BRITISH CHEMICAL ABSTRACTS

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

AUGUST, 1937.

Spectrum of hydrogen. W. M. VENABLE (J. Opt. Soc. Amer., 1937, 27, 155—158).—An analysis shows that the wave nos. of the band lines are accounted for numerically, with high precision, as due not to the simple differences between a large no. of independent levels, but to the compounding of simple differences between a comparatively small no. of levels, including the primary levels; also that definite series relationships exist between all the levels, binding them into a single mathematical system. N. M. B.

Paschen series of hydrogen and deuterium. N. NAGAOKA and T. MISHIMA (Proc. Imp. Acad. Tokyo, 1937, 13, 95—97).—Using an electrodeless discharge in H_2 and D_2, the Paschen series of D were photographed for the range 10,938—8467 A., giving members $m = 6$—17. N. M. B.

Intensity variations of the green and red oxygen lines and the presence of the ε system in aurora and the light of the night sky. L. VEGARD (Z. Physik, 1937, 106, 108—131).—Interference measurements show the presence of the O_2 lines $^1S_0$—$^1D_2$ and $^1D_2$—$^3P_{012}$ in aurora and the light of the night sky. The relative intensity of the red triplet increases with increasing height. Indirect sunlight can give rise to a marked intensity variation. Excitation of the red line 6300 occurs directly as well as from the transition $^1S_0$—$^1D_2$. The intensity variations may be explained by the same processes suggested to explain the intensification of the red triplet of O_2 by excitation with activated N_2. The appearance of bands of the ε system indicates that N_2 in the A (ε^3) state occurs in considerable concn. H. C. G.

Line contours of the atmospheric oxygen bands. C. W. ALLEN (Astrophys. J., 1937, 85, 156—164).—The breadth and structure of the atm. O lines have been determined from the curves of growth of the A, B, and α bands in the solar spectrum. L. S. T.

Line strengths in neon I. C. W. UFFORD (Astrophys. J., 1937, 85, 249—250).—Line strengths for the transition array $2p^54p$—$2p^54s$ of Ne I have been calc. in intermediate coupling, including the electrostatic and spin-orbit interactions. L. S. T.

New effect in the glow discharge in argon. K. GEIGER (Z. Physik, 1937, 106, 17—34).—The glow discharge between a cylindrical anode and two symmetrically disposed cathodes at different negative potentials with respect to the anode is studied in A at pressures of a few mm. with cathodes of brass and Fe. The larger current flows between the pair of electrodes at the lower p.d., due to the special property of differential ionisation of electrons in A, which creates a greater ion density near the electrodes at the lower potential. L. G. G.

Sign of the magnetic moment of the ^{39}K nucleus. R. A. FISHER (Physical Rev., 1937, [ii], 51, 887).—The K resonance lines excited by projecting an at. beam of K into an electrodeless discharge in A show a doublet structure with 0·016 cm.$^{-1}$ separation. The weaker component lies on the lower-frequency side, confirming the inversion of the hyperfine multiplet and indicating a negative nuclear magnetic moment for ^{39}K (cf. Jackson, A., 1936, 397). N. M. B.

Interference measurements of wave-lengths in the ultra-violet spectrum of iron. W. F. MEGGERS and C. J. HUMPHREYS (J. Res. Nat. Bur. Stand., 1937, 18, 543—557).—Measurements on 252 lines (3498—2101 A.) are recorded. H. J. E.

New absorption band of bromine vapour at high temperatures. L. DABROWSKI (Acta phys. polon., 1935, 3, 301—305; Chem. Zentr., 1936, i, 3267).—At 940° and 270 mm. a weak continuous band appears at 2930 A., which is already known in emission. A similar band at 3460 A. is found with I at 775°, but no such Cl bands can be detected. J. S. A.

Variation of continuous absorption of bromine vapour with density and temperature. J. PATKOWSKI (Acta phys. polon., 1935, 3, 385—391; Chem. Zentr., 1936, i, 3267—3268).—As with Cl_2, the Br absorption bands broaden and increase in intensity as the temp. is raised. J. S. A.

Fluorescence bands of cadmium vapour. J. SWIETOSLAWSKA (Acta phys. polon., 1935, 3, 261—270; Chem. Zentr., 1936, i, 3271).—Data are recorded for the van der Lingen bands excited at 650°. The long-λ limit of the bands varies with the λ of the exciting light. J. S. A.

Monochromatically excited fluorescence of cadmium vapour. W. KAPUŚCIŃSKI (Acta phys. polon., 1935, 3, 537—545; Chem. Zentr., 1936, i, 3271).—The structure diminishes as the λ of the exciting radiation is increased above 2800 A. With exciting light of 2980 A. a structureless anti-Stokes fluorescence band is emitted. J. S. A.

Broadening of absorption lines of iodine vapour by foreign gases. W. OPECHOWSKI (Acta phys. polon., 1935, 3, 307—322; Chem. Zentr., 1936, i, 3268).—Under interferometric resolution of individual rotational lines, the effect of additions of N_2 and A is to increase the total absorption of each line. J. S. A.

Hyperfine structure of bands. W. Kessel (Acta phys. polon., 1935, 3, 513—516; Chem. Zentr., 1936, i, 3266).—Interferometric measurements revealed no hyperfine structure in the principal doublet series of the I fluorescence spectrum. J. S. A.

Rôle of absorption of the exciting line in resonance spectra. II. W. Kessel (Acta phys. polon., 1935, 3, 505—512; Chem. Zentr., 1936, i, 3266; cf. A., 1935, 137).—In the excitation of the I and Te resonance spectra by Hg lines, the structure of the absorption is identical with that for emission. J. S. A.

Absorption spectrum of bromine in the near infra-red. O. Darbyshire (Proc. Roy. Soc., 1937, A, 159, 93—109).—The photography and analysis of the absorption system of bromine have been extended from 7600 to 8180 A. Vibrational consts. have been redetermined. G. D. P.

Law for the emission of continuous spectrum radiation (white light) from xenon tubes. M. Laporte (Compt. rend., 1937, 204, 1559—1560; cf. this vol., 336).—The intensity of the radiation from a section of a Xe tube is independent of the angle of inclination to the normal to the tube over the range 0—70°. J. W. S.

Intensity relations of some lines of the mercury spectrum. I. L. Fabelinski (Physikal. Z. Sovietunion, 1937, 11, 390—403).—The ratio of the intensities of the lines 3655 and 3125 A., which have a common upper level with the strong inter-combination line 5770 A., and of the lines 3023 and 3652 A. having a common upper level with the weak inter-combination line 4349 A., have been measured under conditions such that reabsorption was negligible. The deviation from the val. calc. from the formula of Sommerfeld and Heisenberg for the first pair is > for the second. From intensity measurements at high and low pressures a lower limit is obtained for the reabsorption of the lines 3125 and 3652 A. O. D. S.

Absorption of the mercury 5461 A. line in bromine vapour. S. Mrozowski (Acta phys. polon., 1935, 3, 447—454; Chem. Zentr., 1936, i, 3268).—Interferometric measurements show that two Br absorption lines fall within the λλ covered by the chief component of the Hg 5461 A. line. The hyperfine structure components also show a general weakening. With Cl, no line absorption occurs in the rays of the 5461 A. line, but only a general weakening of the whole line. J. S. A.

Structure of the mercury resonance line 2537 A. S. Mrozowski (Helv. phys. Acta, 1936, 9, 27—32; Chem. Zentr., 1936, i, 3270).—The intensity ratios of the components of the 2537 A. line have been redetermined, errors due to reabsorption being avoided. J. S. A.

Absorption measurements in band spectrum of mercury vapour. S. Mrozowski (Acta phys. polon., 1935, 3, 215—233; Chem. Zentr., 1936, i, 3270—3271).—Absorption measurements are recorded for ten λλ between 2749 and 1990 A. At const. temp., the absorption deviates considerably from proportionality to the v.p. J. S. A.

Re-emission in band fluorescence of mercury vapour. F. Aniela (Acta phys. polon., 1935, 3, 323—327; Chem. Zentr., 1936, i, 3270).—Evidence is advanced that re-emission of the exciting line is due to mols. of the vapour, and not to scattering by atoms, as postulated by Frank. J. S. A.

Regularity along a series in the variation of the action cross-section with energy discrepancy in impacts of the second kind. O. S. Duffendack and W. H. Gran (Physical Rev., 1937, [ii], 51, 804—809).—Measurements of the enhancement of the intensities of Pb spark spectrum lines, excited by impacts of the second kind with Ne ions, relative to their intensities in electron impact excitation are plotted against the energy discrepancies of the spectral terms in which the lines originate. The form and characteristics of curves for different series are compared and discussed. N. M. B.

Central intensities of Fraunhofer lines. C. W. Allen (Astrophys. J., 1937, 85, 165—180).—The central intensities of 91 Fraunhofer lines in the red and infra-red regions of the solar spectrum have been measured. L. S. T.

Excitation and emission of limits of the atomic continuous spectra. H. Bartels (Z. Physik, 1937, 105, 704—724).—Theoretical. L. G. G.

Spectral intensity of black-body radiation in the short-wave region. E. Kretschmann (Z. Physik, 1937, 105, 645—657).—Theoretical. L. G. G.

Excitation of characteristic *X*-rays by protons. M. S. Livingston, F. Genevese, and E. J. Konopinski (Physical Rev., 1937, [ii], 51, 835—839).—A qual. study of the *X*-rays produced by 1·76 m.e.v. protons shows that these rays are the characteristic *K* and *L* radiations from the targets used. The variation of intensity with proton energy and with at. no. is in agreement with theory. N. M. B.

Moseley diagram of *X*-ray term values. D. Coster (Physica, 1937, 4, 418—425).—The Moseley curves are brought up to date, and the effect of screening on the slope of the curves is discussed. F. J. L.

***K*-Rays of boron.** A. Hautot and J. Serpe (J. Phys. Radium, 1937, [vii], 8, 175—178).—The *K*-radiation emitted by B has been investigated for both powdered and cryst. B. The radiation consists of a single band which commences on the short-λ side at 65·8±0·4 A., and increases to a max. not far from this edge, the exact position of the max. being dependent on temp. The width of the band is 8·5±0·75 A. B crystallised at lower temp. gives a wider band, with ≮ 3 subsidiary max. Powdered B, prepared by Moissan's method, gives a single band, but its structure varies with temp. of prep. The *K*-radiation of B excited in B_2O_3 and $Na_2B_4O_7$ is more complex than that of elementary B. Assuming that the conductivity electrons of B form a freely moving electron gas, moving in a field of const. potential, the above results indicate that there are three conductivity electrons per atom of B at high temp. At low temp. the assumption of free electrons is no longer sufficient, and this may be due to a change in the cryst. lattice of B at the lower temp. The increasing freedom of the conductivity electrons as the temp. is raised is confirmed by the conductivity of B increasing with rise of temp. A. J. M.

Soft *X*-rays and photo-electrons from nickel at different temperatures. S. Rao (Proc. Roy. Soc., 1937, A, **159**, 283—294).—The photo-electric efficiencies of Cu and Ni exposed to soft *X*-rays are independent of temp. between 30° and 500°. The soft *X*-ray intensity from polycryst. Ni increases with rise of temp. No abrupt change occurs at the Curie point. G. D. P.

Semi-optical lines in *X*-ray spectra. A. T. Maitra (Indian J. Physics, 1937, **11**, 77—89).—Semi-optical lines in the *K*, *L*, and *M* series of *X*-ray spectra arising from an electron ejected from an inner level of an atom going to a vacant, partly vacant, or optical level, followed by a transition from one of these levels, have been identified. F. J. L.

***X*-Ray emission spectra of sulphides and sulphates.** J. Valasek (Physical Rev., 1937, [ii], **51**, 832—834; cf. A., 1935, 1046).—An improved water-cooled clamp for holding the specimen on the target is described. From measurements of $K\beta$ λλ for the alkaline-earth sulphates and for the semi-conducting sulphides Cu_2S, CuS, Sb_2S_3, MoS_2, Ag_2S, and Bi_2S_3 and λλ data for the *K* absorption edges, the energy gap between the occupied and unoccupied zones in the crystals is obtained, and results for sulphates and corresponding sulphides are compared. To account for changes in emission λλ from compound to compound a non-uniform displacement of energy levels is needed in addition to the Madelung energy (cf. Slater, this vol., 8). N. M. B.

Influence of magnetic field on Compton effect. B. Milianczuk (Acta phys. polon., 1935, **3**, 133—142; Chem. Zentr., 1935, i, 3264).—The lack of effect of magnetic fields on the Compton effect is justified theoretically. J. S. A.

Field emission and cathodic disintegration of thoriated tungsten. E. W. Müller (Z. Physik, 1937, **106**, 132—140).—The field emission of surfaces activated either by a wire containing Th or by evaporation from a Th source is dependent largely on the thickness of the coating. The empirical φ^3 law, found to hold with Ba-covered surfaces, holds also for Th surfaces. Bombardment of the surface with ions of A, H, and N results in uniform disintegration of the Th surface. Deactivation of the Th surface with O_2 was observed; the expulsion energy of the poisoned surface was 6 e.v. H. C. G.

(A) **Determination of the Townsend ionisation coefficient α for mixtures of neon and argon.** A. A. Kruithof and F. M. Penning. (B) **Townsend ionisation coefficient and some elementary processes in neon with small admixtures of argon.** A. A. Kruithof and M. J. Druyvesteyn. (C) **Mobility of electrons in neon.** M. J. Druyvesteyn (Physica, 1937, **4**, 430—449, 450—463, 464—466).—(A) The ionisation coeff. $\eta = \alpha/E$ (E = field in volts per cm.) of mixtures of A and Ne has been measured and shows a max. val., 0·037, at 0·1% A, and $E/p_0 = 3V$/cm. mm. (p_0 = pressure in mm. Hg).

(B) The probability that an excited Ne atom will produce an A ion is calc.

(C) The drift velocity of electrons in Ne is calc. from the velocity distribution obtained in the preceding paper. F. J. L.

Polarisation of electrons by scattering in crystals. E. David (Z. Physik, 1937, **105**, 747—749; cf. Weisskopf, A., 1935, 557).—Mathematical. Polarisation is so small that it could not be detected experimentally. H. C. G.

Damped electron waves in crystals. J. C. Slater (Physical Rev., 1937, [ii], **51**, 840—846).—Mathematical. Electrons in solids suffer inelastic impacts if their energy is > the resonance energy of the atoms in the crystal, resulting in strong damping of the electron beams, with consequent broadening of the reflected peaks about the Bragg scattering angles, and reduction of the reflexion coeff. An empirical damping const. is introduced, and, from electron diffraction theory, equations for energy and reflexion coeff. are deduced. N. M. B.

Wave functions in a periodic potential. J. C. Slater (Physical Rev., 1937, [ii], **51**, 846—851).—Mathematical. Approx. solutions of the motion of an electron in a periodic potential, as a crystal lattice, are developed by a new method. N. M. B.

Scattering of fast electrons by thin foils. H. Saegusa and K. Kikuchi (Sci. Rep. Tôhoku, 1937, **25**, 817—828).—The angular distribution of electrons (10, 20, and 30 kv.) scattered by Al, Ni, Ag, and Au foil is recorded at 30—110°. The scattering is mainly elastic, and the distribution is not in complete agreement with that calc. from Rutherford or Wentzel theories, indicating that the Coulomb field does not account for all the scattering. F. J. L.

Electron gases in a magnetic field. E. Lifschitz (Physikal. Z. Sovietunion, 1937, **11**, 141—156).—A kinetic equation is derived for a gas of charged particles in a magnetic field; it leads to expressions for the relaxation time for the appearance of Maxwellian distribution, and for heat-conductivity in the gas. The expansion of a unit group of charged particles under the influence of Coulombic repulsion is obtained as a function of time. L. G. G.

Secondary electron emission of metals with low work function. H. Bruining and J. H. de Boer (Physica, 1937, **4**, 473—477).—Secondary electron emission is not determined primarily by the work function; it is greater for compounds than for pure metals. "Free" conduction electrons contribute relatively little to secondary emission; bound electrons do so more readily. F. J. L.

Annihilation of positive electrons. G. C. Wick (Atti R. Accad. Lincei, 1936, [vi], **23**, 352—357).—Theoretical. O. J. W.

Behaviour of an ion cloud about a dipolar molecule under the influence of an alternating field. S. Oka (Proc. Phys.-Math. Soc. Japan, 1935, **17**, 454—466).—Theoretical. Ch. Abs. (*e*)

Ionisation of potassium atoms at heated platinum and tungsten surfaces. H. Mayer (Z.

Physik, 1937, **105**, 725—733).—The positive ion current is measured between a glowing wire of Pt or W and a coaxial cylinder, all of known dimensions, in saturated K vapour at known temp. The ionisation yield for the metal pairs K–Pt and K–W is given by $g = N_i/N_a$, where N_a is the no. of atoms of K striking, and N_i is the no. leaving, the glowing surface in unit time. $g_{K\text{-}Pt} = 51 \pm 3\%$ and $g_{K\text{-}W} = 56 \pm 3\%$.
L. G. G.

Recombination of ions in air at high pressures. P. Kraus (Ann. Physik, 1937, [v], **29**, 449—472).—The variation of the recombination coeff. (α) of ions in air with pressure (p) has been investigated for p up to 140 kg. per sq. cm. α reaches a max. at about 1·7 kg. per sq. cm. and then decreases rapidly with increasing p. The linear relationship between α and p for $p < 1$ atm. becomes inaccurate for p a little $>$ 1 atm. At higher p, $\log \alpha \propto \log p$. A. J. M.

Application of molecular beams to the production of light ions. R. Planiol (Compt. rend., 1937, **204**, 1632—1633; cf. A., 1935, 599).—Beams of H and N ions have been produced. The H beam gave intense Balmer lines, indicating a preponderance of at. ions. R. S. B.

Chemical at. wt. of carbon. A. F. Scott and F. H. Hurley, jun. (Science, 1937, **85**, 544).—Hydrolysis of BzCl under 50% aq. C_5H_5N and titration with Ag gave, from the analyses of five samples, a preliminary val. of 12·010. L. S. T.

Abundance ratio of isotopes of potassium in animal tissues.—See A., III, 251.

Wilson cloud-chamber investigation of the α-particles from uranium. W. M. Rayton and T. R. Wilkins (Physical Rev., 1937, [ii], **51**, 818—825).—The mean ranges of U α-particles, determined in terms of the mean range of Po α-particles, gave the ratios U-I/Po, 0·6904 ± 0·0007 and U-II/Po, 0·8357 ± 0·0008, corresponding with mean air ranges U-I 2·63 and U-II 3·18 cm. on the basis of Po 3·80 cm. The straggling coeff. of the Po α-particle reference group agreed satisfactorily with experiment. There is evidence of a new α-emitting U isotope. The mean air range of the new group is approx. 2·9 cm., and possible identification with Wilkins' Ac series parent (cf. A., 1928, 1302) and with Dempster's ^{235}U (cf. A., 1935, 1048) is discussed. N. M. B.

Ranges and straggling coefficients of α-particles. A. King and W. M. Rayton (Physical Rev., 1937, [ii], **51**, 826—831; cf. preceding abstract).—A review and evaluation of analytical and graphical methods of range determination reveals several types of errors. The superiority of the mean range over the extrapolated range, as a measure, is shown. An analysis taking account of these errors is developed and applied to data for Po. N. M. B.

Dependence of the β-spectra of radioactive elements on atomic number. A. I. Alichanian, A. I. Alichanov, and B. S. Dželepov (Physikal. Z. Sovietunion, 1937, **11**, 204—224).—The form of β-spectra is shown to be markedly dependent on the at. no. of the radioactive substance. The curve for the energy distribution of electrons from Ra-*E* has no definite max., whereas in the case of light radioactive substances such as radioactive Al and P the curve starts at the origin and passes through a sharp max.
H. C. G.

Pair production in β-decomposition. L. Tisza (Physikal. Z. Sovietunion, 1937, **11**, 425—444).—Mathematical. The probability of pair production is calc. for the limiting cases of high and low β-particle energy. The energy distribution of the pairs in the latter case is given. O. D. S.

Theory of β-transformation and nuclear forces. II. G. Wentzel (Z. Physik, 1937, **105**, 738—746; cf. this vol., 60).—Mathematical. The forces binding a hypothetical spinless particle in a nucleus are examined. The relation between the asymmetry of β-spectra and the energy levels concerned is discussed. H. C. G.

Absorption of γ-rays measured by their photo-effect in beryllium. J. Rotblat (Nature, 1937, **139**, 963—964).—The absorption curves of Ra-*C* γ-rays in Pb, Cu, and Al are exponential and correspond with a mean quantum energy of $1{\cdot}96 \times 10^6$ e.v., showing, in agreement with recent mass data, that only the hardest groups of these γ-rays can extract neutrons from Be nuclei. L. S. T.

Rate of emission of γ-ray energy by radium-*B* and radium-*C*, and by thorium-*B* and thorium-*C*″. L. H. Gray (Proc. Roy. Soc., 1937, A, **159**, 263—283).—Measurements are made which determine the total ionisation produced in air by the complete absorption of γ-rays from Ra-*B* + *C* and from Th-*B* + *C*″. The shape of the absorption–distance curve for the Th-*C*″ γ-rays agrees with expectation, but the curve for Ra-*B* + *C* indicates a proportion of hard radiation relatively $>$ previous estimates.
G. D. P.

Scattering of γ-rays. Z. Bay, G. Papp, and Z. Szepesi (Naturwiss., 1937, **25**, 366).—A new method for the investigation of the scattering of γ-rays using thin metal foils is described. The results of determinations with Al agree with the Klein–Nishina formula. Comparison of the scattering curves of γ-rays at Al and Pb shows a nuclear scattering for the latter independent of angle. The scattering coeff. for Pb is (15·8—20·6) × 10^{-25} sq. cm., in good agreement with the val. calc. on the assumption of dematerialisation of positrons (Jaeger *et al.*, A., 1936, 404). A. J. M.

Deuteron–deuteron reaction. R. B. Roberts (Physical Rev., 1937, [ii], **51**, 810—818).—A detailed account of investigations previously reported (cf. this vol., 108). Results for fast neutrons from a thick D_3PO_4 target bombarded by 100-kv. deuterons and for Ra–Be neutrons are compared. Excitation curves are given and discussed, and variation of neutron yield with thickness of paraffin surrounding the source is examined. The abs. yield of protons is one proton for 6 × 10^6 deuterons. N. M. B.

Temperature equilibrium of *C* neutrons. O. R. Frisch, H. von Halban, jun., and J. Koch (Nature, 1937, **139**, 922—923).—The absorption by Ag of *C* neutrons emerging from a paraffin block at several temp. has been measured. The results are discussed. L. S. T.

Scattering of neutrons in matter. V. L. S. Ornstein (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 464—470; cf. this vol., 107).—Mathematical. The distribution in direction of the velocity of neutrons scattered by protons is discussed.
O. D. S.

Motion of neutrons through paraffin. L. S. Ornstein and G. E. Uhlenbeck (Physica, 1937, **4**, 478—486).—Mathematical. F. J. L.

Relation between effective cross-sections for slow neutrons. R. Fleischmann (Z. Physik, 1937, **105**, 698—703).—The mathematical relation between the effective cross-section of the resonance neutrons of a substance when absorbed by B, and that of thermal neutrons when absorbed by the substance, is discussed. H. C. G.

Scattering of slow neutrons at atomic lattices. G. C. Wick (Physikal. Z., 1937, **38**, 403—406).—Theoretical. A. J. M.

Velocity of slow neutrons. J. R. Dunning, G. B. Pegram, G. A. Mitchell, G. Fink, and E. Segrè (Atti R. Accad. Lincei, 1936, [vi], **23**, 340—342).—Group *C* neutrons have a velocity $\sim 2{\cdot}2 \times 10^5$ cm. per sec., *i.e.*, of the order of magnitude due to thermal agitation. O. J. W.

Scattering of fast neutrons by protons. N. N. Dmitriev (Physikal. Z. Sovietunion, 1937, **11**, 225—238).—Mathematical. It is shown that the shape of the potential energy curve for the interaction of protons and neutrons assumed by Mamasachlisov in order to explain the absorption of slow neutrons also requires the existence of a considerable degree of anisotropy for the scattering of neutrons. This is contrary to experiment. Further, Mamasachlisov's theory requires a much greater cross-section of interaction than that calc. from the Wigner formula. (Cf. this vol., 109.) H. C. G.

Transmutation of heavy elements. (Lord) Rutherford (Proc. Roy. Inst., 1937, 29, 630—635).—A lecture.

Artificial radioactivity. II. K. Diebner and E. Grassmann (Physikal. Z., 1937, **38**, 406—425; cf. A., 1936, 773).—The results of work on the production of radioactive nuclei by the action of α-rays, protons, deuterons, neutrons, electrons, and γ-rays are summarised. The possible types of nuclear reaction giving rise to radioactive nuclei are considered.
A. J. M.

Materialisation of the energy of the β-rays from thorium-*B* + *C*. M. Monadjémi (Compt. rend., 1937, **204**, 1560—1562).—The no. of positrons produced by bombardment of Al screens by β-rays from Th-*B* + *C* increases with increasing screen thickness up to 0·023 g. per sq. cm., and then decreases, becoming zero at about 0·13 g. per sq. cm. Cellophane and Cu screens of equal wt. give similar yields of positrons. J. W. S.

γ-Rays emitted on disruption of $^{9}_{4}Be$ with α-particles. S. Pranchetti (Nuovo Cim., 1935, [ii], **12**, 516—521; Chem. Zentr., 1935, i, 3264).—The excitation curve for γ-rays is determined, using bombarding α-rays of various energies, and agrees with that of the neutrons. It is considered that γ-radiation is emitted from the $^{12}_{6}C$ resulting from the disintegration. J. S. A.

γ-Rays from lithium bombarded with protons. A. I. Alichanian (Physikal. Z. Sovietunion, 1937, **11**, 462—464).—The electron pairs observed by Crane and Gaerttner (cf. this vol., 108) must have been largely produced by internal conversion. The difference in the behaviour of the γ-quanta 14·5 and 17·5 m.e.v. with regard to the formation of pairs and the Compton effect can therefore be explained without the hypothesis of Crane (*ibid.*, 110). O. D. S.

Instability of ^{5}He. J. H. Williams, W. G. Shepherd, and R. O. Haxby (Physical Rev., 1937, [ii], **51**, 888—889).—No.-range distribution curves of α-particles resulting from the reaction $^{7}_{3}Li + ^{2}_{1}H \rightarrow ^{4}_{2}He + ^{4}_{2}He + ^{1}_{0}n$ show the existence of a homogeneous group superimposed on the background of this reaction and interpreted as due to α-particles from $^{7}_{3}Li + ^{2}_{1}H \rightarrow ^{5}_{2}He + ^{4}_{2}He$. It is possible that ^{5}He exists only long enough to give ^{4}He a definite energy before it disintegrates into ^{4}He and a neutron.
N. M. B.

Reported radioactivity of ^{38}A. D. Roaf (Proc. Roy. Soc., 1937, **A**, **159**, 133—137).—There is no evidence that A atoms formed by the disintegration of radio-Cl are radioactive. G. D. P.

Formation of radio-aluminium (^{28}Al) and the resonance effect of ^{25}Mg. W. Y. Chang and A. Szalay (Proc. Roy. Soc., 1937, **A**, **159**, 72—82).—The formation of radio-Al from ^{25}Mg by bombardment of α-particles of different energies is investigated. Resonance levels are found. It is suggested that the potential barrier of a nucleus does not exhibit resonance levels and that the max. in proton or neutron yield are due to changes of transition probabilities.
G. D. P.

Radioactivity due to neutron ejection produced by fast neutrons. M. L. Pool, J. M. Cork, and R. L. Thornton (Physical Rev., 1937, [ii], **51**, 890).—Using a cyclotron, 6·3 m.e.v. deuterons bombarded Li, B, Be, and Cu, and the radiation from these activated in turn N, O, Ag, and Cu shielded from the deuteron beam. The secondary targets were activated differently than by deuterons or slow neutrons directly; ordinary half-life periods are lacking or suppressed and a new radiopositive period appears, agreeing with ejection of neutrons from the nuclei by the exciting radiation. Experiments indicate that most, if not all, of the activation of the secondary targets is due to fast neutrons. The max. neutron energies from Li, B, and Be were 14, 13, and 4·6 m.e.v., respectively. The isotopes formed are $^{63}Cu \rightarrow ^{62}Cu$, $^{65}Cu \rightarrow ^{64}Cu$, $^{107}Ag \rightarrow ^{106}Ag$, and $^{109}Ag \rightarrow ^{108}Ag$.
N. M. B.

Production of radioactive elements by bombardment of lithium and magnesium with α-rays from thorium-*C*′. A. Eckardt (Ann. Physik, 1937, [v], **29**, 497—513).—No activity could be induced in Li by bombardment with 8 cm. α-rays from Th-*C*′ for 10 min. Conditions were suitable for the production of $^{10}_{4}Be$ and $^{9}_{5}B$. Mass determinations indicate that the former is probably a stable nucleus. With Mg the possible nuclei were $^{27}_{14}Si$, $^{28}_{13}Al$, and $^{29}_{13}Al$.

The first two were detected and have half-life 7·6 and 2·2 min., respectively. A. J. M.

Radioactivity produced by γ-rays and neutrons of high energy. W. Y. Chang, M. Goldhaber, and R. Sagane (Nature, 1937, **139**, 962—963).—The radioactive isotopes of O, Cu, Ga, Br, Ag, In, and Sb, the production of which can be ascribed only to the loss and not to the capture of neutrons, are tabulated. The loss of neutrons was effected by irradiation with γ-rays from Li + protons and with neutrons from Li + deuterons and B + deuterons. The 13 min. half-period obtained with Sb is probably due to ^{120}Sb and not to ^{122}Sb. In Ga bombarded with neutrons from Li + deuterons and B + deuterons a new radioactivity of approx. 5 min. half-period has been found in addition to that of the 60 min. period. The new reaction is probably $^{69}_{31}Ga + ^{1}_{0}n \rightarrow ^{66}_{29}Cu + ^{4}_{2}He$. With neutrons of Li + deuterons or B + deuterons, but not with those of Be + deuterons or with slow neutrons, a short-period activity, 8 sec., was found to be due to O, accounted for by the reaction $^{16}_{8}O + ^{1}_{0}n \rightarrow ^{16}_{7}N + ^{1}_{1}H$. L. S. T.

Induced radioactivity of silver with neutrons from slow deuterons. E. Bertl, R. Fürth, F. Oboril, and K. Sitte (Nature, 1937, **139**, 964—965).—The neutrons formed when Be-coated mica is bombarded with 25-kv. deuterons (this vol., 340) are due to the reaction $^{9}_{4}Be + ^{2}_{1}H \rightarrow ^{10}_{5}B + ^{1}_{0}n$. A curve showing the no. of neutrons produced by deuterons of energies up to 35 kv., measured by the no. of Ag atoms transmuted, is given. L. S. T.

Energy–range relations for cosmic-ray particles. P. M. S. Blackett (Proc. Roy. Soc., 1937, **A**, **159**, 19—31).—An absorption curve over the range from sea level down to an equiv. depth of 1500 m. of H_2O is compiled from a no. of sources. Comparison with the measured energy spectrum gives the energy–range curve. Between $E = 0$ and $E = 3 \times 10^9$ e.v. the energy loss is 2—3 times that due to ionisation; between $E = 3 \times 10^9$ and $E = 10^{10}$ e.v. the energy loss is but little $>$ the ionisation loss, whilst at higher energies the loss again increases to $>$ 3 times the ionisation loss. The excess energy loss is attributed to radiation emission and shower formation. G. D. P.

Further measurements of the cosmic-ray energy spectrum. P. M. S. Blackett (Proc. Roy. Soc., 1937, **A**, **159**, 1—18).—With improved methods the energy of 829 cosmic-ray tracks in a field of 12,000—14,000 gauss has been measured. The sp. curvature (σ) spectrum of positive and negative rays is similar, being fairly const. between $\sigma = \pm 0{\cdot}4$, when it drops suddenly. Corresponding with the curvature spectrum, the energy spectrum shows anomalies near $2{\cdot}5 \times 10^9$ e.v. The spectra are interpreted as being the absorption of cosmic rays in air. The evidence for the existence of protons in the main beam is collected and the question of the existence of negative protons discussed. G. D. P.

Study of cosmic-ray particles of high energy in the magnetic field of the Bellevue electromagnet. L. Leprince-Ringuet and J. Crussard (J. Phys. Radium, 1937, [vii], 8, 207—212).—The trajectories of the particles comprising the high-energy portion of cosmic rays (1—20 $\times 10^9$ e.v.) in the magnetic field (13,000 gauss) of the large electromagnet of the Academie des Sciences have been studied. Positively and negatively charged particles were found to enter the Wilson chamber in approx. equal nos. The ultra-penetrating radiation (capable of penetrating 14 cm. of Pb) consists predominantly of positively charged particles. More than a quarter of the ultra-penetrating rays were not deviated by the field, and in many cases had energy $> 20 \times 10^9$ e.v. The radiation passing through 14 cm. of Pb contains a considerably smaller no. of uncharged particles. Secondary trajectories of particles of considerable energy, and showers, were also observed. A. J. M.

Nature of cosmic-ray particles. S. H. Neddermeyer and C. D. Anderson (Physical Rev., 1937, [ii], **51**, 884—886).—Investigations of the energy loss of cosmic rays in Pt support the view of the existence of both penetrating and non-penetrating particles (cf. *ibid.*, 1936, [ii], **50**, 263). These may be less massive than protons, but more penetrating than electrons. N. M. B.

Connexion between cosmic rays and meteoric swarms. J. Zirkler (Naturwiss., 1937, **25**, 367).—The study of Th-C''–γ curves with a specially sensitive apparatus shows the probability of a connexion between cosmic rays and meteoric swarms. A. J. M.

Latitude effect of ultra-radiation. B. Gross (Z. Physik, 1937, **105**, 334—340).—The hypothesis that the latitude effect at submarine levels is produced by an almost homogeneous radiation component is discussed mathematically. L. G. G.

Structure of cosmic ultra-radiation. III. B. Trumpy (Z. Physik, 1937, **105**, 341—347; cf. A., 1936, 1315).—The absorption curves for C electrons were obtained by means of two coincidence counters, used singly and together, under a Pb plate 12 mm. thick. Analysis of the curves does not support the conclusion that B-radiation showers are produced in the plate. Comparison of curves from two and three counters respectively show that small amounts of coinciding B quanta arise under the Pb plate. The quantity of C electrons released from coinciding light quanta in the absorbing medium is a max. between 5 and 7 mm. thickness of Pb. L. G. G.

Showers produced by the soft group of cosmic rays. P. Auger and P. Ehrenfest, jun. (J. Phys. Radium, 1937, [vii], 8, 204—206).—The showers produced by the soft fraction of cosmic rays were studied at an altitude of 3500 ft. Observations of cascades of showers lead to the conclusion that the soft fraction of cosmic rays consists of electrons (both positive and negative), and a non-ionising part consisting of photons. It is probable that the cosmic rays of the lower atm. are not primary, but secondary, being parts of showers produced in the upper atm. by the primary radiation. A. J. M.

Recent progress in the neutrino theory. I. J. Solomon (J. Phys. Radium, 1937, [vii], 8, 179—184).—The recent theoretical work on the neutrino is discussed with a view of overcoming some of its difficulties. The theory of β-disintegration is considered. A. J. M.

Recent theories of light. L. DE BROGLIE (Ann. Soc. Sci. Bruxelles, 1937, **57**, B, 99—119).—An exposition and discussion of the photon theory and of Jordan's neutrino theory. N. M. B.

Magnetic moment of the proton. B. G. LASAREV and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1937, **11**, 445—457; cf. this vol., 121).—The magnetic moment of the proton deduced from measurements of the magnetic susceptibility of H_2 at 1·76° and 2·18° abs. is 2·7 nuclear magnetons with error $<10\%$. O. D. S.

Inelastic collision of deuteron and deuteron. L. I. SCHIFF (Physical Rev., 1937, [ii], **51**, 783—788).—Certain symmetry properties of the reactions are developed to obtain an expression for the angular distribution of the reaction products. Results are in qual. agreement with available experimental data. N. M. B.

