico-chemical basis of the process of amalgamation. I. N. Plaksin and M. A. Koschu-chova (Ann. Sect. Platine, 1936, **13**, 95—111).— The val. of cos θ (θ = angle of contact of Hg on Au, Ag, and Au–Ag surfaces) is greatest for Au and least for Ag during the first min. of contact. After 60 min. max. vals. of cos θ are obtained with 98% Au alloys, and negative vals. are obtained for 10—55% Au alloys. Cos θ is increased by presence of 0·05— 0·1% of Cu, 0·05% of Zn, or 5% of Au in the Hg, and is diminished by [Cu] > 0·5% or [Zn] > 0·1%. The retarding action of Cu or Zn is ascribed to formation of a film of oxides at the amalgam surface, in neutral or alkaline, but not acid, solutions. The velocity of amalgamation is increased by polishing the Au or Ag surfaces, or by treating them with nascent H. R. T.

Pure liquids and liquid mixtures. J. Kendall (Trans. Faraday Soc., 1937, **33**, 2—7; cf. A., 1928, 1325).—F.p. and solubility curves for EtOAc in H₂O alone and with varying amounts of EtOH have been determined. Addition of EtOH up to 10·8 mol.-% does not increase the solubility of EtOAc in H₂O, whilst with >20 mol.-% complete miscibility occurs. The f.-p. curves are anomalous. The solid phase is ice throughout, and no compounds have been isolated. Et₂O–H₂O mixtures behave similarly. F. L. U.

Optical determination of solubility. M. Vil-borg (J. Phys. Chem. Russ., 1936, **8**, 61—67).— Toepler's streaming method may be used for the determination of solubility and for the determination of the concn. of a given solution. The method has been applied to Na K tartrate. E. R.

Solubilities of potassium chloride in deuter-ium water and in ordinary water from 0° to 180°. R. W. Shearman and A. W. C. Menzies (J. Amer. Chem. Soc., 1937, **59**, 185—186).—Solu-bility data are recorded and the differences discussed. E. S. H.

Solubility of silver chloride in aqueous solu-tions of potassium and sodium chlorides. A. Pinkus and M. Haugen (Bull. Soc. chim. Belg., 1936, **45**, 693—716).—The method previously de-scribed (cf. A., 1930, 1246) has been improved and applied to the redetermination of the solubility of freshly pptd. AgCl in 0·0001—1·0M-NaCl and in 0·001—1·0M-KCl. The solubility is a min. in 0·0025M-NaCl or -KCl, the vals. being $2·9 \times 10^{-7}$ and $2·5 \times 10^{-7} M$-AgCl per litre, respectively. At concns. of NaCl or KCl > 0·05M, the data suggest that almost the whole of the AgCl is in the form of a complex. C. R. H.

Solubility of mercurous sulphate in sulphuric acid solutions. D. N. Craig, G. W. Vinal, and F. E. Vinal (J. Res. Nat. Bur. Stand., 1936, **17**, 709—720).—The solubilities at 0° and 28° in 0·001— 4·0M-H₂SO₄ have been measured, the Hg being determined by electrolytic deposition on Pt. For each temp., the solubility decreases with increase in [H₂SO₄] to a min. val. at approx. 0·03—0·04M, increases to a max. val. at approx. 1·0M, and again decreases. The influence of hydrolysis at low [H₂SO₄] is discussed. Chemical and crystallographic analyses of the solid phases at low and high [H₂SO₄] afford no evidence for the presence of basic or acid salts. C. R. H.

Solubility of mercurous oxalate. G. Jantsch and E. Schuster (Monatsh., 1936, **68**, 399—402).— The solubility of Hg₂C₂O₄,H₂O in H₂O increases from 2·61 mg. per litre at 18° to 9·50 at 40·2°. The presence of 0·8N aq. NaNO₃ is without influence. J. W. S.

Solubility of nicotine silicotungstate in solu-tions of dilute hydrochloric acid. J. R. Spies (J. Amer. Chem. Soc., 1936, **58**, 2386—2387).— Solubility data for H₂O and 0·001—0·1N-HCl are recorded. Solubility is max. in H₂O and min. in 0·005N-HCl. E. S. H.

Determination of solubility coefficients of naphthalene vapour in tetrahydronaphthalene and in gas-oil. H. Mauras (Bull. Soc. chim., 1937, [v], **4**, 49—58).—Data for 0—40° are recorded. E. S. H.

Solubility of hydrocarbons in mixtures of phenol and water. R. Vondráček and J. Dostál (Coll. Czech. Chem. Comm., 1936, **8**, 555—560).— The solubilities of n-hexane, n-heptane, β-methyl-pentane, methyl*cyclo*hexane, and C₆H₆ in PhOH– H₂O mixtures of varying composition have been determined at 20° and 30°. E. S. H.

Velocity of crystallisation from supersatur-ated solutions. A. N. Campbell and (Mrs.) A. J. R. Campbell (Trans. Faraday Soc., 1937, **33**, 299—308).—The times required for the commence-ment of spontaneous crystallisation of Ba succinate from pure H₂O and from H₂O containing glucose,

EtOH, or agar have been determined for varying degrees of supersaturation. Glucose and agar retard crystallisation. The velocity of crystallisation after inoculation increases with the degree of supersaturation, but there is no evidence of a max. up to 1500% supersaturation. The velocity coeffs. indicate that diffusion does not completely account for the mechanism of crystallisation. The velocity of crystallisation is decreased by increasing the viscosity of the solution.

J. W. S.

Laws of solubility. M. G. EVANS (Trans. Faraday Soc., 1937, **33**, 166—167; cf. A., 1936, 1204)—It is shown that the entropy of dissolution is frequently given by (heat of dissolution)/m.p.   F. L. U.

Extraction of ferric chloride from hydrochloric acid solutions by *iso*propyl ether. R. W. DODSON, G. J. FORNEY, and E. H. SWIFT (J. Amer. Chem. Soc., 1936, **58**, 2573—2577).—Pr^{β}_2O gives more efficient extraction over a wider range of acid concn. than does Et_2O.   E. S. H.

Diffusion of gases through metals. IV. Diffusion of oxygen and of hydrogen through nickel at very high pressures. C. J. SMITHELLS and C. E. RANSLEY (Proc. Roy. Soc., 1936, **A, 157**, 292—302).—The rate of diffusion of O_2 through Ni at 900° is independent of the O_2 pressure above 0·25 mm.; this is a consequence of the establishment of equilibrium between the O_2 just inside the metal and the layer of NiO formed on the surface, with which it is in contact. The rate of diffusion of H_2 through Ni, measured at 248° and 400°, $\propto \sqrt{P}$ even up to 112 atm. It is considered probable that some of the energy required for diffusion is derived from the kinetic energy of the gas mols.   L. L. B.

Kinetics of the activated adsorption of hydrogen on polished nickel. E. LEIPUNSKI (Acta Physicochim. U.R.S.S., 1936, **5**, 807—812).—Measurements have been made at −145° and −118°. Only 15% of the H_2 is adsorbed sufficiently slowly for the velocity to be determined. The results agree with a kinetic equation based on Langmuir's theory. The no. of adsorbed mols. is 2·4 times the calc. no. of available places, but the discrepancy is more apparent when absence of saturation is taken into account. The calc. heat of activation is 2050 g.-cal., and the steric factor is $2·2 \times 10^{-4}$.

C. R. H.

Platinum electrode. III. Adsorbed atoms and ions on the surface of a platinum electrode. A. FRUMKIN and A. SLIGIN (Acta Physicochim. U.R.S.S., 1936, **5**, 819—840).—Data previously obtained for a platinised electrode in acid and alkaline solutions of NaCl and NaBr (cf. A., 1936, 1207, 1466) have been examined theoretically. In acid solutions the amount of adsorbed gas is negligible over a certain potential range, the p.d. being solely determined by an ionic double layer. In acid solutions for other potential ranges and in alkaline solutions at all potentials, the adsorbed gas has a considerable influence on the p.d. If the amount of adsorbed H_2 is kept const., there is an approx. linear relationship between p.d. and the charge of the double layer. The shape of the characteristic curve of H_2 adsorption on a platinised electrode is

considerably changed by sintering the deposit in H_2, whereby the total surface is decreased. The ratio of H to Pt atoms is calc. as approx. 1 : 4. It is suggested that the adsorbed H is present both as ions, which may exchange with other ions, and also as atoms.   C. R. H.

Sorption of chlorine by active charcoal. I. Relation between the sorption amounts, the temperature, and the pressure. K. ARII (Bull. Inst. Phys. Chem. Res. Japan, 1936, **15**, 1233—1244).—Sorption measurements at 20°, 30°, and 50° are in good agreement with Langmuir's equation. The relation between the amount a sorbed per g. of charcoal at temp. t, the amount sorbed at 0°, a_0, and the equilibrium pressure p, is given by $a = a_0 - (0·091 - 12/p)t$.   R. S.

Absorption of mercury vapour by iodised charcoal. I. V. A. PIANKOV (J. Gen. Chem. Russ., 1936, **6**, 1528—1535).—The C is immersed for 24 hr. in 0·1% I in EtOH, C_6H_6, CS_2, $CHCl_3$, or aq. KI, and dried at 105° (3—4 hr.); the activity of the C rises in the above order with the different solvents. The adsorptive capacity for Hg of I-free C treated with solvents alone rises in the order $CS_2 < CHCl_3 <$ aq. $KBr <$ aq. KI $<$ aq. KCl.   R. T.

Adsorption by dehydrated chabasite as a function of water content. A. B. LAMB and J. C. WOODHOUSE (J. Amer. Chem. Soc., 1936, **58**, 2637—2646).—Max. adsorption of H_2, O_2, and CO_2 at 0° occurs when 97·8, 96·9, and 92·9%, respectively, of the original H_2O content has been removed. For these dehydration vals. max. adsorption of CO_2 occurs at 34·5°, 61·2°, and 100°. The behaviour is attributed to increase of porosity with removal of H_2O so long as the crystal lattice persists, while at the higher temp. required to remove the last portions of H_2O the crystal lattice begins to collapse, with consequent decrease of adsorptive capacity.

E. S. H.

Absorption of phenols and phenol-carboxylic acids by cellulose. K. BRASS and O. GRONYCH (Kolloid-Z., 1937, **78**, 51—68; cf. A., 1934, 839).—The absorption of phenolic substances from aq. solution by cellulose (purified cotton and viscose) may occur by either simple dissolution or adsorption. Partition coeffs. (viscose/H_2O) are as follows : resorcinol 1·04; hydroxyquinol 1·37; phloroglucinol 1·36; pyrogallol 1·35; resorcylquinol 2·17; dihydroxybenzoic acid (1 : 3 : 4) 6·37; (1 : 3 : 5) 6·32; (1 : 2 : 5) 6·34; gallic acid 3·14; digallic acid 10·46. Adsorption data are given for BzOH, o-, m-, and p-$OH \cdot C_6H_4 \cdot CO_2H$, o-$OMe \cdot C_6H_4 \cdot CO_2H$, and o-$C_6H_4(CO_2H)_2$.   F. L. U.

Adsorption of electrolytes on heteropolar surfaces. D. BALAREV (J. Chim. phys., 1936, **33**, 824—827; cf. A., 1936, 677).—It is inferred, from the rates of dissolution of magnesite in a no. of acids, that anions are adsorbed on the surface in accordance with the Hofmeister series.   R. S.

Adsorption on gels. I. Comparative study of selective adsorption from binary mixtures of liquids on gels of silica, alumina, and ferric oxide. K. S. RAO and B. S. RAO (Proc. Indian Acad. Sci., 1936, **4, A**, 562—570).—The influence of

temp. on the capillary space of Al_2O_3 (I) and Fe_2O_3 gels (II) has been studied. An inflexion in the (I) curve at 500° is attributed to the decomp. of Al_2O_3,H_2O, whilst the max. absorptive capacity for (I) is attained at 950° and for (II) 220°. The selective adsorption of $EtOH-C_6H_6$, $EtOH-CCl_4$, $EtOH-H_2O$, $EtOH-C_5H_5N$, and $C_6H_6-CCl_4$ mixtures by (I) and (II) has been studied and compared with the data for SiO_2 gel. Selectivity is determined by the chemical nature of the gel as well as by the capillary space. R. S.

Orientation of molecules in the surface layer of an adsorbent, and the adsorption of gases. I. P. V. AFANASIEV, B. A. TALMUD, and D. L. TALMUD (Acta Physicochim. U.R.S.S., 1936, **5**, 853—862).—If molten palmitic acid (I) is sprayed and the droplets are allowed to cool, the surface of the particles so formed consists of Me groups (" unconverted "). If molten (I) is emulsified with H_2O at 80°, and the emulsion poured into cold H_2O, the solidified droplets have the CO_2H groups in the surface (" converted "). By dissolving (I) in paraffin wax before emulsifying, " converted " (I) is obtained with varying concns. of CO_2H groups in the surface. " Converted " (I) adsorbs much more NH_3 than does " unconverted " (I), the amount corresponding with 1800 layers of NH_3 mols. in the former case, or 0·64 mol. NH_3 per mol. (I). In paraffin solutions of " converted " (I) the amount of adsorbed NH_3 increases with dilution of (I), and at a concn. of 0·01 mol. (I) per litre, the no. of adsorbed NH_3 mols. is 16·2 times the no. of (I) mols. Since the no. of mols. of NH_3 often exceeds the no. of mols. of (I) and since desorption occurs without heating and adsorption takes place in absence of H_2O, it is almost certain that there is no chemical action between NH_3 and (I). It is probable that the surface CO_2H groups of a " converted " adsorbent are not compensated by the CO_2H of the lower layers. Such uncompensated CO_2H may exist for some distance inside the adsorbent and form adsorption planes identical with the surface layer. C. R. H.

Multimolecular adsorbed films. II. General theory of the condensation of vapours on finely divided solids. R. S. BRADLEY (J.C.S., 1936, 1799—1804; cf. A., 1936, 1457).—The equation $\log_{10}(p_s/p) = K_1K_3{}^a + K_4$, where p and p_s are the pressure and saturated pressure, respectively, of the vapour, a is the weight adsorbed, and K_1, K_3, and K_4 are consts., has been deduced for the adsorption of dipolar vapours on finely-divided solids. Except at high pressures, when capillary condensation occurs, agreement with recorded data is obtained over a wide range of p/p_s vals. The influence of the formation of a liquid meniscus and of hysteresis is discussed. J. G. A. G.

Surfaces of ordinary solutions. J. W. McBAIN, T. F. FORD, and D. A. WILSON (Kolloid-Z., 1937, **78**, 1—9).—Recent improvements in the technique of the study of surface tension (σ) and surface adsorption (Γ) are described (cf. A., 1936, 1063, 1355) and in particular a modified Langmuir–Adams trough in which the floating barrier is connected with the walls by a thin membrane which separates not only the surfaces but also the bulk liquids on either side. The application of newer methods to the measurement of abs. Γ, spreading velocity, and study of time needed for the attainment of a Gibbs equilibrium (e.g., several hr. for $CH_2Ph\cdot CH_2\cdot CO_2H$) is discussed. The ascending branch of σ–concn. curves which show a min. is explained on the basis of a submerged electrical double layer, of the order of 100 A. below the surface. F. L. U.

Interfacial tension between a benzene solution of palmitic acid and aqueous solutions of potassium hydroxide, potassium cyanide, or barium cyanide. L. GAY and G. NOGARET (J. Chim. phys., 1936, **33**, 831—847; cf. A., 1935, 1071; 1936, 1064).—The interfacial tension (γ) has been determined for varying concns. of palmitic acid in C_6H_6 and of KOH, KCN, and $Ba(CN)_2$ in H_2O. The cyanides produce a lowering of $\gamma >$ the hydroxides at the same concn., a result which cannot be explained by hydrolysis. The significance of the segments and points of inflexion of the curves is discussed.
R. S.

Oiliness of liquids. II. Friction coefficients of films of uni- and multi-molecular layers. H. AKAMATU and J. SAMESHIMA (Bull. Chem. Soc. Japan, 1936, **11**, 791—796).—The coeff. of friction between glass surfaces is diminished to about one tenth when a unimol. layer of stearic, palmitic, myristic, lauric, oleic, or ricinoleic acid is deposited on one of the surfaces by Blodgett's method (A., 1935, 931). No further decrease occurs when the film thickness is increased, and larger vals. are obtained when the mols. in the film are irregularly arranged.
J. G. A. G.

Primary oxide film on iron. H. R. NELSON (Nature, 1937, **139**, 30).—Electron diffraction patterns of films of electrolytic Fe evaporated and condensed in a vac. on glass, Fe, Pt, and quartz surfaces show only Fe rings. After exposure to dry air at room temp. and pressure for a brief interval the Fe rings become much fainter and two diffuse bands appear in the same positions as on the electron patterns of abraded Fe. The new bands are attributable to a thin film of Fe_3O_4 overlying the Fe. Traces of oxides on evaporated films have been found on patterns taken after brief exposure to air pressures $\rightarrow 10^{-3}$ mm. of Hg. Heating in air for 3 to 7 min. at 150—200° causes the disappearance of the Fe rings and strengthens those due to oxide. The orientation of the oxide lattice in relation to that of the underlying Fe is discussed. L. S. T.

Influence of capillary tube materials on electrokinetic potential. K. GOSTKOWSKI (Acta phys. polon., **3**, 343—345; Chem. Zentr., 1936, i, 1824).—The electrokinetic potential for a paraffin surface is $<$ for shellac but $>$ for glass. J. S. A.

Dialysis of solutions through collodion membranes. I. Dialysis constants of sodium and potassium chloride in presence of certain substances. W. NOWATKE (Rocz. Chem., 1936, **16**, 431—435).—The dialysis consts. of 0·5N-NaCl and -KCl are unaffected by the presence of $NaNO_2$, $CaCl_2$, NaOAc, $CO(NH_2)_2$, glucose, lactose, caffeine, KNO_3, or K_2CO_3. R. T.

Microscopic structure of collodion ultrafilters of graduated porosity. P. GRABAR and J. A. DE LOUREIRO (J. Chim. phys., 1936, **33**, 815—823; cf. this vol., 77).—Collodion " Gradocol " ultra-filters have a cluster structure and not a filament structure as previously supposed. Filters of mean pore diameter <100 mμ are birefringent. The influence of drying is discussed and it is shown that the irregular spaces between the clusters may be treated statistically as circular canals.   R. S.

Method for determining the distribution of mol. wts. in macro-molecular substances. H. DOSTAL and H. MARK (Trans. Faraday Soc., 1937, **33**, 350—353).—The viscosity of solutions of sub-stances with long-chain mols. $\propto i^2$ (where i is the chain length), whereas the osmotic pressure $\propto .1/i$. Hence, if the mean chain length is determined for a mixture of such mols. by each method, an indication is obtained of the distribution of the mol. wts. about this mean val.   J. W. S.

Absorption spectra in the near infra-red of solutions of alcohols in ether or dioxan : form-ation of oxonium compounds. R. FREYMANN (Compt. rend., 1937, **204**, 41—43).—The OH absorp-tion band at $0.96\,\mu$ disappears or decreases in intensity when alcohols are dissolved in Et_2O, dioxan, or $COMe_2$. The effect is attributed to the formation of oxonium compounds with the solvent mols.   A. J. E. W.

Refractometric curves and the state of dis-solved strong electrolytes. A. E. BRODSKI (Trans. Faraday Soc., 1937, **33**, 256—264; cf. A., 1936, 1197).—Refractivity data for aq. solutions of strong electrolytes and for mixtures of these with non-electrolytes are discussed from the point of view of the hypothesis of complete dissociation.   F. L. U.

Light absorption of copper sulphate in heavy water. A. E. BRODSKI and A. A. ZANKO (Acta Physicochim. U.R.S.S., 1936, **5**, 919—920).—The extinction coeffs. of 0.437 mol. $CuSO_4$ in H_2O and in 43.6 and 92.7% D_2O have been measured between 540 and 660 mμ. The coeff. is reduced by D_2O, the reduction being approx. $\propto [D_2O]$.   C. R. H.

Diamagnetism of salts in aqueous solution. G. W. BRINDLEY and F. E. HOARE (Trans. Faraday Soc., 1937, **33**, 268—272; cf. A., 1935, 569).—Susceptibilities (χ) of ions in solution are closely additive. The difference between the ionic χ in solution and that in the crystal varies progressively with Cn/R^2 ($C =$ degree of hydration, $n =$ charge, $R =$ effective radius), and is small for large univalent ions.   F. L. U.

" Force " method of determining the dielec-tric capacity of conducting liquids at low fre-quencies : univalent electrolytes in aqueous solution. W. J. SHUTT and H. ROGAN (Proc. Roy. Soc., 1936, **A**, **157**, 359—372).—The dielectric consts., ε, of solutions of LiCl, NaCl, and KCl up to $0.04N$, of HCl up to $0.01N$, and of NaOH up to $0.02N$ have been determined. The data show that the effect of the presence of univalent ions on the val. of ε for H_2O is <4%. ε falls continuously with increasing concn. of electrolyte.   L. L. B.

Electrostriction of strong electrolytes. E. ERNST and J. TRUKA (Physikal. Z., 1937, **38**, 103—104).—From the variation of the mol. vol. of a solute in solutions of different concn. the vol. contraction (v) per g.-mol. resulting from ionisation may be calc. at different dilutions. By extrapolation the con-traction at infinite dilution (v_∞) is obtained. For a no. of solutes examined $v/v_\infty > \Lambda_r/\Lambda_\infty$.   A. J. M.

Ultramicroscopic estimation of the size of aerosol particles. B. ROTZEIG and N. FUCHS (Acta Physicochim. U.R.S.S., 1936, **5**, 893—902).—The particle radius is calc. from the velocity as measured in a strong reversible electric field, whereby the effect of gravitational velocity can be eliminated, and the Brownian effect minimised.   C. R. H.

Stability of foam. T. SASAKI (Bull. Chem. Soc. Japan, 1936, **11**, 797).—As the concn. of BuOH in H_2O is increased the stability of the foam produced by shaking rises rapidly to a max.   J. G. A. G.

Crystalline arborescences. F. MICHAUD (J. Chim. phys., 1936, **33**, 828—830).—Aq. gelatin + NaOH added to $CO(NH_2)_2$ produces arborescences.   R. S.

Dialysis in the study of colloids. IV. Col-loidal arsenious sulphide. C. B. JOSHI, P. M. BARVE, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, **4**, **A**, 590—602; cf. this vol., 27).—The cata-phoretic speed of As_2S_3 sol decreases with dialysis up to 8 days, increases up to 28 days, and then decreases. The total As, S, and H_2AsO_3, and the KCl and $MgCl_2$ flocculation vals., have been determined at different stages in the dialysis, and the influence of additions of H_2AsO_3, exposure to artificial light and sunlight, and ageing has been studied. The variation in the cataphoretic speed is attributed to changes in the composition of the sol during dialysis. The results do not support the view that the charge is due to dissociation of an ionogenic complex.   R. S.

Spontaneous stable formation of colloids from crystals or from true solution through the presence of a protective colloid. J. W. McBAIN and M. E. L. McBAIN (J. Amer. Chem. Soc., 1936, **58**, 2610—2612).—Examples are described.   E. S. H.