Energetic stability of isobaric nuclei. G. J. SIZOO (Physica, 1937, **4**, 467—472).—Mathematical. F. J. L.

Neutron–proton interactions. J. H. BARTLETT, jun. (Physical Rev., 1937, [ii], **51**, 889).—Available data and theory are discussed in relation to the assumption of a rectangular potential well. N. M. B.

Virial theorem. E. L. HILL (Physikal. Z. Sovietunion, 1937, **11**, 458—461).—A reply to Hellmann (cf. this vol., 124). O. D. S.

Convergence of the Hylleraas variational method. A. S. COOLIDGE and H. M. JAMES (Physical Rev., 1937, [ii], **51**, 855—859; cf. Bartlett, *ibid.*, 1935, [ii], **47**, 697).—Mathematical. The Hylleraas method is justified, from consideration of the wave-equation for He. N. M. B.

Criteria of goodness for approximate wave functions. H. M. JAMES and A. S. COOLIDGE (Physical Rev., 1937, [ii], **51**, 860—863).—Mathematical. N. M. B.

Plain atomic and molecular models in quantum chemistry. J. B. RUMER (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 161—172).—A lecture. J. W. S.

Atomic nucleus and periodic system of the elements. L. MEITNER (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 173—184).—A lecture. The various methods of producing artificial nuclear transformations are discussed. J. W. S.

Chemical elements and fundamental material; Mendeléev's view and the modern concept. F. PANETH (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 115—130).—The development of the conceptions of units of at. structure is traced. J. W. S.

Periodic law viewed from the basis of spectral analysis. D. ROSHDESTVENSKI (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 87—112).—A lecture. The relationships between at. spectra, the electronic states in the atom, and the periodic law are traced in detail. J. W. S.

Nuclear forces. K. NAKABAYASI (Sci. Rep. Tôhoku, 1937, **25**, 1141—1161).—Mathematical. F. J. L.

Density of energy levels of heavy nuclei. J. BARDEEN (Physical Rev., 1937, [ii], **51**, 799—803).—Mathematical. Assuming that the particles move in a simple potential hole, calculations are based on the Van Vleck statistical model. Results do not agree with those of Bethe (cf. A., 1936, 1175). N. M. B.

Nuclear two-, three-, and four-body problems. W. RARITA and R. D. PRESENT (Physical Rev., 1937, [ii], **51**, 788—798).—Mathematical. N. M. B.

Measurement of the Bohr magneton. O. STERN (Physical Rev., 1937, [ii], **51**, 852—854).—A mol.-ray method for the measurement of forces acting on mols., the forces being compensated by the force of gravity (mol. balance), is discussed. N. M. B.

Precision determination of e/m for electrons. A. E. SHAW (Physical Rev., 1937, [ii], **51**, 887).—Using a new focussing method for electrons in superimposed electric and magnetic fields, the val. obtained is $(1{\cdot}7571 \pm 0{\cdot}0013) \times 10^7$ e.m.u. (cf. *ibid.*, 58). N. M. B.

Work of the electromagnetic field in the dynamic theory of Röntgen interference and according to quantum mechanics. F. GALPERIN (Physikal. Z. Sovietunion, 1937, **11**, 182—193).—The work of the electromagnetic field in any given element of the crystal lattice space during one oscillation is zero by the interference theory of Laue and others, but not by quantum mechanics. A. E. M.

Long-wave extensions in the ultra-violet absorption of alkali halide crystals. E. REXER (Z. Physik, 1937, **106**, 70—92).—The influence of optical irradiation, mechanical deformation, and heat-treatment of KBr crystals on the intensity of the sharply defined absorption has been examined. L. G. G.

Absorption spectra of the alkali halides and their constituents in solution. A. K. DUTTA (Trans. Bose Res. Inst. Calcutta, 1934—1935, **10**, 209—221).—Regions of absorption in the ultraviolet and corresponding energies are tabulated; in most cases two regions were found. The longer-λ region of the chlorides is interpreted as the electron affinity spectrum of the H_2O mol., and the shorter-λ region as an electron affinity spectrum of the halogens. The electron affinity of H_2O, calc. by Pauling's relation using the long-λ limit, is for Cl′ 105, Br′ 106, and I′ 106 kg.-cal. The longer-λ region of the bromides and iodides is attributed, supported by electrolytic dissociation theory, to the breaking up of undissociated mols. in the solution. N. M. B.

Origin and mobility of colour centres in alkali halide crystals. H. RÖGENER (Ann. Physik, 1937, [v], **29**, 386—393).—The equilibrium concn. of colour centres in KCl and KBr crystals has been measured in an atm. of K vapour at a series of temp. and pressures. The no. of centres per c.c. $\propto$ no. of K atoms per c.c. of vapour. The proportionality factor is >1 and decreases with rising temp. The mobility of centres in KCl crystals at 670° is independent of their concn. At temp. <550° the mobility decreases with increasing concn. O. D. S.

Band fluorescence of alkali crystals containing oxygen and carbon monoxide. W. Honrath (Ann. Physik, 1937, [v], 29, 421—432).—Easily decomp. crystals containing O, *e.g.*, those of CO_3'', OH', NO_3', NO_2', as well as crystals saturated by heating under O_2 pressure, show the fluorescence observed by von Lüpke (A., 1934, 1286). The spectrum differs only slightly for KCl, KBr, and KI, and consists of a no. of equidistant bands with a separation of 0·12 e.v. The phosphorescence observed in crystals containing *U*-centres by Roos (A., 1934, 1155) can be produced by heating crystals in CO and K vapour simultaneously. O. D. S.

Absorption spectra of zinc and cadmium halides in the vapour state. S. Deb (Trans. Bose Res. Inst. Calcutta, 1934—1935, **10**, 223—240).—Data for the visible and ultra-violet regions at different temp. and v.p. are reported. The vapours absorb continuously from a long-λ limit, resulting in photochemical decomp. into the normal state in accordance with the general equation for heteropolar mols.: $MX_2 + h\nu = M + 2X$, $h\nu$ corresponding with the thermochemical binding energy of the mols. Heats of dissociation are calc. from heats of formation and latent heats of vaporisation and are compared with the corresponding vals. of the beginnings of absorption and interpreted. Other observed absorption regions with energy < the thermochemical binding energy are interpreted as due to a single electron transition in the normal mol. $M^{++}X''$; hence the binding energy of the temporary mol. MX is calc. N. M. B.

New absorption system of cyanogen gas in the near ultra-violet system. S. C. Woo and T. K. Liu (J. Chem. Physics, 1937, 5, 499).—Corrections to a previous paper (this vol., 215). W. R. A.

SiBr bands. E. Miescher (Helv. phys. Acta, 1935, **8**, 587—588; Chem. Zentr., 1936, i, 3269).—The electrodeless discharge excites a series of strong bands between 3240 and 2870 A. J. S. A.

The λ 2708 and 2756 bands of OD. M. Ishaq (Proc. Roy. Soc., 1937, **A**, **159**, 110—122).—The bands are similar to those of OH at λ 2608 and 2677. The vals. of the rotational consts. are determined, and a list of wave nos. is given. G. D. P.

Rotational analysis of the "3*A*" bands of carbon monoxide. R. Schmid and L. Gerö (Nature, 1937, **139**, 928).—The structure of the so-called "3*A*" bands of CO in the region 2200—2600 A., obtained by means of a high-intensity discharge between C electrodes in Ne gas, is described. L. S. T.

Absorption spectrum of liquid nitric oxide. B. Vodar (Compt. rend., 1937, **204**, 1467—1469).—By using the method previously described for N_2O (this vol., 342), the absorption of liquid NO in the visible and ultra-violet has been investigated. At atm. pressure liquid NO exists between —163° and —150·2°. 2 cm. of NO gives a continuous spectrum with minimal absorption at 4600 A. and independent of temp. between —155° and —147°. Liquid NO is light green, probably due to particles of solid N_2O_3. If NO is condensed on N_2O_4 at liquid air temp. no N_2O_3 is formed, but the NO is coloured green at the moment of fusion. W. R. A.

Band spectrum of MgO in ultra-violet. J. Verhaeghe (Wis.- en nat. Tijdschr., 1935, 7, 224—233; Chem. Zentr., 1936, i, 3451).—Three band systems, with origins at 3720, 3766, and 3799 A., are identified. J. S. A.

Influence of preliminary illumination and of temperature on the absorption of light by cuprous oxide. S. I. Goloub and G. A. Koulev (Physikal. Z. Sovietunion, 1937, **11**, 168—181).—The coeff. of absorption of different specimens of Cu_2O throughout the spectrum was increased by preliminary illumination with blue light, but reduced by similar treatment with red light. Rise of temp. up to 140° gave increased coeff. of absorption in the region of 6000 A. A. E. M.

Coloration of zircon by irradiation. J. Lietz (Naturwiss., 1937, **25**, 415—416).—Spectrophotometric determinations of the absorption of specimens of zircon showing coloration due to oxidation, reduction, and exposure to light and radioactive radiations have been carried out. The colours produced by oxidation at high temp. and irradiation with ultra-violet light are similar but distinct. Chemical coloration is usually irregularly distributed through the crystal, whilst that due to irradiation is uniformly distributed, is independent of previous chemical treatment, and resembles the coloration produced in the alkali halides. Three narrow absorption bands corresponding with 2·62, 1·90, and 3·4 e.v., respectively, were observed. During irradiation, zircon emits a fluorescence radiation of 2·5—2·6 e.v. Heating to 120° changes the colour from greenish-brown to red. At 250° the crystal is colourless. A. J. M.

Spectrum of praseodymium oxide in the vapour state. G. Piccardi (Atti R. Accad. Lincei, 1936, [vi], **23**, 358—361; cf. A., 1929, 1207).—λλ and relative intensities of the bands in the visible region are tabulated. O. J. W.

Colour and constitution of bivalent cobalt compounds. W. Feitknecht (Helv. Chim. Acta, 1937, **20**, 659—682).—A review of present knowledge and theories. C. R. H.

Relation between configuration of metallic complex salts and their absorption spectra. H. Sueda (Bull. Chem. Soc. Japan, 1937, **12**, 188—198; cf. this vol., 241).—A comparison of the absorption curves of various nitrito-cobaltammine salts in the neighbourhood of λ 360 mμ indicates that the absorption is expressible as the sum of the absorptions due to certain structural elements into which the complex may be resolved. Differences between observed and calc. vals. of the extinction coeff. are due partly to the adoption of a simplifying assumption and partly to errors of measurement. A *trans* configuration is assigned to $K[Co(NH_3)_2(NO_2)_4]$ (Erdemann's salt). The application of the principle to chloro-aquo-ammine salts of Co and Cr is discussed. F. L. U.

Energy states in solids with particular reference to $NdCl_3,6H_2O$. F. H. Spedding and H. F.

HAMLIN (J. Chem. Physics, 1937, **5**, 429—442).—Absorption spectra of $NdCl_3,6H_2O$ have been photographed over a wide temp. range and two new low-lying states were found. These arise presumably from a splitting of the basic state in a predominantly cubic field. The over-all and relative splitting are rather different from the vals. found for the sulphate because of the change in the crystal field brought about by the break in the homologous series of the hydrated chlorides of the rare earths between Nd and Pr. W. R. A.

Electronic transitions in Nd^{+++} ions and the absorption spectra in solution and crystals. P. C. MUKHERJI (Indian J. Physics, 1937, **11**, 123—141).—The absorption spectra of Nd^{+++} ions (900—200 mμ) have been classified, using solutions at room temp. and large single crystals of various thicknesses at liquid air temp. The existence of a lower excited level, 249 $cm.^{-1}$ above the basic level, at low temp. is indicated. F. J. L.

Energy states of crystalline $Pr_2(SO_4)_3,8H_2O$. F. H. SPEDDING, J. P. HOWE, and W. H. KELLER (J. Chem. Physics, 1937, **5**, 416—429).—Absorption spectra of both crystals and conglomerates of $Pr_2(SO_4)_3,8H_2O$ have been photographed over a wide range of temp. Three new low-lying excited levels exist besides the basic state and their vals. are in fair agreement with calc. vals. of Penney and Schlapp (A., 1932, 985) and with vals. calc. from the field const. *D* for rare-earth sulphates. The spectra are complicated by coupling of the highly excited states with vibrational states. W. R. A.

Ultra-violet absorption spectrum of potassium perrhenate. J. F. H. CUSTERS (Physica, 1937, **4**, 426—429).—A strong band λ 2290 A. and a weak one 2390 A. are observed in the absorption spectrum of $KReO_4$, corresponding with bands at λλ 5465 and 5660 A. in the absorption spectrum of $KMnO_4$. F. J. L.

Influence of solvent on the absorption spectrum of neodymium acetylacetonate. M. RADOÏTCHITCH (Compt. rend., 1937, **204**, 1469—1470).—The spectrum of Nd acetylacetonate in 40 different solvents has been investigated. Solvent influences exert an effect on the bands either by regular displacement in position without change in the structure of the band and without deformation, or an irregular displacement accompanied by change in the structure of the band system. Solvation may account for some of the effects, but the influence of the solvent cannot be explained entirely on the basis of its dielectric const. or dipole moment. W. R. A.

Ionic association and absorption spectra. H. VON HALBAN and B. SZIGETI (Helv. Chim. Acta, 1937, **20**, 746—761).—The absorption spectra of picrates in solvents of low dielectric const. and in conc. aq. solutions of inorg. halides have been investigated. The spectra of undissociated picrate differs only slightly from the spectra of picrate ions in H_2O. The nature of the cation has a slight effect compared with the difference between the spectra of dissociated and undissociated picric acid. Halides have little effect on the spectra of the picrate ion in H_2O. The data are compared with the results of other workers and are discussed. C. R. H.

Variation with temperature of ultra-violet absorption spectra of acetone and iodine in solution. H. J. WALLS and E. B. LUDLAM (Trans. Faraday Soc., 1937, **33**, 776—781).—The absorption max. of $COMe_2$ dissolved in H_2O, MeOH, and C_6H_{14} are displaced towards longer λ with rise of temp., whilst those of I in EtOH are displaced in the opposite sense. The temp. coeff. of the displacement for $COMe_2$ increases with rise of temp. in all solvents, and the displacement itself is much less for H_2O than for the other solvents. The effects are discussed. F. L. U.

Absorption spectra and dissociation energies of normal and *iso*-thiocyanates. S. C. WOO and T. C. CHU (J. Chinese Chem. Soc., 1937, **4**, 162—169).—The ultra-violet absorption spectra of the vapours and solutions in MeOH consist of two continua which merge at high concn. The long λλ of the first continua correspond with the dissociation energies (kg.-cal. per mol.): MeSCN $<108{\cdot}1$, EtSCN $<108{\cdot}5$, MeNCS $<94{\cdot}5$, EtNCS $<99{\cdot}4$, $C_3H_5{\cdot}NCS$ $<100{\cdot}8$, PhNCS $<98{\cdot}0$. A few diffuse bands due to the C_6H_6 ring were observed in the first continuum of PhNCS vapour. The mechanism of photodecomp. is discussed. J. G. A. G.

Absorption spectra and dissociation energies of cyanic acid and some *iso*cyanates. S. C. WOO and T. K. LIU (J. Chem. Physics, 1937, **5**, 499).—Corrections to an earlier paper (cf. A., 1935, 1299). W. R. A.

Continuous absorption spectra of some polyatomic molecules. Y. HUKUMOTO (Sci. Rep. Tôhoku, 1937, **25**, 1162—1169).—The absorption spectra of MeSH, EtSH, PrSH, BuSH, $CH_2Ph{\cdot}OH$, CH_2PhBr, CH_2PhCl, $CH_2Ph{\cdot}CN$, $CH_2X{\cdot}CH_2{\cdot}OH$ ($X =$ Cl, I, CN); $CCl_2Me{\cdot}OH$; $Ph{\cdot}[CH_2]_n{\cdot}OH$ ($n = 2, 3$), and some miscellaneous alcohols, in gaseous and liquid phase, have been measured, and the dissociation energy is estimated from the absorption edge. F. J. L.

Absorption spectra of strychnine and its derivatives.—See A, II, 312.

Light absorption of R_1–R_1 systems. II. Spectra of ergosterol, vitamin-D_2, $\Delta^{\beta\delta}$-decadiene, cholesterol, and isoprene. H. MOHLER (Helv. Chim. Acta, 1937, **20**, 811—816).—The spectra are compared with those of other unsaturated compounds with reference to the arrangement of the double linkings. C. R. H.

Transmission of oxides in the far infra-red. M. PARODI (Compt. rend., 1937, **204**, 1636—1638).—Absorption in the far infra-red has been studied with MnO, SrO, CdO, BaO, and CuO, bands occurring at 33, 47, 51·5, 53, and 31 and 38 μ, respectively. λ for the band is a parabolic function of the at. no. of the metal, including MgO and CaO. Compressibilities have been calc. and agree with experimental vals. R. S. B.

Infra-red absorption spectra of [eight aliphatic] alcohols, [formic and acetic] acids, and their solutions in carbon tetrachloride. E. L. KINSEY and J. W. Ellis (J. Chem. Physics, 1937, 5, 399—405; cf. A., 1936, 268).—The absorptions of the pure liquids in the regions 0·9 to 2·2 μ and 2·0 to 4·0 μ are compared with their absorptions in CCl_4 solution (1 vol. in 19 vols. of CCl_4); data for the vapours of MeOH, EtOH, HCO_2H, and AcOH are also given. Bands characteristic of the OH group are modified in solution, but bands characteristic of the hydrocarbon chain remain unaltered. In solution, polymerisation or lattice structure effects are apparently destroyed, since bands attributable to single mols. are found in solution with much greater intensity than in the pure liquid. These bands in solution are accompanied on the long-wave side by a broad region of continuous absorption attributable to polymerised mols., and this region becomes more intense as the concn. of solute increases, until in the pure liquid it predominates. Comparison is made with the spectrum of NH_2Ph, which displays peculiar behaviour near 1·4 μ. W. R. A.

Infra-red absorption spectra and ethylenic compounds. III. βγ-Ethylenic acids and γ-lactones. R. Delaby and J. Lecomte. **IV. Types of molecular vibration.** J. Lecomte and R. Delaby (Bull. Soc. chim., 1937, [v], 4, 1007—1016, 1016—1024).—III. Acids of the general formula $R\cdot CH{:}CH\cdot CH_2\cdot CO_2H$ (R = Et, Pr^α, Bu^α, Bu^β, n-C_5H_{11}, and n-C_7H_{15}) were obtained by hydrolysis of the corresponding nitriles by means of N-NaOH or conc. aq. $Ba(OH)_2$ at 90—95°. After extraction with Et_2O the extracts were neutralised with HCl, steam-distilled, and the distillates re-extracted with Et_2O. After drying, the Et_2O was removed and the acids were distilled under reduced pressure. In this way the conversion of the βγ-nitrile into the αβ-acid was prevented. γ-Lactones with R = Me, Et, Pr^α, Bu^α, Bu^β, n-C_5H_{11}, n-C_6H_{13}, n-C_7H_{15}, n-C_9H_{19}, n-$C_{12}H_{25}$, and $Pr^\beta\cdot[CH_2]_2\cdot CHMe$ were prepared from the nitriles by boiling with 50 vol.-% H_2SO_4 and extracting with Et_2O, and distilling under reduced pressure. Compared with the saturated acids, the introduction of the βγ-C:C linking has little effect on the absorption bands due to the CO_2H, but the bands due to the saturated C chain are absent in the unsaturated acids. The bands attributed to the CO·O group in the lactones are compared with similar bands found in the case of aliphatic esters.

IV. The bands due to the C:C linking and the influence of substituents are discussed. C. R. H.

Infra-red absorption spectrum of keten. H. Gershinowitz and E. B. Wilson, jun. (J. Chem. Physics, 1937, 5, 500).—The examination of gaseous keten with a rock-salt prism spectrometer between 740 and 3500 cm.$^{-1}$ has revealed bands agreeing roughly with the Raman lines for the liquid. No bands ascribable to $COMe_2$, C_2H_4, or CH_4 were found. Keten has nine fundamentals active in both Raman and infra-red spectra. W. R. A.

Raman spectrum and the structure of water. P. C. Cross, J. Burnham, and P. A. Leighton (J. Amer. Chem. Soc., 1937, 59, 1134—1147).—Raman spectra of H_2O, ice, and D_2O have been determined. The relative amounts of the different co-ordination types of H_2O have been estimated. In the range 25—90°, H_2O is slightly >2-co-ordinated and slightly less co-ordinated than is D_2O. The 2-co-ordinated structures predominate in both liquids. In ice at 0° the 4-co-ordinated structure predominates, but appreciable amounts of 3- and 2-co-ordinated mols. are present. The energy of the H linking in H_2O is calc. as 3 kg.-cal. per mol. per linking. The agreement of the results with those of X-ray data is discussed. E. S. H.

Raman effect in circularly polarised light in quartz, observed along the optic axis. C. Bouhet (Compt. rend., 1937, 204, 1661—1663).—The Raman lines from quartz illuminated by circularly polarised light were found to be completely circularly polarised. Lines 207, 355, and 465 cm.$^{-1}$ had the same sense of rotation as the incident light, and lines 128, 394, 696, and 1161 cm.$^{-1}$ the opposite. R. S. B.

Werner complexes. Raman spectra of complex ions of the type [MX_3]. J. P. Mathieu (J. Phys. Radium, 1937, [vii], 8, 169—174).—The Raman spectra of the complexes Cl_4[Pt en_3], Cl_3[Rh en_3], Br_3[Ir en_3], Cl_2[Zn en_3], and Cl_2[Ni en_3], [en = $(CH_2\cdot NH_2)_2$] have been studied, using Hg lines 4358 and 4047 A. The lines are the sharper the more stable is the complex. The polarisation of the lines was studied for the Pt compound. A. J. M.

Raman effect of two complex molybdotartrates in water. (Mlle.) M. Théodoresco (Compt. rend., 1937, 204, 1649—1651; cf. A., 1936, 1445).—$Na_2MoO_4,2H_2O$ (I) and $Na_2WO_4,2H_2O$ give similar Raman spectra and $Na_4[t_2MoO_3]$ (II) and $Na_2[tMoO_3]$ (III), where t = tartrate, differ from the corresponding W compounds in one line only, 924 cm.$^{-1}$ in (II) and 934 cm.$^{-1}$ in (III). The Raman spectra of (II) and (III) differ very slightly from the spectrum of (I), except for the line due to CO_2H, which becomes a band in the complex tartrates. R. S. B.

Interpretation of Raman spectra of alcohols and acetone by their changes on dissolution in them of metal perchlorates. J. Goubeau (Z. physikal. Chem., 1937, B, 36, 45—84; cf. A., 1933, 764).—The Raman spectra of solutions of perchlorates in MeOH, EtOH, Pr^αOH, Bu^αOH, $COMe_2$, EtOAc, and Et_2O have been determined. In each solvent except MeOAc there is a frequency which is depressed by the solute, whilst the CH frequencies are in general increased. All three frequencies of the ClO_4' ion are increased by the cation, but this effect is weakened by the solvent, and the more so the higher is the dielectric const. of the latter. The alcohols exhibit a line at approx. 1050 cm.$^{-1}$, which is ascribed to oscillation of the C·O linking. Association depresses this frequency. It has been shown for ten aliphatic alcohols that the whole C chain oscillates relatively to the OH. Intermol. forces can be explained as the effect of dipoles and ions on the inductive power of the negative O atom. The inductive effect is large for an α-Me group, but decreases rapidly with increasing chain length and is scarcely perceptible with β-Me groups. R. C.

Raman spectra of some acid chlorides. V. N. Thatte and M. S. Joglekar (Phil. Mag., 1937, [vii],

23, 1067—1078).—The Raman spectra of several acid chlorides are recorded. The characteristic frequency shift due to C:O·linking is ~ 1790 and 1774 cm.$^{-1}$ in aliphatic and aromatic compounds, respectively; the mean shift due to C·Cl linking is 448 cm.$^{-1}$

F. J. L.

Raman effect of organic substances. VIII. Furan derivatives. K. Matsuno and K. Han (Bull. Chem. Soc. Japan, 1937, **12**, 155—163; cf. A., 1934, 1155).—Raman spectra of Me and Et esters of α-furfuracrylic, *trans*-cinnamic, α-furylpropionic, and hydrocinnamic acids are given. The results indicate that the so-called stable furfuracrylates are *trans* esters.

F. L. U.

Raman spectra and molecular structure of ethane and its derivatives. S. Mizushima and Y. Morino (J. Chem. Soc. Japan, 1935, **56**, 1464—1470; cf. A., 1935, 281).—The data for mols. of the type $CH_2X·CH_2X$ are best explained by assuming hindered rotation and not by *cis–trans* isomerism.

Ch. Abs. (*e*)

Raman spectrum and molecular structure of benzene. S. Mizushima and Y. Morino (J. Chem. Soc. Japan, 1935, **56**, 1470—1474).—Hexagonal symmetry is more probable than trigonal. The modes of vibration of C_6Cl_6 and C_6Me_6 are calc.

Ch. Abs. (*e*)

Scattering of light as a function of the relation of particle size to wave-length. N. Fuks (J. Phys. Chem. Russ., 1937, **9**, 295—296).—Remarks on a paper by Gurevitsch and Veitzer (this vol., 220).

E. R.

Chemiluminescence.—See A., III, 275.

Action of the electric field on photoluminescent compounds. Superluminescent and extinction effects. G. Destriau (J. Chim. phys., 1937, **34**, 327—332; cf. this vol., 283).—ZnS previously irradiated by violet or ultra-violet light or *X*-rays emits, even after several days if kept in the dark, a strong superluminescence of short duration followed by a faint superluminescence of long life when a const. or sinusoidal electric field is applied. If, however, irradiation with infra-red rays is interposed before the field is applied, the superluminescence is diminished or completely suppressed (cf. A., 1936, 1320). The electrons responsible for the superluminescence have relatively stable upper levels. The results are further discussed and anomalies are removed. J. G. A. G.

Quantum theory of the phosphorescence of crystal phosphors. II. T. Muto (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 5—25; cf. A., 1936, 270).—The quantum theory of phosphorescence is discussed and applied to crystals with small concns. of foreign ions, *e.g.*, KCl+Tl or Pb.

R. S. B.

Effect of pressure on phosphors. N. Riehl and H. Ortmann (Ann. Physik, 1937, [v], **29**, 556—568).—The effect of pressure on phosphors has been examined in the case of ZnS and alkaline-earth sulphide phosphors. Powdering has no effect on the sp. gr. of the phosphors, and the abs. effect of pressure on the intensity of the emitted light was much overrated in the earlier work, largely because of the failure to take into account the diminution in transparency of the phosphor produced by the powdering. A medium powdered phosphor showed 10%, and an extremely finely powdered one 36%, smaller intensity of emission than the unpowdered phosphor. An approx. calculation of the no. of centres which are brought to the surface by the powdering gives a result agreeing with the experimental determination of the decrease of intensity. The mechanical stability of a phosphorescence centre is as great as that of the normal lattice. A. J. M.

Mercury arc rectifier studied by probe electrodes. T. Hada (J. Inst. Elect. Eng. Japan, 1935, **55**, 965—973).—Data are recorded. Electrons have a Maxwellian velocity distribution, even at 600° near the cathode. Ch. Abs. (*e*)

Photo-electric measurements with antimony. V. Middel (Z. Physik, 1937, **105**, 358—377).—An inner photo-electric effect was found for cathode-sputtered Sb, the max. effect occurring at 3700 A. Measurements of the outer photo-electric effect gave a continuously increasing current with decreasing λ, and a long-wave limit between 3000 and 3100 A.

A. E. M.

Electrical equilibrium in systems of metallic conductors only, and permanent thermo-electric currents in complete metallic circuits. F. Odone (Nuovo Cim., 1935, [ii], **12**, 522—530; Chem. Zentr., 1936, i, 3459).—Theoretical. The inner- and outer-Volta effect, Peltier effect, and Thomson effect are treated thermodynamically. J. S. A.

Conduction of electricity in solids. N. F. Mott (Nature, 1937, **139**, 951—954).—A summary of three lectures. L. S. T.

Electron conductivity and halogen excess in alkali halide crystals. E. Mollwo (Ann. Physik, 1937, [v], **29**, 394—406).—On heating KI and KBr crystals in I and Br, respectively, crystals are obtained which contain excess of halogen in concn. $C \propto$ the pressure of the gas. The proportionality factor is $<0·01$ and increases with rise of temp. The absorption spectra of the crystals are described. The mobility v in electric fields of the excess of halogen is $<$ that of the colour centres and inversely $\propto C$. At const. C, v increases with rise of temp. The thermal diffusion const. of excess of halogen is $>$ that calc. from v. It is supposed that equilibrium exists in the crystal between halogen atoms and mols. and that the electrical conductivity is due to atoms. No excess of halogen was detected in KCl after heating in Cl_2 vapour. O. D. S.

Variation in conductivity of thin film of sodium chloride and rock-salt crystal with temperature. H. Saegusa and T. Matsumoto (Sci. Rep. Tôhoku, 1937, **25**, 805—815).—The variation of conductivity (σ) with temp. (T) of artificial NaCl crystals satisfies $\log \sigma = B + A/T$, but natural rock-salt does not, probably because of impurities. Films of NaCl 5—10 μ thick have high, irregular conductivity, which decreases to 1/10 after heating to 160° and then obeys the above relation. F. J. L.

Conductivity of solid dielectrics at high field strengths. F. Quittner (Physikal. Z. Sovietunion, 1937, **11**, 359—368).—Theoretical. The increase in conductivity at high field strengths is a true property of solid insulators and is probably produced in amorphous bodies by ions and in cryst. bodies by electrons. O. D. S.

Nature of the electrical conductivity of solid dielectrics in strong electric fields. II. Mica at high field strengths. V. Pruschinina-Granovskaja (Physikal. Z. Sovietunion, 1937, **11**, 369—389).—Conduction through mica at 30—60° in fields about 2 × 10^6 volts per cm. is not accompanied by electrolysis. At higher temp. (400°) and 2—5 × 10^5 volts per cm. Al and O_2 are liberated at the cathode and anode, respectively, but in quantities insufficient to account for the whole of the conductivity. Transport nos. of the ions vary with temp. It is deduced from the variation of electronic conductivity with field strength that at low temp. and weak fields conductivity is ionic. O. D. S.

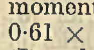
Free intra-molecular rotation and dielectric loss in a high-frequency field. L. D'Or and J. Henrion (Physikal. Z., 1937, **38**, 426).—If a mol. has a polar group capable of free rotation, of which the moment is inclined to the axis of rotation, it can orient itself in a high-frequency field in a different way from the rest of the mol. Since the relaxation time of the group is < that of the whole mol. the orientation could be determined with waves of $1/\nu$ < relaxation time of the whole mol. and > that of the group. If $1/\nu$ > relaxation time of the mol. it would be expected that the dielectric loss of such a mol. would be < that for a mol. without internal free rotation. This has been verified by determining the dielectric loss for $\lambda = 7{\cdot}2$ m. of p-$C_6H_4(CH_2Cl)_2$ (I) (a mol. with internal free rotation) and o-$C_6H_4Cl_2$ (without such free rotation). The dielectric loss of the latter was 2·6 times that of the former. The CH_2Cl groups of (I) must be chiefly responsible for the loss in this compound. A. J. M.

Theory of the measurement of dielectric constants and absorption coefficients in the region of short waves. V. I. Romanov (Physikal. Z. Sovietunion, 1937, **11**, 404—413).—Expressions for the dielectric const. and the absorption of the dielectric filling the condenser are derived from the resonance curves for a system composed of a condenser in the circuit of a Lecher system. O. D. S.

Dipole moment and Raman effect of molecules with groups capable of free rotation. II. S. Mizushima, Y. Morino, and M. Kubo (Physikal. Z., 1937, **38**, 459—462; cf. A., 1935, 12).—The mol. structures of s-$C_2H_4Cl_2$, -C_2H_4ClBr, -$C_2H_4Br_2$, -$C_2H_2Cl_4$, and C_2Cl_6 are considered on the basis of their Raman spectra and dipole moments. In C_2Cl_6 the majority of the mols. have the *trans*-structure, and on account of the symmetry, only a few normal Raman lines are permitted, in agreement with experiment. The disubstitution products are most stable in the *trans*-form. The probability of deviation from this form varies with temp. and solvent. Tetra-substitution products ($CHX_2{\cdot}CHX_2$) show a potential min. in addition to that of the *trans*-structure. The dipole moments of these products depend to a large degree on the solvent, but are little affected by temp. due to displacement of the potential min. in the mol. field of the solvent. The structure of $CH_2(OMe)_2$, in which there is intramol. rotation about two axes, is considered. In this compound there is intramol. rotation about a stable position in which the two Me groups lie on opposite sides of the O·C·O plane. $CH_2(OEt)_2$ and $CHMe(OEt)_2$ have similar structures to $CH_2(OMe)_2$. The dipole moment of $CO(OEt)_2$ is independent of temp. (80—204°). A. J. M.

Theory of effect of magnetic field on dielectric constant of diamagnetic gases and liquids. I—III. A. Piekara (Acta phys. polon., 1935, 4, 53—64, 73—77, 163—175; Chem. Zentr., 1936, i, 3456—3457).—An approx. quant. theory is developed on classical lines. The effect cannot be ascribed to mol. orientation or to intermol. forces, but may be due to the induction of a weak electric moment by strong magnetic fields. The effect is correlated with the superposed magnetic and electrical double refractive effects. J. S. A.

Dielectric constants of gases and vapours. VIII. Dipole moments of some organic compounds containing a double linking. M. Kubo (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 26—32; cf. this vol., 65).—From measurements of ε on the vapours of allyl chloride (I) at 307·8—480° abs. and *cyclo*hexene (II) at 307·5—480·4° the dipole moments have been calc. to be 1·88 × 10^{-18} and 0·61 × 10^{-18}, respectively. Electric polarisation for (I) and (II) is 18·65 and 26·5 c.c., and at. polarisation for (I) is 1·8 c.c. On the assumption that the mean state of (I) is near the *trans*-position, it is inferred that in unsaturated hydrocarbons the double linking contributes to the mol. a small electric moment, the negative end of which lies at the part of the mol. containing the double linking. R. S. B.

Raman effect and dipole moment in relation to free rotation. VII. Quantum mechanical resonance in carboxylic acids. Y. Morino and S. Mizushima (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 33—43).—The Raman spectra of HCO_2H and saturated HCO_2Na have been observed. For HCO_2' the symmetric vibrations are 2822, 1354, and 766 cm.$^{-1}$, and the force consts. $k_{CO} = 9{\cdot}29 \times 10^5$ and $k_{CH} = 4{\cdot}27 \times 10^5$ dynes per cm. The ions HCO_2' and CO_3'' are compared. The change in Raman spectrum on passing from HCO_2' to HCO_2H is discussed in terms of a resonance structure for CO_2H, and the possibility of the existence of a rigid form  $\mathrm{R{-}C}\begin{smallmatrix}\nearrow\mathrm{O}\\ \searrow\mathrm{O}\\ \mathrm{H}\nearrow\ \ \end{smallmatrix}$ differing considerably in energy from the normal form is inferred (cf. this vol., 345). R. S. B.

Dielectric constant and dipole moment of ethyl maleate and fumarate and their ozonides. E. Briner, E. Perrottet, H. Paillard, and B. Susz (Helv. Chim. Acta, 1937, **20**, 762—767).—With CCl_4 as solvent, the following vals. for dielectric const., ε, and dipole moment (× 10^{18}), respectively, have been obtained at 23°. Et maleate (I), 8·58, 2·51; Et fumarate (II), 6·56, 2·23; ozonide of (I), 8·95, 2·53; ozonide of (II), 7·54, 2·29. The vals. of ε for pure ozonides are considered to be < those of the ozonides examined on account of the presence in the latter of decomp. products, *e.g.*, H_2O, acids, which have a high ε. C. R. H.

Dielectric constant and molecular size. Rubber compounds. II. Duprene and rubber hydrochloride. N. J. J. Li (J. Chinese Chem. Soc., 1937, 5, 117—123).—The dielectric consts. of solutions of duprene, $(CH_2{:}CCl{:}CH{:}CH_2)_n$ (I), and rubber hydrochloride (II) in C_6H_6, $CHCl_3$, and CCl_4 are independent of λ ($16{\cdot}6$—3×10^5 m.). The non-polarity of (I) and (II) is discussed. J. G. A. G.

Dielectric properties of Japanese lacquer film. A. Miyata (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 357—369).—Films of Japanese lacquer 0·1 mm. thick were formed on oxidised Al by successive bakings. The dielectric strength was $2{\cdot}5$—4×10^5 volts per cm. and ε was 3·6 at 20°; ε increased slightly with rise of temp. R. S. B.

Atomic refractivities of amide-nitrogen. K. von Auwers (Z. physikal. Chem., 1937, 179, 61—64).—Despite the recognition of the amides in the liquid and dissolved states as tautomeric mixtures (A., 1937, II., 281) the vals. hitherto recognised for the at. refractivities of amide-N are still valid. R. C.

Rotatory dispersion of *iso*hydrobenzoin and dipole moments of *iso*hydrobenzoin and benzoin. F. Eisenlohr and L. Hill (Z. physikal. Chem., 1937, B, 36, 30—44).—The dispersion curves in the visible of *d*- and *l*-*iso*hydrobenzoin at 20—50° show no signs of anomalous rotatory dispersion. The dipole moments of the *l*-, racemic, and meso-forms are 2·70, 2·72, and $2{\cdot}48 \times 10^{-18}$, e.s.u., respectively. R. C.

Theory of optical rotatory power. J. G. Kirkwood (J. Chem. Physics, 1937, 5, 479—491).—Mathematical. A simplified treatment of Born's quantum-mechanical theory of optical activity gives a simple expression for the rotatory parameter of an active mol. in terms of the geometrical configuration and the polarisability tensors of its constituent groups. The rotatory power depends on the optical anisotropy of component groups and on inhibited internal rotation. The abs. configuration and sp. rotation of *d-sec.*-BuOH are calc. W. R. A.

Magnetic rotatory power of compressed and liquefied nitric oxide. H. Bizette and B. Tsai (Compt. rend., 1937, 204, 1638—1640).—The magnetic rotatory power (ρ) of NO has been determined at 19° to −80° at pressure 44·5—142 kg. per sq. cm., and $\lambda = 0{\cdot}546\ \mu$. It is calc. that ρ passes through a max. at −138°. There is indication of polymerisation of NO at −80° under pressure. Verdet's const. at −104° and pressure 68·5 kg. per sq. cm. for $\lambda = 0{\cdot}546$ is $-3{\cdot}684 \times 10^{-2}$, and the % of $(NO)_2 = 21$. R. S. B.

Structure of diborane. S. H. Bauer (J. Amer. Chem. Soc., 1937, 59, 1096—1103).—Electron-diffraction investigation indicates a C_2H_6-like structure with the B—B distance $1{\cdot}86 \pm 0{\cdot}04$ A. and the B—H distance $1{\cdot}27 \pm 0{\cdot}03$ A. The valency angles of B are tetrahedral within 3°. A compatible electron configuration is described in terms of the at. and mol. orbital models. The stability of B_2H_6 in comparison with BH_3 is due to the resonance energy made available through the full use of the four orbitals of B. E. S. H.

Constitution of some halogen compounds of rhodium. J. Meyer, M. Kawczyk, and K. Hoehne (Z. anorg. Chem., 1937, 232, 410—414).—$RhX_3,2C_2H_4(NH_2)_2,(HX)_2$ (X = Cl, Br) and $RhBr_3,2C_3H_6(NH_2)_2,(HBr)_2$ have four ionisable halogen atoms and $2RhBr_3,3NH_2Me,HBr$ has three. They are double salts in which RhX_3 is non-ionisable. F. J. G.

Periodic system of chemical compounds of the type A_mB_n. H. G. Grimm (Trav. Congr. Jubil. Mendeléev, 1936, 1, 355—368).—A lecture. Binary compounds are classified and electron configurations leading to each type of compound are deduced. J. W. S.

Internal sphere of complex compounds. I. Tscherniaev (Trav. Congr. Jubil. Mendeléev, 1936, 1, 461—465).—A lecture. The mechanism of the binding forces in co-ordination compounds is discussed. J. W. S.

Physical chemistry of complex compounds. A. Grünberg (Trav. Congr. Jubil. Mendeléev, 1936, 1, 479—492).—A summary of recent work on complex Pt salts. J. W. S.

Magnetic anisotropy and electronic structure of aromatic molecules. K. Lonsdale (Proc. Roy. Soc., 1937, A, 159, 149—161).—The anisotropy of C_6H_6, cyanuric, and phthalocyanine compounds is explained by supposing that π electrons occupy plane orbits which are free to precess only in their own plane. Valency (*s*) electrons behave as if they are spherically symmetrical and free to precess under the influence of any magnetic field. The radii of orbits calc. from susceptibility data agree with the theory of mol. orbitals, 0·7 A. for *s* electrons and 1·55 A. for C_6H_6 π electrons. G. D. P.

Potential function of the water molecule. G. W. King (J. Chem. Physics, 1937, 5, 405—412).—A method, in which it is assumed that the potential function of the H_2O mol. is unaltered on isotopic substitution, is advanced for evaluating the force consts. in the general quadratic expression for the energy, and on the basis of this method a valency angle of 107° 22′ is obtained in agreement with the val. derived from rotational analysis. Using this val. the potential function is determined by taking into account all the possible modes of at. interaction. W. R. A.

Anharmonicity constants of the potential function of the water molecule. G. W. King (J. Chem. Physics, 1937, 5, 413—415; cf. preceding abstract).—Mathematical. Matrix mechanics have been used to calculate the true vibrational levels of a triat. mol. and its isotopic varieties. The calculations have been applied to the zero-point frequencies of H_2O and D_2O. W. R. A.

Fundamental frequencies of CH_2, CHD, CD_2, CHCl, CDCl, and *cis*- and *trans*-$C_2H_2D_2$ and -$C_2H_2Cl_2$. T. Y. Wu (J. Chem. Physics, 1937, 5, 392—398).—The groups CH_2, CHD, CD_2, CHCl, CDCl have been treated as a valence force system, and the relative dependence of the three fundamental frequencies calc. for each group on the val. of the deformation frequency is utilised in assigning the individual modes of vibration of the group. The calculation is used to assign the calc. frequencies of *cis*-, *trans*-, and *as*-$C_2H_2D_2$ (cf. Manneback and Verleysen, A., 1936, 1324). Recorded data on the polarisation and intensities of Raman lines, infra-red absorption measurements, and application of selection rules are considered for *cis*- and *trans*-$C_2H_2Cl_2$ and a suggested assignment is made. W. R. A.

Thermodynamic functions for molecules having restricted internal rotations. K. S. Pitzer (J. Chem. Physics, 1937, **5**, 469—472).—A theoretical method is given for determining the rotational contribution to the thermodynamic functions of a mol. from a consideration of the potential barriers hindering rotation about the various linkings within the mol. W. R. A.

Thermodynamics of gaseous hydrocarbons: ethane, ethylene, propane, propylene, *n*-butane, Δ^α-butene, *cis*-and *trans*-Δ^β-butene, *iso*butene, and neopentane (tetramethylmethane). K. S. Pitzer (J. Chem. Physics, 1937, **5**, 473—479; cf. preceding abstract).—A reformulation is given of the statistical methods of calculation of the thermodynamics of gaseous hydrocarbons which take into account the contributions due to restricted rotation about C·C linkings. Although assumptions regarding the height and shape of the potential barriers restricting rotation are necessary, it is possible to obtain vals. in agreement with experimental results. The mol. structure data thus obtained, together with available heats of combustion and of hydrogenation, have been employed in calculations which yield thermodynamic consts. and the free energy of formation as a function of the temp. between 300° and 1500° abs.

W. R. A.

Valency angles and binding strength of the carbon atom. T. Förster (Naturwiss., 1937, **25**, 366—367).—The variation in strain on passing from the five- through the four- to the three-membered ring in *cyclo*-aliphatic hydrocarbons results in an increase in the binding frequency of CH in the Raman spectrum, and an increase of the frequency of the "pulsation vibration" of the ring, but not to the extent required if the force consts. of the C·C linkings remain unchanged. The force consts. of the linkings in the ring must become smaller, resulting in a similar change in the binding strength. This conclusion can also be derived from quantum-mechanical considerations. Even greater deviations are observed in the case of rings containing C:C and C⋮C. A. J. M.

Vibrations of asymmetrical collinear triatomic molecules. (Miss) J. E. Rosenthal (J. Chem. Physics, 1937, **5**, 465—466).—Expressions are given for asymmetrical collinear mols. of the types X_2Y and XYZ and are applied to calculating the frequencies of $N_2{}^{18}O$ employing an approx. potential function. The ratio of the partition functions for $N_2{}^{16}O$ and $N_2{}^{18}O$ and the val. of the equilibrium const. of the reaction $N_2{}^{16}O + H_2{}^{18}O \rightleftharpoons N_2{}^{18}O + H_2{}^{16}O$ have been found. W. R. A.

Calculation of the frequencies and modes of vibration of the monodeuteroethylene molecule. G. Lemaitre, C. Manneback, and Y. L. Tchang (Ann. Soc. Sci. Bruxelles, 1937, **57**, B, 120—128; cf. A., 1936, 142, 1324).—The calc. and observed frequencies of C_2H_3D are in satisfactory agreement. Vibration diagrams are given and angles relative to the C–C axis are tabulated. The distribution of potential energy for the four types of symmetry is given for each mode of vibration. N. M. B.

Normal vibrations and the vibrational spectrum of C_2H_6. J. B. Howard (J. Chem. Physics, 1937, **5**, 442—450).—Mathematical. The vibrations, frequencies, and selection rules of C_2H_6 are discussed. Raman and infra-red spectra are satisfactorily accounted for on the basis of the point group D'_{3h}.

W. R. A.

Rotation–vibration spectrum of C_2H_6 and the question of free internal rotation. J. B. Howard (J. Chem. Physics, 1937, **5**, 451—459).—Mathematical. Consideration of the infra-red bands of C_2H_6 suggests strongly the presence of a potential of $\nless$2000 g.-cal. restricting internal rotation. W. R. A.

Transitions in condensed systems. O. K. Rice (J. Chem. Physics, 1937, **5**, 492—499).—A method based on the thermodynamic relation $(\partial E/\partial V)_T = T(\partial S/\partial V)_T$ is presented for studying transitions in condensed phases. It is shown that as the temp. is raised from 0° abs. there must be at least one transition, whilst other transitions may occur due to the setting in of mol. rotations. The method has been applied to N_2 and O_2 for which data are available. The equation of Eyring and Hirschfelder (this vol., 224) relating $V(\partial S/\partial V)_T$ and V does not agree well with experimental data, especially for substances of low b.p. W. R. A.

Lattice energy of potassium bromide and sodium bromide and the electron affinity of bromine. A. N. Tandon (Indian J. Physics, 1937, **11**, 99—107).—The lattice energies of KBr and NaBr determined from thermal ionisation (1400—1650°) are 159 and 176·3 kg.-cal.; the electron affinity of Br is 80 kg.-cal. F. J. L.

Electronic lattice of the transition elements. R. Forrer (Compt. rend., 1937, **204**, 1554—1556; cf. A., 1935, 1305).—The law found previously, $T = F\sqrt{N}$, holds for the transition elements if it is assumed that F, the intensity of interaction between the electronic orbits, $\propto$ their orbital quantum nos. The lattice valency of these elements is equal to the no. of d electrons with non-compensated spin.

J. W. S.

Theory of movement of two electrically charged particles. F. J. Wiśniewski (Acta phys. polon., 1935, **3**, 329—341; Chem. Zentr., 1936, i, 3263).—A theory is developed whereby particles of like charge exert a mutual repulsion at large distances, but an attractive effect at very small distances.

J. S. A.

Elementary expression of the energy affecting a magnetic particle of very small dimensions in a magnetic field. A. Guilbert (Compt. rend., 1937, **204**, 1463—1465).—Mathematical. W. R. A.

Generalisation of aërodynamic and electrodynamic fundamental equations. N. P. Kasterin (Acad. Sci. U.S.S.R., 1937, 16 pp.).—Mathematical. N. M. B.

Tentative statistical theory of Macleod's equation for surface tension, and the parachor. R. H. Fowler (Proc. Roy. Soc., 1937, A, **159**, 229—246).—A theoretical derivation of Macleod's equation from very general assumptions. The val. of the parachor can be computed in terms of known at. consts. for liquids in which the structure is known. Applied to Hg and A fair agreement with experiment is obtained. G. D. P.

***X*-Ray determination of lattice constants and axial ratios of crystals belonging to the oblique systems.** M. J. Buerger (Amer. Min., 1937, **22**, 416—435).—A discussion. L. S. T.

Quantitative determination of lattice disturbance from Debye–Scherrer photographs. R. Brill (Z. Physik, 1937, **105**, 378—388).—A method is described whereby the mean amplitude of vibration of atoms in a crystal lattice may be determined from intensity measurements of Debye–Scherrer photographs. A series of measurements with specimens of Fe prepared by decomp. of the carbonyl and subsequently heat-treated in H_2 at various temp. is reported. H. C. G.

Precision determination of lattice constants by the compensation method. H. van Bergen (Naturwiss., 1937, **25**, 415).—The lattice const., *a*, 3607·53±0·04 X, of Cu was obtained for the (420) and (240) Cu $K\alpha$ reflexions by the compensation method of Kossel (A., 1936, 925). A. J. M.

***X*-Ray scattering in liquids.** B. S. Dželepov (Physikal. Z. Sovietunion, 1937, **11**, 157—167).—Apparatus described incorporates a 40-kv. Coolidge tube with Mo anti-cathode, and NaCl diffraction for *X*-ray diffraction of org. liquids contained in an Al vessel with walls 10 μ thick. Measurement (with $K\alpha_1$ and $K\alpha_2$ radiation) is made over a small angle range with an ionisation chamber filled with EtBr vapour. The method allows observations to be made during transient physical phenomena in the examined liquid. Intensity curves for C_6H_6, MeOH, EtOH, and polymerised styrene are given. L. G. G.

Space chemistry of solid materials. W. Biltz (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 197—212).—A lecture. Regularities in mol. vols. in binary and quaternary glasses, homologous series, isomorphous series, etc. are discussed in relation to crystal structure. J. W. S.

Atomic and ionic radius in crystals. A. K. Boldyrev (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 293—354).—A lecture. The theory of ionic radius and its application to problems of crystallography are summarised. J. W. S.

Intensities of *X*-ray reflexions from single crystals of sodium between 120° and 370° abs. R. H. V. M. Dawton (Proc. Physical Soc., 1937, **49**, 294—306).—Intensity–temp. curves show strong hysteresis which vanishes when the crystals are suddenly chilled by liquid air, but not for slow annealing. At. scattering curves are given, the normal temp. effect is measured with the chilled crystals, and the characteristic temp. is calc. from the Debye–Waller formula. N. M. B.

Size of nuclei in solid metal reactions. G. Derge (J. Chem. Physics, 1937, **5**, 462—464).—The Tammann concept of crystals requires the formation of crystal nuclei and their subsequent growth. An upper limit to the no. of atoms required for formation of such nuclei can be obtained from consideration of existing data, obtained by geometric matching and orientation relationships, for several solid metal reactions. A stable nucleus may contain as few as 10 atoms and certainly $\not>$100. W. R. A.

Powder patterns on ferromagnetic crystals. K. J. Sixtus (Physical Rev., 1937, [ii], **51**, 870—877).—Patterns reported by Bitter (cf. A., 1932, 1077) were studied on large 3·5% Si–Fe crystals. Three types of patterns were observed at low, medium, and high fields, respectively. The direction of I and II is determined by the crystal orientation, and that of III is always nearly normal to the applied field. The characteristics of the types are: I is found only in polished or strained annealed crystals, II is formed at the intersections of magnetic "sheets," lying in dodecahedral (110) planes, with the surface, and III is formed near surface inhomogeneities. N. M. B.

Structural changes during the growth of metal films. A. G. Quarrell (Proc. Physical Soc., 1937, **49**, 279—293).—Extra rings in electron-diffraction patterns for thin films of face-centred cubic metals prepared by evaporation, electrodeposition, chemical deposition, and chemical displacement are due to the fact that the first deposited layers crystallise in close-packed hexagonal crystals having an axial ratio *c*/*a* 1·63, the effective at. radius being the same as in the normal face-centred cubic form. A gradual transition from close-packed hexagonal to face-centred cubic is postulated, and the prominent band is attributed to the progressive contraction of the (100) hexagonal to the (200) cubic spacing during the transition. Certain very thin evaporated films yield intermediate structures, indicating a gradual transition as deposition proceeds, and not one due to at. rearrangement at crit. film thickness. These views are supported by the discovery of an electrodeposited solely close-packed hexagonal Ag film, a similar Au film yielding a pattern of equally pronounced hexagonal and cubic diffractions, and evaporated Co films, mainly hexagonal with a certain amount of the face-centred cubic form. N. M. B.

Orientation of crystals in silicon-iron. R. M. Bozorth (Trans. Amer. Soc. Met., 1935, **23**, 1107—1111).—The component crystals are oriented with a [001] direction parallel to the direction of rolling and a (110) plane in the rolling plane. Ch. Abs. (*e*)

Crystal structures of Ni_2Al_3 and $NiAl_3$. A. J. Bradley and A. Taylor (Phil. Mag., 1937, [vii], **23**, 1049—1067).—Ni_2Al_3 is trigonal, space-group D_{3d}^3 (*C3m*), *a* 4·0282, *c* 4·8906 A. The Al atoms lie at the corners of deformed cubes, $\frac{2}{3}$ of which contain Ni atoms nearly at the centre. $NiAl_3$ is orthorhombic, space-group D_{2h}^{16} (*Pnma*), *a* 6·5982, *b* 7·3515,

c 4·8021 A. 4 Ni and 4 Al atoms form distorted hexagons lying in the reflexion planes, and the remaining 8 Al atoms are in general positions. The Al—Ni distance is 2·42—2·49 A. and Al—Al 2·86 A.
F. J. L.

Crystal structure of solid hydrogen sulphide. S. C. Sirkar and J. Gupta (Indian J. Physics, 1937, **11**, 119—121).—The H–S–H angle in solid H_2S is approx. 109°, and S—H is 2·5 A. The S atoms are arranged in a face-centred cubic lattice and the H occupy the same positions as the F in CaF_2. Space-group O_h^5.
F. J. L.

Structure of liquid hydrogen peroxide. J. T. Randall (Proc. Roy. Soc., 1937, **A**, **159**, 83—92).—An *X*-ray investigation shows that the liquid is essentially a close-packed cubic structure. The structure proposed by Penney and Sutherland (A., 1934, 1158) is confirmed and the dipole moment calc. from the structure is in good agreement with the experimental val.
G. D. P.

Crystal structure of low-temperature quartz. F. Machatschki (Fortschr. Min., 1936, **20**, 45—47; Chem. Zentr., 1936, i, 3480).—Low-temp. quartz has a co-ordination lattice with Si—O distances 1·58 and 1·64, O—O tetrahedron edges 2·54 and 2·69 A., Si—Si 3·05 A. The Si–O–Si angle is 142°. The structure of $AlAsO_4$ and $AlPO_4$ is discussed.
J. S. A.

Structures of silica glass, puzzuolanas, and clays by means of electron diffraction. N. A. Schischakov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 127—130).—SiO_2 glass, puzzuolanas, and clays give similar sharp rings on electron diffraction photographs, characteristic of two-dimensional crystallites. Owing possibly to decomp. produced by the beam, the clays give reflexion from only the Si_2O_5 sheets, which are the main constituents of the puzzuolana. Extra rings in the glasses and puzzuolanas may be due to an additional phase of two-dimensional crystallites aggregated to a cristobalite-like structure.
R. S. B.

Oxidation of iron and cementite and some properties of iron oxides. K. Endô (Sci. Rep. Tôhoku, 1937, **25**, 879—920).—The oxidation and magnetisation of Fe, Fe_3C, Fe_2O_3, and FeO on heating and cooling have been examined. Fe_2O_3 shows a magnetic transformation at 1030° unaccompanied by change in crystal structure. Fe_3O_4 belongs to the spinel type of structure (the unit cell containing 4 mols. of surplus O), changing to Al_2O_3 type at 600°. Limonite belongs to Al_2O_3 type above 350°.
F. J. L.

Orientation of α-iron crystals obtained by reduction of Fe_3O_4. L. N. Katzaurov (J. Phys. Chem. Russ., 1937, **9**, 292—293).—*X*-Ray diagrams of α-Fe obtained by reduction of Fe_3O_4 by H_2 reveal a texture inherited from the Fe_3O_4 crystals. E. R.

Surface magnetisation and block structure of ferrite. W. C. Elmore and L. W. McKeehan (Amer. Inst. Min. Met. Eng., Inst. Met. Div., 1935, Tech. Publ. 656, 15 pp.; cf. A., 1936, 275).—A block model composed of cubes with an edge of 0·5—3·0 μ, and magnetised along the [100] or [110] axes, is proposed. Segregation of foreign atoms may account for the stability of the block boundaries.
Ch. Abs. (*e*)

Relation between fine structure of crystal surfaces and structure of reaction layers formed on them. P. A. Thiessen and H. Schütza (Z. anorg. Chem., 1937, **233**, 35—40).—The 100, 111, and 110 surfaces of Cu single crystals were oxidised in air at 325° and 150 mm., and the structures of the Cu_2O layers determined by *X*-ray or electron-diffraction patterns. The 111 and 110 planes of Cu_2O grow parallel to the corresponding planes of Cu, but the 111 plane of Cu_2O grows on the 100 plane of Cu. The orientation of the oxide layer is such that the surface density of Cu atoms is most nearly the same as in the underlying metal surface. F. J. G.

Zirconium dioxide. *X*-Ray diffraction studies. G. L. Clark and D. H. Reynolds (Ind. Eng. Chem., 1937, **29**, 711—715; cf. A., 1925, i, 149; 1930, 1099).—Zirconyl hydroxide, pptd. from a hot solution of $ZrOCl_2,H_2O$ with NH_3, and dried at 110°, remained amorphous after heating for 12 hr. at 300°, but at 500° developed the tetragonal form, and retained it after long heating at this temp., but slowly transformed into the monoclinic form at 600°. The low-temp. tetragonal form appears to be identical with that stable at >1000°; its inversion temp. (to the monoclinic form) can be raised to >1000° by admixture with SiO_2, with which it appears to form a solid solution. R. C. M.

Crystal structure of bornite, Cu_5FeS_4. D. Lundqvist and A. Westgren (Arkiv Kemi, Min., Geol., 1937, **12**, **B**, No. 23, 6 pp.).—From powder photographs the formula is probably Cu_5FeS_4, and the structure face-centred cubic, with a_0 10·93 A., 80 atoms in cell. If the S atoms are in cubic close-packing, the Cu may be arranged statistically at random (cf. various high-temp. modifications of sulphides), or even inside the S octahedra. B. W. R.

Structure of silver azide, AgN_3. C. D. West (Z. Krist., 1937, **95**, 421—425).—The cell is orthorhombic pseudo-tetragonal, space-group probably V_h^{26}. a_0 5·90, b_0 5·58, c_0 5·96 A. At. parameters and distances are determined and compared with those from the structure of KN_3. Confirmation is found that the N_3 ion is linear symmetrical. B. W. R.

Structure of cadmium azide. M. Bassière (Compt. rend., 1937, **204**, 1573—1574).—CdN_6 crystals about 1 mm. long can be obtained by mixing aq. $Cd(NO_3)_2$ (1 mol.) with aq. NaN_3 (2 mols.) and evaporating the filtered mixture in a vac. over H_2SO_4. The yellowish-white orthorhombic crystals have *a* 7·82 ± 0·02, *b* 6·46 ± 0·03, *c* 16·04 ± 0·08 A.; 8 mols. in unit cell, $d_{calc.} = 3·20 \pm 0·04$ ($d^{20}_{obs.} = 3·24$). The crystals so prepared frequently explode spontaneously or on friction. J. W. S.

Crystal structure of silver nitrite. J. A. A. Ketelaar (Z. Krist., 1937, **95**, 383—393).—The cell is rhombic with a_0 3·50, b_0 6·14, c_0 5·16 A., 2 mols. in cell. Ag and O are located unequivocally; probable locations of the N are given, in the space-group C_{2v}^{20}. The structure is analogous to that of $NaNO_2$.
B. W. R.

Crystal structure of sodium metaborate, $NaBO_2$. S. Fang (J. Amer. Ceram. Soc., 1937, **20**, 214).—The previous data by Cole *et al.* (A., 1935, 434) are claimed to be incorrect. The true vals. are *d* 2·464 ± 0·005, a rhombohedral cell containing 6 mols., *a* 7·22 ± 0·02 A., α 111° 30′, space-group D^6_{3d}.
J. A. S.

Correction in specific gravity and unit cell size of Na_2O,B_2O_3. S. S. Cole, S. R. Scholes, and C. R. Amberg (J. Amer. Ceram. Soc., 1937, **20**, 215).—Incorrect data were reported previously (A., 1935, 434) owing to the sample having become hydrated during the *d* determination. The correct data are *d* 2·462 ± 0·002, a_0 11·90, c_0 6·54 A., $c/a = 0{\cdot}55$, 9 mols. to the cell.
J. A. S.

Crystal structure of zinc bromate hexahydrate, $Zn(BrO_3)_2,6H_2O$. S. H. Yu and C. A. Beevers (Z. Krist., 1937, **95**, 426—434).—The space-group is *Pa*3, and a_0 is 10·316 A. The structure is found in detail, and a Fourier analysis of projected electron density is made. To show the lighter atoms, the effects of the diffraction rings of the heavy Br and Zn are eliminated by calculation. The structure of the H_2O bonds is in agreement with previous work.
B. W. R.

Structure of the triple nitrites. M. van Driel and H. J. Verweel (Z. Krist., 1937, **95**, 308—314).—These compounds are $A_3M(NO_2)_6$ or $A_2BM(NO_2)_6$, where *A* is K, NH_4, Rb, Tl, or Cs, *B* is Ca, Sr, etc., and M is Co, Rh, or Ir in the first and $Fe^{\cdot\cdot}$, $Co^{\cdot\cdot}$, $Ni^{\cdot\cdot}$, or $Cu^{\cdot\cdot}$ in the second formula. From powder measurements on the K_3Co, $(NH_4)_3Co$, K_2CaNi, and K_2PbCu members, a new structure is suggested, space-group *Fm*3. Parameters and at. distances are given, and the solubilities are discussed.
B. W. R.

Crystal structure of compounds of the rare earths with the metalloids of the fifth group. Phosphides of lanthanum, cerium, and praseodymium. I. A. Iandelli and E. Botti (Atti R. Accad. Lincei, 1936, [vi], **24**, 459—464).—LaP, CeP, and PrP have been prepared by heating the corresponding elements together in sealed evacuated tubes. At 400—500° vigorous reaction takes place. *X*-Ray measurements show that the three phosphides probably have a NaCl lattice. The radius of the P''' ion is calc. to be 1·77 A.
O. J. W.

So-called "hollow canals" in calcspar. P. J. Holmquist (Arkiv Kemi, Min., Geol., 1937, **12**, A, No. 10, 16 pp.).—A survey of the literature of these "canals" and other lamination phenomena is made; possible faults due to sliding over intersecting planes are discussed, and illustrated by photomicrographs of an actual crystal, in which the "canals" seem to be neither hollow nor bounded by plane surfaces.
B. W. R.

Structure of cæsium nitrate. C. Finbak and O. Hassel (J. Chem. Physics, 1937, **5**, 460—461).—*X*-Ray investigation and optical examination of crystals in polarised light verify the cubic nature of $CsNO_3$ between the transition point (161°) and the m.p. Single crystals are not destroyed by heating to > the transition temp. and subsequent cooling. The Cs^+ ion lattice in the high-temp. modification is cubic and in the low-temp. variety is pseudo-cubic, with approx. equal lattice consts. Possible space-groups are discussed and $CsNO_3$ appears to belong to the ditrigonal-pyramidal class with space-group C_{3v}.
W. R. A.

Powder and rotation photographs of chiolith. H. Clausen (Z. Krist., 1937, **95**, 394—403).—This substance has a tetragonal cell, a_0 9·90, c_0 10·39 A. The formula is $Na_5Al_3F_{14}$. The space-group is not uniquely determined.
B. W. R.

Possibility of distinguishing right- and left-handed structures in crystals by means of their Laue patterns. J. ter Berg and F. M. Jaeger (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 406—410).—The conditions under which right- and left-handed structures may be distinguished are stated. It is shown that *d*-$(CoX_3)Cl_3,4H_2O$, *d*-$(CrX_3)Cl_3,3H_2O$, and *d*-$(RhX_3)Cl_3,3H_2O$, where X is *l-cyclo*hexane-*trans*-1 : 2-diamine, have analogous crystal structures.
O. D. S.

Crystallography of cupric saccharinate. H. A. Klasens and P. Terpstra (Rec. trav. chim., 1937, **56**, 673—677).—Crystals of $(C_6H_4{<}\begin{smallmatrix}CO\\SO_2\end{smallmatrix}{>}N)_2Cu,6H_2O$, *d* 1·809, have axial ratios $a : b : c = 0{\cdot}513 : 1 : 0{\cdot}448$ and β 78° 46′. *X*-Ray data give *a* 8·4, *b* 16·3, *c* 7·37 A., space-group C^5_{2h}.
C. R. H.

Determination of the atomic parameters in anthraquinone crystals. B. C. Guha (Nature, 1937, **139**, 969).—The C skeleton has a plane structure with true hexagons and C—C distance the same as that in anthracene. The two O are inclined unsymmetrically to the C plane.
L. S. T.

Crystal structure of condensed ring compounds. V. Three isomeric dibenzcarbazoles. J. Iball (Z. Krist., 1937, **95**, 282—295).—3 : 4 : 5 : 6-Dibenzcarbazole is orthorhombic, space-group probably $A2_122$, a_0 14·07, b_0 6·10, c_0 15·36 A. 1 : 2 : 7 : 8-Dibenzcarbazole cryst. from amyl acetate is orthorhombic, probable space-group *F*222, a_0 10·27, b_0 10·26, c_0 50·5 A.; cryst. from C_6H_6 it is monoclinic, probable space-group $P2_1/m$, a_0 14·63, b_0 7·64, c_0 12·08 A., β 96·0°. 1 : 2 : 5 : 6-Dibenzcarbazole is orthorhombic, probable space-group *Pbca*, a_0 31·10, b_0 9·65, c_0 26·61 A. From observed intensities of reflexion and optical data suggestions are made for the mol. orientation.
B. W. R.

Electron diffraction and surface structure. G. I. Finch (Proc. Roy. Inst., 1937, **29**, 601—606).—A lecture.

Structure and formation of thin films studied by electron diffraction. G. I. Finch and S. Fordham (Chem. and Ind., 1937, 632—639).—A summary, with references to published work in this field, together with some unpublished results of the authors.

Oxidation of a crystal surface studied by cathode-ray reflexion. T. Yamaguchi (Proc. Phys.-Math. Soc. Japan, 1935, **17**, 443—453).—The ZnO produced is a single crystal with its (103) plane resting on the cleaved (110) surface of ZnS. The [010] axis of ZnO is parallel to the [110] axis of ZnS.
Ch. Abs. (*e*)

Electron diffraction study of the graphitisation of some industrial lamp-blacks. A. Baroni (Atti R. Accad. Lincei, 1936, [vi], 24, 456—458).—Examination of various lamp-blacks, which had been heated to 700°, 1050°, and 1600° in an inert atm., by electron diffraction showed the graphite structure only in the samples which had been heated to 1600°. O. J. W.

Production of electron-optical structure images with photo-electrons. H. Gross and G. Seitz (Z. Physik, 1937, 105, 734—737).—Ba is evaporated on to the metallic surface under examination, thus rendering it photo-electrically sensitive. Photo-electrons emitted are then focussed to an electron-optical image which shows the detail of the cryst. surface. H. C. G.

Measurement of piezo-electric effects in crystalline powders. J. Engl and I. P. Leventer (Ann. Physik, 1937, [v], 29, 369—385; cf. A., 1936, 582).—The position of resonance for quartz crystals varies with the crystal size in accordance with theory. O. D. S.

Abnormally high magnetic permeability of nickel wire obtained by surface treatment. T. F. Wall (Nature, 1937, 139, 928).—When heated to 1150° in H_2 a pure Ni wire 0·125 in. diameter gave a max. val. of the permeability when cold of 2100 after approx. 7 hr. When electroplated with Cu to a thickness of approx. 0·003 in. and heated to 1030° in H_2 the max. permeability when cold became 3250. After demagnetisation from an induction density of 5150 gauss the coercive val. was 0·24 oersted and the remanent density 1270 gauss. L. S. T.

Analysis of the processes of technical magnetisation. II. Significance of the interaction between elementary regions in regard to the technical magnetisation curve, especially when macroscopic flaws are present. K. H. R. Weber (Z. Physik, 1937, 105, 676—697). H. C. G.

Change of saturation magnetisation with uniform pressure. H. Ebert and A. Kussmann (Physikal. Z., 1937, 38, 437—445).—The effect of uniform pressure on the saturation magnetisation of Fe and Ni, and alloys of Fe with Ni, Co, Cr, Pt, of Ni with Al, Cr, Co, Cu, Mn, of Pt with Mn, and the ternary system Fe–Co–Cr was investigated. For the metals and most of the alloys the effect of pressure was small, the coeff. being 0·1—0·01% per 1000 kg. per sq. cm. Some of the alloys showed a considerable effect over certain composition ranges. Such alloys were always Fe alloys with a face-centred lattice, the added component being itself either ferromagnetic (Ni) or capable of forming ferromagnetic phases (Pt, Cr). The composition range is in the neighbourhood of the $\alpha \rightarrow \gamma$ transition line. A. J. M.

Magnetic properties of natural and artificial iron–oxygen compounds. II. Change of magnetic properties of ferric hydroxides by heating in different gaseous atmospheres. L. Kraeber and W. Luyken (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 149—162; cf. A., 1936, 46).—The change in magnetic properties of different specimens of $Fe(OH)_3$ on heating at 200—900° in N_2 or CO_2 is variable; in CO all the specimens give a product of max. susceptibility when heated at 500°. $Fe(OH)_3$ is readily transformed into ferromagnetic γ-Fe_2O_3, but Fe_2O_3 which has been heated at high temp. does not undergo this transformation. E. S. H.

Quasi-stationary field distribution in large Barkhausen discontinuities, and their indication by the ordinary Barkhausen effect. S. Koch (Avh. norsk. Vid.-Akad. Oslo, Mat.-nat. Kl., 1935, No. 7, 3—40; Chem. Zentr., 1936, i, 3461—3462).—Accepted views are modified on the basis of measurements on Ni and Fe–Ni wires. J. S. A.

Optics of thin metal films. H. Wolter (Z. Physik, 1937, 105, 269—308).—Relations are developed which show the dependence of transmitted and reflected intensities on the optical consts. and thickness of metal films. The results confirm Maxwell's theory and provide means for determining optical consts. and the thickness of metal films from intensity measurements. Available measurements are in good agreement with calc. vals. A. E. M.

Dispersion and absorption of lithium fluoride and sodium fluoride in the infra-red. H. W. Hohls (Ann. Physik, 1937, [v], 29, 433—448).—The refractive indices of cryst. LiF from 0·55 to 15·8 μ and from 39 to 55 μ, of cryst. NaF from 0·55 to 24 μ and from 48 to 55 μ, and of cryst. KCl and NaCl from 23 to 29 μ, the absorption consts. of LiF from 4·5 to 15·8 μ and of NaF from 7·5 to 24 μ, and the reflecting powers of LiF and NaF to 55 μ are tabulated. O. D. S.

The α–β transformation of quartz. H. E. von Steinwehr (Naturwiss., 1937, 25, 348).—The α–β transformation of quartz has been studied by photographing simultaneously the variation of double refraction and circular polarisation with rise of temp. The transformation takes place in three temp. steps. The lower two are accompanied by considerable variations in double refraction, but not the third. All three steps are accompanied by a variation in the increase of circular polarisation. A. J. M.