Mixtures of similarly charged sols. H. R. KRUYT and C. A. NIERSTRASZ (Kolloid-Z., 1937, **78**, 26—31).—The influence of a sol on the stability of another having a similar charge has been studied with mixtures in which the stability changes of each component sol could be followed. With $Ba(NO_3)_2$ as coagulating electrolyte, AgI (negative) sol has a stabilising action on Au sol, the effect being due to I′ present in the former as a peptising agent. AgI has little effect on Congo-rubin sol, in agreement with the observed coagulation vals. for $Ba(NO_3)_2$–KI mixtures. SnO_2 (negative) sol has a stabilising action on Congo-rubin. The protection afforded depends on the method used for preparing the SnO_2, and increases with increasing size of the SnO_2 micelles.   F. L. U.

Formation of tactoids in iron oxide sols. K. COPER and H. FREUNDLICH (Trans. Faraday Soc., 1937, **33**, 348—350).—Formation of tactoids (spontaneous orientation of particles) has been observed in Fe_2O_3 sols prepared by peptising pptd. $Fe(OH)_3$ in H_2O with fused $FeCl_3,6H_2O$. These tactoids are compared with those observed in V_2O_5 and benzopurpurin sols.   J. W. S.

Basic beryllium and complex beryllate hydrosols ; polyolated and polyoxolated structures. A. W. THOMAS and H. S. MILLER (J. Amer. Chem. Soc., 1936, **58**, 2526—2533).—The prep. of sols containing Be in the complex cationic and anionic micelles, respectively, is described. The stability of the sols towards electrolytes and heat, and changes occurring during ageing, have been examined. Conductometric titrations of the cationic sols with the salts show that the tendency of the anions to co-ordinate with the Be atom is in the order ; citrate $>$ tartrate $> NO_3{}'$.   E. S. H.

Critical concentration for micelles in solutions of cetanesulphonic acid. G. S. HARTLEY (J. Amer. Chem. Soc., 1936, **58**, 2347—2354).—Conductivity measurements show that aggregation to micelles occurs at a crit. concn., which increases with rising temp. by about 2% per degree, and is raised by glycerol and lowered by amyl alcohol or HCl. Aggregation is practically complete in $0.01N$ solutions.   E. S. H.

Growth of the particles of a hydrosol in the course of flocculation. A. BOUTARIC and (MME.) M. ROY (Bull. Soc. chim., 1937, [v], **4**, 173—180).—The changes occurring in colloid solutions after adding an electrolyte and before the resultant pptn. have been followed by measuring the change in the absorption coeff. for light of given λ. The coeff. at first increases rapidly, then slowly, until it reaches a limiting val., which is supposed to correspond with the mean size of the particles at the moment of pptn. The limiting vals. have been determined for sols of As_2S_3 and $Fe(OH)_3$ flocculated by different electrolytes.   E. S. H.

Structure formation in ferric phosphate sols. I. B. REVUT (Acta Physicochim. U.R.S.S., 1936, **5**, 679—690).—Coagulation and gel formation in $FePO_4$ sols closely resemble the same processes in $Fe(OH)_3$ sols. The more highly hydrated ions are more effective as coagulants. The appearance of H_3PO_4 in the intermicellar liquid as a hydrolysis product gives rise to peculiarities which distinguish the behaviour of these sols from $Fe(OH)_3$, inasmuch as H_3PO_4 has greater coagulating power than HCl.   F. L. U.

Electrophoretic study of silver iodide sol. H. R. KRUYT and G. E. VAN GILS (Kolloid-Z., 1937, **78**, 32—40; cf. A., 1934, 253).—The no. of μ-equivs. of a hexol salt (hexol no.) required to reduce the electrokinetic potential (e.k.p.) of AgI particles to zero has been measured directly in the presence of potential-determining and non-potential-determining ions. The hexol no. is greatly increased by addition of KI to the electro-dialysed sol, and slightly reduced by addition of KNO_3. The max. coagulating effect

is produced with a smaller hexol concn. than that required for complete discharge, whereas with $Th(NO_3)_4$ the two concns. coincide. The equilibrium e.k.p. is rapidly attained after addition of non-potential-determining ions ($NO_3{}'$), but with potential-determining ions (I′, Br′, Cl′, CNS′) is reached only after 24 hr. The e.k.p. of both positive and negative AgI sols rises during slow coagulation.   F. L. U.

Influence of ultra-violet rays on rhythmic precipitation of silver chromate in an electric field. S. MIYAMOTO (Kolloid-Z., 1937, **78**, 23—26).—Incidence of light from a quartz–Hg lamp on a tube in which rhythmic pptn. of Ag_2CrO_4 is in progress causes the width and the separation of the bands to decrease. The effect is probably due to a reaction product of $K_2Cr_2O_7$ and gelatin formed under the influence of the radiation.   F. L. U.

Mathematical expression of periodic phenomena. P. F. MICHALEV (Kolloid. Shur., 1935, **1**, No. 2, 42—50).—A discussion (cf. A., 1935, 1321).   J. J. B.

Colloids and the biological effect of radiation. R. T. M. HAINES (Nature, 1937, **139**, 32).—Brownian movement in a colloidal Ca oleate protected by gelatin ceased when the particles were strongly illuminated. Illumination apparently decreases the stability of the colloid sufficiently to permit the small amounts of electrolytes present to effect pptn.   L. S. T.

Peptisation of aqueous soap solutions. A. S. C. LAWRENCE (Trans. Faraday Soc., 1937, **33**, 325—330).—Aq. soap solutions are peptised by many alcohols, phenols, and amines, which are more sol. in these solutions than in pure H_2O, but the peptised solutions are still colloidal. There is no evidence of the existence of complexes in simple stoicheiometric proportions. For each soap–peptiser mixture there is a definite saturation point, the amount of peptiser taken up at this point varying between <1 and 17 mols. per mol. of soap. The effect is attributed to complex formation by dipole interaction, the complexes existing only in solution and their solubilities determining the saturation point. The temp. coeff. of peptisation is low.   J. W. S.

Imbibition of hydrosols and of coloured solutions across porous substances. A. BOUTARIC (Bull. Soc. Chim. biol., 1936, **18**, 1817—1830; cf. A., 1936, 1196).—The effect of addition of various substances on the rate of ascent of hydrosols and coloured solutions into filter-paper has been examined. For electrolytes the effect depends chiefly on the valency of the active ion and is more marked with colloidal than semi-colloidal dyes. With electro-negative hydrosols and coloured ions, addition of electrolyte usually retards movement but with electropositive sols and ions either retardation or acceleration may occur. Electrolytes with univalent anions accelerate critically ; as the concentration increases the effect of the electrolyte increases at first and then decreases. Multivalent anions cause retardation. In all cases movement stops when the flocculation point is reached. The effect of dilution of the colloidal solution with liquids miscible with H_2O has also been investigated.   P. W. C.

Syneresis. W. HELLER (Compt. rend., 1937, 204, 43—45).—Three types of syneresis, associated with different types of gel or sol, are distinguished.   A. J. E. W.

Ascorbic and *iso*ascorbic acids as reducing agents for preparing colloidal solutions of gold, palladium, platinum, silver, selenium, tellurium, molybdenum-blue, and tungsten-blue. H. BRINTZINGER (Kolloid-Z., 1937, 78, 22—23).—Details of preps. are given.   F. L. U.

Influence of hydrophilic colloids on base exchange in silicates. E. SAUER and W. RUPPERT (Kolloid-Z., 1937, 78, 71—82).—The rate of displacement of Na by Ca in different artificial zeolites has been measured after addition of hydrophilic colloids to the aq. $CaSO_4$. These exercise in general a retarding influence on the exchange, partly direct, but mainly as a result of alteration of the mechanical properties of the filter material by long-continued action. The substances exercising a direct influence are, in order of effectiveness : tragacanth $>$ starch $>$ gelatin $>$ carragheen, gum arabic and tannic acid being without influence. The order of effectiveness in lowering the efficiency mechanically is : gelatin $>$ gum arabic $>$ carragheen $>$ soil colloids $>$ dextrin $>$ humic acids. Tannic acid has no effect.   F. L. U.

Hydration of dyes and change of their dispersity in presence of salts. N. S. SCHEINKER (Acta Physicochim. U.R.S.S., 1936, 5, 739—748; cf. A., 1935, 1201).—Gradual addition of KCl to aq. solutions of diamond-fuchsin is found by diffusion measurements to decrease the size of the particles at first, but this is followed by an increase. The same effect is produced by C_6H_6 in EtOH solution. The decrease is considered to be caused by desolvation under the influence of KCl or C_6H_6. The average thickness of the solvation films in H_2O and EtOH is 1·7 and 2·6 A., respectively. In aq. solutions of brilliant-cresyl-blue KCl produces an increase of particle size, but there is no pptn. within a wide range of [KCl].   F. L. U.

Emeraldin sols. III. Influence of acidity of the liquid during oxidation of aniline on the dispersity, colour, and amount of oxidation products. V. PTSCHELIN (Kolloid-Z., 1937, 78, 88—95; cf. A., 1936, 1068).—In the oxidation of NH_2Ph by CrO_3 the nigraniline salt (blue) first formed is reduced to an emeraldin salt (green). In presence of gelatin at low acidity a nigraniline sol is formed, which changes slowly to an emeraldin sol on further addition of acid. On dialysing an emeraldin salt sol, a sol of the free base is produced, which is gradually oxidised to a sol of nigraniline base. Data are recorded for the variation in the amount and ash content of the oxidation products of NH_2Ph with acidity.   F. L. U.

Hydrophilic properties of cellulose. III. Hydrophilic properties of electrically neutral cellulose. K. KANAMARU and T. NAKAMURA (Kolloid-Z., 1937, 78, 83—87; cf. A., 1934, 362).—The hygroscopicity (H) of cellulose (calico and manila paper), treated by immersion in aq. $AlCl_3$ of varying concns. and subsequent drying, has been measured

L (A., I.)

by determining the H_2O-sorption isotherms. H decreases with increasing $[AlCl_3]$ and reaches a min. when $Al(OH)_3$ has been adsorbed in such an amount as to make the cellulose electrically neutral. Further adsorption of $Al(OH)_3$ confers a positive charge and increases H. The dielectric strength is a max. at the isoelectric point, and varies in the opposite sense to H.   F. L. U.

Potential and stability of sols of cellulose ethers. S. A. GLIKMAN and E. S. MEDVEDKOV (Kolloid. Shur., 1935, 1, No. 2, 3—15).—The cataphoresis of various particles covered with benzyl- or ethyl-cellulose or with cellulose nitrate has been studied microscopically. The electrokinetic potential ζ is very small in org. liquids but high in H_2O. In H_2O–$COMe_2$ mixtures ζ increases abruptly at the same concn. as that at which the viscosity shows an abrupt decrease. The stability of lyophilic sols is not affected by ζ.   J. J. B.

Colloidal condition of cholesterol, cholesteryl ester, and lecithin. XIV. Formation of cholesterol sols. I. REMESOV (Biochem. Z., 1936, 288, 429—440; cf. A., 1935, 1522).—Data for the reproducibility, dispersivity, and stability of cholesterol (I) sols in H_2O are given and the dependence of these properties on the purity of (I) is discussed. The prep. of (I) sols is possible only in presence of a protective agent.   F. O. H.

Physico-chemical properties of alginic acid. J. K. NOVODRANOV (Ann. Leningrad State Univ., Chem. Ser., 1935, 1, 58—71).—Alginic acid forms well-defined salts with Pb, Zn, Al, Fe, Cu, Ag, K, Na, and NH_4. The Na, K, and NH_4 alginates yield solutions of high η; the surface tension at the interfaces H_2O–air and $–C_6H_6$ is depressed by the salts where the concn. is 0·125 to 2·5% and augmented at a concn. of 5%.   R. T.

Relaxation time and dipole moment of gliadin. S. ARRHENIUS (J. Chem. Physics, 1937, 5, 63—66).—An expression is derived which connects the relaxation time of a polar mol. with the viscosity of the solvent, and with the diffusion and sedimentation data of the solute. This is compared with data for the variation of the dielectric const. of gliadin with the frequency.   W. R. A.

Free and bound water in agar gels. V. I. ROGATSCHEV (Kolloid. Shur., 1935, 1, No. 1, 79—90).—Robinson's method (A., 1931, 1177) of determining bound H_2O was applied to four samples of agar and four marine algæ. The capacity for binding H_2O is independent of the total amount of H_2O absorbed during the swelling, but both are lowered by salts and the lyotropic series holds for the total amount absorbed. H_2O-binding capacity depends only on the cation and decreases when the valency of the cation increases.   J. J. B.

Extension of gelatin [jellies]. J. H. C. MERCKEL (Kolloid-Z., 1937, 78, 41—50).—Load-extension curves for a cylindrical rod of gelatin jelly have been determined under different conditions. Empirical formulæ are given to show the relation between Young's modulus (E) and gelatin concn., and between E for a 20% jelly and the lyotropic no. of an added

K salt. E is nearly const. between p_H 12 and the isoelectric point, below which it decreases slowly as far as p_H 1, and thereafter rapidly. F. L. U.

Application of chain weight loading to determination of jelly strength. I. J. SAXL (Physics, 1936, 7, 62—66).—Penetration–load curves for gelatin jellies are obtained by means of an instrument in which the chain wt. principle is used for applying the load. The device is suitable for the determination of hysteresis characteristics. F. L. U.

Influence of neutral salts on optical rotation of gelatin. V. Rotatory dispersion of gelatin in sodium bromide solutions. D. C. CARPENTER and F. E. LOVELACE (J. Amer. Chem. Soc., 1936, 58, 2438—2441).—The [α] of solutions of gelatin (I) containing NaBr have been measured at 0·5° and 40° for five $\lambda\lambda$. The rotatory dispersion obeys a single-term Drude equation and is governed by an absorption band at 2200 A. The marked change in the rotation caused by NaBr and NaI (cf. A., 1936, 288) at 0·5° is attributed to association of the mol. of (I). Application of Lucas' formulation (A., 1930, 1095) to the data indicates that only two optically active species exist in solutions and gels of (I). H. B.

Physical chemistry of amino-acids, peptides, and related substances. VIII. Relation between activity coefficients of peptides and their dipole moments. E. J. COHN, T. L. McMEEKIN, J. P. GREENSTEIN, and J. H. WEARE (J. Amer. Chem. Soc., 1936, 58, 2365—2370).—The solubilities of glycine (I), carbamidoacetic acid [*heptyl* ester (II), m.p. 98—99°, prepared from the heptyl ester hydrochloride of (I) and aq. KCNO], α-carbamido-hexoic acid [*heptyl* ester (III), m.p. 70—71°], carbamidoacetylglycine (*heptyl* ester, m.p. 123—125°), di- and tri-glycine, and lysylglutamic acid in 80% EtOH containing NaCl (up to 0·25M) at 25° are determined (methods : A., 1935, 26 ; this vol., 24). For low concns. of NaCl the logs. of the activity coeffs. of (I) and the peptides are approx. $\propto$ to their dipole moments. The moments (measured in C_6H_6) of (II) and (III) are 3·6 and $3·5 \times 10^{-18}$ e.s.u., respectively. H. B.

Physical chemistry of proteins. XIII. Solvent action of sodium chloride on egg albumin in 25% ethanol at −5°. R. M. FERRY, E. J. COHN, and E. S. NEWMAN (J. Amer. Chem. Soc., 1936, 58, 2370—2375).—The solubility of isoelectric egg albumin (I) in 25% EtOH at −5° (little denaturation occurs under these conditions) is 0·13 g. per litre ; addition of NaCl (up to 0·489M) causes an increase (up to 41·4 g. per litre). The solvent action of the NaCl is considered a measure of the electrostatic forces between the ions and (I), and is compared with the data for NH_2-acids and peptides (preceding abstract). H. B.

Adsorption of salts by proteins. T. MORAN (Rep. Food Invest. Bd., 1935, 20—23).—The amount of NaCl remaining when a gelatin–NaCl gel is subjected to pressure $\propto$ initial [NaCl]. The adsorption of NaCl by gelatin would appear to be very slight. In presence of NaCl and LiCl the reduction in the hydration of gelatin $\propto$ the hydration of the cation. E. C. S.

Spreading of fibrinogen. E. GORTER, L. MAASKANT, and G. J. VAN LOOKEREN CAMPAGNE (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1187—1191).—Freshly prepared pure fibrinogen scarcely spreads at all even on acid solutions of p_H 1, but fibrinogen solutions may be caused to spread quite readily by the addition of a trace of trypsin or prothrombase. J. W. S.

Transformation temperature of elastoidin. E. FAURÉ-FREMIET and R. WOELFFLIN (J. Chim. phys., 1936, 33, 801—814 ; cf. A., 1936, 1462).—The transformation of elastoidin (I → II) occurs within 0·5° but the temp. is slightly different for different specimens. When the elastoidin is subjected to tension, the transformation temp. t increases to a max. at 81° for tensions > 200 g. per mm., whilst t approaches 195° as the sample is progressively dried. The influence of acids, bases, salts, etc. on t is related to the increase of aq. imbibition but sp. effects occur. R. S.

Behaviour of the electrical conductivity of ovalbumin with change in temperature. A. ORRÙ (Atti R. Accad. Lincei, 1936, [vi], 23, 959—965 ; cf. A., 1936, 877).—The conductivity of aq. ovalbumin varies continuously up to 60° and on cooling no hysteresis effects are observable. When heated to 80°, both dil. and conc. solutions show hysteresis with crit. temp. at 60—62° and 68—72°. The significance of these facts is discussed. F. O. H.

Colloid chemistry of narcosis.—See A., III, 94.

Formation of ethers by the interaction of primary alcohols and olefines at high pressure. D. M. NEWITT and G. SEMERANO (Proc. Roy. Soc., 1936, A, 157, 348—358).—Measurements have been made of the equilibrium const. K for the system $2C_nH_{2n+1}\cdot OH \rightleftharpoons (C_nH_{2n+1})_2O + H_2O$, and the following vals. obtained : EtOH, 7·75 (266°) ; Pr^{a}OH, 9·40 (250°) ; Bu^{a}OH, 11·40 (250°). In the presence of a suitable catalyst and at pressures >10 atm., C_2H_4 and C_3H_6 combine with EtOH, PrOH, and BuOH to give the corresponding mixed ethers, the reaction $C_nH_{2n+1}\cdot OH + C_nH_{2n} \rightleftharpoons (C_nH_{2n+1})_2O$ being reversible and slightly exothermic with respect to ether formation. The reaction is always accompanied by direct dehydration of the alcohol (especially in the case of EtOH) and by partial hydration of the olefine. Vals. of K for the system alcohol–olefine–ether have been determined in each instance. L. L. B.

First dissociation constant of carbonic acid. Y. KAUKO (Ann. Acad. Sci. fenn., 1935, 41, no. 9, 6 pp. ; Chem. Zentr., 1936, i, 1818).—Published vals. are reviewed critically. The mean val. $K = 3·12 \times 10^{-7}$ at 18° is adopted. J. S. A.

Chemical nature of aqueous solutions of carbonic acid. Y. KAUKO (Maataloust. Aikak., 1935, 7, 18—28).—From data for the rate of evolution of CO_2 from H_2O at 6—14° the rate appears to be determined entirely by diffusion ; between 14° and 28° a unimol. chemical reaction appears to be superimposed. It is inferred that dissolved CO_2 is, in part, chemically bound. J. S. A.

Dissociation constants of organic acids. XVI. Thermodynamic primary dissociation constants of alkylmalonic acids. G. H. JEFFERY and A. I. VOGEL (J.C.S., 1936, 1756—1761).—From data for the conductivities of 0.0001—$0.01N$-Na salts at 25°, the vals. of $K_1 \times 10^4$ for the substituted acids are: methyl- 8·47, ethyl- 10·94, n-propyl- 10·26, dimethyl- 7·06, methylethyl- 15·43, diethyl- 70·80, ethylpropyl- 78·37, dipropyl- 91·98. The limiting mobilities of the ions have been evaluated.　　J. G. A. G.

Theory of $L_{\mathfrak{h}}$. III. N. A. TANANAEV (J. Appl. Chem. Russ., 1936, 9, 2055—2057).—Mathematical.
　　R. T.

Strength of acids in formamide. F. H. VER- HOEK (J. Amer. Chem. Soc., 1936, 58, 2577—2584).— Dissociation consts. of several carboxylic acids and phenols have been derived from the conductivity of their solutions in $HCO \cdot NH_2$. The results agree with those obtained independently by measurement of the p.d. between buffer solutions of the acids and a standard salicylate buffer. Dissociation consts. of a group of singly-charged cation acids have been obtained by the potentiometric method. The ion product of $HCO \cdot NH_2$ has the val. 10^{-17}. Comparison of the consts. with corresponding vals. for aq. solu- tions shows that if a carboxylic acid, a phenol, and a singly-charged cation acid have the same strength in H_2O, the phenol will be ~ 25 times as strong as the carboxylic acid in $HCO \cdot NH_2$ and the cation acid ~ 500 times as strong.　　E. S. H.

Amino-acids and peptides. III. Apparent acid dissociation constants in aqueous form- aldehyde solution. M. S. DUNN and J. G. WEINER (J. Biol. Chem., 1937, 117, 381—389).—Relationships (Harris, A., 1929, 648; Levy, A., 1933, 381) between the dissociation consts. of NH_2-acids and $[CH_2O]$ are confirmed and extended to other compounds, and empirical equations valid over a wide range of $[CH_2O]$ $(0.1$—$1.8M)$ are given. Structurally and optically isomeric NH_2-acids have identical acid dissociation consts.　　F. A. A.

Constitution of solutions of potassium bis- muthi-iodides. F. GALLAIS (Compt. rend., 1937, 204, 181—184).—Measurements of magnetic rotatory power (A., 1935, 592) indicate the existence of either $[BiI_6]^{-3}$ or $[BiI_7]^{-4}$ in acid solutions of KI and Bi_2O_3.
　　A. J. E. W.

Hydration of unsaturated compounds. IV. Rate of hydration of *iso*butene in the presence of silver ion. Nature of the *iso*butene–silver complex. W. F. EBERZ, H. J. WELGE, D. M. YOST, and H. J. LUCAS (J. Amer. Chem. Soc., 1936, 59, 45—49; cf. A., 1934, 1312).—Determination of distribution coeffs. shows that the complex ion is $C_4H_8Ag^{\cdot}$, and the equilibrium const. $[C_4H_8Ag^{\cdot}]/[C_4H_8][Ag^{\cdot}] = 61.7$. The rate coeffs. obtained can be interpreted by assuming that the free C_4H_8 present in aq. $AgNO_3$ hydrates, but that the complex does not.　　E. S. H.

Influence of electrolytes on the hydration of some complex cobalt compounds. J. BRÜLL (Compt. rend., 1937, 204, 349—352; cf. A., 1936, 940).—The velocities of hydration of several complexes

of Co containing Cl, Br, I, and NO_3 have been measured and the influence of the bromides of Li, Na, K, Rb, Ba, Ca, and Si is discussed.　　N. M. B.

Complex formation. G. GLOCKLER (Trans. Fara- day Soc., 1937, 33, 224—229).—A general survey is given, and a classification is proposed in which definite chemical compounds are at one end and van der Waals aggregates at the other. The usual con- ceptions of valency are inadequate to deal with all chemical phenomena, and the distinction between primary and secondary valency forces and van der Waals forces is a matter of convenience rather than of fundamental significance.　　F. L. U.