Dependence of modulus of elasticity and the damping of transversely vibrating metal rods on the amplitude. F. Förster and W. Köster (Naturwiss., 1937, 25, 436—439).—The modulus of elasticity and damping of paramagnetic metals and alloys are independent of the amplitude of transverse vibrations, if not too large. For ferromagnetic metals and alloys (*e.g.*, Ni–Fe), however, both modulus and damping are dependent on amplitude, varying in a similar way to magnetostriction. A. J. M.

Elasticity of long-chain substances as a statistical effect. H. Mark (Österr. Chem.-Ztg., 1937, 40, 321—327).—Theoretical. The free rotation of long-chain compounds and the differences between their properties on stretching and those of normal substances are discussed. An expression connecting the distance between the ends of a single haphazardly arranged long-chain mol. with the length of each member of the chain, the valency angle, and the no. of C atoms in the chain is derived. The max. val. of this expression gives the most probable val. for the distance between the ends of the chain, $l\sqrt{(2n/3)}$, where l is the length of the linking between each C atom and *n* is the no. of linkings in the chain. The energy necessary to stretch the chain leads to an expression similar to that for the heat developed on adiabatically compressing a gas. Thus the pressure of a gas tending to increase the vol. is similar to the attraction between the ends of a stretched chain tending to reduce its length. Viewed in this way, the evolution of heat on stretching rubber-like substances, contrary to the behaviour of normal substances, is explained. An equation of state for an ideal rubber, *i.e.*, a rubber the internal energy of which is independent of the amount of stretch, is formulated. The behaviour at high degrees of stretching, when crystallisation occurs, is briefly discussed. C. R. H.

Relation between temperature and the conical indentation hardness of metals. J. Engl and J. Katz (Z. Physik, 1937, **106**, 1—8).—Measurements of the hardness of polycryst. samples of Cu, Ni, Mo, and W over the range 0° to —191·5° are reported. H. C. G.

Heat-treatment and diffusion in salt crystals. E. Rexer (Z. Physik, 1937, **106**, 93—101).—Heat-treatment of salt crystals leads to an inhomogenising of the crystal which is observable in the properties most sensitive to structural changes. Inhomogeneity is due to diffusion of impurities in the crystal. L. G. G.

Optical and photochemical investigation of phosphorus. G. Rathenau (Physica, 1937, **4**, 503—514).—The photochemical conversion of white P into red P is a unimol. reaction; P_2 mols. are first formed and recombine to give P_4 (red), P_4 (white in CS_2) $\rightarrow 2P_2 \rightarrow P_4$ (red). The absorption of both modifications is of the same order, and increases towards the ultra-violet. F. J. L.

Dimorphism of white phosphorus. G. Natta and L. Passerini (Atti R. Accad. Lincei, 1936, [vi], **24**, 464—471).—*X*-Ray measurements at —35°, —55°, and —170° confirm the existence of α- and β-forms of white P. The α-form gives very weak lines, from which the lattice dimensions cannot be determined. This is attributed to the strong thermal agitation of the mols. and not to the transformation into the red form by the action of the *X*-rays. The β-form shows a well-marked cryst. structure, probably hexagonal, *c*/*a* 1·6, *a* 8·55 A., 36 mols. per unit cell, $d_{\text{calc.}}$ 2·12. These vals. have been obtained by means of the powder method and are not exact. It is possible that the structure may be of a lower symmetry type, *e.g.*, pseudo-hexagonal. O. J. W.

Investigation of polymorphic transformations of the alkaline-earth carbonates by the emanation method. K. E. Zimens (Naturwiss., 1937, **25**, 429—431).—The emanation method of Hahn (A., 1929, 737) has been used to study the polymorphic transformations of $CaCO_3$ and $BaCO_3$. The emanation from calcite first begins to increase considerably at 600°; this is the "loosening" temp. at which the amplitude of motion of the lattice constituents becomes so great that they can change places in the lattice. Aragonite shows a considerable increase in the emanation at 450°, at which temp. the rhombic aragonite is converted into the hexagonal calcite. The change is monotropic, and the rate of transformation is dependent on the rate of heating. At 910° the $CaCO_3$ dissociates. The "loosening" temp. of CaO is 1200°. $BaCO_3$ undergoes an enantiotropic transformation at 800°, recrystallisation occurs at 1200°, and dissociation at 1360°. A. J. M.

Polymorphism of crystalline liquids. D. Vorländer (Ber., 1937, **70**, [*B*], 1202—1212).—Of 2561 aromatic, mostly complex, compounds, which contain at least one *p*-substituted C_6H_6 nucleus in the mol., > one third are solid cryst. dimorphous and about 10 trimorphous, whereby the one solid form is usually monotropic to the second or third variety independently of whether the cryst. liquid form is monotropic or enantiotropic to a solid-cryst. variety. The solid polymorphous forms are distributed among these compounds without apparent relationship to saturation or unsaturation, to longer or shorter mols. Only in isolated regions the double linkings $\cdot CH{:}N\cdot$ and $\cdot CH{:}CH\cdot$ appear more favourable than $\cdot CH_2\cdot NH\cdot$ or $\cdot CH_2\cdot CH_2\cdot$ to the development of the phenomenon. Polymorphism of cryst. liquids appears more subject to regularities, since the possibilities are restricted by the greater mobility of the mols. and association arises only with certain types. Of the 2561 compounds, 1238 are not and 1323 are liquid cryst. The latter all follow the law of the associative action and crystal construction of predominatingly unidimensional, linear or extended mols., whereas the other substances are not cryst. liquid by reason of departure from this structural condition. Of 1323 liquid cryst. substances, 135 give two and 51 afford 2—4 liquid cryst. forms. The simpler hydrocarbons with 1—4 C_6H_6 nuclei, Ph_2, $C_6H_4Ph_2$, and $(\cdot C_6H_4Ph)_2$ are not liquid cryst. $C_6H_4(C_6H_4Ph)_2$ and $(\cdot C_6H_4\cdot C_6H_4Ph)_2$ are liquid cryst. In presence of O or groups containing O liquid polymorphous phenomena occur first with derivatives of *p*-$C_6H_4Ph_2$. The majority of such compounds are aromatic substances containing N. Double linkings in conjunction with C_6H_6 nuclei can be of outstanding importance even in the absence of N and *p*-substituents. Extensive linear accumulation of double linkings and *p*-substituted C_6H_6 nuclei imparts high m.p. and super-cryst. structure. The majority of aliphatic, non-saline substances are not liquid cryst. Polymorphous liquid cryst. forms of the alkali and Tl salts of carboxylic acids are almost unknown. The different types of cryst. liquids and their subdivisions are described and methods for the detection of their interconversion are detailed. Polymorphous liquid cryst. substances with > two cryst. liquid forms are listed. H. W.

Superconducting state. F. B. Silsbee (J. Washington Acad. Sci., 1937, **27**, 225—244).—A lecture dealing with the development and results. A. J. M.

Relaxation phenomena in superconductivity. W. H. Keesom and P. H. van Laer (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 390—391).—The transition from the superconductive to the non-superconductive state of Sn, if effected by heating in const. magnetic field, takes place with a relaxation of about 30 sec. O. D. S.

Measurements of the latent heat of tin in passing from the superconductive to the non-

superconductive state at constant temperature. W. H. Keesom and P. H. van Laer (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 390).—Measurements were made at 2·971°, 2·362°, 2·303°, 1·835°, and 1·239° abs. Vals. support the assumptions that the transition process is reversible and occurs through an intermediate state. O. D. S.

Induction of currents in superconductors. P. Grassmann and H. Eicke (Physikal. Z., 1937, 38, 429—437).—Experiments on the induction of currents in superconducting rings of Pb, Sn, Ta, Sn–Hg, Cu–Sn, and Cu–Pb at different temp. show that in the case of the first induced current only part of the energy taken up by the conductor reappears in the induced current. The total energy taken up is independent of the time for which the current flows. When a current is induced in a superconductor a second or third time, the current being the same in intensity and direction as the first, there is, in general, no further considerable consumption of energy, but if the current is induced in the opposite direction, about twice the original energy is taken up. A. J. M.

Theory of superconductivity. L. Landau (Physikal. Z. Sovietunion, 1937, 11, 129—140).—It is shown that when the mean val. of the magnetic field of a superconductor is not zero, the superconductor does not consist of two regions, one superconducting and the other not, but of a large number of layers alternately superconducting and inert. From this follows an explanation of Peierls' transition state. A. E. M.

Sommerfeld and Frenkel electron theories of metals. M. Satô (Sci. Rep. Tôhoku, 1937, 25, 1136—1140).—Mathematical. The two theories give similar expressions for conductivity. F. J. L.

Diamagnetism of an electron gas. A. Papapetrou (Z. Physik, 1937, 106, 9—16; cf. A., 1931, 411).—Landau's results on the diamagnetism of free electrons are valid only for field strengths above a definite limit. In weaker fields complete diamagnetism is to be expected. H. C. G.

Variation of magnetic susceptibility of water with temperature. K. Honda and Y. Shimizu (Sci. Rep. Tôhoku, 1937, 25, 939—945).—Theoretical. Susceptibility and temp. variation are calc. on the assumption that the H_2O mol. can be regarded as a neutral atom. F. J. L.

Change of magnetic susceptibility in metals during melting and allotropic transformation. Y. Shimizu (Sci. Rep. Tôhoku, 1937, 25, 921—938).—The abrupt change in magnetic susceptibility during melting or allotropic change is recorded for Cu, Ag, Au, Sn, Al, Hg, Tl, Na, K, Rb, and Cs. It is due to change in lattice consts. resulting in alteration in the proportion of bound and free electrons. F. J. L.

Magnetic analysis of evaporated bismuth deposits. C. T. Lane (Physical Rev., 1937, [ii], 51, 863—869).—Magnetic susceptibilities of Bi films 0·1—4 μ thick were measured by a compensated Gouy method with Sartorius microbalance. The val. for films of thickness >0·5 μ is independent of thickness, and agrees with that of a single crystal with trigonal axis parallel to the field; for <0·5 μ the val. decreases as thickness is reduced, and the existence of a microcryst. fibre structure, merging into a phase of macrocryst. structure at >0·5 μ, is suggested. Ageing for long periods in vac. increases the susceptibility of films <0·5 μ, the effect being ascribed to a recrystallisation process, but for thicker films this effect is not found. The susceptibility of films >0·5 μ is identical when deposited, respectively, on glass, Au, Cu, and Sn. The susceptibility varies with the residual gas pressure during deposition and, in a different manner, with pressure, according as the field is parallel or perpendicular to the film. N. M. B.

Magnetic susceptibility of vapours of organic compounds. J. Schur (Physikal. Z. Sovietunion, 1937, 11, 194—203).—A method for the determination of χ of org. vapours is described. It is shown, in disagreement with other investigators, that χ for CS_2 and C_6H_6 is not changed in passing from the liquid to the vapour state. L. G. G.

New results of investigations on supersonic waves. E. Hiedemann (Chem. Weekblad, 1937, 34, 390—397).—A review dealing with methods of producing supersonic waves, optical methods of detecting them, their chemical and dispersing effects, and their coagulating effect on some colloids. A. J. M.

Velocity of sound in solutions and its relation to velocity of sound in the solutes. W. Schaaffs (Z. Physik, 1937, 105, 658—675).—Light from a slit illuminated by monochromatic Hg radiation is passed transversely through solutions in which ultrasonic waves are generated. The velocity of sound is calc. from the separation of the resultant diffracted images, and its val. for solutes is obtained by extrapolation of curves for corresponding solutions. L. G. G.

Calculation of the specific heats and entropies of metal vapours from spectroscopic data, with special reference to gaseous iron and copper. K. K. Kelley (U.S. Bur. Mines, 1937, Rept. Invest. 3341, 19 pp.).—Expressions have been derived for the partial sp. heat and entropy of a monat. gas due to changes in electronic energy. From recorded data of energy levels of gaseous Fe and Cu, the calc. vals. have been added to the vals. due to translational energy, $c_{ptr} = 4·967$ and S_{tr} being calc. from the Sackur equation, in order to obtain the true vals. of c_p and S. Up to 1500° abs. c_p for gaseous Cu = 4·967, but with further rise in temp. c_p increases to 7·795 at 5000° abs. With rise in temp. c_p for gaseous Fe increases rapidly from 4·967 at abs. zero to 6·145 at 350° abs., decreases to 5·290 at 1300° abs., and again increases to 7·049 at 4000° abs. and to an estimated val. 7·922 at 5000° abs. No explanation of the abnormality at low temp. is offered. C. R. H.

Heat capacities of selenium crystals, selenium glass, and tellurium at low temperatures. C. T. Anderson (J. Amer. Chem. Soc., 1937, 59, 1036—1037).—Heat capacities of cryst. Se and Te for 50—300° abs. are recorded; the corresponding entropies are 10·49 and 12·85, respectively. Data for Se glass indicate the difference in entropy between 0° and 298·1° abs. to be 11·15. E. S. H.

Specific heats of metals at high temperatures. XXVIII. Heat capacity and electrical resistance of didymium between 300° and 600°. F. M. Jaeger, J. A. Bottema, and E. Rosenbohm (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 481—489).—The sp. heat of didymium was measured from 20° to 600°. Consistent results were obtained only after repeated heating and cooling. The curve of c_p against T shows a transition region between 440° and 467°, and a transition point at 567·5°. From 340° to 440°, $c_p = 0{\cdot}05941 + 0{\cdot}16 \times 10^{-5}(t - 340)$, $C_p = 8{\cdot}430 + 0{\cdot}227 \times 10^{-3}(t - 340)$. From 467° to 560°, $c_p = 0{\cdot}06200 + 0{\cdot}366 \times 10^{-4}(t - 467)$, $C_p = 8{\cdot}798 + 0{\cdot}5193 \times 10^{-2}(t - 467)$. From 575° to 600°, $c_p = 0{\cdot}0665 + 0{\cdot}14 \times 10^{-3}(t - 575)$, and $C_p = 9{\cdot}460 + 0{\cdot}01986(t - 575)$. Data of the electrical resistance between 20° and 600° are tabulated. A transition point is indicated between 508° and 540°.
O. D. S.

Volumes of mercury menisci. W. H. Keesom, (Miss) H. van der Horst, and K. W. Taconis (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 389).—Vols. of Hg menisci, measured from *X*-ray shadowgraphs, are tabulated for tubes of radius^2 from 10 to 100 sq. mm. and meniscus heights from 0·7 to 2·0 mm. O. D. S.

Densities and vapour pressures of alkylbenzenes, aliphatic ketones, and *n*-amyl chloride. J. C. Rintelen, jun., J. H. Saylor, and P. M. Gross (J. Amer. Chem. Soc., 1937, 59, 1129—1130).—The v.p. of PhEt, *o*-, *m*-, and *p*-xylene, *n*-amyl chloride, $COMePr^{\beta}$, $COMeBu^{\beta}$, $COEt_2$, $COPr^{\alpha}_2$, and $COBu^{\alpha}_2$ and the *d* of *n*-amyl chloride, $COMePr^{\beta}$, $COMeBu^{\alpha}$, $COMeBu^{\beta}$, and $COBu^{\alpha}_2$ have been determined at 10°, 30°, and 50°. E. S. H.

Porous structure and specific volume of amorphous and crystalline substances. G. Graue and N. Riehl (Naturwiss., 1937, 25, 423—425).—A modification of the emanation method of Hahn (A., 1929, 737), in which the emanation is applied externally, and the amount which has penetrated into the porous substance is determined, is used to estimate the "inner surface" of substances. The method is applied to the examination of the porous structure and true sp. vol. of cryst. and pptd. ZnS, the results being compared with sp. vols. determined by a pyknometer. The sp. vol. of pptd. ZnS by the pyknometer method was 0·264, and by the emanation method 0·204, showing that in amorphous ZnS there are pores or clefts of at. dimensions due to an irregular arrangement of atoms. Gases may penetrate into the interior of a solid catalyst not only by macroscopic pores, but also by interat. pores and crevices due to deformed lattices. A. J. M.

Thermodynamics of phase changes extending over a definite temperature range. A. J. Rutgers and S. A. Wouthuysen (Physica, 1937, 4, 515—520; cf. this vol., 242).—Theoretical. F. J. L.

Coefficient of thermal expansion of magnesium oxide. M. A. Durand (Physics, 1936, 7, 297—298).—The thermal expansion of single-crystal MgO has been measured from 85° to 480° abs. Data are combined with those of Austin (B., 1932, 64) and tabulated up to 1273° abs. In accordance with Grüneisen's relation the thermal expansion ∝ the heat content. O. D. S.

Viscosity of air. W. N. Bond (Proc. Physical Soc., 1937, 49, 205—213).—A detailed account of results previously reported (cf. A., 1936, 931). The theory of the capillary-tube method used and the corrections involved are given. The val. at 23° is $(1834{\cdot}7 \pm 0{\cdot}8) \times 10^{-7}$ c.g.s. N. M. B.

Viscosity of chlorides of inorganic acids. V. Viscosity of vanadyl and chromyl chlorides. A. I. Lichatscheva and G. P. Lutschinski (J. Gen. Chem. Russ., 1937, 7, 621—622).—The η of $VOCl_3$ and CrO_2Cl_2 varies with temp. in accordance with Lutschinski's formula (J. Phys. Chem. Russ., 1935, 6, 700). R. T.

Influence of electric field on viscosity of liquids. O. Kimura (Bull. Chem. Soc. Japan, 1937, 12, 147—149).—When a 5% solution of stearic acid in C_6H_6 flows in a transverse electric field, the η increases nearly linearly with the field strength up to about 17,000 volts per cm., when it undergoes no further change. It is calc. that at the highest field strength used (30,000 volts per cm.) only a small fraction of the mols. are oriented parallel with the field, and that the viscosity increase is due to mol. association.
F. L. U.

Flow of gaseous mixtures through capillaries. I. Viscosity of binary gaseous mixtures. H. Adzumi (Bull. Chem. Soc. Japan, 1937, 12, 199—226).—η–composition curves have been determined at 20—100° for H_2–CH_4, H_2–C_2H_2, H_2–C_2H_6, H_2–$CHMe{:}CH_2$, CH_4–C_2H_2, C_2H_2–$CHMe{:}CH_2$, and $CHMe{:}CH_2$–C_3H_8. The first four give max., and the curvature in all cases increases with disparity of the mol. wt. of the components. Of the formulæ proposed for the η of gaseous mixtures, one which embodies Kuenen's principle of the persistence of mol. velocity is considered the most appropriate, and with a suitable choice of consts. is found to reproduce the experimental vals. satisfactorily. Conditions for the occurrence of max. are deduced from the formula and found to apply in 50 out of 55 cases examined. The composition corresponding with the max. is displaced by change of temp. Mean free paths of the component gases are calc. Generally, the mean free path of each component in a binary mixture is changed in the direction of the mean val.
F. L. U.

Variations in viscosity with concentration in binary liquid mixtures. H. Lemonde (Compt. rend., 1937, 204, 1628—1630).—Binary liquid mixtures are classified on the basis of the variation of η and diffusion factors with the composition. R. S. B.

Combination of fatty acids with nitrogen bases. IV. Diethylamine and propionic acid: densities, surface tensions, conductivities, and viscosities of the liquid anhydrous system. R. N. Coleman and E. B. R. Prideaux (J.C.S., 1937, 1022—1026; cf. this vol., 241).—$NHEt_2$ salts of the saturated fatty acids C_3—C_8 are viscous liquids completely miscible with EtOH, Et_2O, and C_6H_6. The C_3 and C_4 salts give clear solutions with H_2O

at all dilutions, whilst the others show turbidity beyond a certain dilution. $EtCO_2NH_2Et_2$ melts at 13°, $Pr^{\alpha}CO_2NH_2Et_2$ at 23°, and $Bu^{\beta}CO_2NH_2Et_2$ less sharply at about 6°. The higher members failed to crystallise. The *d*–, σ–, and η–composition curves for $EtCO_2H$–$NHEt_2$ mixtures all exhibit a max. on the acid side of the normal salt composition. The conductivity (κ and Λ) curves show two max. The properties generally resemble those of the corresponding piperidine system. F. L. U.

Equilibrium isotherms and isobars of binary mixtures above the critical points of their constituents. V. Fischer (Ann. Physik, 1937, [v], 29, 514—526).—Theoretical. The v.p.–composition curve for CH_4–C_3H_8 mixtures at 20° has been examined. Equations for the calculation of equilibrium concns. are derived, and the conditions of equilibrium when the temp. and pressure of the constituents are $<$ crit. vals. are obtained. A. J. M.

Quantitative regularities in homologous series. J. H. C. Merckel (Kolloid-Beih., 1937, 45, 413—470).—For aq. solutions of fatty acids, alcohols, and urethanes the slope of the surface tension–concn. curve is related linearly to the no. of C atoms. Variations at very low and high concns. are traced to differences in the orientation of the surface mols. The surface tensions of aq. solutions of Na salts of fatty acids have been determined and compared with the capillary-active vals. A relation between the adsorption of fatty acids by blood charcoal and by potato starch and the no. of C atoms in the fatty acids has been established. The viscosities of aq. solutions of the lower fatty acids and their Li, Na, and K salts, of the Na salts of dicarboxylic acids, and of the lower alcohols are related linearly to the no. of C atoms. E. S. H.

Cryoscopy and conductivity of halogen acids in ethyl alcohol–benzene solution. I. S. Galinker (Ukrain. Chem. J., 1937, 12, 212—220).—Association of EtOH in C_6H_6 rises with increasing [EtOH], and is less in presence of HCl, HBr, or HI. The depression of f.p. of solutions of HX in C_6H_6 falls with increasing [EtOH] to a min., corresponding with formation of 3EtOH,HX. In absence of EtOH the acids are monomeric in C_6H_6. Conductivity in the systems C_6H_6–EtOH–HX rises in the series $X = Cl < Br < I$. R. T.

Application of thermal analysis to the determination of thermal effects in binary and ternary systems. Measurements of (I) specific heat of solids and liquids, (II) latent heat of fusion of solids. K. Hrynakowski and A. Smoczkiewiczowa (Rocz. Chem., 1937, 17, 140—145, 165—168).—I. Approx. vals. for sp. heat are given by Regnault's rate of cooling method.

II. Approx. vals. for latent heat of fusion are given by Tammann's method, depending on determination of rate of crystallisation. R. T.

Vapour pressures of concentrated aqueous solutions. Two co-existing liquid phases. T. Kume (Rev. Phys. Chem. Japan, 1937, 11, 16—24).—Results for aq. solutions of BzOH and cinnamic acid at temp. between 80° and 180° are recorded and discussed. W. R. A.

Calculation of pressure effect on liquid–vapour equilibrium in binary systems. B. F. Dodge and R. H. Newton (Ind. Eng. Chem., 1937, 29, 718—723).—The same general differential equation is obtained for the influence of pressure on the composition of the two phases whether the equilibrium is considered in terms of chemical potential or of fugacity. Since there are insufficient data to permit a rigorous integration, the assumption of ideal solutions is made in order to apply the theory to the four special cases represented by slightly sol. gases in volatile and in relatively non-volatile solvents, very sol. gases in non-volatile solvents, and both components volatile and the temp. below the crit. temp. for each of the components. The equation obtained for the second case is shown from data in the literature to hold accurately for some permanent gases dissolved in H_2O and NH_3, but that derived for the first is not supported by published data for the solubility of CO_2 in C_6H_6, and of NH_3 in H_2O. R. C. M.

D. I. Mendeléev's "singular points" in the theory of solutions and the topology of the chemical diagram. N. S. Kurnakov (Trav. Congr. Jubil. Mendeléev, 1936, 1, 557—577).—A lecture. The importance of points of discontinuity in property–composition curves, first visualised by Mendeléev, is described. J. W. S.

Mendeléev's theory of solutions and the metric of the chemical diagram. N. I. Stepanov (Trav. Congr. Jubil. Mendeléev, 1936, 1, 599—617).—A lecture. The quant. applications of property–composition curves are discussed. J. W. S.

Course of transformations in the irreversible iron–nickel alloys. F. Wever and H. Lange (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 217—225).—The process has been followed by means of magnetic measurements, supplemented by *X*-ray analysis. E. S. H.

Heats of formation of nickel–silicon alloys and melts. W. Oelsen and H. O. von Samson-Himmelstjerna (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 131—133).—The heats of formation of Ni–Si alloys show discontinuities at compositions corresponding with Ni_2Si and NiSi. The heat contents of Ni–Si melts at 1600° are $<$ those calc. from the components. The heats of formation in the liquid state at 1600° are $>$ in the solid state; the max. val. is 14 kg.-cal. per g.-atom at 40 at.-% of Si. Ni silicides exist in the liquid state; the amount of dissociation is small when excess of Ni or Si is present. E. S. H.

Hall effect and some other physical constants of alloys. IV. Silver–tin series of alloys. W. G. John and E. J. Evans (Phil. Mag., 1937, [vii], 23, 1033—1048; cf. A., 1936, 1332).—The resistivity, Hall effect, coeff. of resistance, thermoelectric power (with respect to Cu), and *d* of Ag–Sn alloys have been measured. The phase boundaries observed at 74, 81, 87·5, and 89% Ag are in complete agreement with those determined by Murphy (cf. B., 1926, 278, 792). F. J. L.

Solid solubility of cadmium in lead and the absence of change in the lattice parameter of the lead. E. Jenckel and H. Mäder (Metallwirts., 1937, **16**, 499—502).—According to hardness and electrical resistivity measurements the solubility is 3·1% at the eutectic point and approx. 0·6% at room temp. The lattice parameter of Pb is reduced by only 0·6 × 10^{-3} A. by the Cd. C. E. H.

Ternary alloys. R. Paris (Publ. sci. tech. Min. de l'Air, No. 45, 1—86; Chem. Zentr., 1936, i, 3572).—The Mg–Ca–Zn system and its constituent binary systems are discussed. The Ca–Mg system has a max. in the liquidus curve at Mg_5Ca_3 (49·7% Ca, m.p. 725°); the Mg–Mg_5Ca_3 eutectic is at 17% Ca, 525°; Ca–Mg_5Ca_3 eutectic at 82% Ca, 460°. For the Ca–Zn system, Donski's results (A., 1908, ii, 278) are generally confirmed, but the phase Ca_5Zn_2 is also indicated. Ca_2Zn_3 exists in two modifications, α stable above 430°, β stable at 411—430°, with a peritectic point at 411°, 64% Ca. The Ca–Ca_5Zn_2 eutectic is at 68% Ca, 385°. The ternary system shows a compound $Mg_5Zn_5Ca_2$, m.p. 495°. Mechanical properties are recorded for alloys with 98% Mg, 1% Ca, 1% Zn, and 96% Mg, 2% Ca, and 2% Zn. J. S. A.

Solubility of krypton in various liquids. J. A. M. van Liempt and W. van Wijk (Rec. trav. chim., 1937, **56**, 632—634).—Data for the solubility of Kr (containing 5% of Xe) in H_2O and various org. solvents are recorded. The low solubility in glycerol suggests the suitability of the latter as a sealing liquid. C. R. H.

Solubility of ozone in water and aqueous sulphuric acid of various concentrations. L. I. Kaschtanov and O. N. Oleschtschuk (J. Gen. Chem. Russ., 1937, **7**, 839—841).—The solubility of O_3 in aq. H_2SO_4 at 20° is at a max. in 10% H_2SO_4, and follows Henry's law for a given [H_2SO_4]. Neither H_2SO_5 nor $H_2S_2O_8$ is formed. R. T.

Solubility of anhydrous sodium bromide in water and liquid ammonia. G. K. Distanov (J. Gen. Chem. Russ., 1937, **7**, 676—680).—The solubility of NaBr in H_2O rises continuously from 54·2 at 107° to 60·8% at 248°. In liquid NH_3 the solubility rises from 25% at − 22° to a max. of 54% at 13—75°, above which it falls gradually to 41·0% at 160°. R. T.

Solubility of lithium chloride in water between 70° and 160°. J. N. Friend, R. W. Hale, and S. E. A. Ryder (J.C.S., 1937, 970; cf. A., 1932, 117).—The transition $LiCl,H_2O \rightleftharpoons LiCl$ is at about 96°. The solubility of the anhyd. salt, for which data are recorded, is a linear function of temp. Kremer's results are in general too high. F. L. U.

Solubility of lithium carbonate in water saturated with carbon dioxide under high pressures and properties of the solutions. O. Haehnel (J. pr. Chem., 1937, [ii], **148**, 295—309).—Solutions of Li_2CO_3 in aq. CO_2 contain $LiHCO_3$. Dissociation pressures of the solutions between −12° and 60° are given. The solid could not be isolated in a pure state. The solubility of $LiHCO_3$ decreases with rise of temp. Addition of EtOH to a saturated aq. solution produces evolution of CO_2 and pptn. of Li_2CO_3. Conductivity data are recorded. F. L. U.

Solubility of aragonite in salt solutions. A. A. Browman and A. B. Hastings (J. Biol. Chem., 1937, **119**, 241—246).—The solubility of aragonite has been determined at 38° in 0—0·16M-NaCl and in presence of CO_2 sufficient to maintain a p_H of 7·2—7·6. Aragonite is more sol. than calcite (cf. A., 1927, 416), the ratio of the solubility products being 1·41. Solubility data for $CaCO_3$ gallstones show that they consist of aragonite. J. W. S.

Solubility of slightly soluble electrolytes, precipitated in presence of their reaction products. Application to silver chloride. C. Bedel (Compt. rend., 1937, **204**, 1651—1654).—The solubility (S) of AgCl has been determined by observing the point of appearance of ppt. when 0·001N solutions of Cl′ are dropped into 0·001N-$AgNO_3$. S is approx. independent of other electrolytes, except for Hg salts, which increase it. S increases slightly as the concn. of reactants decreases, and the val. extrapolated to zero concn. of electrolytes is 4·4 × 10^{-4} g. per litre at room temp. R. S. B.

Aqueous solubilities of isomeric pentanols. P. M. Ginnings and R. Baum (J. Amer. Chem. Soc., 1937, **59**, 1111—1113).—Data for the 8 isomerides at 20°, 25°, and 30° are recorded. Solubility is in the order *tert.* > *sec.* > primary isomerides and increases as the OH group approaches the middle of the mol. In the primary and *sec.* isomerides the solubility increases with greater compactness of mol. structure. In general, increasing aq. solubility goes with increasing solubility of H_2O in the alcohol. The aq. solubility of all the isomerides decreases with rise of temp. from 20° to 30°. E. S. H.

Chemistry in liquid sulphur dioxide. V. Solubility of inorganic substances in liquid sulphur dioxide. G. Jander and W. Ruppolt (Z. physikal. Chem., 1937, **179**, 43—50).—Solubilities at 0° are recorded. The salts with the highest solubilities are those which tend to form definite solvates with SO_2. R. C.

Diffusion and reaction of hydrogen in potassium bromide crystals. R. Hilsch (Ann. Physik, 1937, [v], **29**, 407—420).—The solubility of H_2 in KBr crystals has been measured at 520°, 600°, and 680°. The reaction $2K + H_2 = 2KH$ takes place in the crystal lattice when the crystal is heated in a mixture of H_2 and K vapour. The equilibrium const. at 680° has been measured and the dissociation of KBr–KH mixed crystals calc. The diffusion consts. D for H_2 and for KH mols. in the lattice have been measured. D for H_2 is of the same order as that for the colour centres. O. D. S.

Gibbs adsorption equation and adsorption on solids. D. H. Bangham (Trans. Faraday Soc., 1937, **33**, 805—811; cf. A., 1935, 29).—Theoretical. Discrimination is made between similarities in the properties of surface films which are a necessary consequence of thermodynamic laws and those which indicate real similarity of behaviour. F. L. U.

Adsorption of solvent vapour by solute crystal. I. Uhara and M. Nakamura (Bull. Chem. Soc. Japan, 1937, 12, 227—232).—" Lumping " of cryst. powders in moist air occurs when the R.H. is about 2/3 of the val. which corresponds with a saturated solution of the substance, and is therefore not necessarily due to deliquescence. The phenomenon has been studied with NaCl, KBr, tartaric acid, and sucrose, and is shown to be caused by adsorption of H_2O vapour, which increases the range of mobility of the surface ions or mols. and thus facilitates rearrangement of the cryst. surface. The adsorption also leads to chemical action in certain cases; *e.g.*, $(NH_4)_2SO_4$ and $Ca(OH)_2$ react at R.H. 76%, but not at 63%. F. L. U.

Investigation of adsorption of water and carbon dioxide by active oxides by Hahn's emanation method. R. Mumbrauer (Z. physikal. Chem., 1937, **B, 36**, 20—26).—The sorption at room temp. of H_2O by active Fe^{III} and Be oxides and of CO_2 by active Be oxides is a process of reversible adsorption. The adsorption of H_2O reversibly increases the emanating power, E, by loosening the secondary structure, whilst CO_2 has the reverse effect. H_2O and CO_2, when present together, increase E for highly active BeO. R. C.

Adsorption of ethane, ethylene, acetylene, and hydrogen and the polymerisation and hydrogenation of ethylene and acetylene by carbon, carbon contacts, and active iron. R. Klar (Z. Elektrochem., 1937, 43, 379—389).—Adsorption isotherms for C_2H_4 and C_2H_6 on C containing varying amounts of Fe have been determined. The heat of adsorption rises with increasing Fe content; by comparison with active Fe the distribution of the adsorbate on the contact surface has been investigated. The sorption of C_2H_2 can be differentiated into two stages, represented by momentary physical adsorption followed by a slow activated adsorption, and the corresponding heats of adsorption and activation have been determined. The influence of the Fe content of C on the adsorption of H_2 and the influence of the activation temp. on the heat of activation show that adsorption does not occur at the C surface, but at active Fe centres. The activated adsorption of C_2H_2 is a first-order reaction. The apparent energy of activation of the polymerisation of C_2H_4 has been calc. The hydrogenation of C_2H_4 at C contacts at 75—150° has been studied and the energy of activation determined: the mechanism has been elucidated by exchange with D_2. When mixed with H_2 in presence of C, C_2H_2 polymerises but is not hydrogenated. E. S. H.

Adsorption of metallic cations by cellulose. Isoelectric point of cellulose. (Mme.) J. Gavoret (Compt. rend., 1937, **204**, 1643—1645; cf. A., 1932, 908).—The adsorption of $Pb^{\cdot\cdot}$ by cellulose has been studied at p_H 1·2—5·4. Below p_H 2·7 there is no adsorption, and above this point adsorption increases rapidly with p_H. The crit. p_H is independent of $[Pb^{\cdot\cdot}]$ or of the source of the cellulose, and it is suggested that this is the isoelectric point. R. S. B.

Effect of uni-univalent electrolytes on interfacial tension between *n*-hexane and water. A. W. Evans (Trans. Faraday Soc., 1937, **33**, 794—800).—Interfacial tension–concn. curves have been obtained for Li, Na, K, Rb, and Cs chlorides, NaOH, and KCNS at 25°. The results support the theory of Onsager and Samaras (A., 1934, 1068) as opposed to those of Ariyama (this vol., 179) and Oka. F. L. U.

Interpretation of adhesion tension data. K. S. G. Doss (J. Indian Chem. Soc., 1937, **14**, 160—166).—Theoretical. The work of Bartell (A., 1935, 29) is criticised. F. J. G.

Pseudo-extraction and some specific propertoes of films obtainable thereby. L. I. Belaiev (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 137—140).—When inorg. hydrosols are emulsified with org. liquids immiscible with H_2O, the disperse phase collects at the interface, forming a film. The most suitable liquid is *iso*-$C_5H_{11}\cdot OH$. Film formation is retarded in highly conc. and dil. sols. The Au films obtained were golden in colour by reflected and blue or violet by transmitted light. Lamellar films, *e.g.*, of Au, were found to consist of discrete lamellæ 0·05—0·5 mm. in diameter, situated above the interface in the non-aq. layer. The influence of p.d., added reagents, and streams of bubbles and liquid is described. R. S. B.

Binding of solvents by immobilisation. F. Eirich, H. Mark, and T. Huber (Papier-Fabr., 1937, Fest- u. Auslandsheft, 251—258).—By measuring the rate of fall in oil of small bodies with holes bored through them it is shown that the liquid in the holes is largely immobilised. In colloid particles with a porous structure, solvent may therefore be immobilised by purely hydrodynamic forces. A. G.

Diffusion of electrolytes through a membrane. I. M. Kōno and E. Utsunomiya (J. Chem. Soc. Japan, 1935, 56, 1475—1482).—The rates of penetration of 0·1N-alkali salts through Cellophane at 25° are in the order $KBr > KI > KCl > NH_4Cl > NaCl > LiCl$, and $KNO_3 > NH_4NO_3 > NaNO_3 > LiNO_3$. Ch. Abs. (*e*)

Permeability of membranes. V. Origin of bioelectric currents. K. H. Meyer (Helv. Chim. Acta, 1937, **20**, 634—644).—P.d. across a membrane is attributed to ionic changes in the liquid in contact with the membrane rather than to variations in permeability of the membrane. A cell is described in which a portion of an electrolyte solution is separated from the remainder by means of two membranes, one permeable to anions, the other to cations. Ionic changes in the middle compartment lead to p.d. between it and one or other of the outer compartments. Microscopical examination of the electric organ of the cramp-fish suggests that it is formed of a large no. of cells of this type in series. When treated with a mixture of methylene-blue and eosin, the lamellæ of the organ are seen to be in pairs, being alternately dyed, the dorsal lamella blue (permeable to cations) and the ventral lamella red (permeable to anions). C. R. H.

Diasolysis. H. Brintzinger and H. Beier (Kolloid-Z., 1937, **79**, 324—331).—The term " diasolysis " is applied to the passage of substances sol. in org. solvents, *e.g.*, NH_2Ph, $NO_2\cdot C_6H_4\cdot OH$, etc., through membranes of rubber and similar materials, from an aq. solution. The process differs from dialysis in that it occurs only with organophilic solutes, and does not depend on the mol. wt. of the latter. The diasolysis coeff. (*D*) is largely determined by the ratio (solubility in membrane material)/(solubility in liquid). *D* has been measured for a raw rubber membrane and aq. solutions of NH_2Ph and *o*-, *m*-, and *p*-$NO_2\cdot C_6H_4\cdot OH$. The normal hydrolysis equilibrium of aq. *o*-$NO_2\cdot C_6H_4\cdot OK$ is displaced when the solution is separated from H_2O by a rubber membrane, owing to removal of the phenol by diasolysis.

F. L. U.

Osmotic pressure and gas pressure. K. Fredenhagen (Z. Elektrochem., 1937, **43**, 415—421).—A reply to Meyer (cf. this vol., 236).

E. S. H.

Cryoscopic studies on transition points of compounds of organic solvents with salts. III. Congruent m.p. of alcoholates of alkali halides. H. Oosaka (Bull. Chem. Soc. Japan, 1937, **12**, 177—187; cf. A., 1933, 347).—The depression of the congruent m.p. of LiCl,3MeOH, LiCl,4EtOH, LiBr,4EtOH, and LiBr,4Pr^{a}OH by H_2O and a no. of org. solutes has been determined and the cryoscopic const. calc. Abnormal vals. found when near homologues of the solvate alcohol are used are attributed to the formation of solid solutions of solute and alcoholate. Heats of fusion of the alcoholates are calc. F. L. U.

Colloid phenomena. H. C. Hamaker (Rec. trav. chim., 1937, **56**, 727—747).—Colloid phenomena are discussed in relation to graphs in which the attractive and repulsive forces are plotted against the distances between the particles. Several types based on varying assumptions are considered, and two of these are shown to correspond closely with the properties of lyophobic and lyophilic colloids. The properties of these colloids are contrasted and their behaviour is interpreted in terms of the forces between the particles. C. R. H.

Determination of size distribution curves and surface of comminuted materials, exemplified by flour. W. Gründer and H. Sauer (Kolloid-Z., 1937, **79**, 257—273; cf. B., 1935, 520).—The size distribution in specimens of rye and wheat flours suspended in Et phthalate has been determined by measuring the variation with time of the concn. of the suspension at a fixed position in a cell in which the flours were sedimenting. The concns. were measured optically with a step-photometer and with a photo-electric cell. The method is simpler and quicker than the pipette method, and is applicable to any coarse dispersion in which light absorption is independent of particle size. The latter condition is not fulfilled by rice flour in castor oil or Et phthalate. Determination of surface area by measuring the light-reflecting power of the specimens agreed with that calc. from the size distribution. F. L. U.

Cryolysis, diffusion, and particle size. IV. Caseinogen. H. Leichter, G. Umbach, and F. F. Nord (Biochem. Z., 1937, **291**, 191—208; cf. A., 1936, 157).—Measurements of *n* and light absorption show that in 0·1 and 0·2% solutions of caseinogen the particle size is decreased by freezing, whilst in 1% solution it is increased; the chemical properties are not affected in either case. Hence the results of mol. wt. determinations based on rate of sedimentation (*e.g.*, in the ultracentrifuge) may be untrustworthy.

W. McC.

Electric charge of a precipitate formed in presence of excess of either of its constituent ions. I. S. G. Chaudhury and J. Sen-Gupta (J. Indian Chem. Soc., 1937, **14**, 133—140).—The charges of $Cu_2Fe(CN)_6$, $Zn_2Fe(CN)_6$, $(UO_2)_2Fe(CN)_6$, and AgI are not simply determined by that of the ion present in slight excess, but depend on the concn. and in some cases vary with the time. F. J. G.

Change of sign of electric charge in colloidally dispersed and related systems. G. Antonoff (Kolloid-Z., 1937, **79**, 331—334).—Within a limited range of acidity, electrolysis of an aq. suspension of auriferous SiO_2 leads to an anodic deposit consisting mainly of Ca, Fe, and Na (but no Au). The deposit is stable and dissolves in $HCl + HNO_3$ or $HCl + H_2O_2$. The mechanism of its formation is discussed.

F. L. U.

Electroviscous effect and reversal of charge in sodium arabate sols with uni-, bi-, and tervalent cations. L. W. J. Holleman and H. G. B. de Jong (Kolloid-Beih., 1937, **46**, 113—133).—Various electrolytes containing uni-, bi-, and tervalent cations have been shown to give a well-defined min. of η and a reversal of the charge in sols of Na arabate at 25°. The order of the concn. of cation required to reach the η min. is the same as that for the isoelectric point, viz., $Ce^{\cdot\cdot\cdot}$, $UO_2^{\cdot\cdot}$, $Pb^{\cdot\cdot}$, $Cu^{\cdot\cdot}$, $Cd^{\cdot\cdot}$, $Ba^{\cdot\cdot}$, $Ca^{\cdot\cdot}$, ($Mg^{\cdot\cdot}$?), $Li^{\cdot}$. The abs. concns., however, are not identical in the two series, the difference being attributed to the fact that the electrophoresis measurements were made on SiO_2 particles carrying an adsorbed film of the colloid. The results are not in agreement with the Einstein–Smoluchowski formula. The relation between η and electrolyte concn. is discussed. F. L. U.

Anomalies in the dispersion of light by colloidal solutions of silver. C. Jausseran (Compt. rend., 1937, **204**, 1646—1649).—*n* has been determined for colloidal solutions of Ag for λ 6300—3330 A. The dispersion, which resembles the anomalous dispersion in the region of an absorption band, agrees with the theory of Mie, Gans, and Happel (cf. A., 1913, ii, 85). R. S. B.

Dispersion of depolarisation of light-scattering in colloids. II. Silver sols. R. S. Krishnan (Proc. Indian Acad. Sci., 1937, **5**, A, 305—320; cf. this vol., 182).—The depolarisation factors and extinction coeffs. have been measured for six Ag sols at λλ 2500—7000 A. As in the case of Au sols, the depolarisation factors show a large increase in the region of characteristic absorption. The optical anisotropy of the Ag particles is low in the ultraviolet and red regions, but higher in the violet region, where the absorption is a max. Sols prepared by Bredig's method behave anomalously. The results are compared with the depolarisation factors and extinction coeffs. calc. from Gans' theory, and it is inferred that the particles behave optically as elongated ellipsoids with an axial ratio of 0·75. It is suggested that they may be in the form of minute octahedra, which are optically equiv. to such prolate spheroids. The negative streaming double refraction and negative electric double refraction of these sols are explainable in terms of such particles. J. W. S.

Surface tension of colloidal substances. S. N. Banerji (Proc. Nat. Acad. Sci. India, 1936, 6, 317—320).—From measurements (not given) of the surface tension of aq. solutions of various hydrophilic substances it is inferred that the lowering is not due to a high degree of hydration. F. L. U.

Colloid reactions and biological experiments with colloidal tungstic oxide. III. F. Eirich (Biochem. Z., 1937, **291**, 51—60; cf. A., 1935, 296).—The conditions of flocculation of WO_3 sols by EtOH and electrolytes and their behaviour with regard to reversal of charge and protection on admixture with sols of Al_2O_3, Fe_2O_3, gum arabic, dextrin, and serum have been determined. The WO_3 sols are not changed by addition of $COMe_2$, Et_2O, or sucrose. The absorption of *X*-rays by Au sols has been determined. The results of injecting WO_3 sols into rabbits are described. E. S. H.

Coagulation of colloids. XVII. Anomalous coagulative power of aqueous mercury chloride. S. R. Joshi and K. R. Das (J. Indian Chem. Soc., 1937, **14**, 167—171).—A comparison of the coagulating effects of KCl, $BaCl_2$, $AlCl_3$, and $HgCl_2$ on a no. of colloids shows that $HgCl_2$ is comparable with $BaCl_2$. In view of the low ionisation of $HgCl_2$ the effect cannot be adequately explained. F. J. G.

Electrolyte coagulation of weakly solvated sols and electrolyte activity. V. Influence of temperature. W. Ostwald, H. Kokoros, and K. Hoffmann (Kolloid-Z., 1937, 79, 287—307; cf. A., 1936, 1200).—It is shown, on the basis of the Debye–Hückel theory, that the activity coeff. (*f*) of ions in aq. solution decreases with rising temp., in consequence of the decrease in dielectric const. Tables are given to show the relation between *f* and temp. at const. concn., and between the coagulating concn. (*m*) and temp. for const. *f*. Coagulation concns. of different types of electrolyte for As_2S_3 sols have been determined over the range 0—90°, and the results support the theory of coagulation previously published. An explanation of the spontaneous coagulation of electrolyte-free sols at temp. $>100°$ is given. F. L. U.

Influence of lyophilic colloids on wettability of naphthalene. A. C. Chatterji (Proc. Nat. Acad. Sci. India, 1936, 6, 343—347; cf. A., 1934, 23).—The wetting power of aq. solutions of lyophilic colloids for powdered $C_{10}H_8$ is in the order: gelatin $>$ casein $>$ wheat starch, agar $>$ silicic acid. This is also the order of their protective action on Au sols. F. L. U.

Influence of iron salts on the colour and physico-chemical properties of gelatin. M. A. Chenoch (J. Appl. Chem. Russ., 1937, **10**, 671—675).—The colour of gelatin is affected by the presence of $>$0·2 p.p.m. of Fe, to an extent $\propto$ [Fe]. The surface tension of, and the stability of the foams formed from, gelatin solutions are raised, but the η is unaffected, by traces of $FeCl_3$. Photographic emulsions prepared from gelatin containing 0·6 p.p.m. of Fe are of inferior quality to those obtained with Fe-free gelatin. R. T.

Thixotropy of suspensions of a Japanese hydrogen clay. B. Tamamushi (Kolloid-Z., 1937, 79, 309—314).—The existence of an optimal concn. of NaCl in inducing gelatinisation of a suspension of the clay indicates behaviour represented by: H-clay + NaCl $\rightleftharpoons$ Na-clay + HCl. This is confirmed by measurements of the acidity of the ultrafiltrate. The effect of alkali and alkaline-earth cations on the thixotropy of the clay increases with the degree of hydration of the cation. The clay closely resembles bentonite both in composition and in thixotropic behaviour. F. L. U.

Capacity [of liquids] for being spun. R. K. Schofield and G. W. S. Blair (Kolloid-Z., 1937, 79, 308).—The behaviour of a specimen of thixotropic honey which could be drawn into threads suggests the presence of a structural network in liquids capable of being spun. Such a structure would prevent the segmentation which would otherwise result from the operation of surface forces. F. L. U.

Comparative electrochemical study of highly purified lyophilic sols. IV. Constitutive basis of electrochemical pecularities of very pure acidoid sols of vegetable gums. W. Pauli, W. Kölbl, and A. Linsker (Kolloid-Z., 1937, 79, 273—286; cf. this vol., 303).—Conductivity (κ)-temp. curves for lactic (I), lactic + lactylic (II), *d*-gluconic (III), and *d*-glycuronic (IV) acids have been determined, and compared with those given by highly purified acidoid gum arabic (V) sols. The curves given by (II) and (III), but not by (I) and (IV), resemble those for (V) in showing a max., and in being irreversible. Further, the apparent dissociation const. of (II), (III), and (V) increases with increasing concn., that of (I) and (IV) being independent of concn. The observed relations are discussed with reference to the constitution of the respective substances. F. L. U.

Periodic precipitation in absence of foreign gel. I. Ferric hydroxide sol. R. N. Mittra (Proc. Nat. Acad. Sci. India, 1936, 6, 321—332).—The conditions determining the periodic pptn. of $Fe(OH)_3$ from a sol (cf. A., 1933, 224) have been studied when KCl and $NaBrO_3$ are used as coagulants. F. L. U.

Liesegang rings and influence of media in their formation. B. N. Desai (Current Sci., 1937, 5, 584—585).—A theoretical discussion. F. L. U.

Swelling measurements on polymeric homologues of the cellulose nitrates. G. V. Schulz (Naturwiss., 1937, 25, 346—347).—Cellulose nitrates of mol. wt. 443,000, 370,000, 183,000, and 132,000 in $COMe_2$ have been investigated. The connexion between swelling pressure (and hence v.p. lowering) and wt. of solvent is independent of the mol. wt. of the nitrate. The v.p. of the swollen gel is not dependent on mol. concn., but on the ratio of the masses of solute and solvent. Under these circumstances, the swelling is mol. and not capillary. Up to a swelling pressure of 20 atm., the equation, $p = ks^{-n}$ (p = swelling pressure, s = sp. swelling vol., k and n are consts.) holds. The vals. of the consts. k and n are in agreement with those derived from osmotic determinations (cf. A., 1936, 1338). A. J. M.

Theory of electrocapillarity. IV. Electrophoresis. S. R. Craxford, O. Gatty, and H. A. C. McKay (Phil. Mag., 1937, [vii], 23, 1079—1082; cf. A., 1935, 698).—The electrophoretic force on electrically conducting particles in completely polarisable interphases depends only on the particle charge and the potential gradient causing electrophoresis. F. J. L.

Equilibrium dehydrogenation of *n*-butylenes to butadiene, $n\text{-}C_4H_8 \rightleftharpoons C_4H_6 + H_2$. M. I. Dementjeva, A. V. Frost, and E. K. Serebriakova (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 141—143).—The decomp. of C_4H_8 to C_4H_6 and H_2 has been observed at 404—807° using Cr_2O_3 as catalyst. Equilibrium is not established at <480°, and at >540° polymerisation occurs. Vals. of $K_p = p_{H_2}\cdot p_{C_4H_6}/p_{C_4H_8}$ vary considerably according to $\log K_p = -6413/T + 6{\cdot}63 \pm 0{\cdot}13$; the heat of reaction is -29 ± 10—12 kg.-cal. per mol., which agrees with thermal data. R. S. B.

Ethyl alcohol–ethyl acetate and acetic acid–ethyl acetate systems. Vapour–liquid equilibrium data. C. C. Furnas and W. B. Leighton (Ind. Eng. Chem., 1937, **29**, 709—710).—The relations between the liquid and vapour phases have been studied with the Othmer apparatus (A., 1928, 943). The const.-boiling mixture of EtOH and EtOAc contains 46·2% of EtOH, in good agreement with published results. R. C. M.

Influence of colloids and electrolytes on the equilibrium under the action of maltase.—See A., III., 313.

Electrolyte and solvents. P. Walden (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 493—512).—A lecture. Electrolytic dissociation is discussed from the viewpoint of the composition of solute and solvent. J. W. S.

Theory of activity coefficient for strong electrolytes in concentrated solution. I. S. Abe (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 370—382).—A virial equation for osmotic pressure and a corresponding equation for the activity coeff. are deduced for strong electrolytes. Agreement with experiment is shown by HCl, NaCl, $CaCl_2$, and $ZnSO_4$ up to the most conc. solutions, and reasonable vals. of ionic diameter may be calc. R. S. B.

Ionisation constant of α-crotonic acid at 25° from conductance measurements. B. Saxton and G. W. Waters (J. Amer. Chem. Soc., 1937, **59**, 1048—1049).—The val. obtained is $1{\cdot}975 \times 10^{-5}$. E. S. H.

Dissociation constant of *trans*-crotonic acid at 25°. A. I. Vogel and G. H. Jeffery (Chem. and Ind., 1937, **56**, 600).—Vals. for $K = 1{\cdot}97_5 \times 10^{-5}$ and Λ_0 (Na salt) = 83·30 are compared with vals. obtained by Sexton and Waters (see above) and by Ives *et al.* (cf. A., 1933, 780). C. R. H.

Chemical constitution and dissociation constants of monocarboxylic acids. VI. (*a*) Polarity of vinyl and phenyl groups. (*b*) Apparent linear relationship between dissociation constants and dipole moments. J. F. J. Dippy and R. H. Lewis (J.C.S., 1937, 1008—1013; cf. A., 1936, 797).—Dissociation consts. (K) (classical and thermodynamic) and mobilities have been determined at 25° for the following acids in aq. solution: *p*-tolylacetic, $Ph\cdot[CH_2]_2\cdot CO_2H$, $Ph\cdot[CH_2]_3\cdot CO_2H$, *cis*- and *trans*-cinnamic, cinnamylideneacetic, acrylic, vinyl- and allyl-acetic. In all cases K decreases with increasing distance of Ph or $CH_2\colon CH$ from the CO_2H, and is interpreted on the basis of a combination of polarisability and permanent polarisation effects. A marked "steric" effect is observable with *cis*-cinnamic acid, the K val. ($13{\cdot}2 \times 10^{-5}$) for which is $\gg$ that ($3{\cdot}65 \times 10^{-5}$) for the *trans*-acid. A nearly linear relationship exists between the K vals. and dipole moments of BzOH and its Me_1, mono-methoxy-, -halogen-, and -nitro-derivatives, and between those of $CH_2Ph\cdot CO_2H$ and its corresponding derivatives. F. L. U.

Ionic dissociation of alkyl halides. A. Tian and É. Gand (Compt. rend., 1937, **204**, 1811—1813).—The electrical conductivity of H_2O is increased immediately on addition of RI (R = Me, Et, or Pr^a). The I is pptd. completely by aq. $AgNO_3$ in 2 hr. and the solution remaining contains free acid, ROH, and RNO_3. The hydrolysis of RI being very slow, these results are explained by assuming that it behaves as a weak electrolyte in aq. solution. A. J. E. W.

The glutamic acid–pyrrolidonecarboxylic acid system. H. Wilson and R. K. Cannan (J. Biol. Chem., 1937, **119**, 309—331).—Equilibrium consts. and velocity coeffs. for this system have been determined over the p_H range −0·28 to +13·38 and at 100°, 78°, and 118°. The dissociation consts. of glutamic acid are $pK_1 = 2{\cdot}19$, $pK_2 = 4{\cdot}32$, $pK_3 = 9{\cdot}94$, and of pyrrolidonecarboxylic acid 3·32 (cf. A., 1927, ii, 9). The effect of varying [KCl] on the dissociation consts. has also been investigated. The mechanism of the reaction and its use in the routine of protein analysis are discussed. J. W. S.

Exchange of charge between thallous and thallic ions. V. Majer (Z. physikal. Chem., 1937, **179**, 51—60; cf. A., 1936, 918).—Using Th-C'' as radioactive indicator it has been shown that in strongly acid nitrate solution there is free exchange, for the Th-C'' is shared equally between the Tl^I and Tl^{III} salts. In neutral and weakly acid solutions of the nitrates and in solutions of the chlorides more Th-C'' goes to the Tl^I than to the Tl^{III} salt, an effect which seems to be due to hydrolysis of the $Tl(NO_3)_3$, as a result of which some of the $Tl^{\cdots}$ ions are unable to participate in the exchange of charge. R. C.

Determination of the hydration of the ions of sodium iodide. F. Bourion and (Mlle.) O. Hun (Compt. rend., 1937, **204**, 1872—1873).—Cryoscopic methods for determining the hydration of ions (A., 1936, 797; this vol., 362) have been applied to M and $0{\cdot}5M$ solutions of NaI. In $0{\cdot}5M$ solution, NaI, $Na^{\cdot}$, and I' are associated with 14·5, 11·1, and 3·4 mols. H_2O, respectively. W. R. A.

Ionic potential and basic and acidic properties of hydroxides. C. E. Sun (J. Chinese Chem. Soc., 1937, **5**, 148—153).—Recent data show that cations in aq. solution are basic, amphoteric, or acidic according as the ionic potential is <6, approx. 6, or >6 (cf. A., 1929, 269). J. G. A. G.

Fusion diagram for two components giving a eutectic and solid solutions, taking into consideration the degree of dispersion. L. V. Nikitin (J. Gen. Chem. Russ., 1937, **7**, 977—979).—Theoretical. R. T.

M.-p. diagrams of binary systems of condensed gases. H. Veith and E. Schröder (Z. physikal. Chem., 1937, **179**, 16—22).—The systems Kr–CH_4, A–CH_4, and A–Kr are characterised by complete miscibility in the solid state, although A–CH_4 at lower temp. and high A concns. affords evidence of separation into two solid phases. In the system A–O_2 there is a miscibility gap between 79 and 90 mol.-% O_2, and the mixture with 90% O_2 is a peritectic. R. C.

System PbO–B_2O_3. R. F. Geller and E. N. Bunting (J. Res. Nat. Bur. Stand., 1937, **18**, 585—593).—The following *compounds* have been identified: $4PbO,B_2O_3$, two forms, congruent m.p. 565°; $2PbO,B_2O_3$, two forms, incongruent m.p. 497°; $5PbO,4B_2O_3$, incongruent m.p. 548°; $PbO,2B_2O_3$, congruent m.p. 768°. An additional cryst. phase could not be identified. Optical data are recorded. The eutectic (PbO 88%) corresponds with the min. m.p. (493°). H. J. E.

Calcined mixtures of litharge and titanium dioxide. *X*-Ray diffraction study. D. G. Nicholson (Ind. Eng. Chem., 1937, **29**, 716—717; cf. B., 1936, 336).—PbO,TiO_2 is the only compound formed at 680—700° in mixtures of PbO (uncalcined) and TiO_2 (calcined) when the PbO/TiO_2 ratio is varied from 20 to 0·05. R. C. M.

Binary systems of alkali nitrates. N. A. Pushin and M. Radoičić (Z. anorg. Chem., 1937, **233**, 41—46).—Cooling curve data are recorded for: KNO_3–$RbNO_3$ (continuous range of solid solutions); $NaNO_3$–$RbNO_3$ (eutectic 178·5°, 55 mol.-% $RbNO_3$); $LiNO_3$–$RbNO_3$ (equimol. compound m.p. 191°, eutectics 179·5°, 35 mol.-% $RbNO_3$ and 154°, 68 mol.-% $RbNO_3$); $CsNO_3$–$LiNO_3$ (eutectic 174°, 57 mol.-% $LiNO_3$); $CsNO_3$–$Pb(NO_3)_2$ [up to 50 mol.-% $Pb(NO_3)_2$; eutectic 176°, 32 mol.-% $Pb(NO_3)_2$]. F. J. G.

Thermal decomposition of barium carbonates. L. Hackspill and G. Wolf (Compt. rend., 1937, **204**, 1820—1822).—The dissociation pressure of $BaCO_3$ has been measured between 700° and 1250°. An allotropic transformation occurs at 910°, and the BaO–$BaCO_3$ eutectic melts at about 1100°. No basic carbonate could be identified by *X*-ray analysis. A. J. E. W.

Vapour pressure–temperature relations of the binary system zinc nitrate–water. W. W. Ewing and H. M. Fisher (J. Amer. Chem. Soc., 1937, **59**, 1046—1048).—V.p. for unsaturated, saturated, and supersaturated solutions and eutectic mixtures are recorded for the concn. range 0—82% at 10—60°. E. S. H.

Rare-earth metals and their compounds. I. Binary system hexahydrated lanthanum and magnesium nitrates. L. L. Quill and R. F. Robey (J. Amer. Chem. Soc., 1937, **59**, 1071).—The existence of $2La(NO_3)_3,3Mg(NO_3)_2$ is confirmed. E. S. H.

Alkali phosphates and arsenates. III. Tertiary sodium arsenates. H. Menzel and W. Hagen (Z. anorg. Chem., 1937, **233**, 49—83).—The 20° isotherm of the system Na_2O–As_2O_5–H_2O has been determined in the region from NaH_2AsO_4 up to high alkalinity. NaH_2AsO_4,H_2O and $Na_2HAsO_4,12H_2O$ form congruent solutions. In a small range of relatively acid solutions (Na : As 2·3—2·5) the solid phase is the true tertiary arsenate (ortho-salt), but this passes without discontinuity into a homogeneous series of "pseudo-salts" (ψ-salts). Similar relations are found at 0° and 50°. In very conc. alkali two further solid phases appear. The ψ-salts give *X*-ray diagrams closely resembling that of the ortho-salt. Tensimetric curves for the ortho-salt indicated hydrates with 9, 7, and $3H_2O$, and these give characteristic *X*-ray diagrams. In the case of the ψ-salt, hydrates with 10 and $3·5H_2O$, possibly also 7·5 and $5·5H_2O$, are indicated. It retains traces of H_2O which cannot be removed without volatilising NaOH, but the final product gives an *X*-ray diagram identical with that of the anhyd. ortho-salt. This "pseudo-salt anomaly" is compared with that of Na_3PO_4 (this vol., 185) and possible explanations are discussed. F. J. G.

Complex formed by lead iodide and lithium iodide in aqueous solution. (Mme.) N. Demassieux and L. Roger (Compt. rend., 1937, **204**, 1818—1819; cf. A., 1923, ii, 565).—Solubility data for the system PbI_2–LiI–H_2O are recorded together with vals. of d, n, and r_L for the aq. phase. $\mathit{PbI_2,LiI,4H_2O}$, PbI_2, and $LiI,3H_2O$ occur as solid phases. A. J. E. W.

Three-component systems of cobalt chloride and water with calcium, strontium, or thorium chloride. H. Bassett, H. F. Gordon, and J. H. Henshall (J.C.S., 1937, 971—973; cf. A., 1932, 811).—Data for the system $CoCl_2$–$CaCl_2$–HO_2 at 0°, 25°, and 50° are shown in a triangular diagram. The only solid phases present in the system $CoCl_2$–$SrCl_2$–H_2O are the two hexahydrates at 25° and the two dihydrates at 80°. In the system $CoCl_2$–$ThCl_4$–H_2O at 25° there is a large region of $CoCl_2,6H_2O$ and a small one of $ThCl_4,8H_2O$. No double salts or solid solutions were found in any of the systems examined. Cryst. characteristics of the three forms of $CaCl_2,4H_2O$ are described. F. L. U.

Solubility of bone salt. M. M. Logan and H. L. Taylor (J. Biol. Chem., 1937, **119**, 293—307).—The ionic product $[Ca^{\cdot\cdot}]^3[PO_4{}''']^2$ for a solution of p_H 7·4 and containing initially $CaCl_2$ (0·00106M), Na_2HPO_4 (0·00306M), $NaHCO_3$ (0·025M), and NaCl (0·12M), when left in contact with bone powder or with $Ca_3(PO_4)_2$ for 8 days, increases as the amount of solid in contact with the solution decreases below

0·150 g. per litre. The solubility product, expressed as $p[\mathrm{Ca}^{\cdot\cdot}]^3[\mathrm{PO}_4{}''']^2$, is 23·1±0·4. It is inferred that bone salts cannot ppt. spontaneously from blood plasma unless the ion product is increased, and when once formed cannot dissolve unless the $[\mathrm{Ca}^{\cdot\cdot}]$ and $[\mathrm{PO}_4{}''']$ fall below the concns. found in blood plasma. It would seem that the metabolic activity of cells is necessary for both the pptn. and dissolution of the Ca salts. J. W. S.

Solid–liquid phase equilibria in ternary organic systems. XV. The system carbamide–urethane–phenacetin. K. Hrynakowski and F. Adamanis (Rocz. Chem., 1937, **17**, 132—139).—The eu- and peri-tectic mixtures are described. R. T.

System copper–iron–sulphur. H. E. Merwin and R. H. Lombard (Econ. Geol., 1937, **32**, Suppl. to No. 2, 203—284).—Powdered mixtures of Cu_2S and FeS absorb S when heated in S vapour at higher pressures. S-rich solid solutions $Cu_2(Fe)S_{1+}$ (chalcocites) and $Fe(Cu_2)S_{1+}$ (pyrrhotites) are first formed, followed by the production of five ternary compounds, all of which tend to form solid solutions, and finally by the formation of covellite, CuS, and pyrite, FeS_2, which have no appreciable tendency to form solid solutions and are stable even in saturated S vapour over a wide range. Two of the ternary compounds, Cu_5FeS_6 and $Cu_3Fe_4S_6$ (?), are new. Measurements of the S v.p. have been made for some of the systems involved and dissociation pressure curves for $\mathrm{Cu_5FeS_6}$, $\mathrm{Cu_5FeS_4}$ (bornite), $\mathrm{CuFe_2S_3}$ (cubanite), and $\mathrm{CuFeS_{1\cdot94}}$ (chalcopyrite solid solution) have been determined. The system is described in detail for a S v.p. of 455 mm. and data for certain other temp. and pressures are given. Phase changes occurring in the solid state during cooling are also discussed. L. S. T.

Iron corner in the ternary system iron–vanadium–carbon. F. Wever, A. Rose, and H. Eggers (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, **14**, 239—246).—Equilibria have been determined by thermal analysis and micrographic examination. E. S. H.

Behaviour of melts of iron, nickel, and manganese towards their liquid silicates and solid silicic acid at 1600°. W. Oelsen and G. Kremer (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, **18**, 89—107).—Equilibria in the three-phase system metal layer–silicate slag–solid SiO_2 have been determined for the components Fe–Ni–Mn–Si–O at 1600—1650°. E. S. H.

Effect of silicide, phosphide, and carbide formation in iron melts on their equilibria with oxides. F. Körber and W. Oelsen (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, **18**, 109—130).—The heats of formation of Fe–Si alloys have been determined. The influence of Si, P, and C on the equilibrium in the system Fe–Mn–Si–O has been studied at $\nless$1600°; the displacement of the metal–slag equilibrium in the system is compared with the displacement of the solubility limit of graphite in Fe melts by P and C. E. S. H.

Heats of dissolution of hydrogen chloride and bromide. W. A. Roth and A. Bertram (Z. Elektrochem., 1937, **43**, 376—378).—Data are recorded for different dilutions at 20°. At infinite dilution the estimated vals. are +17·45 to 17·50 and +16·0 kg.-cal. for HCl and HBr, respectively. E. S. H.

Dissociation energy of carbon monoxide. R. Schmid (Roy. Hung. Palatin-Joseph Univ., Publ. Dept. Min. Met., 1935, **7**, 171—182; cf. A., 1935, 1299).—The heat of sublimation of solid C = 108 kg.-cal. and λ = 205 kg.-cal. The C·C bond energy is 102 kg.-cal. for solid C and 99 kg.-cal. for aliphatic C compounds. The ionisation potential for $CO \rightarrow CO^+ = 13{\cdot}15$ volts. The val. $D(CO) = 8{\cdot}4$ volts needs confirmation. Ch. Abs. (*e*)

Heat of formation of hydrocarbons. M. Brutzcus (Compt. rend., 1937, **204**, 1802—1804; cf. this vol., 223, 309, 364).—The relations between the heat of formation of a hydrocarbon and the energy vals. of its linkings are discussed. A. J. E. W.

Phase equilibria in hydrocarbon systems. XVIII. Thermodynamic properties of ethane. B. H. Sage, D. C. Webster, and W. N. Lacey (Ind. Eng. Chem., 1937, **29**, 658—666).—Sp. vol., Joule–Thomson coeff., and isochoric sp. heats have been determined for C_2H_6. From these and other primary data, vals. of heat content and entropy have been calc. for a series of temp. from 20° to 120° and at pressures from atm. to 3500 lb. per sq. in. Several diagrams are given illustrating the thermodynamic behaviour of C_2H_6. H. C. M.

Heats of hydrogenation of unsaturated esters. E. Schjånberg (Z. physikal. Chem., 1937, **179**, 39—42).—Calculation of the heats of hydrogenation, *Q*, of crotonic and pentenoic esters has shown that only when the C:C linking is in the γδ-position in the acyl radical is *Q* equal to the val. for C_2H_4. Hiltner's methods and results (A., 1932, 341) are criticised. R. C.

Heat of combustion and structure of cuprene. P. J. Flory (J. Amer. Chem. Soc., 1937, **59**, 1149—1150).—The val. 267 kg.-cal. per structural unit $-C_2H_2-$ is calc. from published data. E. S. H.

Properties of polymerides in solution. IV. Free energy and heat of formation. Solutions of butyl valerate and sebacate. C. G. Boissonnas. **V. Measurement of vapour pressure.** C. G. Boissonnas and A. J. van der Wyk. **VI. Free energy and heat of dissolution. System cellulose nitrate–*cyclo*hexanone.** C. G. Boissonnas and K. H. Meyer (Helv. Chim. Acta, 1937, **20**, 768—779, 779—782, 783—790).—IV. The heat changes in the formation of binary mixtures of the two esters with C_6H_6 and Pr^aBr have been determined calorimetrically and compared with vals. for the free energy obtained by Brönsted and Colmant (cf. A., 1934, 844). The entropy of formation is in each case > for "ideal" mixing, although the difference is small for the system $Bu^aCO_2Bu^a$–Pr^aBr. The difference increases with increase in the val. of the ratio mol. vol. ester/mol. vol. solvent.

V. An apparatus is described for the rapid measurement of v.p. in equilibrium with a solution which can be in the form either of a liquid or a gel. Measurements can be made with < 0.1 g. of substance.

VI. From data for the v.p. and osmotic pressure of solutions of cellulose nitrate (I) in *cyclo*hexanone at 25° and 36°, the free energies of dilution have been calc. For solutions containing 0—70% of (I) the free energy of dilution can be represented by an expression of the form $Aw + Bw^2$, where w is wt.-% (I) and A and B are consts. Applying Raoult's law, the calc. mol. wt. of (I) is of the order of 70,000. From measurements of the temp. coeff. of osmotic pressure, the heat of dilution has been calc. It is negative and is $<$ the free energy of dilution, *i.e.*, the entropy of dilution is $>$ for "ideal" dilution. C. R. H.

Transference of water. III. Its dependence on concentration in electrolysis of barium chloride solutions. M. Taylor and V. R. Willcox (J.C.S., 1937, 902—907; cf. A., 1932, 1092).—Measurements have been made with $0.5M$- and $0.25M$-$BaCl_2$ at 25°, using $CO(NH_2)_2$ as a reference substance. The H_2O transported is $\frac{1}{4}$ to $\frac{1}{3}$ of the quantity obtained with NaCl solutions. In both concns. H_2O moves to the cathode, and the quantity transported changes little with concn., although the transport no. of $Ba^{\cdot\cdot}$ increases rapidly with increasing dilution. It is suggested that the double charge produces a hydration shell which is more firmly bound than that around $Na^{\cdot}$ or Cl'.

F. L. U.

Behaviour of glass electrode at different temperatures. A. A. Smirnov (J. Gen. Chem. Russ., 1937, 7, 796—807).—The influence of temp. is given by $p_H = E/\theta + b_K - 0.0025(t - t_K)$, where E is the p.d. between a HgCl electrode and the glass electrode at $t°$, $\theta = RT/nF$, and b_K is a const. for the temp. t_K at which the glass electrode has been calibrated. Applying the general formula, p_H may be determined with an error $\nless \pm 0.03$, at 24—60°. R. T.