Electrical forces between ions and neutral molecules in aqueous solution. Salting-out effect. P. S. ALBRIGHT and J. W. WILLIAMS (Trans. Faraday Soc., 1937, 33, 247—256).—Dielectric consts. of aq. EtOAc solutions at different concns. have been determined at 25° and 50°, and the results have been used, in conjunction with existing solubility data, to examine the validity of Debye's theory of the salting- out effect. The electrolytes considered are the NH_4 and alkali metal halides (not fluorides), $MgSO_4$, Na_2SO_3, and $ZnSO_3$. With very dil. salt solutions the calc. solubilities agree well with those observed. In solutions of higher salt concn. departures from theory are to be expected and are observed. They are due in some cases to aggregation of the non-electrolyte leading to "salting-in." Excessive salting-out is unusual, but may be produced by highly hydrated ions.　　F. L. U.

Intermolecular forces in solutions. J. H. HILDEBRAND (Trans. Faraday Soc., 1937, 33, 144— 151).—A general survey, in which the relation between the deviations from Raoult's law and energies of vaporisation is discussed.　　F. L. U.

Theoretical basis of Raoult's law. E. A. GUGGENHEIM (Trans. Faraday Soc., 1937, 33, 151— 156).—Conditions for the validity of Raoult's law are discussed, with special reference to the effect of mol. vol.　　F. L. U.

Thermodynamics of cadmium chloride in aqueous solution from e.m.f. measurements. H. S. HARNED and M. E. FITZGERALD (J. Amer. Chem. Soc., 1936, 58, 2624—2629).—E.m.f. vals. for the cells Cd–CdHg$_x$ (11%)|CdCl$_2$ (0·0005—$1M$)|AgCl– Ag have been determined over the range 0—40°. At 25° $E_0 = 0.57300$ volt. The standard potential of Cd(s)|Cd$^{\cdot\cdot}$ at 0—40°, the relative partial mol. heat content and sp. heat of $CdCl_2$ in aq. solution have been calc.　　E. S. H.

Activity coefficient of copper sulphate in aqueous solution. F. E. W. WETMORE and A. R. GORDON (J. Chem. Physics, 1937, 5, 60—63).—The e.m.f. of the cell Cu|two-phase amalgam|CuSO$_4$| Hg$_2$SO$_4$|Hg has been measured at CuSO$_4$ concns. from $0.02M$ to saturation at temp. from 15° to 45°. The activity coeff. of $CuSO_4$ has been calc. from these measurements and from f.p. and heats of dilution.
　　W. R. A.

Osmotic and activity coefficient data of aqueous salt solutions from vapour-pressure measurements. R. A. ROBINSON (J. Amer. Chem.

Soc., 1937, **59**, 84—90).—Data are recorded for $TlNO_3$, $TlClO_4$, $TlOAc$, $RbNO_3$, $RbOAc$, $CsNO_3$, $CsOAc$, $BaCl_2$, $LaCl_3$, $K_4Fe(CN)_6$, and $Al_2(SO_4)_3$. Data for RbCl, RbBr, RbI, CsBr, and CsI have been redetermined. The abnormally low vals. for Na, K, Cs, and Tl nitrates are ascribed to incomplete dissociation. E. S. H.

Activities of aliphatic alcohols and halides in non-polar solvents. J. A. V. BUTLER and P. HARROWER (Trans. Faraday Soc., 1937, **33**, 171—178).—Activity coeffs. (f) of C_6H_6, CCl_4, and *cyclo*hexane in their mixtures agree qualitatively, but are $>$ those given by Hildebrand's theory. Vals. of f for PrCl, PrBr, PrI, BuCl, and BuBr in the above non-polar solvents are in the order $C_6H_6 < CCl_4 < C_6H_{12}$. MeOH, EtOH, PrOH, and BuOH have much larger f vals. in C_6H_6 and CCl_4, due, it is suggested, to association through formation of "OH" bonds. Entropies of dissolution of the alcohols, and their distribution coeffs. between H_2O and C_6H_6 and CCl_4, are calc. F. L. U.

Activity of glycine. E. R. B. SMITH and P. K. SMITH (J. Biol. Chem., 1937, **117**, 209—216).—The osmotic and activity coeffs. of glycine in H_2O at 25° have been determined by an isopiestic method using sucrose as reference substance (cf. Robinson and Sinclair, A., 1934, 1173). W. McC.

Vapour pressures of saturated solutions. A. E. HIRSCHLER (J. Amer. Chem. Soc., 1936, **58**, 2472—2474).—Theoretical. The parallelism of the $\log P$-$1/T$ curves for H_2O and saturated aq. solutions is discussed. E. S. H.

Thermodynamic and kinetic considerations of the vapour-pressure lowering of solutions. K. F. HERZFELD (Physikal. Z., 1937, **38**, 58—64).—The v.p. of a liquid under pressure, and the mechanism of osmotic pressure as well as the lowering of v.p. are considered, and discussed in relation to the views of Fredenhagen (A., 1934, 252, 728; 1935, 579, 699, 1201). A. J. M.

Volatilisation with water vapour of volatile substances in solution. P. JAULMES (Bull. Soc. chim., 1937, [v], **4**, 157—172).—Equations applicable to steam-distillation are deduced theoretically and verified by experiment. E. S. H.

Volatility of boric esters in alcoholic solution. P. JAULMES and E. GALHAC (Bull. Soc. chim., 1937, [v], **4**, 135—139).—The volatility of Et_3BO_3 in EtOH and the influence of the presence of H_2O and H_2SO_4 have been examined and compared with data for the volatility of Me_3BO_3. The results are discussed in relation to the determination of small quantities of H_3BO_3. E. S. H.

Volatility of boric acid with water vapour. System boric oxide-water. M. VON STACKELBERG, F. QUATRAM, and J. DRESSEL [with C. F. SPIESS and M. KUPFFER] (Z. Elektrochem., 1937, **43**, 14—28).—Equilibrium data show that the solid phases are ice, H_3BO_3 (m.p. 170°), HBO_2 (m.p. 203°), and glassy B_2O_3 containing H_2O. The conditions of stability for each of the phases have been determined. The vapour phase in contact with aq. solutions under ordinary conditions contains H_3BO_3 mols., but at very low H_2O pressures and higher temp. HBO_2 mols. are present. The heats of dissolution of H_3BO_3, HBO_2, and B_2O_3 in H_2O have been determined. E. S. H.

Volatility of boric acid. I. Aqueous solutions. P. JAULMES and (MLLE.) A. GONTARD. **II. Dry boric acid and superheated steam.** P. JAULMES and E. GALHAC (Bull. Soc. chim., 1937, [v], **4**, 139—148, 149—157).—I. The $[H_3BO_3]$ in the vapour given off by boiling aq. H_3BO_3 at 1 atm. is 0.0036 ± 0.0003 times $[H_3BO_3]$ in the liquid. The mol. state of H_3BO_3 in solution is discussed.

II. The composition of the vapour obtained by passing steam over H_3BO_3 at 104—204° has been determined. Below 144° the vapour contains H_3BO_3, but above 144° the volatilised product is HBO_2. E. S. H.

Deliquescence and efflorescence. Determination of critical hygrometric states. M. DIESNIS (Ann. Chim., 1937, [xi], **7**, 5—69; cf. A., 1936, 30).—The v.p. of 75 salts and of their saturated aq. solutions at different temp. have been determined by a static method and compared with previous results. Data for 20° and 25° are tabulated and the crit. hygrometric states are recorded. In certain cases, the latter are related to the solubility, but this is not a general rule. R. S.

Palladium–hydrogen equilibrium and new palladium hydrides. L. J. GILLESPIE and L. S. GALSTAUN (J. Amer. Chem. Soc., 1936, **58**, 2565—2573).—The pressure–composition diagram has been investigated between 200° and 313°. The *compounds* Pd_2H, Pd_3H, Pd_4H, and Pd_8H, but not PdH, are indicated. These compounds are regarded as solid solutions which have a fixed composition over a limited range of temp. Pd reacts with Hg, especially when it contains H_2, forming Pd_4Hg_3. E. S. H.

Thermal dissociation of lead peroxide. II. J. KRUSTINSONS (Z. Elektrochem., 1937, **43**, 65—66; cf. A., 1934, 733).—The dissociation pressure of electrolytically prepared PbO_2 has been determined between 287° and 314°. The vals. are $>$ those published for pptd. PbO_2. The calc. heat of dissociation is 20,480 g.-cal. E. S. H.

Thermal dissociation of higher sulphides of nickel. J. I. GERASIMOV, N. I. PIRTZCHALOV, and V. V. STEPIN (J. Gen. Chem. Russ., 1936, **6**, 1736—1743).—NiS_2 may be prepared from NiS and S at 500°. The v.p. at 700—750° of the sulphides represented by NiS_{1-2} rises abruptly when the S content is $>$ that of $NiS_{1\cdot4}$ (Ni_3S_4?). Formation of the solid solutions NiS_2–Ni_3S_4 and Ni_3S_4–Ni_6S_5 is suggested by the analytical and v.p. data. R. T.

Liquid and gaseous phases in the system nitrogen–carbon monoxide. N. F. JUSCHKEVITSCH and N. S. TOROTSCHESCHNIKOV (J. Chem. Ind. Russ., 1936, **13**, 1273—1283).—Mixtures of CO and N_2 at 90—112° abs. conform to the requirements of Raoult's law. The differential latent heats of vaporisation of CO and N_2 for various mixtures have been calc. for different temp. and pressures. Empirical equations connecting fugacity with temp. and pressure are derived. R. T.

Equilibrium curves of low-melting mixtures. M. RUHEMANN (Physikal. Z. Sovietunion, Spec. no., June, 1936, 67—82).—The sp. heats of CH_4–C_2H_6, CO–N_2, O_2–N_2, A–N_2, and A–O_2 mixtures have been determined at low temp., and the phase diagrams are indicated. The equilibrium relations between the two series of solid solutions formed by CO and N_2 are studied in detail.　　　　J. W. S.

Fusion diagrams of highly refractory oxides. VII. Systems with CaO and BeO. H. VON WARTENBERG, H. J. REUSCH, and E. SARAN (Z. anorg. Chem., 1937, **230**, 257—276; cf. A., 1933, 27).—The softening temp. and m.p. of the following mixtures are given : CaO with Cu_2O (E), BeO, MgO (E), Al_2O_3, TiO_2, ZrO_2, ThO_2 (E), Mn_3O_4, NiO (E), CoO (E), Cr_2O_3; BeO with Cu_2O, MgO, Al_2O_3, CeO_2, TiO_2, ZrO_2, ThO_2, Cr_2O_3, Mn_3O_4, Fe_3O_4, CoO, NiO. The systems with BeO, with the exception of BeO–TiO_2 in which compounds are formed, give exclusively simple eutectic curves, in contrast to the chemically similar MgO mixtures. The CaO systems give simple eutectics only with the oxides marked (E). Mixtures of CaO and Cr_2O_3 give $CaCrO_4$ when heated in air at temp. $\Rightarrow 2100°$, at which the O_2-dissociation pressure is <0.01 atm. In absence of air CaO,Cr_2O_3 (m.p. 2170°) is formed.　　　　F. L. U.

Liquidus curve and surface of the systems lithium and calcium nitrates and calcium, lithium, and potassium nitrates. A. LEHRMAN, E. ADLER, J. FREIDUS, and M. NEIMAND (J. Amer. Chem. Soc., 1937, **59**, 179—181).—The system $LiNO_3$–$Ca(NO_3)_2$ shows a eutectic at 235·2° and 70% $LiNO_3$. In the system $LiNO_3$–$Ca(NO_3)_2$–KNO_3 the eutectic temp. is 117·4° and the composition $LiNO_3$ 23, $Ca(NO_3)_2$ 15, KNO_3 62%.　　　　E. S. H.

Temperature–concentration equilibria in the systems chloroform–chlorine and chloroform–bromine. Chloroform chlorinates. J. A. WHEAT and A. W. BROWNE (J. Amer. Chem. Soc., 1936, **58**, 2410—2413).—The following *compounds* are formed : $(CHCl_3)_2,Cl_2$ (m.p. $-80.0°$), $CHCl_3,Cl_2$ (m.p. $-96.5°$), $CHCl_3,2Cl_2$ (m.p. $-112.5°$), $CHCl_3,3Cl_2$ (m.p. $-115°$). Br does not form compounds with $CHCl_3$.

　　　　E. S. H.

The system SO_2–decalin. W. F. SEYER and W. F. CORNETT (Ind. Eng. Chem., 1937, **29**, 91—92).—F.p. and complete miscibility temp. for decalin containing 72·5% of *trans* and 27·5% of *cis* forms are recorded. The crit. solution temp. is 41·8°. Since the f.p. of the two-liquid systems decrease with increase in mol.-% SO_2, the solubilities of the two forms of decalin are different.　　　　R. C. M.

Thermal analysis of mixtures of ammonium nitrate, guanidine nitrate, and nitroguanidine. T. URBAŃSKI and J. SKRZYNECKI (Rocz. Chem., 1936, **16**, 353—358).—Data for the binary eutectics are : NH_4NO_3 (I) 74, guanidine nitrate (II) 26%, f.p. 127·7°; (I) 80, nitroguanidine (III) 20%, f.p. 131·5°, (II) 59, (III) 41%, f.p. 166·5°; those for the ternary eutectic are : (I) 60, (II) 22·5, (III) 17·5%, f.p. 113·2°. R. T.

Thermal analysis of binary systems containing glyceryl trinitrate. I, II. J. HACKEL (Rocz. Chem., 1936, **16**, 323—333, 366—376).—I. $PhNO_2$, m-$C_6H_4(NO_2)_2$, s-$C_6H_3(NO_2)_3$, o-, m-, and p-$C_6H_4Me\cdot NO_2$, s-$C_6H_3Me(NO_2)_2$, tetryl, and hexogen yield simple eutectics with the two modifications of glyceryl trinitrate (I).

II. Et centralite forms an unstable 1 : 1 compound with the two modifications of (I), whilst binary systems of (I) with mannitol hexanitrate, erythritol tetranitrate, pentaerythritol tetranitrate, $NHPh_2$, urethane, phenylurethane, phthalide, and Me centralite consist of simple eutectics. The systems (I)–camphor and –glycol dinitrate were only partly studied, owing to the high η and low velocity of crystallisation of the mixtures.　　　　R. T.

Thermal analysis of binary mixtures containing esters of nitric acid. IV. T. URBAŃSKI (Rocz. Chem., 1936, **16**, 359—365).—The data suggest formation of unstable 1 : 2 compounds of mannitol hexanitrate (I) with $PhNO_2$, o-$C_6H_4Me\cdot NO_2$, and Et o-nitrocinnamate, and of a 2 : 1 compound with Et o-nitrobenzoate. Simple eutectics are formed in the systems : (I)–$NHPh\cdot CO_2Et$, –erythritol tetranitrate –s-$OEt\cdot C_6H_2(NO_2)_3$, and pentaerythritol tetranitrate–m-$NO_2\cdot C_6H_4\cdot NH_2$ and –$Me_2C_2O_4$.　　　　R. T.

Activity of carbonyl groups of benzil in binary systems. K. HRYNAKOWSKI and H. STASZEWSKI (Rocz. Chem., 1936, **16**, 388—394).—The systems benzil–PhOH, –$NHPh_2$, –o- and –m-$C_6H_4(OH)_2$ consist of unbroken series of practically ideal solutions. It is inferred that the residual valencies of the CO groups are not augmented by their proximity in benzil.

　　　　R. T.

Equilibrium of reaction of nickel with carbon dioxide. A. F. KAPUSTINSKI and A. SILBERMAN (Acta Physicochim. U.R.S.S., 1936, **5**, 605—616).—Equilibrium data for $Ni + CO_2 \rightleftharpoons NiO + CO$ have been determined by the method previously described (A., 1936, 1464) between 600° and 1000°. The heat of formation, free energy, and entropy of NiO are calc.

　　　　F. L. U.

System lime–boric oxide–silica. E. P. FLINT and L. S. WELLS (J. Res. Nat. Bur. Stand., 1936, **17**, 727—752).—The phase diagram for the system CaO–B_2O_3–SiO_2 has been constructed. An area of liquid immiscibility extends across the diagram from the CaO–SiO_2 side to the CaO–B_2O_3 side, crossing the SiO_2, CaO,$2B_2O_3$, and CaO,B_2O_3 (I) regions. The existence of $5CaO,B_2O_3,SiO_2$ (II), m.p. 1419°, has been established. Solid solutions of (I), 2CaO,B_2O_3, or (II) in 2CaO,SiO_2 (III) cause a max. lowering of 190° in the temp. at which α–β inversion of (III) occurs.　　　　C. R. H.

Electrolysis of sodium chloride in liquid ammonia. III. Solubility in the ternary system NaCl–NH_4Cl–NH_3. E. I. ACHUMOV and E. A. EZEROVA (J. Gen. Chem. Russ., 1936, **6**, 1418—1429).—Phase diagrams are recorded for the interval $-70°$ to 110°. Pt is appreciably sol. in NH_3–NH_4Cl at $>80°$.　　　　R. T.

System $CaSO_3$–H_3PO_4–H_2O. J. D'ANS and P. HÖFER (Angew. Chem., 1937, **50**, 101—104).—The (enhanced) solubilities of anhydrite and gypsum (at 25° and 83°) and of $CaSO_4,0.5H_2O$ (I) (at 83°) in H_3PO_4–H_2O mixtures have been determined, and the

bearing of the data on the production of H_3PO_4 from $Ca_3(PO_4)_2$ is discussed. At 25°, anhydrite is stable when the solution contains > 83 g. of H_3PO_4 per 100 g. of H_2O, whilst at 83° it is stable over the whole range of solutions; owing to the great tendency to supersaturation, the solubilities of gypsum and (I) can, however, be determined at this temp. and the inversion point, above which (I) is the less sol., corresponds with 45 g. of H_3PO_4 per 100 g. of H_2O.

R. C. M.

System $FeAsO_4$–NaOH–H_2O. I. S. VEICHHERTZ and I. V. KRASCHEVSKAJA (J. Appl. Chem. Russ., 1936, 9, 1909—1919).—The reaction $FeAsO_4 + 3NaOH \rightarrow Fe(OH)_3 + Na_3AsO_4$ proceeds to completion at 90° when 6 mols. of NaOH are taken per mol. of $FeAsO_4$, irrespective of the [NaOH]. When the ratio $FeAsO_4$: NaOH < 0·25, the compounds $Na_6Fe(AsO_4)_3$, $Na_3Fe(AsO_4)_2$, and $Na_3Fe_2(AsO_4)_3$ appear to be formed.

R. T.

Thermal decomposition of ammonium-permutite, ammonium-bentonite, and ammonium-clay. O. BOTTINI (Kolloid-Z., 1937, 78, 68—71).—The % loss of NH_3 from NH_4-permutite, -bentonite, and -clay has been measured at 50° intervals between 50° and 550°. Differences in the form of the curves point to structural differences between the three substances.

F. L. U.

Calculation of isothermals in quaternary systems. T. A. POPOVA (J. Phys. Chem. Russ., 1936, 8, 85—87).—A consideration of the isothermals in the system $CaO + Al_2O_3 + Fe_2O_3 + SiO_2$.

E. R.

Solid phase rule (Bodenkörperregel) in the peptisation of metal oxides. N. F. JERMOLENKO (Kolloid. Shur., 1935, 1, No. 2, 16—27; cf. A., 1930, 158).—The peptisation of CuO in aq. NH_3, of Ni_2O_3 and Fe_2O_3 in aq. HCl, and of PbO in aq. HNO_3 varies with the amount of the solid phase and the original concn. of the solution.

J. J. B.

Free energy of hydrogen cyanide from spectroscopic data. A. R. GORDON (J. Chem. Physics, 1937, 5, 30—32).—The free energy and heat content of gaseous HCN are calc. from spectroscopic data, and vals. for the equilibrium const. for the formation of gaseous HCN from its elements are recorded which are in good agreement with those of Lewis and Randall, but not with those of Badger. The equilibrium const. for the exchange reaction with D_2 is also given. The entropy of liquid HCN is computed.

W. R. A.

Latent energy of solid solutions. J. CICHOCKI (Compt. rend., 1937, 204, 233—234).—The latent energy is defined as the work required to compress the solute atoms into the space available in the solvent lattice. The lowering of the m.p. of Cu by dissolved Al, calc. on this basis, is in agreement with experiment.

A. J. E. W.

Association, heat of mixing, and miscibility gaps. K. L. WOLF (Trans. Faraday Soc., 1937, 33, 179—190).—Heats of dilution are discussed in reference to the formation of " mol. and supermol. solutions " and " mol. mixtures."

F. L. U.

Derivation of certain thermodynamic relations; a generalised equation of sorption and a new equation of electrocapillarity. B. V. DERJAGUIN (Kolloid. Shur., 1935, 1, 217—222).—The changes of free energy associated with the movement of a sorbent in a gravitational field and of a double layer in an electrostatic field are calc. and the results discussed.

J. J. B.

Energy and entropy of hydration of organic compounds. J. A. V. BUTLER (Trans. Faraday Soc., 1937, 33, 229—236; cf. A., 1935, 441, 1067; 1936, 1205).—The free energy, heat (ΔH) and entropy (ΔS) of hydration of simple org. compounds in very dil. solution are discussed. The relation between ΔH and ΔS both for non-polar compounds and for aliphatic alcohols is linear, but the two lines do not coincide.

F. L. U.

Heat capacity of bound water and of soil. P. I. ANDRIANOV (Kolloid-Z., 1937, 78, 107—108).—The calc. sp. heat of H_2O in combination with $MgSO_4$, $CuSO_4$, $CaSO_4$, and $Na_2S_2O_3$ is 0·4—0·8. Measurement of the sp. heat of dried and moist soils shows that the sp. heat of the hygroscopic H_2O is 0·70—0·75.

F. L. U.

Heats of dissolution and heats of reaction in liquid ammonia. F. C. SCHMIDT, J. SOTTYSIAK, and H. D. KLUGE (J. Amer. Chem. Soc., 1936, 58, 2509—2510).—Mol. heats of dissolution of NH_4Cl, NH_4Br, EtOH, PbI_2, HgI_2, LiI, LiBr, RbBr, and C_5H_5N in liquid NH_3 have been determined. The heat of dilution is negative for EtOH and positive for the NH_4 salts.

E. S. H.

Heat of hydrogenation of ethylene. F. D. ROSSINI (J. Res. Nat. Bur. Stand., 1936, 17, 629—638).—Thermal data for the combustion of H_2, C_2H_4, and C_2H_6, and for the hydrogenation of C_2H_4 have been examined. The most trustworthy vals. for the reaction C_2H_4 (gas) + H_2 (gas) → C_2H_6 (gas) based on hydrogenation and combustion data, respectively, are $-32·64 \pm 0·06$ and $-32·78 \pm 0·13$ kg.-cal. per mol.

C. R. H.

Heat of reaction of the aldol condensation with [formation of] hexose-1-phosphoric acid. O. MEYERHOF and W. SCHULZ (Biochem. Z., 1936, 289, 87—96).—The heat of the enzymic reaction glyceraldehyde (I) + dihydroxyacetonephosphoric acid (II) → hexose-1-phosphoric acid (III) is 15,000 g.-cal. per mol. (82 g.-cal. per g. of hexose) both for the synthesis of fructose 1-phosphate and for the mixture of d-fructose and d-sorbose 1-phosphates. The heat of reaction of the chemical aldol condensation using (I) is 14,500 g.-cal. (81 g.-cal. per g.) and using $CO(CH_2 \cdot OH)_2$ 19,000 g.-cal. (106 g.-cal. per g.). The difference of 25 g.-cal. is ≤ the val. derived from the heat of combustion. Since the vals. for the synthesis of (III) correspond almost exactly with those for synthesis of hexose diphosphate from 2 mols. of (II) (14,000 g.-cal. per mol.) it follows that the intermediate reaction (II) ⇌ glyceraldehydephosphoric acid is approx. thermoneutral.