Energy states of valency electrons in metals. I. 4. Nature of electrode potentials and mechanism of catalytic action of metal surface. I. 5. Threshold value of overvoltage of hydrogen on zinc electrode. M. Satô (Sci. Rep. Tôhoku, 1937, 25, 829—870, 871—878; cf. A., 1936, 1316).—I (4). The normal electrode potentials for the (0001), $(10\bar{1}0)$, $(11\bar{2}0)$, $(10\bar{1}1)$, and $(11\bar{2}1)$ faces of a single Zn crystal in $0.5N$-H_2SO_4 and $0.5N$-$ZnSO_4$ have been measured; the vals. are attributed to electron transitions between certain energy levels. The potential barrier which gives rise to the electrode potential is identical with the photo-electric threshold barrier, and this is used to calculate the abs. vals. of the potential barriers of Zn and H_2 electrodes. The catalytic action of metal surfaces is due to the unstable state of some of the valency electrons in the transient surface layer.

I (5). The potential barrier at the threshold val. of the overvoltage of H on a Zn electrode is 2·684 e.v., arising from the difference between the energy vals. $E_1 - E_2$ in the Zn electrode, and the dissociation energy of H_2^+. F. J. L.

Diffusion potentials. III. V. Čupr. **IV.** V. Čupr and K. Marek (Publ. Fac. Sci. Univ. Masaryk, 1937, No. 234, 16 pp.; No. 237, 15 pp.).—III. A method is described for the determination of the diffusion potential between a test solution and solutions which contain HCl, KCl, or HCl + KCl. A knowledge of the difference of the e.m.f. of cells with and without the test solution is required. A comparison of Henderson's equation applied to the case where a relatively better conducting solution is in contact with two others shows only small differences as compared with the equation of Lewis and Sargent. The latter equation is shown to hold for solutions of HCl and KCl up to a total concn. of $0.2N$. With higher concns. there are considerable deviations.

IV. When experimental vals. for more conc. solutions of KCl + HCl with equal activities of Cl' are substituted in the Lewis and Sargent equation, vals. for the diffusion potential are obtained which differ from those given by the above method. Vals. of the diffusion potential for equally conducting solutions are not const. as they should be. The equations would seem to require modification by the introduction of an unknown factor which takes account of the circumstance that the individual ions may participate differently in the conductivity and diffusion of solutions. F. R.

Diffusion of an electrolyte. I. Theoretical. II. Experimental. J. J. Hermans (Rec. trav. chim., 1937, 56, 635—657, 658—672).—I. Expressions are derived for the diffusion coeff. and diffusion potential, L. The equation for L agrees satisfactorily with recorded data for solutions of HCl, NaCl, and $BaCl_2$ at concns. $\ngtr 0.03$, 0·03, and 0·01 g.-mol. per litre, respectively, the vals. being respectively $<$, approx. $=$, and $>$ the vals. calc. from Nernst's theory. In the case of NaCl the electrophoretic and electrostatic terms in the author's equation are of similar magnitude and almost cancel each other.

II. New measurements of L for solutions of NaCl at 18° and $BaCl_2$ at 25° support the author's theory. Data for HCl in a H_2O–EtOH mixture containing 40 mol.-% EtOH agree with theory at concns. $\ngtr 0.009$ g.-mol. per litre. The smaller range of validity of the equation for EtOH–H_2O solutions as compared with aq. solutions is ascribed to the lower dielectric const. of the former solvent. The equiv. conductivity and transport no. of HCl in EtOH–H_2O solutions have been determined. C. R. H.

Polarographic studies with the dropping mercury cathode. LXVIII. Hydrogen overpotential in light and heavy water. J. Novák (Coll. Czech. Chem. Comm., 1937, 9, 207—237).—The inflexion points on the current–voltage curves due to the deposition of hydrions at the dropping Hg cathode in 99·6% D_2O (I) at 20° and 60° are negative to the extent of 87 and 71 mv., respectively, with respect to the vals. in H_2O. The factor b of the $b \log i$ term of the overvoltage relation is 113 mv. in (I) and 102 mv. in H_2O at 20°, and increases less rapidly than is required by the linear relation with T. The electrode potential of 1% Tl–Hg in (I) is 3 mv. $>$ in H_2O, and the potential of electroreduction, π, of maleic acid in $0.1N$-HCl in (I) is 13 mv. $>$ in H_2O (cf. A., 1935, 1079). The π of O_2 to H_2O_2 in $0.1N$-K_2CO_3 is the same in H_2O as in (I), but the π

of H_2O_2 to H_2O in (I) is 84 mv. negative with respect to that in H_2O (cf. A., 1930, 304; 1935, 1208).
J. G. A. G.

D. Mendeléev and the phenomena of contact. N. D. Zelinski (Trav. Congr. Jubil. Mendeléev, 1936, **1**, 629—638).—A lecture. Conditions occurring at interfaces and their significance in contact catalysis are discussed. J. W. S.

Flow potentials on platinum. H. R. Kruyt and J. Oosterman (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 404—406).—Preliminary. It is impossible to determine the electrokinetic potential of Pt accurately by flow potential measurements; owing to wall conductivity, the ends of the capillary become polarised to H_2 and O_2 electrodes and the measured e.m.f. is determined by the p.d. of these electrodes. O. D. S.

Influence of ammonium molybdate on acidity of sugar solutions. M. Niculescu (J. pr. Chem., 1937, [ii], **148**, 289—294).—The acidity of aq. $(NH_4)_2MoO_4$ is increased by addition of arabinose, glucose, fructose, galactose, lactose, maltose, and sucrose. The formation of complexes is inferred.
F. L. U.

Molecular resonance systems. III. Indicator properties of some anilinesulphonephthaleins. G. Schwarzenbach and G. H. Ott (Helv. Chim. Acta, 1937, **20**, 627—633).—Equilibrium consts. and transition points for a no. of substituted anilinesulphonephthaleins have been determined. The influence of substituents and the magnitude of salt errors are discussed. C. R. H.

Electrolytic reduction potentials of organic compounds. XII. Reduction potentials of *p*-aminoazobenzene. M. Shikata and I. Tachi. **XIII. Reduction potentials of dimethylaminoazobenzene.** I. Tachi (Mem. Coll. Agric. Kyoto, 1937, No. 40, 1—10, 11—20).—See A., 1933, 1121, 1122.
J. W. S.

Oxidation–reduction potentials measured with the dropping mercury electrode. I. Studies with quinhydrone and determination of limits of measurement. II. Polarographic investigation. New method. O. H. Müller and J. P. Baumberger (Trans. Electrochem. Soc., 1937, **71**, Preprints 34 and 35, 459—470, 471—484).—I. The upper limit of potential depends on the presence of ions which form ppts. with $Hg^{\cdot\cdot}$, and can be calc. if the concn. and solubility product of the ions are known. When the concn. of ions is $<10^{-5}M$ the potential is not affected. The dropping Hg electrode can be used for determining oxidation–reduction potentials from the upper limit down to potentials < that of the H_2 electrode. Experiments with quinhydrone in buffered solutions of p_H 2—8 are described.

II. The determination of oxidation–reduction potential in org. systems from a single polarographic curve is described. The approx. concns. and the ratio of oxidant to reductant can be read from the same curve. Results for several org. systems are recorded. The existence of semiquinones is demonstrated and the potentials characterising the two steps in their oxidation have been determined.
E. S. H.

Anodic polarisation of tungsten. J. P. E Duclaux (Compt. rend., 1937, **204**, 1633—1635).—The electrolysis of H_2SO_4 has been studied with a W anode which had been (*a*) polished and (*b*) subjected to anodic polarisation in aq. NH_3. A layer of high resistance forms on the anode and causes the current to decrease. R. S. B.

Passivity of iron and steel in nitric acid solution. Y. Yamamoto (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 299—342).—Mg, Sn, Pb, and Al are electronegative, and Cu, Ag, Mo, W, Au, Pt, and C are electropositive, to Fe in HNO_3. Ni is electropositive or electronegative according to whether $[HNO_3]$ is < or > 25%. Passivity is prevented when Fe is in contact with Ni or Cu, and is accelerated when in contact with Ag, W, Mo, or C. The influence of the other metals is not so great. C. R. H.

Influence of ultrasonic waves on the passivity of metals. G. Schmid and L. Ehret (Z. Elektrochem., 1937, **43**, 408—415).—The action of ultrasonic waves destroys the passivity of Fe or Cr in HNO_3 or of Pb anodes in aq. Na_2CO_3, but favours the formation of anodic films on Al and the passivation of a Ni anode in aq. $Na_2SO_4 + H_2SO_4$. E. S. H.

Two-step oxidation treated for the case of phenanthraquinonesulphonate. L. Michaelis and M. P. Schubert (J. Biol. Chem., 1937, **119**, 133—140).—K phenanthraquinone-2- and 3-sulphonates (prepared by oxidation of the corresponding phenanthrenesulphonates by CrO_3 in glacial AcOH), when suspended in EtOH to which conc. aq. NaOH (5%) has been added, yield green rhombic plates of the semiquinones (I), which potentiometric measurements show to be acids slightly stronger than the quinols. The max. fraction of (I) which can exist in very alkaline solutions is 0·67. Contrary to the indication of potential curves, however, these can exist at $p_H < 6$. The significance of inflexion points in potentiometric titration curves is discussed. J. W. S.

Influence of concentration of indifferent electrolyte on the magnitude of the diffusion current of the cation under analysis. J. P. Gochschtein (J. Gen. Chem. Russ., 1937, **7**, 789—795).—The height of the wave obtained in the polarographic determination of Zn falls to a min. and then rises, with increasing concn. of indifferent electrolyte ($LaCl_3$, $BaCl_2$, KI). R. T.

Potential gradient of gelatin under tension. (Mlle.) S. Veil (Compt. rend., 1937, **204**, 1645—1646).—The variation with time of the potential gradient in gelatin with electrodes 8 cm. apart and a p.d. of 2 volts has been determined. R. S. B.

Affinity. J. E. Verschaffelt (Wis.- nat. Tijdschr., 1935, **7**, 203—216; Chem. Zentr., 1936, i, 3259). —Theoretical. Affinity is treated as the rate of change dQ'/dw of uncompensated heat of reaction Q' with degree of reaction w. J. S. A.

Bimolecular association reactions. G. E. Kimball (J. Chem. Physics, 1937, **5**, 310—313).—The mean life-time of an unstable mol. formed by the association of two polyat. radicals can be calc. by classical methods by assuming that all the energy of formation is stored up mainly as vibrational energy in the unstable intermediate complex. This period, which is usually long in comparison with the time between collisions, determines the order of a gaseous reaction. Approx. vals. for certain unstable mols. are given and the kinetic order of the reaction is determined from them. W. R. A.

Displacement law of maximum velocity of bimolecular heterogeneous reactions. D. Reichinstein (Helv. Chim. Acta, 1937, **20**, 644—647).—A graphical method correlating adsorption velocity with the amount of substance adsorbed and its concn. in the external space is applied to the theoretical examination of the problem. C. R. H.

Steady-state rate of a chain reaction for the case of chain destruction at walls of varying efficiencies. G. von Elbe and B. Lewis (J. Amer. Chem. Soc., 1937, **59**, 970—975).—Theoretical. The cases of chain initiation at the wall and in the gaseous phase are considered. With negligible branching there exist characteristic relations between rate and vessel diameter, which may be used for the kinetic study of the unbranched reaction, whereas the branching reaction may be studied from explosion limits. The influence of vessel diameter on rate is described quantitatively for varying chain-breaking efficiencies. E. S. H.

Reactions in the system containing nitrogen dioxide, carbon monoxide, and oxygen; NO_3 as an intermediate in the classical termolecular oxidation of nitric oxide. G. M. Calhoun and R. H. Crist (J. Chem. Physics, 1937, **5**, 301—309).—The kinetics of some reactions in the system containing NO_2, O_2, and CO have been studied from 658° to 800° abs. The reaction is heterogeneous at low NO_2 pressures, but becomes homogeneous above 10 mm. The homogeneous oxidation of NO has been investigated at low p_{O_2} and const. p_{NO} and p_{CO} and the corresponding bimol. coeffs. determined over a range of temp. These do not show a linear logarithmic variation with respect to $1/T$, and this is attributed to an increase in the energy of activation. The oxidation of CO in the system appears to proceed by means of either NO_2 or NO_3. The improbable termol. order previously observed in the oxidation of NO is attributed to two consecutive bimol. reactions also involving either NO_2 or NO_3. W. R. A.

Combustion of paraffin hydrocarbons. G. von Elbe and B. Lewis (J. Amer. Chem. Soc., 1937, **59**, 976—984).—Theoretical. The concepts of "peroxide branching" operating at low temp. and of "peracid branching" at high temp. are described. The mechanisms of primary aldehyde-forming reactions and secondary non-chain reactions are discussed. E. S. H.

Spontaneous ignition of hydrocarbon–air mixtures. C. R. Kent (J. Proc. Australian Chem. Inst., 1937, **4**, 179—190).—A summary of results published by Townend and co-workers (cf. A., 1936, 801, etc.). J. G. A. G.

Homogeneous first-order gas reactions. VI. Decomposition of methylene diacetate, methylene dipropionate, and methylene dibutyrate. C. C. Coffin and W. B. Beazley (Canad. J. Res., 1937, **15**, B, 229—236).—The thermal decomp. of methylene diacetate (I) vapour between 220° and 305° and at pressures ranging from several cm. to several atm. is homogeneous and of first order. It is opposed by a second-order recombination of CH_2O and $COMe_2$ which prevents the exact determination of the equilibrium. The rate of reaction was investigated by analytical and by pressure change methods. Methylene dipropionate and dibutyrate decompose at the same rate as (I) and the energies of activation are identical, in agreement with the view that the extent to which a radical can influence the energy of activation is dependent on its position in the mol. W. R. A.

Rate of homogeneous thermal decomposition of acetaldehyde in the gaseous phase. M. Letort (J. Chim. phys., 1937, **34**, 265—320).—Full details are given of work previously summarised (A., 1936, 707; 1934, 1073). The rate of decomp. of 32—443 mm. of MeCHO at 473—578° is given approx. by $-dc/dt = k_0c_0^{-0{\cdot}5}c^2$, where c_0 is the initial concn., c is the concn. at time t, and $\log k_0 = 12{\cdot}647 - 46{,}000/2{\cdot}3026RT$ (units: min., g.-mol., litre); the observed initial velocities, v_0, conform very closely to $v_0 = k_0c_0^{1{\cdot}5}$. The energy of activation is 46 ± 0·6 kg.-cal. and is independent of [MeCHO] (cf. A., 1933, 910). The results are discussed with reference to earlier work. J. G. A. G.

Thermal polymerisation of styrene. H. Dostal and W. Jorde (Z. physikal. Chem., 1937, **179**, 23—31).—The course of the reaction at various temp. and concns. is the same in vessels of varying kinds of glass. O_2 accelerates the reaction. It seems either that the chain-breaking reaction is heterogeneous or that several reactions of differing orders occur at once. The period of induction varies in length and may be absent. R. C.

Kinetics of the thermal polymerisation of styrene in solution. H. Suess, K. Pilch, and H. Rudorfer (Österr. Chem.-Ztg., 1937, **40**, 287—288; cf. this vol., 249).—The polymerisation of styrene in PhMe, PhCl, and CCl_4 solution has been studied at 80°, 100°, and 120°. J. W. S.

Isotope exchange in water and deuterium oxide. H. Erlenmeyer, W. Schoenauer, and G. Schwarzenbach (Helv. Chim. Acta, 1937, **20**, 726—732).—K succinate, KOAc, and anhyd. H_3PO_2 dissolved in D_2O and maintained at room temp. underwent isotope exchange to the extent of 0·042, 0·25, and 2·4 H atoms per mol., respectively. $Ba(D_2PO_2)_2$, prepared by dissolving BaO in D_2O and treating the $Ba(OD)_2$ with white P in a N_2 atm., did not undergo isotope exchange in contact with H_2O for several hr. The results are discussed with reference to the relation between exchange velocity and dissociation const. C. R. H.

Rate of alkaline hydrolysis of pentenoic esters. E. Schjånberg (Z. physikal. Chem., 1937, **179**, 32—38).—The rate of hydrolysis, v, of certain pentenoic and valeric esters has been determined. With the esters of βγ- and γδ-unsaturated acids v runs parallel with the dissociation const. of the acid, K. For esters of αβ-unsaturated acids v is $<$ for the esters of the corresponding saturated acids, but constitutive effects obscure any relation between v and K. The activation energy, q, and action const., α, of the esters of *sec.* alcohols vary with temp. A double linking at $\alpha\beta$ in the acyl radical raises q, but at $\beta\gamma$ it depresses q and at $\gamma\delta$ has very little effect. R. C.

Reaction between phthalic anhydride and ethylene glycol. A. N. KOGAN (J. Appl. Chem. Russ., 1937, **10**, 900—907).—The velocity of the reaction corresponds with that of a bimol. reaction. The closest agreement between the calc. and the experimental vals. of the sap. vals. of the products is found when the substrates are taken in equimol. proportions, and the rate of increase of the mol. wt. of the resins formed is the greatest for such mixtures. Evidence of reaction between OH groups is obtained in the case of mixtures containing excess of glycol. R. T.

Reactions in concentrated sulphuric acid. II. Influence of gases. J. MILBAUER (Chem. Obzor, 1935, **10**, 201—204; Chem. Zentr., 1936, i, 3489).—The combustion of sucrose, citric acid, and phloroglucinol in H_2SO_4 in streams of N_2, CO_2, SO_2, and O_2 has been studied and the concn. of SO_2 in the issuing gases measured; the evolution of SO_2 is fastest with O_2. 100 c.c. of 90·8% H_2SO_4 dissolve 0·446 g. of SO_2 at 100° and 0·04 g. at 237°. H. N. R.

Mechanism of substitution reactions: reaction of benzyl chloride with mercuric salts. I. ROBERTS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, **59**, 1063—1070).—The kinetics of the reaction and the distribution between the major products, $CH_2Ph{\cdot}NO_3$ and $CH_2Ph{\cdot}OH$, have been studied in dioxan–H_2O mixtures. The influence of added NO_3', ClO_4', and $HgCl_2$ and the kinetic complications due to a slow secondary reaction have been investigated. A two-step mechanism involving non-ionised $Hg(NO_3)_2$ as principal reactant and CH_2Ph^+ as an intermediate is discussed. E. S. H.

Kinetics of the sulphuric acid condensation of *o*-benzoylbenzoic acid.—See A., II, 294.

Mechanism of hydrolysis and alcoholysis of alkyl halides: reactions of methyl, ethyl, and *tert.*-butyl bromides with aqueous ethyl alcohol. W. TAYLOR (J.C.S., 1937, 992—993).—Contrary to the theory of Hughes and Ingold (A., 1935, 452), both MeBr and EtBr show unimol. hydrolysis in aq. EtOH, and the velocities of hydrolysis of alkyl bromides follow the order $Bu^{\gamma}Br \gg MeBr > Pr^{\beta}Br > EtBr$. This suggests that the min. velocities of reaction of alcohols or acetates with HBr observed at Et may be due not to a change of mechanism from unimol. to bimol., but to the varying nature of the alkyl group. J. W. S.

Liquid-phase reactions at high pressures. I. Hydrolysis of esters, and the Knoevenagel reaction. D. M. NEWITT, R. P. LINSTEAD, R. H. SAPIRO, and E. J. BOORMAN (J.C.S., 1937, 876—883).—The reaction $AcOH + EtOH \rightleftharpoons EtOAc + H_2O$ has the same equilibrium const. at 5000 atm. as at 1 atm., but both the esterification reaction and the hydrolysis by mineral acid are greatly accelerated. The hydrolysis of $Et_2C_2O_4$, $CN{\cdot}CH_2{\cdot}CO_2Et$ (I), $CH_2Cl{\cdot}CO_2Et$, $CCl_3{\cdot}CO_2Et$, Et malonate, and Et diethylmalonate by H_2O or HCl at room temp., and the esterification of $CCl_3{\cdot}CO_2H$ are greatly accelerated by high pressure. Hydrolysis of linseed and soya-bean oils by dil. acid is also accelerated, but tristearin cannot be hydrolysed by H_2O, dil. acid, or dil. alkali at room temp./5000 atm. The reaction of (I) with *cyclo*pentanone in presence of piperidine (II) is accelerated at high pressure, whilst interaction of (I) with *cyclo*hexanone (III) occurs at 60°/5000 atm. without addition of (II). As (III) does not condense with either Et malonate or EtOAc under these conditions, it is concluded that either (I) or the condensation product, in the imino-phase, catalyses the high-pressure reaction. Some reaction occurs between (I) and Et 2-methyl*cyclo*hexanone-2-carboxylate at high pressure (cf. A., 1936, 846), but none with Et 2-methyl*cyclo*hexanone-2-β-propionate. (III) and *cyclo*pentanone show self-condensation under high pressure, especially in presence of (II), yielding 2-Δ^1-*cyclo*hexenyl*cyclo*hexanone and 2-*cyclo*pentylidene*cyclo*pentanone, respectively. The results do not accord with the conclusion that liquid-phase reactions which do not proceed at atm. pressure also do not proceed under like conditions at high pressure (A., 1934, 603). J. W. S.

Reactions at high pressure and the apparatus used. B. WAESER (Chem.-Ztg., 1937, **52**, 534—535).—The influence of high pressures up to 30,000 atm. on reaction velocity, bacteria and toxins, the phase changes of elements, and electrode phenomena are reviewed. Basset's work on the synthesis of NH_3 (cf. A., 1935, 455, 593; 1936, 1456) is described in greater detail. R. S. B.

Mechanism of dissolution of pure metals and alloys. M. CENTNERSZWER (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 217—240).—The diffusion theory of dissolution of metals and alloys in acids or alkalis is of only very limited application; in most cases the velocity of dissolution is determined by other factors, viz., passivation of the metal surface and H overpotential at the various surfaces. The process of dissolution involves diffusion, chemical, and, in the case of impure metals and alloys, electrochemical processes. The velocity of the chemical process is expressed by $dx/dt = K(C - x)^n$, where C is the concn. of reagent at the metal surface, and n is a const., varying from 0·25 to 4. R. T.

Explosion of aluminium powder dust clouds. R. B. MASON and C. S. TAYLOR (Ind. Eng. Chem., 1937, **29**, 626—631; cf. A., 1936, 34, 570).—Using two powders with an average particle thickness of 0·28 and 0·14 μ, the lower limit of ignition in dry air was at 40—50 mg. of Al per litre, and of explosion, approx. 110 mg. per litre. Explosion ceased when the O_2 content of the air was reduced below 10 vol.-% with CO_2; N_2 was a slightly less efficient inhibitor. Ignition was obtained by blowing an Al fuse in the explosion vessel. Published results are discussed. R. C. M.

Homogeneous catalysis by means of halogens. H. J. SCHUMACHER (Angew. Chem., 1937, **50**, 483—488; cf. this vol., 314).—The homogeneous catalytic action of halogen mols. and atoms, mainly in the gas phase, including halogen-sensitised photochemical reactions, is reviewed. R. S. B.

Retardation of chemical reactions. VII. Reaction between potassium permanganate and hydrogen peroxide in acid solution. K. C. Bailey and G. T. Taylor (J.C.S., 1937, 994—999).—At const. initial [$KMnO_4$] and [H_2SO_4] the reaction velocity (v) increases with increasing initial [H_2O_2] to a max. at [H_2O_2] = 0·005, falls to a min. at [H_2O_2] = 0·16, and then rises slowly. At const. [$KMnO_4$] and [H_2O_2] ($<$0·001), v increases with increasing [H_2SO_4] and tends to become const. at high [H_2SO_4]. With const. [$KMnO_4$] and [H_2O_2] ($>$0·02), v increases with increasing [H_2SO_4] to a max., then falls to a min., and finally rises again. $Mn^{\cdot\cdot}$ ions catalyse the reaction strongly at [H_2O_2] $\not>$ that corresponding with max. v. v increases with increasing [$KMnO_4$], but at high [H_2O_2] is not proportional to it. Theories of this reaction do not explain the results. It is suggested that the reduction of MnO_4' to MnO_3' and reoxidation of the latter by high-energy H_2O_2 mols may be involved. The empirical relation $v=k_1[H_2O_2][H_2SO_4][KMnO_4]/(k_2+k_3)[H_2O_2]^2[H_2SO_4]^2$ gives fair agreement with experiment. J. W. S.

Organic catalysts. H. Wahl (Rev. gén. Mat. col., 1937, 41, 265—268).—A review.

Hydrolysis rates of some monoacid triglycerides under the influence of pancreas extract. III. Influence of the reaction product and the constitution of the triglyceride on the hydrolysis rate. K. Holwerda (Rec. trav. chim., 1937, 56, 714—726).—The experiments previously described (cf. A., 1937, III, 268; A., 1936, 297) have been extended to the triglycerides of the C_8—C_{13} fatty acids, the hydrolysis rate being measured in solutions of p_H 4·0. The reduction in rate due to acid formation and the negligible effect on the rate of the constitutions of the triglycerides are again observed. C. R. H.

Inactivation of iron catalysts for ammonia synthesis by steam.—See B., 1937, 664.

Activation of specific linkings in complex molecules at catalytic surfaces. III. Carbon–hydrogen and carbon–carbon linkings in propane and ethylene. K. Morikawa, N. R. Trenner, and H. S. Taylor (J. Amer. Chem. Soc., 1937, 59, 1103—1111; cf. A., 1936, 1213, 1346).—The exchange reaction between C_3H_8 and D_2 at a Ni catalyst occurs in a temp. range 90° $<$ that for the hydrogenation decomp. yielding C_2H_6 and CH_4. The exchange is inhibited by H_2 to the $-0{\cdot}76$ power and the decomp. to the $-2{\cdot}6$ power of [H_2]. Methods for the prep. of C_3D_8 and deuteropropanes and deuteroethanes of known C–D content are described. The availability of H_2 in a Ni–kieselguhr catalyst for exchange reactions has been studied. Reaction of C_2H_4 with D_2 at a Ni surface at $-80°$ to 65° involves exchange as well as addition; exchange also occurs at a Cu catalyst. C_2H_4 polymerises to C_4- and higher hydrocarbons at 0° on Ni, but the breaking of the C–C linking is negligible. E. S. H.

Kinetics of the decomposition of carbonyl selenide on an allotropic selenium surface. R. H. Purcell and F. D. Zahoorbux (J.C.S., 1937, 1029—1035).—The v.p. of COSe has been redetermined over the temp. range $-95°$ to $-23°$. The latent heat of evaporation is 49·3 g.-cal. per g. The decomp. of the vapour on a Se surface formed by its own decomp. has been studied at 120°, 130°, and 140°. The results indicate that the form of Se which first deposits (Se I) changes into a more stable form (Se II). At 120°, and at lower COSe pressures at 130° and 140°, this change is more rapid than the decomp. of COSe, so the catalytic surface consists of Se II, whereas at higher pressures at 130° and 140° the decomp. is the more rapid and the surface comprises Se I. The decomp. is unimol. on both allotropes, but Se II has the greater catalytic activity. At intermediate pressures at 130° and 140° both Se I and Se II may be present and the course of the reaction can be interpreted from the proportions of the allotropes present. J. W. S.

Cuprene formation. J. M. Calhoun (Canad. J. Res., 1937, 15, B, 208—223).—Using a flow method the formation of cuprene (I) by the CuO-catalysed polymerisation of C_2H_2 has been studied from 230° to 330° and the results support the photochemical evidence of a chain mechanism. The reaction shows an induction period which diminishes as the temp. rises, followed by the rapid attainment of a max. rate and a subsequent gradual decrease in rate. At 330° the reaction is explosive. Exit gases contain considerable amounts of C_2H_4 and free H_2 which increase with rise of temp. The H_2 split off does not bear a const. ratio to amount of (I) formed. The yield of (I) based on C_2H_2 reacting is approx. 85%. An exponential expression expressing the rate of absorption of C_2H_2 over 72 hr. at 290° under the conditions of experiment is derived and is integrated to give the amount of (I) formed at any time, thereby making it possible to predict yields. The heat of polymerisation, calc. from the heat of combustion of (I), is 61—70 kg.-cal. per mol. of C_2H_2 polymerised. W. R. A.

Catalytic toxicity and chemical structure. II. Influence of chain length in the alkyl sulphide and thiol series. E. B. Maxted and H. C. Evans (J.C.S., 1937, 1004—1008; cf. this vol., 316).—The relative inhibiting powers of both *n*-alkyl sulphides and *n*-alkylthiols on the hydrogenation of crotonic acid catalysed by Pt-black increases with increasing length of the C chain. The effects of the sulphides are 2·5—2·6 times as great as those of the corresponding thiols. J. W. S.

Rôle of copper in methyl alcohol catalysts.—See B., 1937, 646.

Catalytic activity of cobalt sulphide for gas-phase reduction of nitrobenzene to aniline.—See B., 1937, 647.

Catalytic preparation of propyl and *iso*propyl acetate and butyrate.—See B., 1937, 647.

Attack of nitric esters by diphenylamine in presence of catalysts.—See B., 1937, 732.

Theory of difference effect. M. Straumanis (Z. Elektrochem., 1937, 43, 406—407). W. J. Müller (*ibid.*, 407). M. Straumanis (*ibid.*, 407).—Polemical (cf. A., 1936, 1474). E. S. H.

Electrolysis of alkali chlorides. Action of magnesium and calcium salts. A. Linari and G. Bonfiglio (Chim. e l'Ind., 1937, **19**, 252—254).—In the electrolysis of saturated NaCl solutions with a Hg cathode the presence of Mg salts promotes the formation of H_2 at the cathode, but Ca salts have no effect. O. J. W.

Electrochemical behaviour of rhodium. II. Higher oxidation states of rhodium. G. Grube and B. Gu. **III. Potentiometric titration of the higher oxidation states of rhodium in acid solution.** G. Grube and K. H. Mayer (Z. Elektrochem., 1937, **43**, 397—403, 404—406; cf. A., 1934, 154).—II. The solutions obtained by electrolytic oxidation of $Rh_2(SO_4)_3$ in H_2SO_4 or $Rh(ClO_4)_3$ in $HClO_4$ contain Rh^{IV} and Rh^{VI}, respectively. A dark blue oxide can be pptd. from the Rh^{VI} solutions and redissolved in excess of alkali; from the Rh^{IV} solutions a green oxide is pptd., also sol. in excess of alkali. Rh^{VI} is also formed by oxidation of alkaline solutions of Rh^{III} by Cl_2 or NaOCl. The oxidation potential of $Rh^{III} \rightarrow Rh^{IV}$ is +1·40 volts and that of $Rr^{IV} \rightarrow Rh^{VI}$ 1·46 volts. In acid solution Rh^{IV} decomposes in accordance with $3Rh^{IV} \rightleftharpoons 2Rh^{III} + Rh^{VI}$.

III. The above conclusions are confirmed by potentiometric titration of the oxidised solutions with $Fe(NH_4)_2(SO_4)_2$. E. S. H.

Electrolysis of salts of barium and radium in acetone. M. Haïssinsky (J. Chim. phys., 1937, **34**, 321—326).—Strongly adhering deposits of Ba compounds are obtained on cathodes of Pt, Au, Ag, Ni, and Cu by electrolysing small quantities of BaI_2 and $Ba(CNS)_2$ in $COMe_2$ with a Ag anode which combines with anodic oxidation products. Ba and Ra together in solution are deposited simultaneously under these conditions. J. G. A. G.

Electrolytic reduction of ferric sulphate in presence of titanium sulphate. I. G. Schtscherbakov and K. J. Gratschev (J. Appl. Chem. Russ., 1937, **10**, 607—616).—Practically quant. reduction of Fe^{III} to Fe^{II} in solutions containing $Ti(SO_4)_2$ is achieved by electrolysis (Pb electrodes) at 40—50°, with an asbestos diaphragm. O_2 not containing H_2 is obtained as a by-product, when the c.d. is $\not<$ 1·25 amp. per sq. dm. R. T.

Influence of superposition of an alternating current on the electro-deposition of zinc and copper. V. I. Skirstimonskaja (J. Appl. Chem. Russ., 1937, **10**, 617—623).—The yields of Zn or Cu diminish when an a.c. is superposed on a d.c. in the electrolysis of the salts. The nature of the deposits does not vary until the c.d. of the a.c. is 0·7 that of the d.c., above which the Cu deposits become darker in colour, and contain oxides, the Zn deposits become more porous, and the bubbles of H_2 at the cathode become larger. R. T.

Electrochemical oxidation of *n*-butyl alcohol. I. I. I. Radtschenko (J. Appl. Chem. Russ., 1937, **10**, 683—687).—$PrCO_2H$ and $PrCO_2Bu$ are obtained in the anodic oxidation of BuOH in aq. H_2SO_4. The relative yield of ester falls with increasing duration of electrolysis, and ∝ the ratio of free to dissolved BuOH. R. T.

Electrolysis of phthalic and hemipinic acids.—See A., II, 291.

Electrolysis in the glow discharge. VI. Behaviour of chloric and perchloric acids and their alkali salts. A. Klemenc and R. Eder (Z. physikal. Chem., 1937, **179**, 1—15; cf. A., 1935, 457).—The above in aq. solution are reduced in either the anode or the cathode fall. $HClO_3$ is reduced directly to HCl, apparently by activated H_2O mols. probably produced in the gas phase under the influence of the localised action of the current in the glow: $2HClO_3 + H_2O^* = H_2O + 2HCl + 3O_2$. The amount of $HClO_3$ reduced in the cathode fall is ≫ corresponds with Faraday's law. H formed at the poles plays a negligible part in the reductions and polar O is relatively inert. The ratio of the current yield in reduction in the cathode fall to that in reduction in the anode fall is the same for the reduction of $HClO_3$ as for the reduction of H_2SO_4. The amount of "knallgas" produced is inversely ∝ the amount of reaction of the electrolyte. R. C.

Dependence of the rate of photochemical reactions in solution on the concentration of reagents. B. J. Sveschnikov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 177—182).—Theoretical. The rate of irreversible reactions proceeding in presence of a second reagent *A* (*e.g.*, oxidation or reduction reactions in presence of an acceptor) is discussed. The pseudo-unimol. const. then ∝ [*A*]. J. S. A.

Photochemical union of hydrogen and chlorine. M. Tamura (Rev. Phys. Chem. Japan, 1937, **11**, 1—15).—By utilising the method of thermal analysis the change in the reaction velocities with time in the union of H_2 and Cl_2 has been studied both before the photostationary state was reached and after the light was shut off. Theoretical explanations are given. The mean life of reaction chains has been calc. The [Cl] has also been calc. Since the velocity of formation of HCl ∝ the 0·6 power of the light intensity, chains are terminated principally by self-neutralisation; simple triple collisions of the type $Cl + Cl + M \rightarrow Cl_2 + M$ are, however, not favoured. W. R. A.

Photochemical investigations. IV. Photochemical decomposition of deuteroammonia. E. O. Wiig (J. Amer. Chem. Soc., 1937, **59**, 955—958; cf. this vol., 370).—The photo-decomp. of NH_3 is about 1·3—1·5 times as rapid as that of ND_3 in the pre-dissociation bands at λ 2100 A. The same ratio holds approx. for the rate of decomp. of ND_3 at 2138 A. in a discrete band to that at 2100 A. in a diffuse band. The data are discussed. E. S. H.

Photo-decomposition of chlorine dioxide in carbon tetrachloride solution. J. W. T. Spinks and H. Taube (J. Amer. Chem. Soc., 1937, **59**, 1155—1156).—Using λ 3650 A., the decomp. products contain relatively large amounts of Cl_2O_6. E. S. H.

Photolysis of azomethane. M. Burton, T. W. Davis, and H. A. Taylor (J. Amer. Chem. Soc., 1937, **59**, 1038—1045).—The rate of photolysis by λλ > 3500 A., using a Hg lamp, and the nature of the products have been determined at different temp. The amount of N_2 produced is generally > that of gaseous hydrocarbon. The amount of higher hydrocarbon (expressed as C_3H_8) increases with degree of decomp. and with lowering of temp.; no H_2, and only a little unsaturated hydrocarbon, is produced. Preliminary work on decomp. in presence of MeCHO is reported. It appears that decomp. is not by rupture, but by a rearrangement mechanism to form stable mols. The mechanism is discussed; the hypothesis of the formation of an additive compound by reaction with free Me radicals is consistent with the results. E. S. H.