P. W. C.

Conductance of aqueous solutions as a function of concentration. II. Potassium ferrocyanide. J. JONES and F. C. JELEN (J. Amer. Chem. Soc., 1936, 58, 2561—2565; cf. A., 1934, 491).—Data obtained at 0° and 25° for a wide range of

concn. have been applied to various equations already proposed.   E. S. H.

Resistance and capacity behaviour of strong electrolytes in dilute aqueous solution. I. Simultaneous observation of conductance and dielectric constant at high radio frequencies. II. Dispersion of electrical conductance. O. M. ARNOLD and J. W. WILLIAMS (J. Amer. Chem. Soc., 1936, **58**, 2613—2616, 2616—2624).—I. Apparatus of the comparator-resonance type is described and the theory of the circuits discussed.

II. Dispersion of electrical conductance has been studied in very dil. solutions of strong electrolytes of different valency types. The results agree with theory and indicate that interionic forces offer an adequate explanation of the behaviour of an ideal electrolyte.   E. S. H.

Degree of dissociation of bi-bivalent salts in very dilute aqueous solution. E. A. O'CONNOR (Nature, 1937, **139**, 151—152).—Conductivity data for aq. solutions of Ca and Sr dithionates and sulphates, and of their mixtures in which S_2O_6'' and SO_4'' are the common negative ions, show that the corresponding Ca and Sr salts have practically the same Λ over the range 0·00005—0·001 equiv. The plot of Λ against (equiv. concn.)$^{\frac{1}{2}}$ deviates from linearity only at the highest concn. but the slope of this line is $\geqslant$ that predicted by Onsager's equation and salts with the higher Λ_∞ give the smaller slope, contrary to this equation. The conductivities of all the mixtures are additive, indicating complete dissociation.   L. S. T.

Influence of carbamide and mannitol on the conductivity of potassium chloride. K. JABŁCZYŃSKI and Z. JAWORSKI (Rocz. Chem., 1936, **16**, 411—415).—The conductivity of 0·5—2N-KCl is reduced by addition of $CO(NH_2)_2$ or mannitol, to an extent corresponding with the increased η of the solutions. It would seem that K· and Cl′ are not hydrated.   R. T.

Conductivity of salts in n-propyl and iso-propyl alcohols. F. HOVORKA and J. C. SIMMS (J. Amer. Chem. Soc., 1937, **59**, 92—95).—Data are recorded for KI, KBr, NaI, and NaBr as solutes. The calc. dissociation consts. show that these systems are weak electrolytes. The principle of additivity does not apply.   E. S. H.

Constitution of organo-metallic bases and salts. K. A. JENSEN (Z. anorg. Chem., 1937, **230**, 227—285; cf. this vol., 14).—Compounds of the type $R_{n-1}MX$ and $R_{n-1}MOH$ (M = n-valent metal, X = acid radical), although frequently designated "salts" and "bases," usually exhibit only slight conductivity in H_2O or MeOH. Ions are provided, not by direct dissociation, but by chemical interaction with the solvent (aquotisation, alcoholisation), e.g., $[SnMe_3OH] + H· \rightleftharpoons [SnMe_3H_2O]·$; $[HgEtCl] + H_2O \rightleftharpoons [HgEtH_2O]· + Cl′$.   F. L. U.

Conductivity and cataphoretic speed measurements of benzopurpurin 4B, Congo-red, and sky-blue F.F. B. N. ACHARYA, A. M. PATEL, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, **4**, A, 503—513).—The influence of dye concn., dialysis, and addition of NaCl and $BaCl_2$ has been studied. Changes in conductivity and cataphoretic speed are attributed to aggregation of the dye ions to form ionic micelles, and the dyeing of cotton fibre by substantive dyes is explained on this basis.   R. S.

Influence of gelatin on transport numbers and conductivity of hydrochloric acid and potassium chloride. V. M. VDOVENKO and N. A. MALOV (J. Gen. Chem. Russ., 1936, **6**, 1609—1614).—The transport no. u of Cl′ falls with increasing concn. of gelatin (I) to a const. val. at 1%, for 0·02N-HCl; for 0·1N-HCl it rises continuously, whilst for 0·1N-KCl max. u is obtained with 4% (I). The sp. conductivity of 0·02N-HCl and of H· falls to a const. val. at 3% (I), whilst that of Cl′ rises to a max. at 1% (I), and then falls to a const. val. at 3%.   R. T.

Standard electrode potential of silver. J. J. LINGANE and W. D. LARSON (J. Amer. Chem. Soc., 1936, **58**, 2647—2648).—Published data for the standard potential of the Ag–AgCl electrode and the activity product of AgCl lead to $E^0_{Ag, Ag^+} = -0.7996$ volt.   E. S. H.

Theory of metal potential. I. Local current theory of metal potential and its application to the electromotive behaviour of metals in oxygen-free solutions. II. Metal potential in oxygen-containing or oxidising solutions. W. J. MÜLLER (Monatsh., 1936, **68**, 431—449; **69**, 437—445).—I. The author's theory is applied to the explanation of anomalies presented by measurements of the potential at Cd, Fe, Ni, and Zn electrodes.

II. The theory is extended to cover depolarised electrodes.   J. W. S.

Influence of electrolytes on electrification of water by atomisation. T. MALARSKI (Acta phys. polon., **3**, 43—74; Chem. Zentr., 1936, i, 1810—1811).—Small amounts of electrolytes have a considerable influence on the atomisation potential; cations and anions exert a sp. effect in the same sense as that shown in electrokinetic phenomena. A tentative relation is derived between electrolyte concn. and the double layer potential.   J. S. A.

Diffusion potentials. I. Measurements relating to concentration-elements. II. Maxima and minima in the diffusion of a mixture of electrolytes. J. J. HERMANS (Chem. Weekblad, 1937, **34**, 25—27).—The problem of diffusion potential is discussed and certain conclusions are checked by diffusion measurements in dil. HCl, NaCl, and $BaCl_2$ solutions. Max. and min. effects are readily observed in the diffusion of 0·01—0·1N-NaCl in 1% agar into NaOH (phenolphthalein indicator) and 0·01N-HCl in 2% agar into H_2O (indigocarmine indicator).   S. C.

Potentials at the interface of two liquid phases. IV. K. KARCZEWSKI (Rocz. Chem., 1936, **16**, 348—352).—The potential ε at the interface aq. KCNS–Bu$^\beta$CO$_2$H becomes more positive with increasing [KCNS] up to 0·1N, and then falls gradually; in the case of $CH_2Ac·CO_2Et$ a max. is attained at 0·01N-KCNS. In the systems aq. KCNS–Bu^{a}OH, –Bu$^\beta$OH, –iso-C_5H_{11}·OH, and –EtOAc, ε falls continuously with rising [KCNS].   R. T.

Potential difference at an air–water interface. J. A. CHALMERS and F. PASQUILL (Phil. Mag., 1937, [vii], **23**, 88—96).—A val. of 0·26 volt has been obtained for the sum of the p.d. at H_2O–air, air–wet filter-paper, and filter-paper–H_2O interfaces. The individual vals. for the two last interfaces are supposed to be zero owing to the random orientation of the H_2O mols., and the val. 0·26 volt thus represents the p.d. at the H_2O–air interface; this is probably due to a surface double layer of oriented H_2O mols. A. J. E. W.

Cells with dissimilar electrodes. (MLLE.) S. VEIL (Compt. rend., 1937, **204**, 242—244; cf. A., 1935, 1462).—The effect of oxidising or amalgamating the electrodes on the e.m.f. of the cell metal I–H_2O–metal II is discussed. The e.m.f. of the cell Zn–Na_2S (sat.)–gelatin–$Fe(NO_3)_3$ (sat.)–Pt is 2·05 volts. A. J. E. W.

Oxidation–reduction potentials of thiol compounds derived from thermal data. H. BORSOOK, E. L. ELLIS, and H. M. HUFFMAN (J. Biol. Chem., 1937, **117**, 281—308; cf. A., 1935, 304).—The oxidation–reduction potentials of the systems cystine (I) ⇌ cysteine (II) and dithiodilactic acid ⇌ thiolactic acid have been calc. The vals. previously obtained by direct measurement for the (I) ⇌ (II) system are not characteristic. The reduction of indigotindisulphonate by (II) is catalysed by SeO_2, which yields a cryst. compound with (II), but not by salts of Fe, Cu, Co, Ni, or Mg. W. McC.

Oxidation–reduction potentials of 2-hydroxyphenazine and 2-keto-10-methyl-2 : 10-dihydrophenazine [*N*-methyl*apo*safranone]. P. W. PREISLER and L. H. HEMPELMANN (J. Amer. Chem. Soc. 1937, **59**, 141—144).—The oxidation–reduction potentials of 2-hydroxyphenazine and methyl*apo*safranone (I) (Kehrmann and Cherpillod, A., 1925, i, 302) are determined electrometrically. Both systems show the two-step process below p_H 3 and a transformation into an apparent one-step process above p_H 3. (I) is suggested as an indicator for determination of p_H (2—4) and oxidation–reduction potentials. H. B.

Oxidation–reduction potential of reductic acid. (MME.) N. MAYER (Compt. rend., 1937, **204**, 115—117).—The oxidation of reductic acid to oxyreductic acid is a reversible process; the val. of E_0 is $+0·467 \pm 0·005$ volt at 23°. A. J. E. W.

Oxidation–reduction equilibrium. I, II. L. BRÜLL (Annali Chim. Appl., 1936, **26**, 437—442, 443—450).—I. The potential associated with two reversible oxidation–reduction systems in equilibrium is discussed theoretically.

II. The experimental results for the system benzoquinone–quinol–chlorobenzoquinone–chloroquinol are in good agreement with calc. vals. L. A. O'N.

Hydrogen overvoltage and the reversible hydrogen electrode. J. A. V. BUTLER (Proc. Roy. Soc., 1936, **A**, **157**, 423—433).—When the adsorption energy of H atoms on a metallic cathode is appreciable, these can be deposited at a lower potential than "free" H, liberated according to Gurney's mechanism (A., 1932, 25). At a certain p.d. the rates of transfer of H ions to adsorption positions and of the reverse process are equal, and the activation energy of the reversible transfer may be low enough to give rise to a reversible electrode. H cannot be continuously liberated in this way unless the rate of desorption as H_2 mols. is > the rate of electrolytic separation. L. L. B.

Overvoltage of hydrogen at mercury. S. VON NÁRAY-SZABÓ (Naturwiss., 1937, **25**, 12—13).—The overvoltage, e, at a pure Hg cathode is given by $e = a + b \log i$ (in which a and b are consts. and i is the c.d.). For $2N$-HCl, a varies from —0·484 to —0·582 volts and for $2N$-H_2SO_4 it is —1·044 volts, whilst b varies from —0·072 to —0·126 for $2N$-HCl, and from —0·055 to 0·075 for $2N$-H_2SO_4. Traces of As_2O_3 cause a considerable increase in e, and the curve is no longer linear. O_2 affects e similarly, but traces of Pt are without effect. A. J. M.

Concentration polarisation in the electrolysis of water. P. I. SOKOLOV [with Z. F. LEVISSON] (J. Gen. Chem. Russ., 1936, **6**, 1721—1728).—Concn. polarisation in the electrolysis of aq. solutions, as measured by means of an auxiliary gas electrode fitted to the working electrodes, can be almost completely eliminated at the cathode, and partly so at the anode, by adequate circulation of the electrolyte. The aggregate polarisation potential in electrolysis of 30% KOH (c.d. 500—5000 amp. per sq. m.) varies from 0·151 to 0·183 volt, pointing to the existence of very considerable differences in [OH'] at the cathode and anode. R. T.

Cathode polarisation in precipitation of zinc from solutions of its simple salts. O. ESSIN and A. LEVIN (J. Gen. Chem. Russ., 1936, **6**, 1539—1548).—The expression $E = k \log D$, where E is the cathode polarisation potential, k is a const., and D is the c.d., is shown to hold for 0·5—1·0N-$ZnSO_4$ in 0·1—0·3N-H_2SO_4, at c.d. >0·1 amp. per sq. cm., if corrections are made for the effects of dissolution of Zn at the cathode, and for the polarisation potential of H_2. At very low c.d. (<0·01 amp. per sq. cm.) an additional potential of about 0·06 volt appears. R. T.

Cathodic polarisation in the deposition of copper and zinc from solutions of complex cyanides. O. ESSIN and E. ALFIMEEVA (J. Phys. Chem. Russ., 1936, **8**, 137—146).—Experiments relating to the deposition of Zn from $K_2Zn(CN)_4$ show that the cathodic polarisation is entirely of the concn. type. The same conclusion follows from observations on the deposition of Cu from CuCN + 1·5 or 2KCN, if it is assumed that the only anions present in the solutions are CN' and $Cu(CN)_2'$. E. R.

Simultaneous discharge of cadmium and hydrogen ions from solutions of complex cyanide salts. O. ESSIN and T. BEKLEMISCHEVA (J. Gen. Chem. Russ., 1936, **6**, 1602—1608).—The cathode potential–c.d. curves obtained in electrolysis of 0·1M-$K_2Cd(CN)_4$ + 0·05M-KCN can be explained in terms of concn. polarisation, due to changes in the concn. of the cation. Discharge of H· at the cathode takes place in accordance with the equation of Erdey-Gruz and Volmar (A., 1930, 1376). R. T.

Concentration polarisation in fused salts. S. KARPATSCHEV and S. REMPEL (J. Phys. Chem. Russ., 1936, 8, 134—136).—The existence of concn. polarisation in fused electrolytes is shown by a comparison of the current–potential curves of fused KCl + LiCl with and without stirring. E. R.

Passivity of iron and steel in nitric acid solution. XIII. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1936, 15, 1257—1284; cf. A., 1936, 938).— It is suggested that passivity occurs when the dissolution potential of Fe in aq. HNO_3 exceeds the decomp. voltage of the solution. This has been confirmed by increasing or decreasing the decomp. voltage by addition of $CO(NH_2)_2$ and $NaNO_2$ or $AgNO_3$, respectively. R. S.

Passivity of chromium. V. E. MÜLLER and V. ČUPR (Z. Elektrochem., 1937, 43, 42—52; cf. A., 1936, 800).—The conditions for the activation of passive Cr in acids by cathodic polarisation and for the passivation of active Cr by anodic polarisation have been determined. The influence of the anion is discussed. E. S. H.

Principle of polarographic measurements. A. H. W. ATEN (Chem. Weekblad, 1937, 34, 22— 23).—An explanation is given of the method of measuring concn. of ions by use of the dropping Hg electrode. S. C.

(A) Sound-sensitive state of certain metallic electrodes. (B) Influence of concentration of electrolyte on sound-sensitivity of platinum electrodes. L. V. NIKITIN (J. Gen. Chem. Russ., 1936, 6, 1393—1400, 1401—1403).—(A) The electrode potential at which cathodes in $0.001N$-HCl exhibit sensitivity to acoustic waves (cf. A., 1935, 306) in the electrolyte varies with the nature of the cathode (Pt, Pb, Cu, Fe, Al), with the duration of electrolysis, and with the c.d. The anode does not take any part in the phenomenon.

(B) With a Pt cathode in $0.0001—0.2N$-HCl the min. and max. c.d. at which acoustic effects are obtained run parallel with the [HCl]. R. T.

Theory of unimolecular reactions. L. LANDAU (Physikal. Z. Sovietunion, 1936, 10, 67—77).—The transition from unimol. to bimol. reaction type with decrease in the pressure is studied in terms of the entropies of the reactants. R. S. B.

Combustion levels. W. T. DAVID (Nature, 1937, 139, 67—68).—A discussion. L. S. T.

Influences of dilution on the explosive combustion of hydrocarbons. W. A. BONE and L. E. OUTRIDGE (Proc. Roy. Soc., 1936, A, 157, 234— 248).—The effects of dilution with He, A, and N_2, respectively, on explosions of $C_2H_4 + O_2$ (I) and $C_2H_2 + O_2$ (II) mixtures have been studied. Combined chemical, photographic, and spectrographic evidence is adduced to show that, whereas there is neither H_2O formation nor C separation during the undiluted explosions, progressive dilution beyond a point at which the mean flame temp. becomes <2000° may induce both. This effect is more marked in (I) than in (II), and with N_2 than with A or He as diluent. It is probably due to the fall in flame temp. induced by dilution. L. L. B.

Slow combustion of benzene. J. AMIEL (Ann. Chim., 1937, [xi], 7, 70—120; cf. A., 1936, 684, 939).— The slow combustion of $C_6H_6 + 7.5O_2$ mixtures at 1 atm. pressure in sealed Pyrex tubes has been studied. Below 400° reaction is very slow, but at >565° the mixture explodes. The % of CO_2 in the products after 2 hr. increases steadily with rise of temp., and at 473° becomes equal to the % of CO, which attains a max, at 476°. The whole of the C_6H_6 is oxidised after 2 hr. at 510° and combustion of the CO is complete at 575°. Analytical data are given showing the variation in the % of CO, CO_2, and O_2 with time, and triangular diagrams have been constructed. The reaction velocity is a const. for a considerable fraction of the total time and varies with the temp. according to $\log_e V = -28300/T + 41.95$. PhOH and traces of benzoquinone are formed but aldehydes and peroxides could not be detected. R. S.

Influence of dissociation on flame temperatures. L. REINGOLD (Chaleur et Ind., 1935, 16. 275—284, 463—472; Chem. Zentr., 1936, i, 1821).— The effect on temp. of combustion of thermal dissociation processes occurring between 1500° and 2000° is calc. J. S. A.

Action of oxygen in polymerisation reactions. H. DOSTAL and H. MARK (Oesterr. Chem.-Ztg., 1937, 40, 50—51).—In the polymerisation of vinyl derivatives an induction period, of the same order as the mean time of growth of a single polymeride chain, is observed only in presence of O_2. O_2 is considered to increase the mean time of growth of chains by hindering the intramol. or intermol. chain-breaking processes. J. S. A.

Reactions of sodium atoms with oxides of nitrogen. C. E. H. BAWN and A. G. EVANS (Mem. Manchester Phil. Soc., 1935—1936, 80, 1—6).—The rate of reaction between Na vapour and NO_2 is 4 times that between Na and N_2O. The primary reaction is $Na + N_2O$(or NO_2) → $NaO + N_2$(or NO). To secondary reactions between NaO and Na vapour is attributed the chemiluminescence which accompanies the reaction, and which for NO_2 is < for N_2O on account of quenching by the NO formed. The chemiluminescence with N_2O is decreased by raising the temp. of the reaction zone. The reaction between Na vapour and NO is termol. and is not chemiluminescent. C. R. H.

Kinetics of gaseous addition of halogen acids to isobutene. G. B. KISTIAKOWSKY and C. H. STAUFFER (J. Amer. Chem. Soc., 1937, 59, 165— 170).—The gaseous thermal decomp. of $Bu^\gamma Br$ at 509—564° abs. is a homogeneous unimol. reaction, with the rate const. $k = 10^{13.3 \pm 0.4} e^{-(40,500 \pm 1000)/RT}$ sec.$^{-1}$ The equilibrium of $Bu^\gamma Br$ and $Bu^\gamma Cl$ with isobutene and the respective halogen acid has been investigated at 361—533° abs. The heats of reaction, free energy changes, and rate equations of the association reactions have been determined. The isomerisation of $Bu^\gamma Cl$ to $Bu^\beta Cl$ at 270° is <7.8% at equilibrium. E. S. H.

Thermal decomposition of gaseous silicon tetramethyl. D. F. HELM and E. MACK, jun. (J. Amer. Chem. Soc., 1937. 59, 60—62).—At 659—717°

the reaction is homogeneous and unimol. at pressures >10 cm.; at lower pressures it is of a higher order. The energy of activation is about 79,000 g.-cal.; the velocity coeff. is given by $\log_e k = 35 \cdot 03 - 78,800/RT$. A deposit of Si and C is produced during decomp.

E. S. H.

Primary processes in the thermal decomposition of butane.—See B., 1937, 20.

Introduction of radioactive halogen into organic molecules. N. BREJNEVA, S. ROGINSKI, and A. SCHILINSKI (Acta Physicochim. U.R.S.S., 1936, 5, 549—574).—Exchange reactions with $AlBr_3$ containing one radioactive Br are applied to the introduction of radioactive Br into Br_2, HBr, and org. bromides. The velocity of exchange increases with rise of temp., and is slower for aromatic than for aliphatic bromides. Similar exchange reactions with chlorides and iodides have also been investigated.

C. R. H.

Reaction kinetics of mixed polymerisations. H. DOSTAL (Monatsh., 1936, 69, 424—426).—The kinetics of the production of polymerides from two or more different initial products are developed.

J. W. S.

Effect of structure on the reactions of organic compounds. Benzene derivatives. L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 96—103).— The effect of a m- or p-substituent in the C_6H_6 ring on the rate or equilibrium of a reaction in which the reacting group is in a side-chain attached to the ring is given by $-RT \log_e K + RT \log_e K^0 = \Delta F = (A/d^2)(B_1/D + B_2)$, where K is a rate or equilibrium const. for a substituted reactant, K^0 that for the unsubstituted reactant, ΔF a free energy change, d the distance from the substituent to the reacting group, D the dielectric const. of the medium, and A, B_1, and B_2 are consts. independent of temp. and solvent. The formula agrees with the theory that a substituent acts by internal electron displacement. Tables of substituent and reaction consts. are given, from which the effects of many substituents can be calc.

E. S. H.

Kinetics of the oxidation of ferrous ions by nitric acid. E. ABEL (Monatsh., 1936, 68, 387—393).—Oxidation of $Fe^{\cdot\cdot}$ by HNO_3 occurs through formation of HNO_2, and comprises successive reactions between HNO_2 and $Fe^{\cdot\cdot}$, HNO_2, $Fe^{\cdot\cdot}$, and $H^{\cdot}$, HNO_2, $H^{\cdot}$, and NO_3', and NO_2 and $Fe^{\cdot\cdot}$. The velocity coeffs. of these reactions have been determined.

J. W. S.

Reaction between osmium tetroxide and hydrobromic acid. II. Rate study. H. D. KIRSCHMAN and W. R. CROWELL (J. Amer. Chem. Soc., 1937, 59, 20—23; cf. A., 1933, 351).—The reaction kinetics have been investigated at 100° in $1 \cdot 2$—$3 \cdot 5M$-HBr. The reaction in the rate-determining step is of the first order with respect to each of the reacting constituents. A mechanism for the steps in the initial stages of the reaction is proposed.

E. S. H.

Influence of neutral salts on the velocity of esterification and viscosities in ethyl–alcoholic hydrochloric acid. A. KAILAN and W. MELZER (Monatsh., 1936, 69, 377—398).—The viscosity (η) and velocity of esterification (v) at 25° have been determined for BzOH solutions in $N/3$ and $2N/3$ HCl in EtOH, to which various amounts of LiCl, $CaCl_2$, or $HgCl_2$ are added. In a first approximation, the results may be explained by assuming that v is decreased by the increase in η. In EtOH almost free from H_2O the addition of salts only increases η, but in presence of H_2O, neutral salts, through hydrate formation, decrease the retarding action of the H_2O. Increase in the $[H_2O]$ and decrease in the [HCl] favours the increase in sp. conductivity of the EtOH solution through addition of these salts. $HgCl_2$ has the least effect of the salts investigated.