Use of deutero-compounds as indicators for the presence of free radicals in organic decomposition reactions.—See A., II, 323.

Preparation of alkali deuterides. L. HACKSPILL and A. BOROCCO (Compt. rend., 1937, **204**, 1475—1477).—Alkali deuterides are prepared by synthesis in the same way as hydrides; they have analogous formulæ and appear to be identical in cryst. form. W. R. A.

Reactions between potassium chlorate and ammonium salts. HANTKE (Angew. Chem., 1937, **50**, 473—476).—Mixtures of $KClO_3$ and NH_4 salts react after many days' storage at room temp., but explosively at higher temp. Analyses of the products are approx. in agreement with $30KClO_3 + 20NH_4X = 20KX + 4KNO_3 + 6KCl + 24HCl + 18O_2 + 6HNO_2 + 2HNO_3 + 4N_2 + 24H_2O$; there may be further complications depending on the particular NH_4 salt used. A. G.

Chelation of diamines with cupric salts. F. W. CHATTAWAY and H. D. K. DREW (J.C.S., 1937, 947—948).—The action of $(CH_2{\cdot}NH_2)_2$ (= en) (1·9 g. or 3·8 g.) on aq. $CuCl_2,2H_2O$ (5·3 g.) yields *bisethylenediamminocupric cuprichloride* (I) (light greenish-blue needles, m.p. 233°, readily sol. in H_2O, insol. in org. solvents) and $[Cu\ en_2]Cl_2,H_2O$ (II) (deep purple needles, m.p. 218°), respectively. The action of aq. K_2PtCl_4 on (I) or (II) yields $[Cu\ en_2]PtCl_4$ (III) (lilac-pink, sparingly sol. in H_2O). Addition of dil. HCl (2 or 4 equivs.) to (I) or (II) yields $[enH_2]CuCl_4$ (golden-yellow leaflets, m.p. 272°), a reaction reversed by NaOH, but no intermediate stage could be isolated. $CuCl_2$ and *iso*butylenediamine similarly yield *bisisobutylenediamminocupric cuprichloride* (IV) [light blue or bluish-green, m.p. 232° (decomp.), sol. in H_2O or hot EtOH] and *chloride* (V) (dark purple, very sol. in H_2O, sol. in cold EtOH). (V) dried in air contains $0{\cdot}5H_2O$ and has m.p. 245°; a dihydrate also exists. With K_2PtCl_4 (IV) and (V) yield the platinochloride [lilac, m.p. about 228° (decomp.), insol. in H_2O]. The palladochloride is unstable, decomp. in contact with the reacting solution to give iso*butylenediaminopalladous chloride* (dark yellow). *Bis*iso*butylenediamminocupric α-bromocamphor-π-sulphonate* (mauve, m.p. 237°) could not be resolved and geometric isomerides of (IV) could not be isolated. $CuSO_4$ and $(CH_2{\cdot}NH_2)_2$ yield *bisethylenediamminocupric cuprisulphate hexahydrate* (light blue), which with K_2PtCl_4 yields (III). J. W. S.

Action of chlorine on certain calcium silicates. P. P. BUDNIKOV and E. I. KRETSCH (Ukrain. Chem. J., 1937, **12**, 183—189).—Equal amounts of $CaCl_2$ are produced in a given time by chlorination at 18—750° of CaO,SiO_2, $2CaO,SiO_2$ (both prepared from CaO and SiO_2 at 1450°), or CaO, whence it is concluded that CaO is present in the free state in all cases. R. T.

Attack on metals by carbon tetrachloride in presence of water. R. DUBRISAY and G. ARDITTI (Compt. rend., 1937, **204**, 1568—1570).—When CCl_4 is introduced into one limb of an inverted V-tube, and H_2O into the other, and, after introduction of a metal, the whole is evacuated and sealed, Zn is attacked when in the CCl_4, but not when in the H_2O, whilst Cu is attacked only when in the H_2O. It is concluded that the $CuCl_4$ is reduced by at. H formed by the action of Zn on H_2O or dil. HCl. The action on Cu is attributed to reaction between CCl_4 and H_2O giving rise to $COCl_2$ or Cl_2. This view is confirmed by the fact that the gas evolved is mainly CO. J. W. S.

Constitution of double salts. XX. Diammines with benzidine and tolidine.—See A., II, 335.

Reactions of dihydroxyfluoboric acid. J. W. KROEGER, F. J. SOWA, and J. A. NIEUWLAND (J. Amer. Chem. Soc., 1937, **59**, 965—969).—$H_3BO_2F_2$ contains 1 strongly acidic and 2 non-acidic H atoms; it reacts with $NiCO_3$, forming $Ni(H_2BO_2F_2)_2,3H_3BO_2F_2$. With dioxan the product is $C_4H_8O_2,H_3BO_2F_2$, m.p. 139·5—140·5°. The prep. of $(AcOBF)_2$, m.p. 206—207°, is described and its structure discussed. E. S. H.

New boric acid [hypoboric acid], $H_4B_2O_4$, and its esters. E. WIBERG and W. RUSCHMANN (Ber., 1937, **70**, [*B*], 1393—1402).—Esters $BCl(OR)_2$ are readily obtained from BCl_3 (1 mol.) and ROH (2 mols.) at low temp. or by admixture of BCl_3 and $B(OR)_3$. They are readily converted by Na–Hg (prepared in a vac.) in complete absence of moisture into hypoboric esters. *Me hypoborate*, $[B(OMe)_2]_2$, has m.p. −24·9° to −23·7°, b.p. 93°. The corresponding *Et₄* ester is not readily volatile at room temp. They are colourless liquids of pleasant odour which at room temp. readily and quantitatively decompose into normal boric esters and B, which is thus readily obtained in a reactive form. When hydrolysed with H_2O they give free *hypoboric acid* as a colourless solid. Its aq. solutions are readily oxidised to H_3BO_3 when exposed to air; they reduce $KMnO_4$ and $AgNO_3$ but not I. Addition of acid increases the stability of the solutions. H. W.

[Thermite type of] combustion reactions. M. TRAUTZ and J. D. HOLTZ (J. pr. Chem., 1937, [ii], **148**, 225—265).—The effects of the max. v.p. and temp. attained during this type of reaction and of the two-phase separation occurring are discussed on the assumption that the equilibrium etablished obeys the Lorenz mass-action law for condensed systems deducible from the thermodynamic potentials. This is confirmed by experimental data for numerous reactions. Tammann's potential series for high temp. is also extended. BeO cannot be reduced to Be by Al. The reaction $3SiO_2 + 4Al \rightleftharpoons 2Al_2O_3 + 3Si$ and certain reactions in presence of S have been studied in detail. It is probable that equilibrium is nearly attained in these reactions. J. W. S.

Separation of the rare earths. W. Fischer, W. Dietz, and O. Jübermann (Naturwiss., 1937, **25**, 348).—The principle of distribution may be applied to the separation of the rare earths. It is possible to find pairs of liquids between which rare-earth compounds will distribute themselves, and for which the distribution coeff. is sufficiently large to enable a reasonable separation to be made. The rare-earth halides will distribute themselves between H_2O and alcohols, ethers, ketones, etc., the distribution coeffs. being different for the different elements. The distribution equilibrium may be shifted by the addition of various substances to the solvents, and other salts, in addition to the halides, may be used. The difference in distribution coeff. of the salts of two rare-earth elements differing in at. no. by 1 may amount to 50%. Automatic distribution fractionating columns may be used. A. J. M.

Selenides of the rare earths. W. Klemm and A. Koczy (Z. anorg. Chem., 1937, **233**, 84—96).—*Selenides* of La, Ce, Pr, Nd, Sm, Dy, Er, Yb, Y, and Sc have been obtained by heating the oxide or chloride in gaseous H_2Se. With La, Ce, and Pr *polyselenides* (M_2Se_4) are formed; Nd gives an impure polyselenide, whilst others give M_2Se_3. The polyselenides form M_2Se_3 when heated in vac. *d*, *X*-ray diagrams, and magnetic data are given, and there is a discussion of poly-compound formation in general among the rare earths. F. J. G.

Purification of europium. H. N. McCoy [with A. S. King, L. Pauling, G. P. Baxter, and F. D. Tuemmler] (J. Amer. Chem. Soc., 1937, **59**, 1131—1134).—A cryst. ppt. of pure $EuCl_2,2H_2O$ is obtained by reducing with Zn a conc. solution of rare-earth chlorides (containing $\nless$70% of Eu) and treating with conc. HCl. The isomorphism of $EuSO_4$ and $BaSO_4$ has been established by *X*-ray examination. The at. wt. of Eu has been determined as 151·95. E. S. H.

Nitrogen hexoxide (NO_3). H. J. Schumacher (Z. anorg. Chem., 1937, **233**, 47—48).—Attention is directed to the work of Schumacher and Sprenger (A., 1928, 1100; 1929, 515) and Sprenger (A., 1931, 1239). F. J. G.

Solubility of arsenious oxide in aqueous magnesium, calcium, strontium, and barium chlorides and bromides. E. Józefowicz (Rocz. Chem., 1937, **17**, 169—174).—The solubility at 25° of As_2O_3 in aq. Mg, Ca, Sr, and Ba chlorides and bromides, over a range of concns. from 0 to 7*N* for Ca and Mg, and up to saturation for Sr and Ba salts, has been determined. The compounds $3As_2O_3,SrBr_2,6H_2O$ and $3As_2O_3,CaBr_2,6H_2O$ are described, and the existence of $2As_2O_3,BaCl_2$ and $2As_2O_3,BaBr_2$ is confirmed. R. T.

New oxide of bromine, BrO_2. I. R. Schwarz and M. Schmeisser (Ber., 1937, **70**, [*B*], 1163—1166).—A mixture of Br and O_2 (1 : 5) is subjected to the silent electric discharge between Al electrodes, the mixture being cooled in the tube itself. After removal of O_3, the excess of Br is distilled at $-30°$, when *BrO_2*, decomp. about 0°, remains as an egg-yellow solid. In a high vac. at 0° BrO_2 appears to undergo disproportionation. H. W.

Recovery of iodine from waste iodide solutions. C. C. De Witt (J. Chem. Educ., 1937, **14**, 215—217).—Details for the recovery and purification of the I, and its conversion into KI or NaI, are given. L. S. T.

Chemistry of rhenium. G. E. F. Lundell and H. B. Knowles (J. Res. Nat. Bur. Stand., 1937, **18**, 629—637).—A dil. $KReO_4$ solution when acidified with H_2SO_4 and passed through a Jones reductor at approx. 5° yields a strongly reducing solution, which deposits Cu or Ag from aq. solutions of their salts. Oxidation to Re^{VII} by $KMnO_4$ shows the Re in this solution to have a valency of -1, and thus to resemble the halogens in their hydrides. The Re is oxidised to a valency of $+1$ if the solution is heated to 50° in absence of O_2. Re may be electrodeposited from solutions containing 5% of H_2SO_4 at a c.d. of 0·25 amp. per sq. dm. The deposits are slightly contaminated. The deposited Re can be oxidised directly to $HReO_4$ by exposure to moist air or O_2, or by anodic oxidation. The deposits are stable when dry. H. J. E.

Isomerism and allotropy of oxides of iron. Ferromagnetic basic iron chlorides. R. S. Hilpert and R. Schacht [with A. Hoffmann] (Ber., 1937, **70**, [*B*], 1437—1446).—Reduction of Fe_2O_3 by H_2–steam at 400° leads exactly to FeO,Fe_2O_3. This can also be effected by dry NH_3 at 300° provided the Fe_2O_3 has been heated previously at $>600°$. Pptn. of an equimol. mixture of Fe^{II} and Fe^{III} salts by alkali gives a product about $FeO,2Fe_2O_3$ reduced by H_2–steam or dry NH_3 to FeO,Fe_2O_3. The material obtained by pptg. Fe^{II} by aq. NH_3 in presence of KNO_3 and air has not exactly the composition Fe_3O_4, which it acquires when heated in H_2–steam or NH_3. The ultimate production of Fe_3O_4 under so varied conditions establishes its chemical individuality. Whether compounds with other mol. ratio exist cannot be established, since to the limit FeO,Fe_2O_3 solid solutions are formed which give identical *X*-ray diagrams. This is unaffected when the materials are heated at 1000° under CO_2, although a deep-seated chemical change is caused thereby. This similarity of cryst. structure has caused the differences in chemical behaviour to be overlooked. It is particularly shown in the behaviour of magnetites towards Cl_2 and O_2. If the Fe_2O_3 used has not been heated above 500° the FeO,Fe_2O_3 obtained therefrom adds Cl at $>200°$ giving a basic *chloride*, $FeOCl,Fe_2O_3$. If it has been heated at 600—900° reaction occurs at 270—320° with formation of $FeCl_3$ and Fe_2O_3. Further complications arise from the dependence of the properties of Fe_3O_4 on the reducing agent applied to Fe_2O_3. That obtained with H_2–steam shows the lines of Fe_2O_3 and others which cannot be attributed to α-Fe_2O_3. Use of NH_3 leads to a product which is slightly ferromagnetic and has only the α-Fe_2O_3 lines. Oxidation of Fe by CO_2 or steam occurs so slowly that a high temp. is requisite. Ferrum reductum in CO_2–steam at 850° gives a product containing Fe and FeO much in excess of that required by Fe_3O_4. This and Fe_3O_4 from technical sources gave α-Fe_2O_3 when heated with Cl_2. Ferroferrites of the second and third group which have been heated at about 300° add Cl in amount corresponding with [FeO], the pptd. product and metaferrite thus giving compounds $FeOCl,2Fe_2O_3$ and $FeOCl,Fe_2O_3$, respectively. The property of adding Cl disappears when the ferroferrites are heated at 600—1000° whereby they are converted into the variety which is essentially oxidised and simultaneously decomposed with production of $FeCl_3$. If the ferroferrite has been heated only at 600° the product is γ-Fe_2O_3, whereas α-Fe_2O_3 results if the product has been heated at 900°. Treatment with Cl_2 is therefore valuable in investigating the previous history of a magnetite. Ferroferrites which add Cl are transformed by gaseous O_2 at 100—120° into γ-Fe_2O_3. [$(NH_4)_2S_2O_8$ can replace O_2.] Ferroferrites which do not add Cl are slowly oxidised by O_2 at 300—400° to non-magnetic α-Fe_2O_3. Ferromagnetism disappears entirely when Fe^{II} is completely oxidised. The chemical formulation of the ferroferrites is discussed. The basic chloride $FeOCl,Fe_2O_3$ is the first known ferromagnetic salt. Its Röntgen diagram is similar to that of magnetite. Cl is replaced by O at 240° with production of a ferromagnetic oxide giving the lines of spinel and α-Fe_2O_3, whereas at 400° it gives a rhombohedral Fe_2O_3 which is completely non-magnetic. Warming with dil. Na_2CO_3 or NaOH replaces Cl by OH giving a strongly ferromagnetic hydroxide, which loses H_2O at 300°/vac. giving a strongly ferromagnetic Fe_2O_3. Ferromagnetism can therefore occur with rhombohedral and cubic Fe_2O_3, but it does not appear possible to obtain a cubic Fe_2O_3 without ferromagnetic properties. H. W.

Preparation of iron oxide as a source of high-purity iron. H. E. CLEAVES and J. G. THOMPSON (J. Res. Nat. Bur. Stand., 1937, **18**, 595—607).—Various methods of purifying Fe salts are reviewed. The prep. of pure Fe_2O_3 from electrolytic Fe by conversion into $Fe(NO_3)_3$, recrystallisation, and pptn. with aq. NH_3 is described. Si (0·005—0·006%) was the chief impurity in the product; Al, Ca, Mg, and Cu together were $<0·001$%. H. J. E.

Investigation of mode of formation and structure of active α-ferric and beryllium oxides with Hahn's emanation method and *X*-rays. R. MUMBRAUER and R. FRICKE (Z. physikal. Chem., 1937, B, **36**, 1—19; cf. this vol., 171).—During dehydration of α-$Be(OH)_2$ and α-FeO_2H with admixed radio-Th the rate, *E*, at which emanation is given off increases. Tempering the active oxides obtained by dehydration of the hydroxides reduces *E*, due to decrease in the internal surface as a result of increase in the orderliness of the lattice. The total surface area calc. from the primary particle size determined by *X*-ray investigation is $\gg$ the val. calc. from *E*, and the discrepancy increases with rise in the temp. of prep. of the oxides. It is inferred that *E* is determined by the secondary structure and that the emanation method is suitable for determining the internal surface area reached comparatively rapidly by a gas. Above a temp. equal to approx. half the abs. m.p. *E* for strongly ignited inactive α-Fe_2O_3 begins to rise with the temp., which is apparently due to a temp.-loosening of the lattice, possibly place-changing. The corresponding temp. for BeO is considerably lower, the determining factor being here, perhaps, loosening of the secondary structure or adsorbing layers. R. C.

Hahn's emanation method and density of packing. R. FRICKE and O. GLEMSER (Z. physikal. Chem., 1937, B, **36**, 27—29).—The emanating power of Fe^{III} oxide preps. with admixed radio-Th is reduced by compression. R. C.

Potassium ferrites. S. KRZYŻAŃSKI (Rocz. Chem., 1937, **17**, 146—153).—Ortho-$Fe(OH)_3$ and conc. aq. KOH at 160° yield hexagonal crystals of $K_2O,2Fe_2O_3$ (I), difficultly hydrolysed by H_2O. At 200° (I) is converted by KOH into square plates of K_2O,Fe_2O_3, and at $>200°$ into octahedral crystals of the same composition, both readily hydrolysed by H_2O. Crystallographic data for the salts are recorded. R. T.

Prussian-blue paradox. D. DAVIDSON (J. Chem. Educ., 1937, **14**, 238—241).—The reactions between $Fe^{\cdot\cdot\cdot}$ and $Fe(CN)_6^{\prime\prime\prime\prime}$ and $Fe^{\cdot\cdot}$ and $Fe(CN)_6^{\prime\prime\prime}$ to form Prussian-blue (I) and Turnbull's blue, respectively, are markedly influenced by the redox equilibrium $Fe^{\cdot\cdot\cdot} + Fe(CN)_6^{\prime\prime\prime\prime} \rightleftharpoons Fe^{\cdot\cdot} + Fe(CN)_6^{\prime\prime\prime}$, which is displaced largely to the right. Excess of $Fe^{\cdot\cdot\cdot}$ hinders instead of accelerates the formation of (I), but excess of $Fe^{\cdot\cdot}$ favours the formation of a blue product from $Fe(CN)_6^{\prime\prime\prime}$. The slowness of the formation of (I) is due to the almost complete disappearance of the ions required for its formation, as a result of the immediate establishment of the above equilibrium. In testing for org. N, the common practice of adding $FeCl_3$ is unnecessary and undesirable. L. S. T.

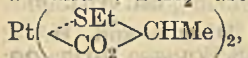
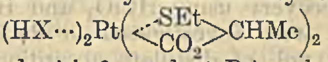
Formulation of Prussian-blue. D. DAVIDSON (J. Chem. Educ., 1937, **14**, 277—281; cf. preceding abstract).—A discussion. Sol. Prussian-blue may be regarded as the K salt of ferri-ferrocyanic acid, $H^+[[Fe(CN)_6]^{\prime\prime\prime\prime}Fe]^-$, named "berlinic acid." Its colour and composition are accounted for by assuming polynuclear complex formation between $Fe^{\cdot\cdot\cdot}$ and the N end of the (CN) groups present in $Fe(CN)_6^{\prime\prime\prime\prime}$. This supercomplex is highly polymerised owing to stereochemical restrictions. Insol. Prussian-blue is Fe^{III} berlinate, $Fe^{+++}[[Fe(CN)_6]^{\prime\prime\prime\prime}Fe]^-_3$, and Turnbull's blue is ferrous berlinate, $Fe^{++}[[Fe(CN)_6]^{\prime\prime\prime\prime}Fe]^-_2$, or, as ordinarily pptd., a double K Fe^{II} berlinate. The colour and composition of the complex ferrocyanides of Zn, Cu, or Ag with K can be explained in a similar manner by assuming polynuclear complexes based on structural units derived from a consideration of the co-ordination numbers of the metals concerned. L. S. T.

Metal carbonyls. W. HIEBER (Z. Elektrochem., 1937, **43**, 390—397).—A review of published work. E. S. H.

Action of primary aromatic amines on 1 : 6-dichlorodiethylenediamminocobaltic chloride.—See A., II, 286.

Surface reactions, and some reactions in organic solvents. B. STEIGER (Mikrochem., 1937, **22**, 216—227).—The occurrence of reaction between solid components when warmed together [*e.g.*, $Ni(OH)_2$

with dimethylglyoxime (I) or rubeanic acid] or when rubbed together in the absence of solvent [*e.g.*, $PbPh_4$ and dithizone (II)] is discussed. Reaction may be facilitated by the presence of a solvent for one of the substances only, *e.g.*, between Cu_2C_2 and (II) in presence of $CHCl_3$. $Ni(CO)_4$ reacts directly with (I) and (II), and traces of $Ni(CO)_4$ in oils etc. may be so detected. This and other drop reactions in non-aq. media may be carried out on a liquid (H_2O) surface to enhance the sensitivity. J. S. A.

Constitution, optical activity, and photochemical behaviour of platinous complexes. III. I. Lifschitz and W. Froentjes (Z. anorg. Chem., 1937, **233**, 1—34; cf. A., 1935, 1335).—With a view of elucidating their structure complex platinous derivatives of $SEt\cdot CHMe\cdot CO_2H$ (*A*H) have been studied chemically, polarimetrically, and spectroscopically, and compared with other platinous complexes. α- and β-PtA_2 are *cis*- and *trans*-isomerides of  $\mathrm{Pt}\Big(<\!\genfrac{}{}{0pt}{}{\cdots\mathrm{SEt}}{\mathrm{CO_2}}\!>\mathrm{CHMe}\Big)_2$, the *cis* compound being the more stable. Complexes X_2Pt(*A*H)$_2$ may be of two types which differ widely in reactivity etc., viz., (I) *cis*- or *trans*-(HX···)$_2$Pt  $\mathrm{Pt}\Big(<\!\genfrac{}{}{0pt}{}{\cdots\mathrm{SEt}}{\mathrm{CO_2}}\!>\mathrm{CHMc}\Big)_2$ (a loose additive compound with 6-covalent Pt) and (II) *cis*- or *trans*-X_2Pt(···*A*H)$_2$. In solution there is equilibrium PtA_2 + 2HX $\rightleftarrows$ (I) $\rightleftharpoons$ (II). *trans*-Halides are of type (II); *cis*-halides and *trans*-$(ClO_4)_2$Pt(*A*H)$_2$ are of type (I). From *d*- or *l*-*A*H the following *compounds* are obtained: *cis*-Br_2Pt(*A*H)$_2$ (in solution only), $[\alpha]_D^{18}$ ±14° in $CHCl_3$; *trans*-Br_2Pt(*A*H)$_2$ (III), m.p. 221—222°, $[\alpha]_D^{18}$ ∓9° in EtOH, mutarotation occurs in MeCN, $[\alpha]_D^{18}$ max. ±34°; *trans*-I_2Pt(*A*H)$_2$ (IV), decomp. 230°, $[\alpha]_D^{18}$ ∓13° in EtOH, ±13° in MeCN + 10% EtOH; *trans*-I_2Pt(*A*Na)$_2$; *cis*-ClO_4Pt*A*(*A*H), m.p. 195—197° with decomp., $[\alpha]_D^{18}$ ±41° in EtOH; *trans*-$(ClO_4)_2$Pt(*A*H)$_2$,2H_2O, m.p. 118°, $[\alpha]_D^{18}$ ±37° in EtOH; *cis*-Cl_2Pt(*A*Me)$_2$, $[\alpha]_D^{18}$ 7·5° in Et_2O; *trans*-Br_2Pt(*A*Me)$_2$, $[\alpha]_D^{18}$ ±14° in MeOH; *trans*-I_2Pt(*A*Me)$_2$, $[\alpha]_D^{18}$ ±6·1° in MeOH, ±7° in MeCN. (III) and (IV) have the opposite rotation to the parent acid in EtOH, but the same in MeCN. Other compounds: d-*alanine complexes*: $Pt(C_3H_6O_2N)_2$ decomp. 250°, $[\alpha]_D^{18}$ −14° in H_2O; $Cl_2Pt(C_3H_7O_2N)_2$ [two *isomerides*, (i) m.p. 185—186° with decomp., $[\alpha]_D^{18}$ +54° in EtOH; (ii) decomp. 203°, $[\alpha]_D^{18}$ +15° in EtOH, probably respectively *trans*- and *cis*-; also *dihydrate* of the former, decomp. 152°)]; l-*menthylamine complexes*: $Cl_2Pt(C_{10}H_{21}N)_2$ [two *isomerides*, (i) m.p. 246°, $[\alpha]_D^{18}$ −97° in EtOH, −94° in CCl_4, probably *trans*-, (ii) (impure), m.p. 160—163°, $[\alpha]_D^{18}$ −53° in EtOH, probably *cis*-]; $[ClPt(C_{10}H_{21}N)_3]Cl$, m.p. 120—121°, $[\alpha]_D^{18}$ −93° in CCl_4. Absorption spectra in the ultra-violet of PtA_2, X_2Pt(*A*H)$_2$ (X = Cl, Br, I), I_2Pt(*A*Na)$_2$, and $Cl_2Pt(Y)_2$ (Y = $AsEt_3$, PEt_3, SEt_2, and C_5H_5N) are recorded and compared. F. J. G.

Pterotactic derivatives of bivalent platinum with optically active, cyclic *trans*-1 : 2-diamines. F. M. Jaeger and J. ter Berg (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 490—498).—Compounds of the type $[Pt(base)_2]Cl_2$ have been prepared by reaction between K_2PtCl_4 and *cyclo*pentanediamine (Cptn) and *cyclo*hexanediamine (Chxn). d-[*Pt*(l-*Cptn*)$_2$]*Cl*$_2$ and d-[*Pt*(l-*Chxn*)$_2$]*Cl*$_2$ were obtained as the only products of reaction with the *l*-bases, and are isomorphous. The two compounds are strongly dextrorotatory between 4200 and 7000 A., the rotation being > that of the free bases. Their configuration is discussed and it is suggested that the two mols. of cyclic base are inserted into the complex ion in an oblique position, twisted with respect to each other like the wings of a propeller, giving a "pterotactic" structure with only axial symmetry. By mixing the *l*- and *d*-forms in equal quantities *racemates* identical with those formed by reaction with racemic bases were obtained. [*Pt*(r-*Chxn*)$_2$]d-$C_4H_4O_6$,12H_2O was prepared but could not be separated. Attempts to prepare the inactive [Pt(*d*-Chxn,*l*-Chxn)]Cl_2 led to the formation of the racemic compound [*Pt*(*Chxn*]$_2$]*Cl*$_2$,6H_2O. Crystal structures of all compounds are detailed. O. D. S.

Elements beyond uranium and their chemical behaviour. O. Hahn, L. Meitner, and F. Strassmann (Ber., 1937, **70**, [*B*], 1374—1392).—The most important property of the elements beyond U is their precipitability by H_2S from solutions containing much HCl. For more rapid work treatment with Et_2O–H_2O brings them into the aq. layer, whereas the bulk of the U remains in the Et_2O. A further separation is based on their volatility. Similarities between Rh and eka-Rh are found in the absence of electrochemical separation on noble metals from acid solution, of separation with metallic Bi undergoing deposition from alkaline solution, in the quant. precipitability with H_2S from HCl of medium concn. and slight precipitability from very conc. acid, and in the volatility as chloride or oxide at higher temp., whilst differences exist, since eka-Rh is not volatile from H_2SO_4 in a stream of HCl. eka-Os resembles Os in co-separation with metallic Bi, quant. precipitability by H_2S even from highly conc. HCl, quant. precipitability with NaOH in presence of uranyl salts, and volatility as oxide at high temp., and differs from Os in that it is not volatile when distilled with HNO_3 and is electrochemically deposited on Pt in acid solution. eka-Ir and Ir are alike in their co-separation with metallic Bi and almost complete precipitability with H_2S from not too conc. HCl, whereas they differ since eka-Ir has considerable volatility when ignited, is electrochemically deposited from acid solution on Pt, does not form mixed crystals appreciably with $(NH_4)_2PtCl_6$, and is partly sol. in the pptn. with NaOH. Similarities between Pt and eka-Pt are found in the distinct solubility during pptn. with NaOH, in the formation of mixed crystals during the pptn. of Pt as $(NH_4)_2PtCl_6$, and in the good precipitability by H_2S from not too conc. HCl; the differences depend on the considerable volatility of eka-Pt when gently ignited and the electrochemical deposition of it on Pt in acid solution. H. W.

Spectroscopic analysis. N. S. Bayliss (Soc. Chem. Ind. Victoria, 1936, **36**, 1182—1194).—A review. J. S. A.

Chromatographic analysis. E. Coffari (Chim. e l'Ind., 1937, **19**, 255—256).—A summary of the method and of its applications. O. J. W.

Principle of the process of qualitative analysis. A. Schleicher (Z. anal. Chem., 1937, **109**, 161—166).—Parallels are discussed between the pptn. of metals in the order of increasing solubility products of their sulphides and hydroxides, and their successive electrolytic deposition and spectrographic detection according to the order of their deposition potentials. J. S. A.

Significance of $p_{\rm H}$ in qualitative analysis. N. A. Tananaev and S. J. Schnaiderman (J. Appl. Chem. Russ., 1937, **10**, 924—931).—The $p_{\rm H}$ of N and $0{\cdot}1N$ solutions of salts afford information as to their identity. The routine determination of $p_{\rm H}$ is recommended, and its val. in qual. analysis is illustrated. R. T.

Determination of $p_{\rm H}$ by means of the glass electrode. M. J. Dallemagne (Biochem. Z., 1937, **291**, 159—173).—For accurate determinations the three characteristics (*a*) asymmetry potential, (*b*) calibration curve $mV/p_{\rm H}$, and (*c*) calibration curve $mV/T°$ must be known for each glass membrane; these vary with time, especially during the first 15 days of working. The characteristics fulfil the theoretical requirements the more closely the lower is the resistance of the membrane. The val. of the membrane depends on the composition of the glass, its thickness, regularity, and superficial area. The lowering of resistance with rising temp. favours measurements at 37° for certain biological purposes. Irregularities in published results are ascribed to the deviation from the theoretical val. of the potential change with temp. E. S. H.

Conductometric determination of traces of water in liquid sulphur dioxide.—See B., 1937, 665.

Polarimetric determination of water in acetic acid.—See B., 1937, 647.

Determination of the D_2O content of small quantities of water. H. Fromherz, R. Sonderhuff, and H. Thomas (Ber., 1937, **70**, [*B*], 1219—1223).—The method involves the adjustment of the *d* of the sample until a SiO_2 float neither rises nor sinks. Coarse adjustment is effected by alteration in temp. and fine adjustment is regulated by change in pressure. The apparatus is figured. The method is suited to the examination of the aq. product obtained by combustion of org. substances containing D. H. W.

Iodometric determination of perchlorates, and comparison of methods for their determination. V. Biber and F. Barskaja (J. Appl. Chem. Russ., 1937, **10**, 740—750).—0·15—0·25 g. of perchlorate, 0·6 g. of Cr_2O_3, and 1 g. of Na_2CO_3 are ignited in a CO_2 atm. for 20 min., cooled in CO_2, the melt is extracted, and the extract is diluted to 100 ml. 12 ml. of 5% HCl and 2 g. of KI are added to 25 ml. of filtrate, followed by 400 ml. of H_2O, and the solution is titrated with $0{\cdot}1N$-$Na_2S_2O_3$ (1 ml. = 0·4432 mg. Cl). Trustworthy results are obtained using Rothmund's (A., 1909, ii, 434), Tschernobaev's (A., 1905, ii, 416), or the above methods, but not Blangey's method. R. T.

Determination of perchlorates.—See A., III, 334.

Standard mixed chloride samples. Effect of ball-mill grinding and mixing on the actual analyses as compared with calculated values. G. F. Smith (J. Chem. Educ., 1937, **14**, 241—242).—Samples of KCl and NaCl ground and mixed by the procedures outlined are satisfactory. L. S. T.

Qualitative tests for acids in presence of thiosulphates. A. Foschini (Z. anal. Chem., 1937, **109**, 246—251).—S_2O_3'' is destroyed by successive additions of H_2O_2 and HNO_3 or HCl. I and Br are thereby liberated from I′ and Br′. Cl′, CrO_4'', AsO_4''', PO_4''', and $Fe(CN)_6$ may then be detected as usual. AsO_3''' is detected by addition of $CuSO_4$ to the original alkaline solution; NO_2' and NO_3' by reduction to NH_3. J. S. A.

Determination of iodine in iodides. R. L. Raigorodska and E. S. Binova (Farm. Shur., 1935, No. 1, 23—25).—Free I is titrated with $Na_2S_2O_3$ and total I′ with $AgNO_3$. Ch. Abs. (*e*)

Fluorine distillation. D. Dahle and H. J. Wichmann (J. Assoc. Off. Agric. Chem., 1937, **20**, 297—303; cf. A., 1936, 950).—The rate of distillation of F_2 and its recovery using $HClO_4$ and H_3PO_4 in place of H_2SO_4 were investigated in detail. The recovery $\propto$ the vol. of distillate according to the same logarithmic relation as was previously established, but with $HClO_4$ and H_3PO_4 variations in recovery rate are $>$ with H_2SO_4. E. C. S.

Liquid nitrogen in magnetic experiments. P. Kapitza and C. J. Milner (J. Sci. Instr., 1937, **14**, 201—203).—The dependence on degree of purity of liquid N_2 and magnetic field strength of temp. rises due to the paramagnetism of O_2 present as an impurity is considered. A simple and sensitive method of measuring the O_2 content of liquid N_2 is described. N. M. B.

Rapid detection of ozone. M. Schlesinger-Konstantinova (Sotz. Rekonstr. i Nauk., 1935, No. 6, 167).—The O_3 produces a fluorescent substance by interaction with a dissolved substance, the amount of O_3 being deduced from the intensity of fluorescence. Ch. Abs. (*e*)

Determination of traces of hydrogen sulphide in the air. E. Quitmann (Z. anal. Chem., 1937, **109**, 241—246).—H_2S is absorbed by bubbling through 2% aq. $Cd(OAc)_2$ containing AcOH. The CdS suspension produced is treated with $0{\cdot}1N$-I, the excess of which is then titrated back. J. S. A.

Volumetric determination of sulphate with sodium rhodizonate. L. von Zombory (Magyar chem. Fol., 1935, **41**, 189—192; Chem. Zentr., 1936, i, 3369).—The applicability of the method is confirmed. J. S. A.

Determination of sulphur in coal.—See B., 1937, 637.

Aluminothermic determination of sulphur in iron ores.—See B., 1937, 678.

[Determination of] selenium. J. A. Mathews, A. C. Curl, and R. A. Osborn (J. Assoc. Off. Agric. Chem., 1937, **20**, 194—202).—Alkaline ashing may result in the loss of 40% of Se. Wet combustion is preferable. A modification of the Williams and

Lakin method is suggested. By the turbidimetric method of determination 4—20 × 10^{-7} g. of Se can be determined to within 2 × 10^{-7} g., smaller vols. of reagent being used than prescribed in the standard procedure. Apparatus and a procedure are described for the electrometric titration of 1—2000 × 10^{-6} g. of Se. The colorimetric and gravimetric methods are also discussed. E. C. S.

Determination of selenium and tellurium in sulphide ores.—See B., 1937, 665, 666.

Titration of nitric acid and its esters in concentrated sulphuric acid. W. D. Treadwell and H. Vontobel (Helv. Chim. Acta, 1937, **20**, 573—589).—Titrations have been carried out electrometrically with $FeSO_4$ dissolved in 30% H_2SO_4, using a Pt cathode and an anode consisting of a tube in the bottom of which is inserted a plug of gelatinous H_2SiO_3, the tube being filled with 96% H_2SO_4, and connexion being made at the top of the tube by means of a Pt spiral coated with PbO_2. The nitrate is dissolved in conc. H_2SO_4 and N_2 or CO_2 is bubbled through the liquid during titration. The method is applicable at $[HNO_3] \nless 6 \times 10^{-6}$ mol. per litre. The accuracy is diminished on reducing the $[H_2SO_4]$ on account of the increased volatility of HNO_3 in such solutions. Applications of the method to the determination of nitrate in nitrite and in pptd. $BaSO_4$ and to the determination of glyceryl and cellulose nitrates are described. Comparison is made with colorimetric determinations. C. R. H.