J. W. S.

Organic reactions. Velocity as a means of appreciating steric molecular constitution. J. RODRIGUEZ VELASCO and J. R. DE LA BORBOLLA (Anal. Fís. Quím., 1936, 34, 603—636; cf. A., 1936, 940).—The velocities of hydrolysis of AcCl (I) and $CH_2Cl \cdot COCl$ (II) have been determined in C_6H_6, PhMe, and xylene at 15—35° and the relation $k_1/k_2 = (K_2/K_1)^{\frac{1}{2}}$ is confirmed. From the energies of activation and reaction coeffs. it is shown that (I) and (II) have the same functional steric hindrance to hydrolysis. Within certain limits the dilution does not influence the velocity of hydrolysis. Substitution of D_2O for H_2O has no effect, showing that the $H^{\cdot}$ do not catalyse the reactions. L. A. O'N.

Kinetics of addition of bromine to ether. A. S. SELIVANOVA and J. K. SYRKIN (J. Phys. Chem. Russ., 1936, 8, 48—50).—Br dissolved in CCl_4 reacts with Et_2O; the additive product is a brown liquid immiscible with CCl_4. By titrating the Br remaining in CCl_4 after different times and correcting for solubility of the bromide in CCl_4, fairly const. vals. are obtained for the reaction velocity coeffs. at 15°, 20°, and 25°. The activation energy is 19 kg.-cal. (27 kg.-cal. if calc. by a formula taking into account the change in η); the non-exponential term is $3 \cdot 5 \times 10^9$ (or $9 \cdot 5 \times 10^{10}$), corresponding with a steric factor $\sim 10^{-2}$. The reaction is thus a " normal " one. Addition of I accelerates the reaction. E. R.

p_H **of sugar solutions and hydrolytic power.**— See B., 1937, 75.

Kinetics of the oxidation of copper at high temperatures. G. VALENSI (Compt. rend., 1936, 203, 1354—1356; cf. A., 1936, 1085).—Measurements of the rate of oxidation of Cu sheets to CuO (270—950°/760 mm.) are recorded. During the initial formation of Cu_2O and CuO the square of the O_2 absorbed $\propto$ the time. As soon as the Cu has disappeared the rate becomes slower. In the first stage of the reaction the effect of temp. is not in accordance with Arrhenius' law. H. J. E.

Optimum chemical reactivity of adsorbed gases at their critical temperatures. G. EMSCHWILLER (Compt. rend., 1936, 203, 1070—1072).— Factors influencing the velocity of reactions involving adsorbed gases are discussed. Changes in the velocity at the crit. temp. of the adsorbed gas may be due to change in its state. A. J. E. W.

Reaction of sodium nitrite with nitrogen oxides. E. G. SEDASCHOVA (Ukrain. Chem. J.,

1936, **11**, 327—333).—The rate increases with the [NO$_2$] of the gas. The optimum temp. is 20—40°.   J. J. B.

Chlorination of ferric oxide in presence of carbon. A. V. PAMFILOV and E. G. SCHTANDEL (J. Gen. Chem. Russ., 1936, **6**, 1639—1640).—Formation of FeCl$_3$ from Fe$_2$O$_3$–C mixtures commences at 200°, and proceeds rapidly at 280°, at a rate $\propto$ rate of flow of the Cl$_2$.   R. T.

Kinetics of dissolution of zinc oxide in sulphuric acid. A. N. KRESTOVNIKOV and E. A. DAVIDOVSKAJA (J. Phys. Chem. Russ., 1936, **8**, 77—84).—Pressed tablets of ZnO (2 × 2 × 1·6 cm.), with five sides covered by paraffin, are exposed to H$_2$SO$_4$ and the consts. K of Boguski's equation $K = (2 \cdot 303 v/tF) \log [c/(c − x)]$ are calc. ($c =$ initial concn. of acid, $x =$ concn. of ZnO in solution at time t, $v =$ vol., $F =$ surface). $K \propto$ the velocity of stirring. It decreases steadily with increase in concn. of H$_2$SO$_4$. This can be accounted for by changes in activity and in η. K increases linearly with temp. All results agree with the assumption that diffusion is the process determining the dissolution velocity.   E. R.

Velocity of interaction of sulphuric acid with zinc in water and in ether solution. L. E. SABININA (J. Phys. Chem. Russ., 1936, **8**, 165—180).— "Reduced conductivity" ($\epsilon_r =$ conductivity × viscosity) is calc. for different mixtures (Et$_2$O + H$_2$SO$_4$, H$_2$O + H$_2$SO$_4$). A sharp max. of ϵ_r occurs in Et$_2$O at 92% H$_2$SO$_4$, and two max. (at 20% and 50—60% H$_2$SO$_4$) in H$_2$O. The dissolution velocity of Zn in these solutions is determined by measuring the vol. of H$_2$ evolved (H$_2$O solutions) or by measuring the change in conductivity due to a decrease in concn. of free acid (Et$_2$O solutions). Max. of the initial dissolution velocity correspond with the max. of ϵ_r. It is assumed that both max. are due to max. in the concn. of complex ions [Et$_2$O,H]$^+$ and [H$_2$O,H]$^+$.
                                                                                E. R.

Rate of dissolution of magnesium in acids. C. V. KING and W. H. CATHCART (J. Amer. Chem. Soc., 1937, **59**, 63—67).—The rate of dissolution of Mg cylinders, rotating with a peripheral speed of 2000 cm. per min., has been determined in 12 acids in presence of Mg salts. The results are correlated with determinations of the diffusion coeffs. of the same acids, alone and with Mg salts, in a porous-glass disc type of diffusion cell.   E. S. H.

Corrosion of zinc and low-copper–zinc alloys. —See B., 1937, 48.

Combustion rate of carbon. Study of gas-film structure by micro-sampling.—See B., 1937, 8.

Activity of cokes towards carbon dioxide.— See B., 1937, 8.

Kinetics of an esterification reaction in benzene. M. M. DAVIES (Trans. Faraday Soc., 1937, **33**, 331—336).—The kinetics of the BzOH–CH$_2$Ph·OH esterification, in C$_6$H$_6$ solution and catalysed by p-C$_6$H$_4$Me·SO$_3$H (I), have been investigated at 74·3°, 100°, and 137°. The results accord with the view that only the monomeric mols. of the reactants are kinetically active. The great catalytic activity of (I), relative to that of HClO$_4$, HBr, or picric acid, is attributed to its labile nature.   J. W. S.

Autocatalytic increase in rate of ester hydrolysis by pancreatic lipase.—See A., III, 96.

Antioxidants and autoxidation of fats. VII. Classification of inhibitors.—See B., 1937, 57.

[Lubricating] oil oxidation.—See B., 1937, 12.

Atomic interchange between water and saturated hydrocarbons. C. HORREX and M. POLANYI (Mem. Manchester Phil. Soc., 1935—1936, **80**, 33—35).—When heated for 10—20 hr. with D$_2$O at 90—100°, in presence of a Pt catalyst, 30—40% of the H atoms in *cyclo*hexane or *iso*-C$_5$H$_{12}$ are replaced by D. The rate of interchange is $>$ with D$_2$, or the reverse of what is observed with unsaturated and aromatic compounds.   C. R. H.

Synthesis of sodamide from its elements, and its thermal decomposition. I. K. SAKURAZAWA and R. HARA (J. Soc. Chem. Ind. Japan, 1936, **39**, 491B).—Na, N$_2$, and H$_2$, at pressures $>$30—50 atm., and at 350—450°, react in presence of Fe catalysts to form NaNH$_2$, 93% of the Na being changed under the most favourable conditions.   C. R. H.

Minimum amounts of catalysts which give a maximum effect in concentrated sulphuric acid. J. MILBAUER (Coll. Czech. Chem. Comm., 1936, **8**, 543—554).—The effect of Pt on the reaction of H$_2$ with hot conc. H$_2$SO$_4$ increases at first linearly with [Pt], but reaches a max. above 2 mg. per 100 c.c. The rate of oxidation of CO by H$_2$SO$_4$ at 250° $\propto$ the at. concn. of Ru, Rh, Pd, Os, Ir, or Pt. Sol. sulphate catalysts tend to separate from the hot H$_2$SO$_4$ as a melt, and the rate of the catalysed reaction then tends to a limit. SiO$_2$ and tungstic acid act as catalysts in virtue of their large surface, but V$_2$O$_5$ and MoO$_3$ are reduced and catalyse the reactions in H$_2$SO$_4$.
                                                                                E. S. H.

Contact activity of chromium oxide in oxidation of sulphur dioxide.—See B., 1937, 133.

Influence of carriers on catalysts. P. J. IVANNIKOV (J. Gen. Chem. Russ., 1936, **6**, 1462—1469).— Cu catalysts of the reaction EtOH $\rightarrow$ MeCHO+H$_2$, prepared from pure CuO, or from Cu(OH)$_2$ pptd. on C, are unstable, changing their activity during the reaction. Adadurov's theoretical conclusions (J. Phys. Chem. Russ., 1933, **4**, 907), based on the action of this catalyst, are questioned on this ground (see following abstract).   R. T.
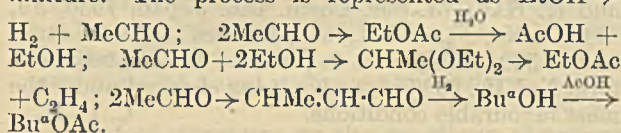
Influence of the carrier on which the catalyst is deposited on the direction of reactions. I. E. ADADUROV, I. I. RIVLIN, and H. M. KOVALEV (J. Phys. Chem. Russ., 1936, **8**, 147—158; see preceding abstract).—The change in the relative yields of NO and N$_2$ by oxidation of NH$_3$ on a Pt catalyst deposited on BeSO$_4$, MgSO$_4$, CaSO$_4$, SrSO$_4$, and BaSO$_4$, at 450°, 550°, 650° and 750°, has been measured. The relative quantities of NO decrease from 80—97% with BaSO$_4$ to ~50% with BeSO$_4$. This is attributed to a decrease in the "strength" of the catalyst by the electric fields of the smaller ions.   E. R.

Synthesis of esters by dehydrogenation of alcohols. II. Preparation of catalysts, and

influence of activators. **IV. Preparation and regeneration of catalysts.** B. N. DOLGOV and M. M. KOTON (J. Gen. Chem. Russ., 1936, **6**, 1444—1451, 1456—1461).—II. The most active Cu–Ce catalyst is obtained by adding conc. aq. NaOH to aq. Cu(OAc)$_2$ containing 0·2% of Ce(NO$_3$)$_3$, at 40°, and washing the ppt., which is dried at 110° and reduced in H$_2$. Pptn. on active C containing no Fe augments, and pptn. on Fe-containing C, SiO$_2$ gel, pumice, kieselguhr, or kaolin diminishes, activity. The yield of EtOAc obtained at 275° in presence of a series of Cu catalysts rises in the order Cu + 5% Ag, 1% V, 2% MnO, 10% MgO, 0·2% Tl, 0·2% Ce + 2% Mn, 0·5% Fe, 0·5% Zn, 0·2% Y, 1% Tl, 0·2% La, 1% Ni, Cu alone, 2% Cr$_2$O$_3$, 0·2% Th, 0·2% Ce + 1% Ni, 0·2% Ce, 0·1% Th, 5% Al$_2$O$_3$, 1% TiO$_2$, 0·2% Ce + 0·2% Ni, 1% Co, 0·2% Ce + 5% Al$_2$O$_3$. The yields of EtOAc are reduced by presence of H$_2$O, AcOH, or MeCHO, but not EtOAc, in the reaction mixture. The process is represented as EtOH →

H$_2$ + MeCHO; 2MeCHO $\xrightarrow{H_2O}$ AcOH + EtOH; MeCHO+2EtOH → CHMe(OEt)$_2$ → EtOAc +C$_2$H$_4$; 2MeCHO→CHMe:CH·CHO $\xrightarrow{H_2}$ Bu^{a}OH $\xrightarrow{AcOH}$ Bu^{a}OAc.

IV [with N. V. SIDOROV]. Inactivated catalyst, Cu, or Cu containing 0·2% of Ce or 0·9% of Zr is fused with an equal wt. of Al at 600—800°, and the powdered alloy is treated with 10% NaOH at 100° to complete extraction of Al. The resulting catalysts give EtOAc in 50% yield at 275°.   R. T.

Catalytic hydrolysis of ether. N. KOZLOV and N. GOLUBOVSKAJA (J. Gen. Chem. Russ., 1936, **6**, 1506—1509).—The activity of a no. of catalysts in the reaction Et$_2$O + H$_2$O → 2EtOH, at 280—350°, rises in the series : Fe$_2$O$_3$ < ZnO < MgO < Al$_2$O$_3$ < Al$_2$O$_3$–ZnO < Al$_2$O$_3$–MgO < Al$_2$O$_3$–Fe$_2$O$_3$. Of these catalysts, Al$_2$O$_3$ is the most active in the reaction Et$_2$O → 2C$_2$H$_4$ + H$_2$O.   R. T.

[Catalytic] synthesis of methyl alcohol at low pressures.—See B., 1937, 116.

[Catalytic] gasoline synthesis from carbon monoxide and hydrogen.—See B., 1937, 108.

[Catalytic] preparation of acetylene from methane.—See B., 1937, 106.

Catalytic reactions of carbon with steam-oxygen mixtures.—See B., 1937, 8.

Electrolytic preparation of lead and zinc from their sulphides. N. A. IZGARISCHEV and N. K. GRIGORIEV (J. Gen. Chem. Russ., 1936, **6**, 1676—1685).—Pb or Zn is obtained in good yield by electrolysis of suspensions of PbS or ZnS in 1 : 1 KCl–NaCl at 740—768° (cathode c.d. 0·14 and 0·51 amp. per sq. cm. for Pb and Zn, respectively). The process consists probably in liberation of Na at the cathode, followed by 2Na + PbS(ZnS) → Na$_2$S + Pb(Zn).   R. T.

Electrodeposition of copper and zinc.—See B., 1937, 52.

Electrolytic separation of bivalent ytterbium. A. BRUKL (Angew. Chem., 1937, **50**, 25—29).—Rare earths, freed from other metals, are converted into sulphates and electrolytically reduced with a Hg cathode and a C anode, the latter immersed in a porous cell containing dil. H$_2$SO$_4$. The electrolyte contains sulphates 120 and H$_2$SO$_4$ 50 g. per litre, and the temp. is maintained at ⊁20°. With a c.d. of 0·05 amp. per sq. cm., YbSO$_4$ of high purity is pptd. The mother-liquor can be further electrolysed after the addition of pptd. SrSO$_4$, when YbSO$_4$ is deposited in the SrSO$_4$. The mixed sulphates are ignited, the YbSO$_4$ forming Yb$_2$O$_3$ which is dissolved in conc. HCl and so separated from the SrSO$_4$. Traces of Sr can be removed by the addition of dil. H$_2$SO$_4$ which ppts. SrSO$_4$ on long keeping. The solubility of YbSO$_4$ at 17° in 0·2N-, N-, and 2·5N-H$_2$SO$_4$ is 4, 8, and 20 g. per litre, respectively. A method is outlined for the determination of Yb by electrolytic reduction, oxidising the Yb·· with NH$_4$Fe(SO$_4$)$_2$, and titrating the Fe·· so produced with KMnO$_4$. The application of electrolytic reduction to the separation of Lu and Tu from Yb is described.   C. R. H.

Electrolysis of ferrous chloride, bromide, and iodide and of ferric chloride in mixtures of water and ethyl alcohol. C. CHARMETANT (Compt. rend., 1936, **203**, 1345—1347; cf. A., 1935, 1086).—In the electrolysis of FeCl$_2$, FeCl$_3$ and MeCHO are formed at the anode, the FeCl$_3$ yield being a min. for an [EtOH] of 450 g. per litre. The Fe formed at the cathode decreases and the H$_2$ liberated increases with increasing c.d. In electrolysing FeBr$_2$ all of the Br liberated forms FeBr$_3$. No EtOH is oxidised. I is liberated at the anode from FeI$_2$, and dissolves. For FeCl$_3$ at a moderate [EtOH] all of the Cl liberated oxidises EtOH. Pure Fe is deposited at the cathode after several hr., and with a high c.d. and [EtOH]. The adherence is very poor.   H. J. E.

[Electro-]deposition of nickel.—See B., 1937, 146.

Electro-deposition of manganese.—See B., 1937, 146.

Electrolysis of manganese solutions.—See B., 1937, 52.

Electrolytic preparation of magnesium hydroxide.—See B., 1937, 33.

Electrochemical oxidation of ψ-cumene.—See A., II, 92.

Electrolysis of mixtures of propionates with sulphates and with perchlorates.—See A., II, 84.

Possibility of a selective effect of high-frequency fields in flames. A. E. MALINOVSKI (Physikal. Z. Sovietunion, 1936, **9**, 264—267; cf. A., 1935, 708).—When a const. electric field is applied to a flame the velocity of combustion is decreased and the flame may be extinguished. With an alternating field the effect is the smaller the greater is the frequency (ν) and vanishes at 1·5 × 10^7. At ν >1·5 × 10^7 the alternating field accelerates combustion. Results are discussed in terms of an electron plasma in the gas, and the characteristic frequency of the plasma is calc. to be 7·2 × 10^7 for hydrocarbons, in agreement with the 20% acceleration observed with ν = 3·4 × 10^7.   R. S. B.

Reduction of oxides of iron by hydrogen and carbon monoxide in a high-frequency electromagnetic field.—See B., 1937, 43.

Decomposition of hydrogen iodide and formation of hydrogen bromide under influence of X-rays. P. GÜNTHER and H. LEICHTER (Z. physikal. Chem., 1936, B, **34**, 443—460).—In the decomp. of gaseous HI by exposure to X-rays the yield is independent of the pressure. The yield per ion calc. from the work of ionisation of HI by the X-rays, assuming that the reaction is initiated by ions created by the rays, agrees with the observed val. for the decomp. of HI by α-particles. To decompose 1 g.-mol. of HI 93 kg.-cal. ($\pm 10\%$) of secondary electron energy is needed. In the formation of HBr from H_2 and Br_2 vapour the yield is $\leqslant$ than in the HI decomp. and varies with the Br_2 pressure. It is inferred that the chemical action of X-rays in gaseous systems consists in some of the energy of the radiation appearing in the system as kinetic energy of secondary electrons, part of which then produces ion pairs, which excite the reacting mols.   R. C.

Theory of photographic developability.—See B., 1937, 90.

Free radicals in the dissociation of gaseous metal alkyls by light. N. A. PRILESHAEVA and A. N. TERENIN (J. Phys. Chem. Russ., 1936, 8, 111—116).—Paneth's method of detecting free radicals is further developed by using a light beam and a photocell to measure the velocity of dissolution of the mirror. It is applied to detect radicals formed by photo-decomp. of $COMe_2$, $HgMe_2$, and $PbEt_4$. The max. production of radicals from $HgMe_2$ occurs at 2200 A., where diffuse predissociation bands were described previously. $HgMe_2$ gives about 5 times as many radicals as $PbEt_4$.   E. R.

Quantitative analysis of the photochemical bleaching of visual purple solutions in monochromatic light. H. J. A. DURTNALL, C. F. GOODEVE, and R. J. LYTHGOE (Proc. Roy. Soc., 1936, A, **156**, 158—170).—See A., 1936, 1480. The quantum efficiency, defined as the quotient of the no. of chromophoric groupings destroyed by the no. of quanta absorbed, is approx. 1.

Blackening of photographic plates under the influence of positive ions. L. M. NEMENOV (Physikal. Z. Sovietunion, 1936, 9, 132—139).—The effect of positive ions from ^7Li, of energy 1000—5000 volts, is nearly the same for Ilford Q and Hilger Schumann plates. The smallest current at 5000 volts registered on the plates after 5 min. exposure is $2 \cdot 1 \times 10^{-12}$ and $1 \cdot 8 \times 10^{-12}$ amp. per sq. cm. respectively.   R. S. B.

Absorption of carbon dioxide by amines. [Purification of hydrogen.]—See B., 1937, 35.

Interchange of hydrogen isotopes in complex cobaltammines. F. W. JAMES, J. S. ANDERSON, and H. V. A. BRISCOE (Nature, 1937, **139**, 109).—In agreement with Erlenmeyer and Gärtner (A., 1934, 1321) it is found that all the amine H in complex Co ammines can be interchanged with D when the ammines are dissolved in approx. 3% heavy H_2O. At 25° and 35° interchange is slow, the time of half-change being several hr. This may explain Bankowski's failure to obtain complete replacement of H in certain complex ammines (A., 1935, 458, 1332).   L. S. T.

Preparation of conductivity water of high purity. P. A. THIESSEN and K. HERRMANN (Z. Elektrochem., 1937, **43**, 66—69).—Apparatus and technique are described.   E. S. H.

Acid fluorides of the alkali metals. I. Rubidium. E. B. R. PRIDEAUX and K. R. WEBB (J.C.S., 1937, 1—4).—$KF,2HF$, RbF,HF, m.p. 204—205°, and $RbF,2HF$, m.p. 51·7°, were prepared by evaporating aq. solutions containing HF. A *substance*, probably $RbF,3HF$, m.p. >0°, was obtained by adding RbF,HF to cold anhyd. HF.   J. G. A. G.

Differential production of soluble sulphates from mixtures of metallic oxides.—See B., 1937, 34.

[Thermal stability of] silver oxides used in the production of cæsium photoelectric cells.—See B., 1937, 54.

Action of cupric sulphate and nitrate on pure copper. G. GENESLAY (Bull. Soc. chim., 1937, [v], **4**, 111—114).—In a limited supply of O_2 the product is Cu_2O; in excess of O_2 the formation of Cu_2O is followed by that of $3CuO,SO_3,2H_2O$ or $Cu(NO_3)_2,3Cu(OH)_2$. In CO_2, $CuSO_4$ and Cu do not form a basic carbonate.   E. S. H.

Corrosion of copper by magnesium chloride solutions in moist air and in an atmosphere of carbon dioxide. G. GENESLAY (Bull. Soc. chim., 1937, [v], **4**, 117—120).—Aq. $MgCl_2$ in presence of air yields $CuCl_2,3CuO,3H_2O$; in presence of CO_2 the product is malachite.   E. S. H.

Corrosive action of alkali carbonates and of ammonium carbonate on copper. G. GENESLAY (Bull. Soc. chim., 1937, [v], **4**, 120—122).—The product is generally malachite, although in some circumstances azurite may be formed.   E. S. H.

Can moulds modify the action of copper sulphate on copper ? G. GENESLAY (Bull. Soc. chim., 1937, [v], **4**, 123—125).—The action is not modified by the presence of *Penicillium glaucum* (cf. Compt. rend., 1890, **111**, 655).   E. S. H.

Identification, by Debye and Scherrer's method, of constituents of the corrosion patinas of copper. M. GUILLOT and G. GENESLAY (Bull. Soc. chim., 1937, [v], **4**, 125—129).—When Cu is exposed to aq. $CuSO_4$ in presence of air the film of corrosion product consists of $3CuO,SO_3,2H_2O$; in aq. $Cu(NH_3)_4SO_4$ in presence of CO_2 the product is malachite, but when access of air is prevented Cu_2O is formed. Alkali H carbonate solutions give a blue patina consisting of azurite ; chloride solutions yield atacamite, $CuCl_2,3CuO,3H_2O$.   E. S. H.

Copper carboxydiammine [diamminocarbonato-copper] and its decomposition products with water and with heating. G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 114—116).—The prep. of $Cu(NH_3)_2CO_3$ by a modified procedure is described. It is sol. as a non-electrolyte in EtOH or $COMe_2$, and is hydrolysed by H_2O yielding malachite. Dry

thermal decomp. yields a mixture of N compounds and basic Cu carbonates.   E. S. H.

Oxidation of magnesium in the liquid state. R. DELAVAULT (Separate, Paris Univ., 1936, 94 pp.; cf. A., 1934, 853, 1185).—The oxidation of molten Mg in air begins by formation of globular protruberances, probably due to surface phenomena, *e.g.*, difference in surface tension. Pure Mg does not show this effect when heated in pure O_2 at low pressure, or in N_2, NH_3, CO, or H_2O vapour at atm. pressure, but shows it in CO_2. Addition of 0·5% of Mg to Zn or 25% of Mg to Al produces the phenomenon with these metals. The same effect is shown by Al heated in a mixture of O_2 and Br. S, SO_2, NH_4BF_4, NH_4F, NH_4HF_2, HF, BF_3, Se, NH_4Cl, and HCl all prevent ignition of molten Mg in air. The results are in accord with Pilling and Bedworth's theory (B., 1923, 359).   J. W. S.

So-called magnesium trisilicate.—See B., 1937, 85.

Formation of atacamite by incorporation of copper powder in magnesium oxychloride compositions. D. S. HUBBELL (J. Amer. Chem. Soc., 1937, 59, 215—216).—X-Ray examination has identified atacamite as the product of exposing the compositions to moist air. Sunlight retards and ultra-violet light prevents its formation. E. S. H.

Effect of low-p_H waters on zeolites.—See B., 1937, 1.

Reactions of various salts in preventing scale in steam boilers.—See B., 1937, 1.

Formation of mercuriammonium compounds from mercuriammonium nitrate by double decomposition. III. Mercuriammonium bromate. S. AUGUSTI (Boll. Chim.-farm., 1936, 75, 661—664; cf. A., 1936, 574).—A yellowish-white ppt. of Hg_2NBrO_3,H_2O is obtained by mixing aq. solutions of $KBrO_3$ (2·5%) and ammoniacal Hg_2NNO_3. The following reactions occur quantitatively: (1) $Hg_2NBrO_3 + 2Na_2S + 3H_2O \rightarrow 2HgS + NH_3 + 3NaOH + NaBrO_3$, (2) $Hg_2NBrO_3 + 8KI + 4H_2O \rightarrow 2K_2[HgI_4] + NH_4BrO_3 + 4KOH$, (3) $Hg_2NBrO_3 + 4Na_2S_2O_3 + 4H_2O \rightarrow 2Na_2[Hg(S_2O_3)_2] + 4NaOH + NH_4BrO_3$. On warming reactions (2) and (3) are accompanied by: $NH_4BrO_3 + NaOH \rightarrow NaBrO_3 + NH_3 + H_2O$ (similarly with KOH).   O. J. W.

Stability of [sodium] perborate in washing powders.—See B., 1937, 132.

Reaction of alumina with iron sulphide in presence of carbon.—See B., 1937, 43.

Higher-valency compounds of the rare earths. II. Dysprosium oxide. G. JANTSCH and E. WIESENBERGER (Monatsh., 1936, 68, 394—398).—Pure Dy_2O_3 shows no appreciable gain in wt. when heated in O_2 or air at 300—1000°, whilst Dy_2O_3 containing a little Tb_2O_3 shows only a slight gain. The product obtained by fusion of Dy_2O_3 in KNO_3 and $NaNO_3$ and in $KClO_3$, after removal of sol. matter, contains no higher oxide which liberates I from KI.   J. W. S.

[Explosive] compounds of thallium with aromatic nitro-compounds.—See B., 1937, 190.

Katz effect. I. TANANAEV (J. Gen. Chem. Russ., 1936, 6, 1430—1432).—When aq. HF and H_2SiF_6 are titrated together the vol. of KOH used is < when the acids are titrated separately; the effect is due to adsorption of HF by SiO_2 present as impurity, and not, as Katz supposed (cf. A., 1904, ii, 442), to formation of double compounds of HF and K_2SiF_6.   R. T.

Reaction of titanium tetrachloride with hydrogen peroxide in dry ethyl acetate. D. G. NICHOLSON and M. A. REITER (J. Amer. Chem. Soc., 1937, 59, 151—152).—A white *compound*, containing Ti, Cl, and H_2O_2 in the ratio 1 : 1 : 1, has been prepared. The compound is sol., with decomp., in H_2O, and decomposes when heated.   E. S. H.

Decomposition of zircon by chlorination. G. P. ALEXANDROV (Ukrain. Chem. J., 1936, 11, 287—297).—A mixture of zircon (62% ZrO_2) and wood charcoal, when heated in a current of Cl_2 at 750—800°, gives in an exothermic reaction >90% of $ZrCl_4$, which is separated by pptn. as $ZrOCl_2,8H_2O$ from the distillate containing also $FeCl_3$, $AlCl_3$, and $TiCl_4$.   J. J. B.

Preparation of hafnium salts. G. P. ALEXANDROV, G. O. BYK, and J. P. HOCHSCHTEIN (Ukrain. Chem. J., 1936, 11, 298—303).—The separation method of Prandtl (A., 1933, 38) may be applied to the crude $ZrOCl_2$ mentioned (cf. preceding abstract).   J. J. B.

Existence and stability of the phosphonitrile radicle PN : synthesis of phosphorus dichloronitride. H. MOUREU and G. WETROFF (Compt. rend., 1937, 204, 51—53).—$(PNCl_2)_3$ is formed from $(PN)_n$ (A., 1935, 742; 1936, 440) and Cl_2 at 500—800°. The mechanism of the reaction is discussed.   A. J. E. W.

Preparation and properties of certain lower phosphoric acids. III. Magnesium hypophosphate. V. N. OSIPOV and A. S. TITOVA (J. Gen. Chem. Russ., 1936, 6, 1559—1562).—The hydrates $Mg_2P_2O_6,2, 3, 6$, and $12H_2O$ are described; the existence of $Mg_2P_2O_6,24H_2O$ (Rammelsberg, A., 1892, 404) is questioned.   R. T.

Ammonolysis of tantalum pentachloride. H. MOUREU and C. H. HAMBLET (J. Amer. Chem. Soc., 1937, 59, 33—40).—Equilibrium pressure–composition determinations show that the primary reaction product of liquid NH_3 with $TaCl_5$ is $Ta(NH_2)_2Cl_3,7NH_3$, which is decomposed to $Ta(NH_2)_2Cl_3$ by heating in vac., *via* $Ta(NH_2)_2Cl_3,5NH_3$. Thermal decomp. of $Ta(NH_2)_2Cl_3$ in presence of gaseous NH_3 yields Ta_3N_5 and in vac. some TaN and an undetermined, volatile Ta compound are also formed. At higher temp., in NH_3 or vac., Ta_3N_5 decomposes into TaN and N_2. Ta_3N_5 has d 8·5 and is slightly diamagnetic. The magnetic susceptibility of $TaCl_5$ is $-0.231 \pm 0.002 \times 10^{-6}$.   E. S. H.

Mixed halides of bismuth. G. P. LUTSCHINSKI and A. I. LICHATSCHEVA (J. Gen. Chem. Russ., 1936, 6, 1452—1455).—$BiCl_2$ and Br at 70—90° give $BiCl_2Br$. BiOI and aq. HCl yield $BiCl_2I$, converted by hydrolysis into $BiCl_2 \cdot OH$.   R. T.

Thiocyanogen chlorides. A. BARONI (Atti R. Accad. Lincei, 1936, [vi], **23**, 871—873).—By the action of Cl_2 on a solution of $(CNS)_2$ in $CHCl_3$ at —60° a white solid, m.p. ~ 70°, with the composition CNSCl, is obtained. It is probably a mixture of the monochloride with higher polymerides (cf. A., 1927, 46). The trichloride $(CNS)Cl_3$, orange, b.p. 57—58°/ 20 mm., d_4^{19} 1·6208, n_D^{19} 1·576, was obtained by the action of Cl_2 in excess on a solution of $(CNS)_2$ in EtBr at —50°. O. J. W.

Selenium iodides. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], **4**, 132—135).—The m.p. diagram of the Se–I system has been redetermined. The results show that the supposed compounds of Se and I do not exist. Chemical evidence supporting this conclusion is described. E. S. H.

Preparation and hydration of CaO,Cr_2O_3 and $2CaO,Cr_2O_3$. Y. SANADA (J. Soc. Chem. Ind. Japan, 1936, **39**, 466B).—On fusing 1 mol. of $CaCO_3$ with 1 mol. of Cr_2O_3 at 1200—1350° for 3 hr., CaO,Cr_2O_3 was obtained in orthorhombic crystals which do not react with H_2O. From 2 mols. of CaO and 1 mol. of Cr_2O_3 were obtained irregular grains of $2CaO,Cr_2O_3$, from which H_2O dissolved $Ca(OH)_2$. G. H. C.

Theory of chrome tanning.—See B., 1937, 68.

Production of bromides by action of bromine on bases in presence of formates.—See B., 1937, 33.

Compounds of nitroprussides and hexamethylenetetramine.—See A., II, 89.

Oxidation of univalent nickel by the action of water in presence of CN′ ions. G. TEDESCHI (Atti R. Accad. Lincei, 1936, [vi], **23**, 894—899).—Oxidation–reduction potentials of the system $Pt|Ni′$-$Ni″|KCl|Hg_2Cl_2|Hg$ have been measured, in which the Ni ions result from the dissociations $[Ni(CN)_3]″ \rightleftharpoons Ni′ + 3CN′$ and $[Ni(CN)_4]″ \rightleftharpoons Ni″ + 4CN′$. Measurements were made without and with excess of CN′ ions. Only the solutions of $K_2[Ni(CN)_3]$ containing excess of CN′ reduce H_2O according to $Ni′ + H_2O = Ni″ + \frac{1}{2}H_2 + OH′$. This process, however, is not catalysed by the CN′ ions (cf. A., 1923, i, 904). O. J. W.

Aquotisation and hydrolysis of [cobalt] chloro- and aquo-pentammine chlorides. P. SPACU (Bull. Soc. chim., 1937, [v], **4**, 130—132).—X-Ray investigations have shown that $[CoCl(NH_3)_5]Cl_2$ (I) is converted in H_2O or dil. HCl into $[Co(NH_3)_5H_2O]Cl_3$, which is in turn converted by aq. NH_3 into $[Co(NH_3)_5OH]Cl_2$ (II). By heating with HCl (II) is reconverted into (I). E. S. H.

Pyridine complexes of quadrivalent platinum derivatives.—See A., II., 74.

Potentiometric titration. E. H. T. JUKES (J. Inst. Brew., 1937, **43**, 80—81).—A convenient potentiometric technique, using a quinhydrone electrode, is described. J. S. A.

Chemical spectral analysis.—See B., 1937, 51.

Quantitative precipitation at extreme concentrations. V. V. NJEGOVAN and V. MARJANOVIĆ

(Z. anal. Chem., 1937, **108**, 33—34).—Polemical, against Kolthoff (A., 1936, 677). J. S. A.

Azo-coupling in volumetric analysis. A. KOROLEV and K. ROSTOVZEVA (Z. anal. Chem., 1937, **108**, 26—29).—The Bucherer diazonium salt titration is modified by adding gum arabic or gelatin as a protective colloid, to prevent coagulation of the azo-dye and adsorption of the azo-component. The end-point is detected by spotting on filter-paper impregnated with NH_4Cl. Oxidisable substances may be titrated in presence of S or, better, $Na_2S_2O_3$. J. S. A.

Buffer solutions for determination of p_H. A. SHORE (Biochem. J., 1937, **31**, 219—222).—Stock solutions of p_H at the limits of the range required are prepared. Solutions of intermediate p_H are obtained by mixing the stock solutions according to tabulated data. J. N. A.

[Determination of] p_H of electroplating baths.—See B., 1937, 51.

Systematic detection and separation of anions. Z. KARAOGLANOV (Z. anal. Chem., 1936, **107**, 395—408). —A group test procedure is described whereby the commoner anions are separated progressively into (i) acids giving volatile products when heated with AcOH: $CO_3″$, $CN′$, $S″$, $SO_3″$, $S_2O_3″$, $NO_2′$, $OCl′$; (ii) $NO_3′$ and $BO_3‴$, tested for immediately following removal of group (i); (iii) acids pptd. from AcOH solutions by $Ba(OAc)_2 + Ca(OAc)_2$: $SO_4″$, $SiF_6″$, $IO_3′$, $F′$, $C_2O_4″$, $CrO_4″$, tartrate; (iv) acids pptd. from the filtrate on making alkaline with NH_3: $PO_4‴$, $AsO_4‴$, $SiO_3″$; (v) acids pptd. by $Pb(OAc)_2$ in neutral solution: $Fe(CN)_6⁗$, $I′$, tartrate, $AsO_3‴$, $Br′$, $Cl′$, $CNS′$; (vi) $Fe(CN)_6⁗$ and $AsO_3‴$, pptd. completely on making the filtrate from (v) alkaline; (vii) $CNS′$, $Br′$, $Cl′$, $I′$, pptd. by $AgNO_3$ from HNO_3 solution; (viii) $ClO_3′$, $ClO_4′$, $BrO_3′$, remaining unpptd. The subsequent detection and separation of acids within each group is described. J. S. A.

Semi-micro- and micro-Carius determination. R. H. KIMBALL, H. H. WITTENBURG, and D. E. MACFADYEN (Ind. Eng. Chem. [Anal.], 1937, **9**, 48—49).—Modified procedure is described. The sample is weighed in a Ag-foil capsule, which dissolves and allows the halide to be siphoned directly from the bomb tube on to a micro-filter tube. E. S. H.

Behaviour of perchloric acid in analytical work. J. MEYER and W. SPORMANN (Z. anal. Chem., 1936, **107**, 387—388).—Explosions are not due to the formation of the readily hydrolysed perchloric esters (cf. this vol., 46), but to the spontaneous decomp. of $HClO_4$ in presence of org. matter. J. S. A.

Danger of explosion with perchloric acid. O. HACKL (Z. anal. Chem., 1936, **107**, 385—387).—The risk of explosion (cf. above) has been already described in the literature. J. S. A.

Sodium chlorite as a volumetric oxidising agent. D. T. JACKSON and J. L. PARSONS (Ind. Eng. Chem. [Anal.], 1937, **9**, 14—15).—Advantages of standard solutions of $NaClO_2$ are discussed. Results for the determination of SO_2, $SO_3″$, and $HSO_3′$ by $NaClO_2$ are given. E. S. H.

Determination of iodine in water.—See B., 1937, 93, 193.

Determination of iodine in tincture of iodine and in sodium and potassium iodides.—See B., 1937, 186.

Use of iodine and potassium iodate as volumetric oxidising agents in solutions containing mercuric salts. I. Effect of mercuric salts on the stoicheiometry of oxidation–reduction reactions. Titration of arsenite and antimonite with standard solutions of iodine or potassium iodate. N. H. FURMAN and C. O. MILLER. **II. Oxidation of phenylhydrazine and of semicarbazide by means of potassium iodate.** C. O. MILLER and N. H. FURMAN (J. Amer. Chem. Soc., 1937, 59, 152—161, 161—164).—I. The influence of Hg¨ on the oxidation of halides by various agents has been investigated. The oxidation–reduction potentials of equiv. mixtures of AsO_4''' and AsO_3''' and of I and I′ have been determined in aq. HCl and H_2SO_4 at different concns.; the influence of Hg salts on the potentials of the I–I′ mixtures has been explained. $1 \cdot 2$—$3 \cdot 8N$-arsenite or 2—$2 \cdot 8N$-antimonite solutions in HCl can be titrated with standard I if $HgCl_2$ is added to increase the I–I′ potential. Procedure for the determination of Sb with standard KIO_3 by reduction to I, I′, or ICl, as desired, is described. II. The best conditions for the quant. reduction of KIO_3 to KI, with Hg present, or to ICl in 3—6N-HCl by $NHPh \cdot NH_2$ (I) or $NH_2 \cdot CO \cdot NH \cdot NH_2$ (II) have been investigated. With (I) an end-point may be obtained, corresponding with reduction of KIO_3 to I, at low acid concn. (II) may be titrated selectively by KIO_3 when $CO(NH_2)_2$ is also present. The mechanisms of the reactions involved have been investigated.   E. S. H.

Determination of fluorine in water.—See B., 1937, 193.

Iodometric determination of sulphate in natural waters. N. GUSEV (Hydrochem. Mat., U.R.S.S., 1936, 9, 3—16).—200 c.c. of the H_2O are heated to the b.p. and 5 c.c. of a solution of $BaCrO_4$ in HCl are added. After heating for 3—5 min. the liquid is neutralised with $2 \cdot 5N$ aq. NH_3, filtered, and the CrO_4'' in the filtrate determined iodometrically. The average error is 2%.   R. S. B.

Indirect titration of sulphate with barium chloride, using sodium rhodizonate (or the sodium salt of tetrahydroxybenzoquinone) as indicator in the solution. A. MUTSCHIN and R. POLLAK (Z. anal. Chem., 1937, 108, 8—18).—Only the bluish-red Ba rhodizonate pptd. in presence of halogens reacts with SO_4'' sufficiently rapidly to show an indicator action. SO_4'' cannot be titrated directly with Ba, but may be pptd. with an excess of $BaCl_2$ in presence of much $NH_4Cl + 30\%$ of $COMe_2$. Na rhodizonate is added, and the excess of Ba is titrated back very slowly with $(NH_4)_2SO_4$.   J. S. A.

[Simultaneous] determination of sulphur dioxide and sulphur trioxide from burning sulphur.—See B., 1937, 34.

Determination of sulphur in oils etc.—See B., 1937, 11.

Rapid determination of selenium in sulphur. —See B., 1937, 34.

Determination of nitrogen in nitrates and nitric esters in the Lunge nitrometer and by Schlösing's method. I—III. K. LESNIČENKO (Chem. Obzor, 1935, 10, 140—146, 165—168, 192—193; Chem. Zentr., 1936, i, 2150).   J. S. A.

Determination of ammonia in sea-water. V. S. KRASNOVA (J. Appl. Chem. Russ., 1936, 9, 2068).—Thomas' method (A., 1912, ii, 991) is recommended.   R. T.

Influence of electrolytes on the reduction of nitrates with Cu–Mg (alloy) and Cu–Zn powder. T. ARND and H. SEGEBERG (Angew. Chem., 1937, 50, 105—107; cf. B., 1932, 201; 1933, 118; A., 1936, 442).—$0 \cdot 5$ g. of $NaNO_3$ is quantitatively reduced to NH_3 by 5 g. of Cu–Mg alloy in the presence of $CaCl_2$, $BaCl_2$, NaCl, or KCl; with NaCl no foaming occurs. With Cu–Zn dust the efficiency of the reduction of $0 \cdot 5$ g. of $NaNO_3$ is greater in the absence of MgO and is reduced by chlorides in the order $MgCl_2 < CaCl_2 < BaCl_2 < NaCl < KCl$, reaching 100% with 15 g. of dust and 10 g. of $MgCl_2$ or 20 g. of $CaCl_2,6H_2O$; using $0 \cdot 25$ g. of $NaNO_3$, however, low results were obtained only with $CaCl_2$ in the absence, and $MgCl_2$ in the presence, of MgO. Quant. reductions of fertiliser salts with Cu–Zn dust in the presence of NaCl are recorded. Zn dust, in presence of NaCl, effected complete reduction of $NaNO_3$ only in fairly acid (HCl) solutions.   R. C. M.

Micro-analysis of gases. IV. Nitrous oxide and methane. F. E. BLACET and D. H. VOLMAN (Ind. Eng. Chem. [Anal.], 1937, 9, 44—45; cf. A., 1933, 930; 1934, 1188).—Modified procedure for the combustion of gases, using a heated Pt loop, is described. N_2O is determined by removing O_2 and H_2O by P and KOH, respectively, and then reducing with H_2. CH_4 is determined by combustion with excess of O_2, removing H_2O, and determining the CO_2 produced.   E. S. H.

Detection of nitrous and nitric acids in drinking waters.—See B., 1937, 93.

Photoelectric determination of phosphorus. C. W. EDDY and F. DE EDS (Ind. Eng. Chem. [Anal.], 1937, 9, 12—14).—A photoelectric colorimeter and its application to the determination of P ($0 \cdot 001$—$0 \cdot 01$ mg.) in biological matter by Kuttner and Lichtenstein's procedure (A., 1930, 725) are described.   E. S. H.

Determination of carbon in glasses coloured by carbonaceous matter.—See B., 1937, 138.

Determination of atmospheric carbon dioxide. —See B., 1937, 133.

Rapid determination of carbon dioxide in air. —See B., 1937, 191.

Determination of alkali in glass.—See B., 1937, 138.

Use of picric acid in qualitative microchemical analysis. A. F. ORLENKO and N. G. FESSENKO (Z. anal. Chem., 1936, 107, 411—417).—NH_4, Na, Mg, Ba, Sr, Pb, Zn, Ni, Hg¨, Hg˙, and Ag˙ give

with picric acid cryst. salts of highly characteristic form.   J. S. A.

Colorimetric determination of silver as colloidal sulphide. L. DE BROUCKÈRE and R. PETIT (Bull. Soc. chim. Belg., 1936, **45**, 717—725).—The method described for the determination of Cu (cf. A., 1935, 318) is applied to the determination of Ag in HNO_3 solutions. For the greatest accuracy, [Ag] should be between 0·0056 and 0·056 g. per litre, and [HNO_3] should be between 0·03 and 0·13N.   C. R. H.

Determination of hardness of waters.—See B., 1937, 92, 192.

Determination of beryllium, aluminium, and magnesium in ferrous alloys.—See B., 1937, 47.

Specificity of the magnesium hypoiodite reaction. V. LUCAS (Rev. Assoc. Brasil. Farm., 1936, **17**, 9—16).—The Schlagdenhauffen NaOBr–KI reaction for Mg depends on a simple adsorption of I by the pptd. $Mg(OH)_2$. Greater sensitivity is obtained by the substitution of slightly alkaline NaOCl for the NaOBr. The ppt. given by Al may be distinguished by addition of excess of NaOH, which dissolves the $Al(OH)_3$. A ppt. is obtained with ≮0·001 mg. of Mg per litre, and a colorimetric method for smaller quantities is described.   L. A. O'N.

Colour test for magnesium. E. EEGRIWE (Z. anal. Chem., 1937, **108**, 34—37).—To dil. aq. benzoazurin G, the neutral test solution, free from NH_4 salts, is added, + a few drops of conc. aq. NH_3. In presence of Mg, a blue coloration or bluish-violet ppt. is produced; limiting concn. 1 in 900,000. Cations other than K, Na, Rb, Cs, Li, and Tl should be absent.   J. S. A.

Determination of magnesium in natural water by Pfeifer's method. N. GUSEV (Hydrochem. Mat., U.S.S.R., 1936, **9**, 17—24).—100 c.c. of the H_2O are freed from CO_3'' by neutralising with 0·05N-HCl (alizarin indicator). The solution is diluted to 200 c.c. with excess of aq. $Ca(OH)_2$ and kept for 1—2 hr. on a water-bath. The liquid is siphoned from the $Mg(OH)_2$ and titrated with 0·05N-HCl.   R. S. B.

Phosphate method of determination of magnesium. P. S. SAVTSCHENKO (J. Appl. Chem. Russ., 1936, **9**, 2069—2074).—$MgNH_4PO_4,6H_2O$ is best pptd. from aq. EtOH solutions. Theoretical results are obtained for ≮5 mg. of Mg. Excess of NH_4· does not interfere.   R. T.

Use of crotonaldehyde to reduce the postprecipitation of zinc on copper sulphide. J. R. CALDWELL and H. V. MOYER (J. Amer. Chem. Soc., 1937, **59**, 90—92).—Small concns. of crotonaldehyde (I) minimise the co-pptn. of ZnS with CuS. (I) appears to react with H_2S adsorbed at the CuS surface and thus prevents post-pptn. of ZnS.   E. S. H.

Quantitative spectral analysis of zinc.—See B., 1937, 144.

Determination of zinc in foods.—See B., 1937, 82.

Determination of cadmium in zinc concentrates and metallic zinc. Method of inner

electrolysis using simple apparatus.—See B., 1937, 49.

Hexanitratoammonium cerate as a proposed reference standard in oxidimetry. G. F. SMITH, V. R. SULLIVAN, and G. FRANK (Ind. Eng. Chem. [Anal.], 1936, **8**, 449—451).—The prep. of pure $(NH_4)_2Ce(NO_3)_6$ from a low-grade, Th-free mixture, containing 40—50% of CeO_2 and Ce_2O_3 and 50—60% of Pr, Nd, and La oxides, is described. $(NH_4)_2Ce(NO_3)_6$ is a complex salt and is stable in 0·5—2·0N-H_2SO_4 at 100°.   E. S. H.

Potentiometric determination of rare earths. G. JANTSCH and H. GAWALOWSKI (Z. anal. Chem., 1936, **107**, 389—395).—The Ce earths may be determined by pptn. from neutral or weakly acid solution with an excess of 0·1N-$H_2C_2O_4$, and subsequently titrating the excess of $H_2C_2O_4$, or an H_2SO_4 solution of the ppt., potentiometrically with $KMnO_4$. Alternatively, the neutral aq. nitrates may be titrated directly with 0·1N-$Na_2C_2O_4$, a small amount of standard $Hg_2(NO_3)_2$ being added to permit the use of a Hg reference electrode. The method is accurate also for Y, but not for the Yb metals.   J. S. A.

Determination of small amounts of aluminium in presence of aluminium oxide. I. J. KLINOV and T. I. ARNOLD (J. Appl. Chem. Russ., 1936, **9**, 2075—2078).—The Al_2O_3, containing 2—10% of Al, is treated with standard $FeCl_3$, and the $FeCl_2$ formed is determined titrimetrically. Gravimetric methods, based on oxidation of Al to Al_2O_3, extraction of Al by dil. HCl, or pptn. of Cu from aq. $CuSO_4$ by Al, gave high results.   R. T.

Determination of alumina by means of 8-hydroxyquinoline. P. P. BUDNIKOV and S. S. SHUKOVSKAJA (J. Appl. Chem. Russ., 1936, **9**, 2079—2087).—Methods for determination of Al in bauxite, clay, and earthenware are discussed.   R. T.

8-Hydroxyquinoline method for rapid determination of alumina. W. STEGER (Ber. deut. keram. Ges., 1935, **16**, 624—627; Chem. Zentr., 1936, i, 2180).—The method is satisfactory.   J. S. A.

Rapid determination of aluminium in complex irons and steels.—See B., 1937, 47.

Separation of gallium and its colorimetric determination by means of quinalizarin. H. H. WILLARD and H. C. FOGG (J. Amer. Chem. Soc., 1937, **59**, 40—45).—Ga may be determined colorimetrically (0·02 mg. per litre) by the pink or amethyst lake formed with quinalizarin under specified conditions. V and Mo must be absent, and only small amounts of Al or Fe should be present. Procedure for separating Ga from larger amounts of Pb, Cu, Sn, Sb, In, Pt, and Ge, which also give coloured lakes under the prescribed conditions, is described.   E. S. H.

Determination of manganese in manganese and iron citrate.—See B., 1937, 86.

[Analytical] deposition of manganese [in steel] at the mercury cathode.—See B., 1937, 52.

Simultaneous photometric determination of manganese, silicon, and chromium. H. PINSL (Arch. Eisenhüttenw., 1936—1937, **10**, 139—143).

The method depends on the measurement of the extinction coeff. in the Pulfrich photometer with appropriate filters of the colours produced by oxidising a solution of the steel in HNO_3 with $(NH_4)_2S_2O_8$ in the presence of $AgNO_3$ and treating the solution with $(NH_4)_2MoO_4$. Various corrections are necessary and these are determined on solutions free from Mn, Cr, and Si. The results are calc. to % by means of graphs constructed from standard solutions.

A. R. P.

Determination of titre of permanganate solutions by means of ammonium oxalate. M. M. KIRILOV (J. Appl. Chem. Russ., 1936, 9, 2065—2067).—$(NH_4)_2C_2O_4$ pptd. from aq. solution by EtOH and dried at 85—90° is recommended for standardisation of aq. $KMnO_4$.

R. T.

Detection and separation of rhenium. I. WADA and R. ISHII (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 55—84).—The sample is treated with HNO_3 and HF if necessary, evaporated to dryness, heated at 120—130° for 1 hr., and dissolved in $6N$-HNO_3, when Ge, W, Nb, and Ti are insol. The solution is evaporated almost to dryness and boiled with conc. HBr + Br, when As, Ge, and Se are distilled off. On dilution Ag is pptd. as AgBr, and Tl, Au, In, and Ga may be extracted from the filtrate with Et_2O. HCl is added to the remaining HBr solution until $0.3N$ in HCl and the cold product is treated with H_2S, when most of the Re remains in solution. The ppt. is dissolved in cold $0.3N$-HNO_3, when most of the Re goes into solution. The Re in solution is pptd. as sulphide with Mo, Pt, Ir, Rh, and Ru. The Re in the ppt. is dissolved in hot $2N$-HNO_3 and recovered as sulphide after removal of Pb by H_2SO_4, Bi by hydrolysis, Pt and Pd by HCO_2H, Te by H_2SO_3, Cu and Cd by NaOH, and Sb by Na_2O_2. All the Re thus obtained as sulphide is dissolved in aqua regia, and Ru is removed as RuO_4 by adding NaOH, heating, and passing in Cl_2. The Re is again obtained as sulphide and this is dissolved in HCl and distilled with H_2SO_4 at 190—195°. Re is collected in the receiver and can be detected by $SnCl_2$ and KCNS. The determination consists in converting the sulphide into per-rhenate by H_2O_2, and weighing as the nitron salt. R. S. B.

Detection of ferrous iron in presence of ferrocyanide. A. B. SCHACHKELDIAN (J. Appl. Chem. Russ., 1936, 9, 2097).—2—3 ml. of 5% $K_4Fe(CN)_6$ are added to 4 ml. of 3% $MnSO_4$ containing 0.25% of $CoSO_4$, when a white ppt. is obtained in absence, and a greenish-blue ppt. in presence, of traces of Fe^{II}.

R. T.

Determination of small quantities of iron oxide in raw materials and glass.—See B., 1937, 133, 136, 138.

Determination of official preparation of iron by means of ceric sulphate. I. Assay of saccharated iron carbonate.—See B., 1937, 85.

Assay of saccharated iron compounds.—See B., 1937, 86.

Colorimetric determination of cobalt by nitroso-R-salt. J. W. H. LUGG and S. W. JOSLAND (Austral. J. Exp. Biol., 1936, 14, 319—321).—The determination of Co by nitroso-R-salt (A., 1933, 312)

fails in the presence of excess of Ca. A modification of the method is described in which hydroxides and phosphates of other metals present are kept in solution by the addition of citrate, and buffered NaOH is used to bring the p_H to 8.5. The solution is not heated after addition of HNO_3. E. A. H. R.

Electro-analysis of cobalt with three electrodes. F. GUZMÁN and M. RIAL (Anal. Fís. Quím., 1936, 34, 636—640; cf. A., 1936, 1222).—The indicator potential method gives results for NH_3-Co solutions containing SO_4'', HCO_2', PO_4''', OAc', C_2O_4'', and BO_3''' to within 1—2%. Anodes of passive Fe and cathodes of brass are used, with an indicator potential of about 700 mv., corresponding to 0.017 ma. It is not possible to separate Co from Ni.

L. A. O'N.

Determination of chromium and sulphur [in iron and steel].—See B., 1937, 142.

Electrometric analysis of mordanting baths for the textile industry.—See B., 1937, 30.

Fluorine derivatives of quadrivalent uranium, and the determination of uranium as fluoride. V. G. CHLOPIN and E. K. GERLING (J. Gen. Chem. Russ., 1936, 6, 1701—1714).—The U^{IV} salt is dissolved in aq. HF, and NH_4F is added, when U is quantitatively pptd. as $UF_4,NH_4F,0.5H_2O$; Fe^{III} and $\not> 30\%$ of V do not interfere. The salts $UF_4,0.5$, 1.5, and $2H_2O$ are described. The above *compounds* are regarded as co-ordination complexes. R. T.

Rapid spectral determination of tin in ores.—See B., 1937, 48.

Spectrographic analysis [and electrolytic refining] of tin.—See B., 1937, 48.

Colorimetric determination of titanium in presence of bromine compounds. D. LEWIS (Z. anal. Chem., 1936, 107, 408—409; cf. A., 1936, 813).—Errors in the determination of Ti by means of H_2O_2, due to the liberation of Br, may be obviated by addition of $COMe_2$. J. S. A.

Inorganic chromatography. G. M. SCHWAB and K. JOCKERS (Naturwiss., 1937, 25, 44; cf. A., 1936, 810, 1218).—The methods of chromatographic analysis can be applied to the separation of cations. From neutral aq. solution, cations are adsorbed on Al_2O_3 in the following order : Sb''', Bi''', Cr''', Fe''', UO_2'', Pb'', Hg'', Cu'', Ag', Zn'', Co'', Cd'', Ni'', Mn''. This order is unaffected by the combinations of ions present in a system, or by the anions present. In some parts of the series the separation is very narrow, e.g., Cr'''–Fe''', Co''–Cd'', Cd''–Ni'', but Co'' is readily separable from Ni''. The basic nature of the adsorbent also sometimes gives rise to difficulty. Separation of two ions which are close together in the series is often made more obvious by the addition of an element lying between them. H' is adsorbed like a metal. The above adsorption series is entirely altered when the adsorption takes place from an aq. NH_3 or alkali tartrate solution. In aq. NH_3 the series is Co'', Zn'', Cd'', Cu'', Ni'', Ag', and in alkali tartrate, $(Mn'', Cd'', Zn'', Co'', Ni'')$, Pb'', Cu'', Bi''', Fe''', Cr''', the ions in parentheses being almost inseparable. The method is of use in the detection of traces of impurities. A. J. M.

Chromatography of colourless substances. L. Zechmeister, L. de Cholnoky and (Mlle.) E. Ujhelyi (Bull. Soc. Chim. biol., 1936, **18**, 1885—1887).—The use is described of solutions of various reagents which are often suitable for rendering visible the positions of colourless layers of substances adsorbed in the chromatographic column.   P. W. C.

Determination of bismuth as 8-nitroquinoline bismuthi-iodide. G. Canneri and D. Bigalli (Annali Chim. Appl., 1936, **26**, 455—460).—Berg and Wurm's method (A., 1927, 847) is modified by the use of 8-nitroquinoline. The ppt. may be dried at 100° and weighed as $C_9H_6O_2N_2,HBiI_4$, or dissolved in acid and titrated with KIO_3. Good results have also been obtained by titrating the I liberated from the HCl solution of the ppt. by HNO_2, after extraction with CS_2. The volumetric methods are more suitable for the determination of small quantities of Bi.
L. A. O'N.

[Electrolytic] determination of bismuth and copper in lead alloys containing antimony and tin.—See B., 1937, 146.

Drop reactions for detection of osmium. N. A. Tananaev and A. N. Romanjuk (Z. anal. Chem., 1937, **108**, 30—32).—Os, as OsO_4, gives a very sensitive blue coloration on filter-paper impregnated with aq. $K_4Fe(CN)_6$ or benzidine. By boiling the solution, and directing the vapour $+ OsO_4$ on to the spot of reagent, 0·001 mg. of Os per c.c. may be detected in presence of all other cations.   J. S. A.

Platinum resistance thermometry. IV. Determination of constants in Van Dusen's equation. M. Matsui, Z. Kuroda, and R. Yumen (J. Soc. Chem. Ind. Japan, 1936, **39**, 472—475b).—In order to extend the scale of instruments down to −190°, consts. have been determined, the equation becoming $R_t/R_0 = 1 + 0.0039701t − 0.0_65841t^2 − 0.0_{11}442(t − 100)t^3$.
C. R. H.

Heat changes of slow reactions. I. Methods of continuous calorimetry. R. Sandri (Monatsh., 1936, **68**, 415—430).—The heat developed during slow reactions may be determined by normal adiabatic calorimetry, the amount of heat developed and stored in the calorimeter being measured, or by measuring the heat flow to the surroundings. The sources of error of the processes, calibration, and the correction of the results are discussed. The former method is applicable only to large amounts of reactants and the second only to small amounts. An advantage of the second method is that the measurements are isothermal and a thermostat may contain several calorimeters at the same time. Suitable apparatus is described.   J. W. S.

Apparatus for constant temperature. R. E. Coker and E. W. Constable (Science, 1936, **84**, 581—582).   L. S. T.

Thermocouple gauge for vacuum measurement. G. C. Dunlap and J. G. Trump (Rev. Sci. Instr., 1937, [ii], **8**, 37—38).—The construction of a simple gauge is described. The couple is Nichrome–"Advance."   C. W. G.

Diphenylmethane calorimeter. K. S. Evstropiev (J. Phys. Chem. Russ., **8**, 1936, 130—133).—

The calorimeter described by Schtschukarev et al. (A., 1934, 748) is improved by excluding gas bubbles by twice crystallising CH_2Ph_2 in a vac.   E. R.

Cryoscopy in camphor. J. F. Durand (Bull. Soc. chim., 1937, [v], **4**, 67—71).—The micro-method for mol.-wt. determination described is a modification of that of Rast (A., 1922, ii, 421).   E. S. H.

Simplified procedure for determining normal b.p. by the comparative method [of Swientoslawski]. M. Wojciechowski (Nature, 1936, **138**, 1096).   L. S. T.

Colour measurement of opaque surfaces. E. R. Bolton and K. A. Williams (Analyst, 1937, **62**, 3—10).—The surface to be tested is illuminated by a beam incident at 45°, the intensity at a no. of λ of the scattered light reflected at 90° being determined photo-electrically after passing through Wratten or Ilford filters. A standard white surface is prepared by smoking with burning Mg.   E. C. S.

Colorimetry with a spectrometer. R. A. Houstoun and A. J. Younger (Phil. Mag., 1937, [vii], **23**, 49—63; cf. A., 1933, 1265; 1934, 748).—Beams of white and monochromatic light, both plane-polarised, and with their planes of polarisation at right angles, are superposed and viewed through an analysing nicol prism, rotation of which gives a complete series of " monochromatic plus white " mixtures. These are compared with the unknown colour. The use of the method is discussed.   A. J. E. W.

Photo-electric microcolorimeter. K. A. Evelyn and A. J. Cipriani (J. Biol. Chem., 1937, **117**, 365—369).—Modifications of the instrument already described (A., 1936, 1223) permitting the absorption of small samples (0·1—2·0 c.c.) or very thin layers of highly absorbing substances to be measured are described.   F. A. A.

Colorimetry with a series of standards. V. G. Gurevitsch (J. Gen. Chem. Russ., 1936, **6**, 1433—1443).—A series of colour standards of increasing intensity is prepared, such that it is just possible to distinguish each standard from the neighbouring ones, when the concn. of substance responsible for the coloration is given by $y = ae^{-bx}$ (x = serial no. of standard, a and b are consts.). The vals. of a and b are determined for a no. of colorimetric methods [NO_2', NO_3', As, P, NH_3, $CuSO_4$, picric acid, $C_6H_4(NO_2)_2$, dinitrophenol, $C_6H_3Cl(NO_2)_2$], and the prep. of permanent colour standards for each method is described.   R. T.

Sensitivity of double-layer radiometer. M. L. Veingerov (Physikal. Z. Sovietunion, 1936, **9**, 580—587).—The sensitivity of the radiometer can be increased by blackening a small area of the surface and concentrating the radiation on that area. The min. energy which can be measured with an accuracy of 1% is calc. to be 0.34×10^{-8} watt.   O. D. S.

Illustration of the use of optical lattices for X-ray spectroscopy. W. Kossel (Physikal. Z., 1936, **37**, 855—856).—A demonstration experiment in which the lattice for X-ray spectroscopy is replaced by one with a lattice const. of 1—2 mm., and visible light is used, is described.   A. J. M.

High-dispersion prism spectrographs and barometric pressure. A. ELLIOTT and W. H. B. CAMERON (J. Sci. Instr., 1937, **14**, 28—30).—The need for eliminating spectral line shifts due to changes of temp. and atm. pressure when using a multi-prism spectrograph is discussed, and methods of effecting this in the case of a Littrow spectrograph are described. N. M. B.

Condensing monochromator for X-rays. I. FANKUCHEN (Nature, 1937, **139**, 193—194).—Crystals of pentaerythritol ground at a suitable angle are convenient for increasing the concn. of monochromatic X-rays. The use of monochromatic radiation estab-lishes the spurious nature of the innermost halo observed (A., 1937, III, 71) with conc. solutions of tobacco mosaic virus. L. S. T.

Layer-line and Debye photographs by means of the characteristic X-rays of the crystal itself. C. FINBAK and O. HASSEL (Nature, 1937, **139**, 194—195). L. S. T.

X-Ray goniometer using beams of large aper-ture for photographically recording crystal-powder reflexions. J. C. M. BRENTANO (Proc. Physical Soc., 1937, **49**, 61—77).—The construction and use of an instrument designed in relation to the factors determining the various aberrations of X-ray reflexions from microcryst. powders are described. Discussions and data for powder layers with spherical and toroidal surfaces are given. N. M. B.

Polarisation photometer for the visual deter-mination of differences in blackening and its application in photographic spectral photo-metry. M. PESTEMER and G. SCHMIDT (Monatsh., 1936, **69**, 399—419).—Sources and magnitudes of errors in spectral photometry by the method of com-parison spectra are discussed. A new form of polar-isation photometer is described and the application of blackening differences measured thereby to ex-tinction measurements explained. By interpolation of the blackening difference–extinction curve the accuracy of determination of the extinction coeff. is 1—2% even in band max. J. W. S.

Apparatus for determining the electrokinetic potentials of powdered substances. V. M. GOR-TIKOV (Kolloid. Shur., 1935, **1**, 233—238).—The diaphragm is made by centrifuging a suspension of the powder. Electro-osmosis through diaphragms of $BaSO_4$, soils, and kaolin was measured. J. J. B.

Physical methods in chemical laboratories. XXXIII. Polarographic methods in the labor-atory. A. WINKEL and G. PROSKE (Angew. Chem., 1937, **50**, 18—25).—Polarographic methods and their application to org., inorg., and micro-analysis, to the determination of constitution, and to the solution of kinetic problems are described. C. R. H.

Photo-counters in the study of chemi- and bio-luminescence : Gurwitsch effect. C. MAXIA (Atti V Congr. Naz. Chim., 1936, **2**, 798—808).—A crit. survey of the various methods, depending on the use of photo-electric counters, which have been used in investigating mitogenetic radiation. The negative results obtained by certain workers are con-sidered to be due mainly to the use of counters which are not sufficiently sensitive. O. J. W.

High-speed counter circuit of the Neher–Harper type. W. F. LIBBY, D. D. LEE, and S. RUBEN (Rev. Sci. Instr., 1937, [ii], **8**, 38).—Improve-ments are described (cf. A., 1936, 1084). C. W. G.

Effect of hydrogen on the time-lag of argon-filled photo-electric cells. N. R. CAMPBELL and R. S. RIVLIN (Proc. Physical Soc., 1937, **49**, 12—13).—The proportion of H_2 required to produce the decrease in time-lag previously reported (cf. B., 1936, 844) has been determined by means of a Pirani gauge. N. M. B.

Influence of low temperature on photo-electric cells. A. AMERIO (R. Ist. Lombardo Sci. Let. Rend., 1935, [ii], **68**, 735—741 ; Chem. Zentr., 1936, i, 1813).—Tl_2S cells show a decreased conductivity κ at low temp., the ratio κ (light) : κ (dark) being $>$ at room temp. Se cells show a decreased sensitivity at low temp. J. S. A.

Continuously acting cloud-chamber. H. BRINK-MAN (Proc. K. Akad. Wetensch. Amsterdam, 1936, **39**, 1185—1186).—A new form of cloud-chamber in which the gas is periodically expanded and com-pressed is described. The H_2O vapour becomes supersaturated during expansion, and for certain expansion ratios condensation occurs only on the ions. The homogeneity of the concn. of H_2O vapour is restored during compression. J. W. S.

Method for taking electron diffraction photo-graphs with simultaneous irradiation of two samples. V. VERZNER (Physikal. Z. Sovietunion, 1936, **9**, 549—550).—The diffraction cones from two adjacent irradiated samples are separated by a brass screen in the diffraction camera. O. D. S.

Apparatus for detecting pyroelectricity. H. LE QUÉRÉ (Bull. Soc. Franç. Min., 1936, **59**, 137—142). L. S. T.

Electron microscope. L. C. MARTIN, R. V. WHELPTON, and D. H. PARNUM (J. Sci. Instr., 1937, **14**, 14—24).—A new two-stage electron microscope for the microscopy of small objects by means of electron beams is described. An optical micro-scope is included, and any object detail can be brought from the optical to the electron system. The focussing coils are mounted in the vac., and the various parts can be centered on the electron beam axis. N. M. B.

Electrical apparatus for semi-micro-determin-ation of nitrogen. A. CONTARDI and S. ERIGHIAN (R. Ist. Lombardo Sci. Let. Rend., 1935, [ii], **68**, 702—706 ; Chem. Zentr., 1936, i, 1922).—A Dumas method, with electrical heating, using 20—50 mg. of material, is described. J. S. A.

Electric and magnetic focussing in mass spectroscopy. A. J. DEMPSTER (Physical Rev., 1937, [ii], **51**, 67—69).—The theory is discussed for a type of instrument in which an electric field forms a real image of the entrance slit with rays of one velocity near the entrance to a magnetic field, and in which the velocity dispersion due to the electric field is

counterbalanced by the velocity dispersion in the magnetic field.   N. M. B.

Theory of the electrostatic beta-particle energy spectrograph. F. T. ROGERS, jun. (Rev. Sci. Instr., 1937, [ii], **8**, 22—24).—The equations necessary for the use of the electrostatic velocity analyser as an energy spectrograph for β-particles are derived.   C. W. G.

Simple equipment for electrolysing heavy water. C. M. SLACK and L. F. EHRKE (Rev. Sci. Instr., 1937, [ii], **8**, 39).—The circuit is automatically broken before the level of liquid can change sufficiently to allow the gases to mix.   C. W. G.

Conductometric apparatus for fast reactions. E. EFTRING (Svensk Kem. Tidskr., 1936, **48**, 276—281).—A method which gives accurate results for reactions complete in 30 sec. is described.   M. H. M. A.

Standard quinhydrone electrode. V. SCHO-MAKER and D. J. BROWN (Ind. Eng. Chem. [Anal.], 1937, **9**, 34—35).—The prep. and advantages of a quinhydrone half-cell, in which the solution is K tetroxalate, saturated at 0°, are described.   E. S. H.

Automatic recording of magnetisation curves. W. STEINHAUS and E. SCHOEN (Physikal. Z., 1937, **38**, 1—5).—Apparatus for the photographic recording of magnetisation curves for all types of ferromagnetic materials is described.   A. J. M.

Micro-Kjeldahl apparatus. J. E. SCOTT and E. S. WEST (Ind. Eng. Chem. [Anal.], 1937, **9**, 50).—Modified apparatus is described.   E. S. H.

Automatic Orsat apparatus.—See B., 1937, 9.

Apparatus for determining carbon dioxide in stone dust.—See B., 1937, 133.

Carbon monoxide analyser and indicators.—See B., 1937, 133.

Filters for sampling industrial dusts.—See B., 1937, 2.

Obtaining dust samples from mine air.—See B., 1937, 2.

Simplest and most accurate viscosimeter and other instruments with suspended level.—See B., 1937, 1.

Precision recording dilatometer.—See B., 1937, 96.

Surface tension of solid substances. R. N. J. SAAL and J. F. T. BLOTT (Physica, 1936, **3**, 1099—1110).—A review and discussion of methods of determining σ for solids. Different methods give results in poor agreement, and none gives a true measure of σ.   A. J. E. W.

Determination of the surface tension of a liquid by the formation of drops at the bottom of a capillary tube in which the linear move-ment of the meniscus is observed. G. DUCH (Compt. rend., 1936, **203**, 1336—1338).—σ is deduced from the movement of the liquid meniscus in a capillary during the formation and detachment of a drop of the liquid at the lower end.   H. J. E.

Sealing metallic wires in glass. M. E. RINCK (Bull. Soc. chim., 1937, [v], **4**, 199—200).   E. S. H.

Technique of measuring swelling. T. P. TIA-SHELOVA (Kolloid. Shur., 1935, **1**, No. 1, 91—95).—An apparatus is described.   J. J. B.

Complete gravimetric analysis by precipitation directly in Jena glass filter crucibles. G. G. LONGINESCU and I. I. PRUNDEANU (Bull. Acad. Sci. Roumaine, 1936, **18**, No. 6—7, 1—7).—In the analytical technique described, pptn. is effected directly in the Gooch crucible, filtration being performed without any ageing of the ppt.   J. S. A.

Low-capacity orifice-meters of glass. I. For liquid measurement. II. For gas measurement. S. HATTA, M. KATORI, and U. ITÔ (J. Soc. Chem. Ind. Japan, 1936, **39**, 406—410B).—I. An apparatus for the measurement of a low rate of flow is described, and a theory is given.

II. The application to gas flow, and the necessary modification in the theory, are described.   T. W. P.

Automatic regulators.—See B., 1937, 96.

Production of water with very small conductivity. K. GOSTKOWSKI (Acta phys. polon., **3**, 75—80; Chem. Zentr., 1936, i, 1827).—A distillation apparatus coated internally with paraffin is described.   J. S. A.

Induction pump for liquid mercury. E. S. GILFILLAN, jun., and S. N. MACNEILLE (Rev. Sci. Instr., 1937, [ii], **8**, 28—34).—Polyphase current flowing through coils wound around two concentric tubes induce currents in Hg in the annular space. The Hg may be lifted to >1 m. and speeds >50 c.c. per sec. can be obtained.   C. W. G.

Determining the speed of air-driven centrifuges. H. SHAPIRO and C. BUTT (Rev. Sci. Instr., 1937, [ii], **8**, 35).—Lissajou figures are obtained in a cathode-ray oscillograph by the application of two potentials of different frequencies, one known and the other unknown. The latter is obtained by reflexion from the centrifuge, of which the frequency is estimated from the shape of the figure produced.   C. W. G.

Ozoniser. W. SHEEHAN and W. CARMODY (Ind. Eng. Chem. [Anal.], 1937, **9**, 8).—Simple laboratory apparatus is described.   E. S. H.

Döbereiner's catalytic researches. E. THEIS (Angew. Chem., 1937, **50**, 46—50).—An historical lecture.   C. R. H.

Theory and experiment in exact science. W. GERLACH (Angew. Chem., 1937, **50**, 10—18).—A lecture, with examples drawn from recent advancements in physics and chemistry.   C. R. H.

Geochemistry.

Electrical conductivity of air in a potash mine in Catalonia. C. DAUZÈRE (Compt. rend., 1937, **204**, 38—39).—κ for air in the mine was < for air on the surface, probably owing to effects of dust and ventilation. κ was high in the neighbourhood of large masses of material of high [K], the increase being attributed to ionisation by radioactive K.

A. J. E. W.

Microscopic examination of fog-, cloud-, and rain-droplets. N. FUCHS and I. PETRJANOFF (Nature, 1937, **139**, 111—112).—A method of measurement is described. L. S. T.

Re-determination of the deuterium–protium ratio in normal water. J. L. GABBARD and M. DOLE (J. Amer. Chem. Soc., 1937, **59**, 181—185).—Lake Michigan H_2O has D : H = 1 : 6900. E. S. H.

Mineral waters of Venetia. Chemical and physico-chemical analysis and classification according to Marotta and Sica. G. BRAGAGNOLO (Annali Chim. Appl., 1936, **26**, 460—475).—A summary of the analyses of the waters (5 oligo-mineral, 44 indifferent mineral, 18 mineral, 2 hypothermal, 2 thermal, and 5 hyperthermal) is given.

L. A. O'N.

Representation of the composition of mineral waters. G. BRAGAGNOLO (Atti V Congr. Naz. Chim., 1936, **2**, 703—706).—From the composition of a mineral H_2O and from the activities of the dissolved ions calc. by means of Bonino's theory the activity coeff. of the H_2O is calc. O. J. W.

Analysis of the water, gas, and mud of the " prehistoric " thermes of the Montegrotto thermes (Colli euganei). E. MAMELI and U. CARRETTA (Annali Chim. Appl., 1936, **26**, 475—488).—The H_2O is hyperthermal, radioactive, and contains $Na^{\cdot}$, $K^{\cdot}$, $Ca^{\cdot\cdot}$, $Mg^{\cdot\cdot}$, Cl', Br', I', SO_4'', and HCO_3', CO_2, O_2, and N_2, and suspended SiO_2. The gas is chiefly N_2 with a little CO_2, O_2, and CH_4. The sediment contains Fe, Ca, CO_3, SiO_2, and org. matter. The mud is radioactive and contains Ca, Al, Fe, CO_3'', SiO_2 and org. matter. L. A. O'N.

Change during the year of the salt content of the River Gruschevka. P. KASCHINSKI (Hydrochem. Mat., U.S.S.R., 1936, **9**, 122—142).—The greatest content of minerals was found in July and in winter (separation of ice). R. S. B.

Boron content of mineral waters and mud of the U.S.S.R. I. E. S. BURKSER and M. J. SCHAPIRO (Hydrochem. Mat., U.S.S.R., 1936, **9**, 154—163).—A discussion. R. S. B.

Determination of content of alkali metals in water, and water from soil and sea mud. P. KASCHINSKI (Hydrochem. Mat., U.S.S.R., 1936, **9**, 143—153).—For most samples of H_2O, unless the alkali content is large and very disproportionate in K and Na, the total content of alkali metal, calc. neglecting the difference in equiv. wts., differs by 3% from the direct determination. R. S. B.

Mud deposits of the Chansche Sea. G. P. ALFERIEV (Hydrochem. Mat., U.S.S.R., 1936, **9**, 102—121). R. S. B.

Results of analysis for the mud from Chansche and Gniloje Seas (near Eisk) in 1932, and brine tests. P. KASCHINSKI and K. LAZAREV (Hydrochem. Mat., U.S.S.R., 1936, **9**, 51—94).—The brine from both seas was practically identical. The relative content of KCl and $MgSO_4$ has increased and that of NaCl decreased since 1928. The H_2O from mud contains CO_3'' from micro-organisms. R. S. B.

Radioactivity of mud taken in 1932 from the Gniloje Sea. K. LAZAREV (Hydrochem. Mat., U.S.S.R., 1936, **9**, 95—101).—On the average 100 g. of fluid and dry mud contain 0·3 and 0·8 units, respectively, compared with 0·05 unit in 1926.

R. S. B.

Boron in brine and the salt deposits of the Ukraine. II. J. D. GNESIN and L. S. DOROSINSKI (Hydrochem. Mat., U.S.S.R., 1936, **9**, 164—169).—From 30 tests it is concluded that there is no B in the salt deposit and rocks in the region of Donbass (U.S.S.R.). R. S. B.

New phosphate, bermanite, occurring with triplite in Arizona. C. S. HURLBUT, jun. (Amer. Min., 1936, **21**, 656—661).—Bermanite, $(Mn^{II},Mg)_5Mn^{III}_8(PO_4)_8(OH)_{10},15H_2O$, orthorhombic, occurs as a reddish-brown mineral; hardness 3·5, d 2·84; n_α 1·687, n_β 1·725, n_γ 1·748 (all $\pm$0·003), a_0 6·25, b_0 8·92, c_0 19·61 A. (X-ray measurements), Fe_2O_3 3·03, Mn_2O_3 28·76, MnO 13·79, MgO 2·39, CaO 0·72, Na_2O 0·32, H_2O 19·33, P_2O_5 31·39, total 99·73% [analyst F. A. GONYER]. L. S. T.

Chlorite. A. N. WINCHELL (Amer. Min., 1936, **21**, 642—651).—A revised correlation (cf. *ibid.*, 1928, **13**, 161) of variations in optical properties and chemical composition incorporating additional data.

L. S. T.

Magnetite metacrysts. G. M. SCHWARTZ (Amer. Min., 1936, **21**, 635—641).—Examples which show that magnetite forms metacrysts, especially in metamorphosed Fe formations and chlorite schists, are cited and their origin is discussed. L. S. T.

Babingtonite and epidote from Westfield, Massachusetts. C. PALACHE (Amer. Min., 1936, **21**, 652—655).—Analyses are given. L. S. T.

Occurrence of bauxite in Montenegro. G. PETUNNIKOV (Montan. Runds., 1935, **27**, No. 23, 1—7; Chem. Zentr., 1936, i, 1476).—The composition and extent of good quality bauxite deposits are discussed. J. S. A.

Paragenesis of kyanite-eclogites. C. E. TILLEY (Min. Mag., 1936, **24**, 422—432).—Analyses of pyroxenes and garnets are tabulated and plotted on a triangular diagram together with analyses of kyanite-eclogites and kyanite-free eclogites. The points for these two rock types lie on either side of a line joining the pyroxene and garnet points. New analyses are given of a kyanite-eclogite and the contained pyroxene and garnet from Weissenstein, Bavaria. L. J. S.

Crystal structure of krennerite. G. TUNELL and C. J. KSANDA (J. Washington Acad. Sci., 1936, **26**, 507—509).—The unit cell has a_0 16·51, b_0 8·80,

c_0 4·45 A., all $\pm$0·03 A., and contains 8 mols. of $AuTe_2$. Ag is held mainly in solid solution. The nature of the space-group is discussed. R. S.

Strange morphology of calaverite in relation to its internal properties. G. Tunell and C. J. Ksanda (J. Washington Acad. Sci., 1936, **26**, 509—528; cf. A., 1935, 286).—The authors' results and those of previous workers relative to the morphology of calaverite are discussed in detail. It is not a polymorph of krennerite, nor does it consist of aggregates of differently oriented grains. Only one structural lattice is present and this is closely related to the simple S faces. The complex faces are connected with the appearance of adventive diffraction spots in the X-ray spectra, but a complete explanation of both phenomena is lacking. R. S.

Formation of metal enrichments in mid-German copper schists. G. Gillitzer (Metall u. Erz, 1935, **32**, 533—542; Chem. Zentr., 1936, i, 1200). H. J. E.

Analysis of monazites from the Aldan and S. Yenisei auriferous deposits. V. K. Zemel (J. Appl. Chem. Russ., 1936, **9**, 1969—1971).—Aldan monazite contains 14·9% ThO_2, as compared with 0·26% in S. Yenisei monazite. The content of individual rare-earth elements is the same in both deposits. R. T.

Monazite of Shinkolobwe (Katanga). J. Thoreau, R. Breckpot, and J. F. Vaes (Bull. Acad. roy. Belg., 1936, [v], **22**, 1111—1122).—The mineral occurs in small, topaz-yellow, polyhedric prisms with the {$\bar{1}11$}, {101}, {110}, and {100} faces well developed, and the {210}, {011}, {111}, and {$\bar{3}11$} faces much less so. Analysis gave SiO_2 0·95, P_2O_5 24·90, CaO 0·37, CeO_2 32·29, ThO_2 0·2, other rare earths 41·63%, traces of MgO and Fe_2O_3, total 100·34. Spectrographic analysis showed the presence, qualitatively, of Ga, Sa, Nd (high), Pr, La, Y (<0·1%), Mo, Ni, Ti, Pb, B, traces of Co, and of 0·1% Th. R. C. M.

Transfusion of quartz xenoliths in alkali basic and ultrabasic lavas, S.W. Uganda. A. Holmes [with F. Hecht] (Min. Mag., 1936, **24**, 408—421).—Blocks of quartz enclosed in lava show a rim of augite, and material transfused from the lava has penetrated between the quartz grains with the development of glass. Chemical analyses are given of the glass (SiO_2 79%) and of some new types of lava. L. J. S.

Twisted [crystals of] quartz. G. Laemmlein (Compt. rend. Acad. Sci. U.R.S.S., 1936, **4**, 279—282).—Crystals from the northern Urals show a sub-parallel growth of sub-individuals with the zone-axis [$\bar{1}2\bar{1}3$] in common. L. J. S.

Physical properties of certain iron oxides. W. H. Newhouse and J. P. Glass (Econ. Geol., 1936, **31**, 699—711).—A mineral with the properties and occurrence of maghemite replaces magnetite (I) from a no. of localities. It replaces titaniferous as well as non-titaniferous (I) and its composition varies from $(Fe,Ti)_2O_3$ to Fe_2O_3. It may be a weathering product, but probably it may also be formed by certain hydrothermal or late magmatic processes. In certain respects it corresponds with, but is not identical with, the ferromagnetic Fe_2O_3 from Iron Mountain, California. X-Ray and magnetic data are discussed. L. S. T.

Colloidal tin ore deposits. R. Herzenberg (Econ. Geol., 1936, **31**, 761—766).—A theory of colloidal origin of some of the Sn ore deposits of Bolivia, involving oxidation of thiostannate solutions to unstable sols of colloidal stannic acid and pptn. and coagulation of stannic acid gel, is advanced. L. S. T.

Granites of the Malayan tin belt compared with tin-granites from other regions. J. Westerveld (Proc. K. Akad. Wetensch. Amsterdam, 1936, **39**, 1199—1309).—The petrological properties and chemical composition of Malayan Sn-granites are described and compared with those of Cornwall, Saxony, Finland, Bolivia, and Transvaal. J. W. S.

Sericitisation of pegmatites in the Gdov district, Leningrad. P. M. Murzaev (Compt. rend. Acad. Sci. U.R.S.S., 1936, **4**, 265—268).—In a recently discovered outcrop of biotite-gneiss beneath Palæozoic rocks the felspar is altered to a fine scaly aggregate of sericite. This is believed to be due to hydrothermal action, whereas in northern Karelia a similar product is produced by surface weathering. L. J. S.

Alkaline and acid solutions in hypogene zoning at Cerro de Pasco. L. C. Graton and S. I. Bowditch (Econ. Geol., 1936, **31**, 651—698).—The relations and sequence of alkalinity and acidity in the solutions responsible for the sulphide deposits and associated wall rock alteration at Cerro de Pasco, Peru, are described and discussed. L. S. T.

Fatigue in rock exfoliation. D. T. Griggs (J. Geol., 1936, **44**, 783—796).—Subjection of a coarse-grained granite to temp. differences of 110° for a period corresponding with 244 years of natural insolation produced no surface changes apparent in a photomicrograph. When the effect of H_2O is superimposed on temp. changes a marked change quickly appears in the specimen. L. S. T.

Characteristics of Italian metalliferous deposits in basic rocks. A. Stella (Atti R. Accad. Lincei, 1936, [vi], **23**, 830—838).—The classification of the various deposits according to their probable modes of formation is discussed. O. J. W.

Xenotime nodules from Kawabe. Composition of Ishikawa xenotime. S. Iimori and J. Yoshimura (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 17—21).—Grey nodules with botryoidal surfaces have been found near Ishikawa, embedded in felspars. The composition after allowing for inclusions of Zr is P_2O_5 29·08, SiO_2 2·04, $(Nb,Ta)_2O_5$ 0·36, TiO_2 0·03, Y earths 51·87, Ce earths 4·58, ThO_2 2·20, ZrO_2 2·66, UO_3 1·09, Al_2O_3 1·37, Fe_2O_3 0·94, CaO 0·79, ignition loss 3·00%. R. S. B.

Weathering of rocks and composition of clays. A. Salminen (Ann. Acad. Sci. fenn., 1935, A, **44**, No. 6, 139 pp.; Chem. Zentr., 1936, i, 2176).—Differences of weathering development are attributed to variation in the reaction of soil solutions. In Northern districts and lacustrine conditions, with acidic soil-H_2O, enrichment of SiO_2 occurs. Moist climates and maritime weathering, with alkaline soil-H_2O, tend

to enrich Al_2O_3 and Fe_2O_3. In Finland weathering is pronounced only where soil-H_2O has a high [H_2SO_4]. The finer mechanical constituents of clays, independent of age, are richer in basic constituents than are the coarser particles. This effect outweighs chemical weathering in the case of Finnish clays. J. S. A.

Mineral constitution of various ceramic clays. —See B., 1937, 37.

Chlorine content of the Leda clay [from Waterville, Maine]. A. S. KNOX (Science, 1936, 84, 419—420).—The vals. obtained varied from 0·0000731 to 0·0000789 g. of Cl per g. of clay. Their geochemical significance is discussed. L. S. T.

Analyses of Tertiary igneous rocks from Antrim and Staffa. A. HOLMES (Proc. Roy. Irish Acad., 1936, 46, B, 89—94).—Detailed analyses are given of olivine-basalt, basalt, olivine-dolerite, and rhyolite. L. J. S.

Distribution of rare-earth elements in certain auriferous deposits. V. K. ZEMEL (J. Appl. Chem. Russ., 1936, 9, 1972—1984).—The auriferous deposits contain the entire complex of chalcophilic elements. Bi and Te, but not Ga, Ge, or In, tend to concentrate in Au ores. Certain deposits have a considerable content of rare-earth elements. R. T.

Action of sulphide minerals on solutions of gold and platinum salts. O. E. ZVJAGINTZEV and E. L. PISARSHEVSKAJA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 73—74).—The actions of powdered galenite, sphalerite, pyrite, and chalcopyrite on solutions of Na_2PtCl_6 and H_2PtCl_6 have been investigated. After 1—1·5 months the galenite contained about 20% Pt as PtS_2. Reaction with the other minerals is slow. O. D. S.

Hydro-amphibole from South Devon. W. Q. KENNEDY and B. E. DIXON (Z. Krist., 1936, 94, 280—287).—A low-grade metamorphic amphibole from the Start peninsula, S. Devon, has been examined chemically and optically, and its chemical constitution is discussed in relation to the abnormal H_2O content and the Warren formula. B. W. R.

Sepiolites. G. MIGEON (Bull. Soc. Franç. Min., 1936, 59, 6—134).—A detailed investigation of the group. Analyses of 32 samples from different parts of the world are summarised; for the majority the ratio $SiO_2 : MgO$ is 1·50. In 12 new samples from other localities the ratio is 1·30 to 1·70. Dehydration and dilatometric changes with temp. up to 1100° have been determined, and the corresponding changes in the lattice have been followed by means of X-rays. The zeolitic properties are discussed. The general formula is $Si_4O_{11}(MgH_2)_3H_2O(H_2O)_n$, where $(H_2O)_n$ represents zeolitic H_2O and Mg corresponds with Mg + Ca + Fe. The monohydrate begins to decompose at approx. 350°, and at approx. 750° $Si_4O_{11}(MgH_2)_3$ breaks down with the formation of enstatite. $a : b : c$ is probably 1·47 : 1 : 0·338. L. S. T.

Bituminous tripolites of Sicily. P. LEONE, F. CIPOLLA, and S. VINTI (Atti V Congr. Naz. Chim., 1936,

2, 785—788).—A geological and chemical description of the tripolite deposits of Serradifalco in Caltanissetta, which contain 14—19% of oil. O. J. W.

Native bismuth and bismutite from Ishikawa. S. HATA (Bull. Inst. Phys. Chem. Res. Japan, 1936, 15, 1291—1292).—Native Bi, d 9·84, contained Bi 98·0, Pb 1·0, Sb 0·2, V 0·2, Fe 0·1, Mn + Zn 0·2, CaO 0·8, SiO_2 0·3%. Bismutite, $3Bi_2O_3,2CO_2,0·5H_2O$, d 7·02, contained Bi_2O_3 89·03, CO_2 5·99, PbO 1·01, Sb_2O_3 0·24, V_2O_3 0·30, Fe_2O_3 0·51, CaO 0·30, SiO_2 1·17, Al_2O_3 0·32, MgO 0·10, S 0·08, H_2O+ 0·72, H_2O- 0·60%. R. S.

Classification of "pelagosite" as a new type of calcareous alga. M. AIROLDI (Atti R. Accad. Lincei, 1936, [vi], 24, 18—23).—The mineral pelagosite ($CaCO_3$ 79·47, $SrCO_3$ 2·27, $MgCO_3$ 3·13, org. matter 2·10%) originates from a calcareous alga for which the name *Sclerothamnium nitens* is proposed. F. O. H.

Palygorskites. H. LONGCHAMBON (Compt. rend., 1937, 204, 55—58).—X-Ray diffraction data are given, and the behaviour on heating is described and discussed. Observed analogies confirm that the palygorskites are related to the sepiolites by isomorphous replacement of Mg by Al. A. J. E. W.

Fluorine content in Chinese common salt. —See B., 1937, 33.

Analysis of pietra di Trani [limestone]. —See B., 1937, 33.

Heavy mineral assemblages of soils from the goldfields of Western Australia. D. CARROLL (Geol. Mag., 1936, 73, 503—511).—Mineralogical analyses of soil from the Au-bearing belt of W. Australia show that the character of the heavy residue of a soil often gives an indication of the nature of the parent rock. In most of the localities examined the soils have been formed *in situ* by weathering of the underlying rocks. L. S. T.

Fossil carbon in the Mesozoic of Longobucco in Calabria. F. PENTA (Atti R. Accad. Lincei, 1936, [vi], 23, 794—801).—The physical and microscopic properties are described. A summary of the action of 10% HNO_3 on various fossil carbons is given. O. J. W.

Marahunite, a boghead coal in the lignite stage. O. STUTZER (Z. deut. geol. Ges., 1935, 87, 616—620; Chem. Zentr., 1936, i, 1351). H. J. E.

Structure of tectonic coals. W. E. PETRASCHECK (Z. deut. geol. Ges., 1935, 87, 622—632; Chem. Zentr., 1936, i, 1351). H. J. E.

Biogenic spontaneous heating of peat. B. L. ISATSCHENKO and M. N. MALTSCHEVSKAJA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 377—380).—The spontaneous heating of peat (50—80 cm. below the surface) is a biogenic process promoted by various micro-organisms acting in a moist and aërated medium, followed by chemical decomp., the nature of which is outlined. F. N. W.