Iodometric determination of potassium nitrate. A. S. Vetrov (J. Appl. Chem. Russ., 1937, **10**, 751—754).—0·2 g. of KNO_3, 1·5 g. of Cr_2O_3, and 1 g. of Na_2CO_3 are heated at 800—900° for 5 min., in a CO_2 atm., and the Na_2CrO_4 formed is determined iodometrically. R. T.

Determination of nitric oxide in [coal] gas.—See B., 1937, 639.

Use of the photo-electric comparator in the determination of small quantities of arsenic by the Bougault method. Thuret (J. Pharm. Chim., 1937, [viii], **25**, 18—23).—Successful use of the photo-electric cell to compare the cloudiness produced in the Bougault method by a minute quantity of As, against that from a standard, depends on stabilising the system against flocculation; this can be done by adding gum arabic, when As at a concn. of 10^{-4} mg. per c.c. can be determined to ±2%. E. W. W.

Determination of small amounts of arsenic in tin. B. Tougarinoff (Bull. Soc. chim. Belg., 1937, **46**, 142—170).—Sn, containing $\nless$0·005% of As and $\ngtr$0·5% of Sb, is dissolved in 80% aq. $FeCl_3,6H_2O$, or in H_2SO_4 with subsequent addition of N_2H_4,H_2SO_4 or NH_2OH,HCl, and HCl. As is then distilled off as $AsCl_3$, and is determined in the distillate. Following dissolution in $FeCl_3$, the distillate is neutralised with NaOH, and As is titrated directly with 0·05N-$KBrO_3$ or with 0·02N-I. After dissolution in H_2SO_4, As is pptd. from the distillate by H_2S, and the ppt. is dissolved in NaOH. The solution is evaporated with HNO_3, and As is pptd. as Ag_3AsO_4, which is subsequently dissolved in HNO_3 and titrated with NH_4CNS. Alternatively, the Sn is dissolved in HCl. As is thereby liberated as AsH_3, which is absorbed in 0·1N-I. The excess of I is then titrated back. J. S. A.

Determination of the anions of the arsenic and selenium acids in presence of one another. J. Milbauer (Z. anal. Chem., 1937, **109**, 171—177).—AsO_4''' is pptd. as $MgNH_4AsO_4$ without interference. AsO_3''' is oxidised with $H_2O_2 + NH_3$ to AsO_4''', and determined indirectly from the total AsO_4'''. Cl' interferes with the pptn. of SeO_4'' as $BaSeO_4$, but pptn. with $Ba(ClO_4)_2$ in presence of $HClO_4$ is quant.; the $BaSeO_4$ is dried at 105°. SeO_4'' may also be pptd. with benzidine. SeO_3'' is finally found indirectly by determination of the total Se by reduction with N_2H_4,H_2SO_4. J. S. A.

Determination of arsenic and sulphur in neosalvarsan etc.—See B., 1937, 729.

Optical spectroscopic determination of boron. Polarising attachments. R. K. Calfee and J. S. McHargue (Ind. Eng. Chem. [Anal.], 1937, **9**, 288—290).—Natural gas saturated with Me borate in MeOH is ignited in an O_2 blast to excite the spectrum. A standard solution on ignition and polarisation produces a reference spectrum in juxtaposition to the spectrum of the sample. Results for the B content of plant materials are reported. E. S. H.

Analysis of felspar. Determination of ferric oxide. I. Decomposition of sample. II. Application of titanometry. E. W. Koenig (J. Amer. Ceram. Soc., 1937, **20**, 230—233, 233—235).—I. A 3 g. of sample (200-mesh) is moistened with H_2O or EtOH in Pt dish, heated with 20 c.c. of HF solution, transferred to a flask containing 10 g. of H_3BO_3, 50 c.c. of 50% H_2SO_4, and 100 c.c. of H_2O; the Fe^{III} is then reduced with $SnCl_2$ and electrometrically titrated (hot) with 0·005N-$K_2Cr_2O_7$. Interference due to Pt from the $Na_2S_2O_7$ is avoided.

II. A sample dissolved by the above method is oxidised with $KMnO_4$ (excess removed by boiling), cooled to 26°, treated with 5 c.c. of 25% NH_4CNS solution, and titrated with $TiCl_3$ in an atm. of CO_2. J. A. S.

Determination of silicon in aluminium and aluminium alloys.—See B., 1937, 687.

Determination of silica in clays.—See B., 1937, 671.

Rapid determination of carbon in fuels.—See B., 1937, 637.

Determination of carbon monoxide in air.—See B., 1937, 733.

Determination of potassium as potassium silver cobaltinitrite. A. M. Ismail and H. F. Harwood (Analyst, 1937, **62**, 443—452).—The complex salt is pptd. in 20% aq. $COMe_2$, washed once with 50% aq. $COMe_2$, and subsequently with 80% aq. $COMe_2$ and titrated with $Ce(SO_4)_2$. With the procedure outlined the ppt. is of const. composition. 1 ml. of 0·02N-$Ce(SO_4)_2$ = 0·1087 mg. K. Adaptation of the method to the determination of K in soils is described. E. C. S.

[Conductometric titration of sodium fluoride.]—See B., 1937, 705.

Development of electro-drop analysis. II. H. Fritz (Mikrochem., 1937, 22, 168—181).—The detection of NH_4 and Hg by drop tests on a polished Cu sheet is discussed. $Hg(CN)_2$ reacts in presence of NH_3. J. S. A.

Colorimetric determination of silver in minerals.—See B., 1937, 686.

Spectrographic determination of magnesium in aluminium alloys.—See B., 1937, 686.

Separation of zinc from cobalt, nickel, and manganese by means of hydrogen sulphide, and subsequent precipitation of zinc with anthranilic acid. E. A. Ostroumov (Ann. Chim. Analyt., 1937, [iii], 19, 145—152).—Zn alone is pptd. by the slow passage of H_2S from a $CH_2Cl{\cdot}CO_2H$ + NaOAc buffer solution at p_H 2·6, 5 c.c. of 4% aq. acraldehyde (for 0·05 g. of ZnO) being added during pptn. Filtration of the ppt. is assisted by the addition of cellulose. The ppt. is ignited to ZnO, which is dissolved in HCl and pptd. with anthranilic acid. Zn is finally weighed as Zn anthranilate. J. S. A.

Quantitative electrodeposition of zinc from acid citrate solutions. R. Winchester and L. F. Yntema (Ind. Eng. Chem. [Anal.], 1937, 9, 254—256).—Zn is determined by electrodeposition from aq. $ZnSO_4$ containing 0·0375M-citric acid at p_H 4—5. Interference is caused by NO_3', dimethylglyoxime, $CO(NH_2)_2$, Sb, As, Bi, Cd, Co, Cu, Fe, Pb, Mn, Hg, Ni, and Ag, but not by $NH_4^{\cdot}$, Al, Cr, or Sn. The error is about 0·1%. E. S. H.

Determination of cadmium in zinc concentrates and in metallic zinc.—See B., 1937, 684.

[Determination of] lead. P. A. Clifford (J. Assoc. Off. Agric. Chem., 1937, 20, 191—194; cf. A., 1936, 443).—PO_4''' present as impurity in the KCN or NaCN used in the dithizone method interferes by causing slow pptn. of Pb. E. C. S.

Determination of lead by means of 8-hydroxyquinoline. V. Hovorka (Coll. Czech. Chem. Comm., 1937, 9, 191—206).—The wt. of ppt. obtained using a wide range of concn. of reactants was generally $<$99% of the stoicheiometric val. The deficiency is independent of $[NH_3]$ and concn. of 8-hydroxyquinoline (I) when the proportion is $\not<$ 2·5 mols. of (I) : 1 g.-atom of Pb (cf. A., 1929, 164). J. G. A. G.

Determination of lead peroxide. J. N. Mrgudich and G. L. Clark (Ind. Eng. Chem. [Anal.], 1937, 9, 256—258).—The Lux method has been modified by replacing HNO_3 with $HClO_4$ and $KMnO_4$ with $Ce(SO_4)_2$ and observing the end-point electrometrically. E. S. H.

Determination of lead in alloys.—See B., 1937, 684.

Analysis of red lead.—See B., 1937, 699.

Quantitative spectral analysis of lead, tin, and cobalt. R. Breckpot (Ann. Soc. Sci. Bruxelles, 1937, 57, B, 129—140; cf. A., 1936, 180; B., 1937, 50).—Data for the spectral determination of Tl and Bi in Pb, of Cu, Pb, Fe, As, Sb, and Cd in Sn, and of Ni, Fe, Mn, Cu, Zn, Al, Pb, Ag, Mg, Ca, and Si in Co are tabulated and discussed. N. M. B.

Reaction of copper salts and hydrobromic acid and its application to the microchemical detection of cupric cation. S. Augusti (Mikrochem., 1937, 22, 139—145).—Addition of 2 c.c. of saturated aq. KBr + 1 c.c. of H_2SO_4 to a solution containing Cu produces a reddish-violet ring at the interface. The reaction may be carried out microchemically on a clock-glass with 25% HBr. Ag, Pb, $Cu^{\cdot}$, $Hg^{\cdot}$, Cd, $Fe^{\cdot\cdot\cdot}$, and Cl interfere. J. S. A.

Microchemical analysis of very small grains. M. Rey and M. Zeicher (Bull. Soc. chim. Belg., 1937, 46, 173—177).—The material, spread on a glass plate, is attacked by exposure to HCl or HNO_3 vapour. A second glass plate, coated with gelatin (or a piece of photographic paper freed from Ag salts) and impregnated with a sp. reagent (*e.g.*, K_2COS_2 for Cu) is placed in contact with the material. In the presence of the material sought, each grain leaves a more or less intensely coloured spot. In favourable cases (*e.g.*, Ni with dimethylglyoxime) the size of the spot forms a semi-quant. measure of the amount present. J. S. A.

Potentiometric determination of copper in steel.—See B., 1937, 681.

Determination of copper in coloured glasses.—See B., 1937, 670.

Determination of copper.—See B., 1937, 682.

Determination of copper cyanide electrolytes.—See B., 1937, 683.

Analysis of brass, bronze, etc.—See B., 1937, 683.

Determination of small amounts of mercury in ores.—See B., 1937, 685.

Application of *X*-ray spectroscopic method to chemical analysis of the rarer elements. V. Determination of samarium in rare-earth mixtures. S. Shinoda (J. Chem. Soc. Japan, 1935, 56, 1483—1486; cf. A., 1935, 1338).—The intensities of the $L\alpha_1$ line of Sm and the $L\beta_1$ line of Nd are equal when $Sm_2O_3 : Nd_2O_3 = 0{\cdot}646$. Ch. Abs. (*e*)

Application of luminescence to quantitative analysis: micro-determination of samarium. M. Servigne and É. Vassy (Compt. rend., 1937, 204, 1566—1568; cf. this vol., 63, 328).—The Sm is brought into solid solution in Ca tungstate and, after grinding, micro-crystals of about equal size are selected. The intensity of the Sm bands in the luminescence spectrum of the Ca tungstate $\propto$ the [Sm] and can be utilised for determining Sm. J. W. S.

Test paper for aluminium. W. E. Thrun (J. Chem. Educ., 1937, 14, 281).—The aluminon test is adapted. L. S. T.

Alkalimetric determination of aluminium in presence of salts of monohydroxy-acids. II. A. V. Pavlinova (J. Appl. Chem. Russ., 1937, 10, 732—739).—Tartronic or salicylic acid may be used in place of lactic or citric acid, in the method previously described (this vol., 47). R. T.

Determination of aluminium and alumina in steels.—See B., 1937, 681.

Quantitative spectral analysis of aluminium and its alloys.—See B., 1937, 686, 687.

Reaction for manganese. E. Jensen (Z. anal. Chem., 1937, 109, 178—180).—The material is dissolved in acid, and treated with 2 vols. of conc. HCl. 4 vols. of 1 : 1 Et_2O + HCl are added, and then a few crystals of $KClO_3$. In presence of Mn the solution becomes green. Increased sensitivity is attained by evaporating the HCl solution, moistening the residue with HNO_3, and then adding Et_2O–HCl; limit, 0·005 mg. J. S. A.

Potentiometric determination of manganese, chromium, vanadium, molybdenum, and titanium in steels.—See B., 1937, 681.

Determination of manganese in ores and in ferromanganese.—See B., 1937, 685.

Analysis of manganese ores.—See B., 1937, 665.

Spectrophotometric determination of iron in ores.—See B., 1937, 678.

Colorimetric determination of cobalt in soils and animal organs.—See B., 1937, 706.

Sensitivity of borax and microcosmic beads for detection of cations. S. Augusti and V. Pascalino (Mikrochem., 1937, 22, 159—167).—Bead tests are sufficiently sensitive for the microchemical detection of Cr, Co, and Cu only. For Cu, the sensitivity is much enhanced by adding to the bead a fragment of $SnCl_2$, and then heating in the oxidising and reducing flames. J. S. A.

Detection of molybdenum in steel.—See B., 1937, 681.

Formation of tin hydride in the reduction of hydrochloric acid solutions of tin, in quantitative analysis. I. P. Alimarin and R. E. Arest-Jakubovitsch (J. Appl. Chem. Russ., 1937, 10, 920—923).—Reduction of 0·1 g. of Sn^{IV} in HCl by Zn or Al involves loss of about 10^{-5} g. of Sn as SnH_4, whilst with Mg the loss is 5×10^{-5} g. Dissolution of Sn–Mg–Zn alloys in HCl involves significant loss of Sn as SnH_4. R. T.

Potentiometric determination of titanium, iron, and molybdenum in ores, slags, and ferrotitanium.—See B., 1937, 685.

Determination of zirconium in steels.—See B., 1937, 681.

Phosphotungstate method for vanadium [determination]. Spectrophotometric study. E. R. Wright [with M. G. Mellon] (Ind. Eng. Chem. [Anal.], 1937, 9, 251—254).—The solution recommended contains 0·025M-Na tungstate, 0·5M-H_3PO_4, and 0·6N-HNO_3, -H_2SO_4, -HCl, or -$HClO_4$. Procedure for application to the determination of V in alloy steels is described. E. S. H.

Electrometric determination of vanadium and of small amounts of chromium in steel.—See B., 1937, 681.

Determination of bismuth in brass, copper, and zinc.—See B., 1937, 683.

Electrical laboratory tube furnace with granulated carbon (kryptol) resistance heating for high temperatures (1600°). I. Trifonov, D. Mirev, and G. Toschev (Österr. Chem.-Ztg., 1937, 40, 315—316).—In a sheet-Fe cylinder packed with 2 kg. of kryptol is fixed a horizontal heating tube on each side of which is a pair of horizontal C electrodes. With a current of 150 amp., stepped down from 220 to 30 volts, a temp. of 1600° can be attained in <1 hr. C. R. H.

Micro-oven. F. Pavelka (Mikrochem., 1937, 22, 247—250).—A form of oven for micro-beakers, -crucibles, etc. made from Al blocks separated by insulating sheet, and giving graded temp. between 40° and 320°, is described. J. S. A.

Use of overhead heating in analytical laboratories. II. F. Heinrich and F. Petzold (Chem.-Ztg., 1937, 61, 568; cf. A., 1936, 445).—The advantages and energy efficiency of evaporating and heating liquids by an immersion heater are discussed. J. S. A.

Thermal conductivity of synthetic substances. S. Erk, A. Keller, and H. Poltz (Physikal. Z., 1937, 38, 394—402).—Apparatus for a comparison method of determining the thermal conductivity of bad conductors is described. The standard substance was a glass plate, of which the conductivity was previously determined by an abs. method. The densities and thermal conductivities of 46 synthetic plastics are recorded. A. J. M.

Search for high-efficiency light sources. S. Dushman (J. Opt. Soc. Amer., 1937, 27, 1—24).—A review and discussion. H. J. E.

Measurement and interpretation of fibre diffraction patterns. G. L. Clark and A. F. Smith (Rev. Sci. Instr., 1937, [ii], 8, 199—201).—An instrument for measuring the positions of interferences on fibre patterns, and a machine for the evaluation of unit cell size and the indexing of interferences on diffraction patterns, are described. N. M. B.

Recording microphotometer. H. V. Knorr and V. M. Albers (Rev. Sci. Instr., 1937, [ii], 8, 183—184).—A new instrument giving an inked record, and using a photo-electric cell as the light-sensitive device, is described. N. M. B.

Improvements in the integrating photometer for X-ray crystal analysis. R. H. V. M. Dawton (J. Sci. Instr., 1937, 14, 198—200).—Improvements include the substitution of a mechanical clutch with magnetic release for the original magnetic clutch. N. M. B.

Polarisation spectrometer for investigation of surface films on metals. A. B. Winterbottom (J. Sci. Instr., 1937, 14, 203—208).—The construction, adjustment, and calibration of an instrument provided with a Sénarmont compensator and an ellipticity half-shade system, and methods of prep. and examination of surfaces when determining optical consts. or surface films, are described. N. M. B.

Theory and design of the cam of an oscillating-crystal X-ray spectrograph. S. H. Yü (Z. Krist., 1937, 96, 1—6).—A theoretical deduction of the necessary cam shape is given. B. W. R.

Determination of refractive indices of melts. L. Kofler (Mikrochem., 1937, 22, 241—246).—An immersion method using glass powders of known n, mixed with the melt, as standards of reference, is employed. J. S. A.

Electrophotometer of barrier-layer [photo-] cells for colorimetry and opacimetry. P. Meunier (Bull. Soc. Chim. biol., 1937, **19**, 113—118; cf. A., 1936, 445). F. O. H.

Regularities and characteristic properties of resistance [photo-]cells. O. P. Fuchs and H. Kottas (Z. tech. Phys., 1936, **17**, 47—54; Chem. Zentr., 1936, i, 3461).—Characteristic cell consts. are derived from the relation of Vieweg and Pfestorf. J. S. A.

Development of photo-electric cells.—See B., 1937, 693.

Innovations in microscopy. A. Kufferath (Woch. Brau., 1937, **54**, 197—200).—Modern equipment and processes for photomicrography are described and discussed. I. A. P.

Measurement of extra hard X-rays and gamma rays in Roentgens. G. C. Laurence (Canad. J. Res., 1937, **15**, A, 67—78).—The intensity in Roentgens per sec. of X-rays or γ-rays harder than 0·03 A. may be measured with a small thimble chamber with homogeneous walls of elements of at. no. <13 and thick enough to prevent the passage of β-rays. W. R. A.

Production of cathode-ray tube screens. H. W. Leverenz (J. Opt. Soc. Amer., 1937, **27**, 25—35).—A review of the production and properties of various types of screen. H. J. E.

Potentiometer for measuring small electromotive forces and resistances. C. H. Johansson (J. Sci. Instr., 1937, **14**, 194—198).—An instrument, modified in order to reduce disturbing thermoelectric forces, is described. N. M. B.

Geiger–Müller counters. P. B. Moon (J. Sci. Instr., 1937, **14**, 189—193).—A review of the mechanism of the instrument, modifications of the basic circuit designed to control the behaviour, and recent developments of special types for sp. purposes. N. M. B.

Low-resistance glass electrodes. H. Mouquin and R. L. Garman (Ind. Eng. Chem. [Anal.], 1937, **9**, 287).—Procedure for making the electrodes is described. E. S. H.

Errors of the glass electrode. W. C. Gardiner and H. L. Sanders (Ind. Eng. Chem. [Anal.], 1937, **9**, 274—278).—At temp. >30° the glass electrode deviates from the H_2 electrode over the whole p_H range. The deviations increase with rise of temp. and are influenced by the $[Na^{\cdot}]$. Correction curves for two commercial types of glass electrode have been worked out. The theoretical implications are discussed. E. S. H.

Universal cell for electrolysis. V. Sihvonen (Suomen Kem., 1937, **10**, B, 13).—The middle portion of an H-shaped cell is attached by means of rubber bands, and its open ends may be provided with parchment paper diaphragms. M. H. M. A.

Apparatus for measuring the total normal thermal emissivity of sheet materials in the range 60—260°. P. F. McDermott (Rev. Sci. Instr., 1937, [ii], **8**, 185—192).—A radiometer for measurements accurate to ±1% of black-body emission on sheet material up to ⅜ in. thick, without contact or damage to the surfaces, is described. A table of results for 16 surfaces with comparative available vals. is given. N. M. B.

200 kv. neutron source. C. M. Slack and L. F. Ehrke (Rev. Sci. Instr., 1937, [ii], **8**, 193—196; cf. Tuve, A., 1935, 1185).—The tube described for the utilisation of the D–D reaction embodies a capillary arc ion source and a target of heavy ice. The activation in Ag by the neutrons produced with 280 microamp. of unresolved ions at 200 kv. was 10 times that due to a 200 millicurie Rn–Be source. N. M. B.

Absolute method for measuring the dielectric constants of fluids and solids at ultra-high frequencies. R. King (Rev. Sci. Instr., 1937, [ii], **8**, 201—209).—A new parallel-wire method gives results depending only on the λ at which measurements are made, the thickness of the sample in the form of a thin slab, and a bridge shift along the parallel wires measured in air. This relation is derived, the method is outlined, and results with H_2O and EtOH are given. N. M. B.

Rigid support for heated filaments. M. Fox (Rev. Sci. Instr., 1937, [ii], **8**, 220).—A mass spectrograph is fitted with a helical filament of 6-mil W wire wound on a cylinder of synthetic sapphire 1 mm. diameter and 1 cm. long; this is supported at the ends in holes in the stout conductors carrying the current. N. M. B.

Micro-burette. A. Friedrich (Mikrochem., 1937, **22**, 251—253). J. S. A.

Maintenance of correct values on laboratory weights. W. M. Thornton, jun. (J. Chem. Educ., 1937, **14**, 270—274).—Possible sources of alteration in the masses of wts. of the screw-knob type are discussed, and a modification of Richards' method of calibration is described. L. S. T.

Fundamentals of micro-weighing technique. H. Sternberg (Mikrochem., 1937, **22**, 187—201).—Factors affecting the accuracy of weighings, arising from changes in zero, temp., and humidity, electrostatic charges, and changes in buoyancy correction are exhaustively discussed. J. S. A.

Niobates. P. Sue (Ann. Chim., 1937, [xi], **7**, 493—592).—Previous work (A., 1933, 585; 1934, 742; 1935, 825; 1936, 575, 690, 1070; this vol., 41) is summarised. Apparatus for recording the evolution of CO_2 when Nb_2O_5 is heated with alkali carbonates is described. F. L. U.

Vacuum flask method of technical gas analysis.—See B., 1937, 666.

Capillary viscosimeters. W. Philippoff (Arch. Tech. Mess., 1937, No. 69, 34—35T).—Various types are illustrated. R. B. C.

Electro-dialyser. G. Sankaran (Indian J. Med. Res., 1935, **23**, 219—222).—A simple form of apparatus is described. R. N. C.

Ionic and mol. wts. by dialysis. H. Brintzinger (Z. anorg. Chem., 1937, 232, 415—422).—Apparatus and procedure are described. F. J. G.

Direct determination of low vapour pressures. K. C. D. Hickman, J. C. Hecker, and N. D. Embree (Ind. Eng. Chem. [Anal.], 1937, 9, 264—267).—Two tensimeter–hypsometers for determining v.p. of substances over the range 0·001—4·0 mm. are described. Data are given for the vac.-pump fluids, two sterols, and a dye. E. S. H.

Multiple-column mercury manometer for pressures to 200 atmospheres. J. R. Roebuck and W. Cram (Rev. Sci. Instr., 1937, [ii], 8, 215—220).—An improved steel manometer consisting of 9 columns of Hg alternating with 8 of PhMe, and accurate to 1 in 10,000 at 200 atm., is described. N. M. B.

Direct registration of variations of superficial pressure as a function of the surface and temperature (unimolecular layers). D. G. Dervichian (J. Phys. Radium, 1935, [vii], 6, 221—225).—An apparatus for the photographic recording of variations of surface tension of thin films is described. A. J. M.

Apparatus for the preparation of doubly distilled water. E. C. H. J. Noyons (Chem. Weekblad, 1937, 34, 434).—Tap-H_2O is distilled into a second distillation flask from which it is distilled into a suitable receiver. The apparatus is semi-automatic. S. C.

Carbon dioxide generator for the micro-Dumas determination of nitrogen. E. B. Hershberg and G. W. Wellwood (Ind. Eng. Chem. [Anal.], 1937, 9, 303).—The generator is designed to work with commercial solid CO_2. E. S. H.

Micro-determination of density by the falling-drop method. S. Hochberg and V. K. LaMer (Ind. Eng. Chem. [Anal.], 1937, 9, 291—292).—Apparatus and technique for determining the *d* of aq. solutions to ±0·0001 are described. E. S. H.

Microchemical balance room. W. R. Kirner (Ind. Eng. Chem. [Anal.], 1937, 9, 300—303).—The construction of the room and the methods employed for dust removal, vibration-free mounting of the balances, heat-free illumination, and humidity and temp. control are described. E. S. H.

Storage of carbon dioxide from "dry ice" for Dumas determinations. W. H. Hamill and J. A. Alicino (Ind. Eng. Chem. [Anal.], 1937, 9, 290).—The gas is stored under slight pressure in 40-litre carboys. E. S. H.

Paper as a medium for analytical reactions. I. Improvements in the spot test technique. B. L. Clarke and H. W. Hermance (Ind. Eng. Chem. [Anal.], 1937, 9, 292—294).—Modifications by the use of a capillary burette and thin, close-textured papers impregnated with reagents that have a low solubility in the liquids under test are described. E. S. H.

Apparatus for removal of liquid and indicator for characterisation of filtrate in P_2O_5 determination. J. Królikowski (Uprawa Rós. Nawōz., 1935, 7, 510—511; Chem. Zentr., 1936, i, 3371—3372).—Modifications of the Lorentz method are described. J. S. A.

Extraction apparatus. G. Kubiczek (Chem. Fabr., 1937, 10, 231—232).—A simple apparatus in which liquids and liquid–solid mixtures, as well as solids, may be extracted is described. Two types, for solvents (*A*) lighter, and (*B*) heavier, than the liquid to be extracted, both contain a (removable) device consisting of a glass tube, one end of which is funnel-shaped and the other formed into a perforated ring. In (*A*), solvent, as it drops from the condenser, is distributed below the sample, through which it rises to be returned by a siphon to the extraction flask. In (*B*), solvent is distributed above the sample and collects below it, to be siphoned back to the flask. I. C. R.

Apparatus for producing pure hydrogen [for hydrogen electrodes]. P. Gesteau (J. Pharm. Chim., 1937, [viii], 25, 11—17).—Dil. H_2SO_4 is electrolysed in a vessel in which the Pt electrodes are enclosed in long tubes, open at the bottom; H_2 formed is washed by alkaline pyrogallol and by H_2O before passing, through a tap, to the H_2 electrode. The electric current is kept on; when the tap is closed, pressure of H_2 forces the electrolyte down and breaks the circuit. The const. pressure of H_2 prevents the entry of air. E. W. W.

Universal micro-desiccator. P. Röscheisen and P. Brettner (Mikrochem., 1937, 22, 254—257). J. S. A.

Method for sealing β-magnesia windows into steel spectroscopic absorption furnaces and a needle valve for controlling the evacuation of such furnaces. R. T. Brice (Rev. Sci. Instr., 1937, [ii], 8, 209—212).—The windows are sealed into heavy steel tubes by mechanical pressure of a 1° taper fit-on on Al or Cu bands and the window units are sealed into a furnace by means of Al, Cu, or Ni gaskets. A stainless steel needle valve and seat, operating at furnace temp., and controlling an evacuation port in the side of a vac. furnace, is described. N. M. B.

Improvement in filter tubes with glass frit. F. Canal (Mikrochem., 1937, 22, 250).—A constriction above the filter plate holds the asbestos bed in place. J. S. A.

Apparatus for filtration under reduced pressure on the micro- and semi-micro-scale. M. Arnoux (Bull. Soc. Chim. biol., 1937, 19, 760—762). P. W. C.

Apparatus for hot extraction. S. M. Strepkov (Z. anal. Chem., 1937, 109, 262—266).—A universal apparatus, permitting the vol. of oil, H_2O, etc. extracted to be measured, is described. J. S. A.

Periodic system of the elements in a new form. E. W. Zmaczynski (J. Chem. Educ., 1937, 14, 232—235).—The elements are arranged on the surface of a cone divided into 32 small sectors which are joined in groups of 8 into four large sectors. Advantages of the new arrangement are pointed out. L. S. T.

Fictions in chemistry. A. Mittasch (Angew. Chem., 1937, 50, 423—433).—A discussion of the use and utility of pictures, symbols, and metaphors. F. L. U.

Demonstration experiments using universal indicators. L. S. FOSTER and I. J. GRUNTFEST (J. Chem. Educ., 1937, **14**, 274—276). L. S. T.

[Laboratory experiments in chemiluminescence.] E. W. COTTMAN (J. Chem. Educ., 1937, **14**, 236—237).—Details for producing chemiluminescence by the oxidation of triphenylglyoxaline (I) are given. Aq. or EtOH extracts of coffee, tea, mustard, yeast, fused carbohydrates, etc. can replace (I). L. S. T.

Fritz Haber. E. BERL (J. Chem. Educ., 1937, **14**, 203—207).—Biographical. L. S. T.

Geochemistry.

Eclipses of the moon, and the distribution of atmospheric ozone. B. FESSENKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 119—121).—From the intensity of the earth's shadow on the moon it is inferred that O_3 is present at 20—30 km. from the earth's surface. R. S. B.

Geochemical investigations of volcanoes in Japan. I. Gases and spring waters of the volcano Asama. I. K. NOGUCHI. **II. Chemical composition of the lavas of the volcano Oshima, Izu.** I. IWASAKI (J. Chem. Soc. Japan, 1935, **56**, 1495—1510, 1511—1522). CH. ABS. (*e*)

Geothermal stages and the chemistry of artesian waters of N. Daghestan. I. I. TSCHEBOTAREV (Razvedka Nedr, 1935, **5**, No. 3, 23—26). CH. ABS. (*e*)

Carotenoids and other lipoid-soluble pigments in the sea and in deep marine mud. D. L. FOX (Proc. Nat. Acad. Sci., 1937, **23**, 295—301).—Suspensions in sea-H_2O and marine mud have been analysed for carotenoids and the results are discussed. W. R. A.

Mineral names. L. J. SPENCER (Amer. Min., 1937, **22**, 682—685).—A discussion. L. S. T.

Geochemistry and the theory of metallurgy. A. F. KAPUSTINSKI (Sotz. Rekonstr. i Nauk., 1935, No. 5, 22—43).—A discussion. CH. ABS. (*e*)

Mejonite of Somma-Vesuvius. A. SCHERILLO (Period. Min., 1935, **6**, 227—239; Chem. Zentr., 1936, i, 3293).—Crystallographic data are recorded. Mejonite is tetragonal, space-group C^5_{4h}, with *a* 12·24, *c* 7·59 A. J. S. A.

Geochemistry of caustobiolites. N. A. ORLOV and V. A. USPENSKI (Chim. Tverd. Topl., 1934, **5**, 663—679). CH. ABS. (*e*)

Luminescence of certain minerals. S. KREUTZ (Bull. Acad. Polonaise, 1936, A, 501—509).—The fluorescence of willemite weakens above 160°, and disappears below 480°. The fluorescence of a violet fluorite showed two spectral regions of emission at —180°. The colour of the material, but not its fluorescence, was destroyed on heating. The effect of heating on the fluorescence of calcites from different sources is described. J. S. A.

Alteration of fluorescence colours on fresh cleavage surfaces of calcite. K. OBENAUER (Zentr. Min., 1935, A, 357—361; Chem. Zentr., 1936, i, 2899).—The pink fluorescence from cleavage faces of native calcite crystals (source indicated) disappeared when fresh cleavage faces were prepared. J. S. A.

Crystallography of axinite and the normal setting of triclinic crystals. M. A. PEACOCK (Amer. Min., 1937, **22**, 588—624).—*X*-Ray investigations give for the elements of the structural lattice of axinite in normal setting a_0 7·151, b_0 9·184, c_0 8·935 A., α 91° 52′, β 98° 09′, γ 77° 19′, in good agreement with vals. of the elements of the morphological lattice. The unit cell contains $H_2B_2Al_4Ca_4(Mn,Fe)_2Si_8O_{32}$; $d_{calc.}$ 3·316, n_X 1·683, n_Y 1·688, n_Z 1·692 (all ±0·002). L. S. T.

Morphology of gordonite. F. H. POUGH (Amer. Min., 1937, **22**, 625—629).—Gordonite, $MgO,Al_2O_3,P_2O_5,9H_2O$, from Fairfield, Utah, has $a : b : c = 0·5192 : 1 : 0·6942$, α 109° 27′, β 110° 57½′, and γ 71° 40½′. L. S. T.

Babingtonite. W. E. RICHMOND, jun. (Amer. Min., 1937, **22**, 630—642).—Babingtonite (I) from Woburn, Mass., is triclinic with $a : b : c = 0·6417 : 1 : 0·5746$, α 91° 31′, β 93° 51′, γ 104° 04′. *X*-Ray measurements give a_0 7·39, b_0 11·52, c_0 6·61 A., α 91° 48′, β 93° 48′, γ 103° 54′; $a_0 : b_0 : c_0 = 0·642 : 1 : 0·574$. The unit cell contains $Fe^{III}{}_2Fe^{II}{}_2Ca_4Si_{10}O_{28}(OH)_2$. n_X is 1·720, n_Y 1·731, and n_Z 1·753 (all ±0·003). (I) and rhodonite form a group of structurally related pyroxenoids, which shows only partial relationships to the wollastonite group. L. S. T.

Distinction between enargite and famatinite (luzonite). G. A. HARCOURT (Amer. Min., 1937, **22**, 517—525).—*X*-Ray powder diffraction patterns and spectrographic intensity data for minute specimens of minerals of the enargite group from different localities show that the enargite (I) structures are rich in As and those of luzonite (II) rich in Sb, and that the proportions of As to Sb do not overlap for the two series. The proportion of Sb in Cu_3AsS_4 may increase only up to a definite amount and the (I) crystal structure may still be retained, and similarly with the proportion of As in Cu_3SbS_4 and the (II) structure. The second series should be named the famatinite (III) series. The diffraction pattern of (III) (luzonite) is closely similar to those of germanite and colusite, and hence (III) has the sphalerite type of structure. The structural relations of (I) and (III) are thus analogous to those of sphalerite and wurtzite. L. S. T.

Synadelphite and plumbosynadelphite. C. S. HURLBUT, jun. (Amer. Min., 1937, **22**, 526—533).—Synadelphite (I) from Långban is a practically colourless mineral with a red coating of different material. *X*-Ray examination shows that (I) is orthorhombic with a_0 9·91, b_0 18·70, c_0 10·65 A., unit cell vol. 1962 A.³, mol. wt. 4246, and *d* 3·57. The colourless interior

contains [F. A. Gonyer] SiO_2 1·45, As_2O_5 26·89, Al_2O_3 1·41, Fe_2O_3 0·86, MnO 53·10, CaO 1·55, MgO 4·62, K_2O 0·79, Na_2O 0·62, H_2O 8·52, total 99·81%; n_X is 1·750, n_Y 1·751, and n_Z 1·761. The red coating on (I) is a new variety which is now named plumbosynadelphite (II), *d* 3·79, hardness 4, n_X 1·851, n_Y 1·864, n_Z 1·894. The analysis of (II) is similar to that of (I), except for the presence of 3·24% of PbO. *X*-Ray photographs show a difference in structure.
L. S. T.

Dakeite, a new uranium mineral from [Wamsutter,] Wyoming. E. S. Larsen, jun., and F. A. Gonyer (Amer. Min., 1937, **22**, 561—563).—Dakeite (I), *d* 2·51, hardness 2·5 approx., n_X 1·489$\pm$0·002, n_Y 1·542$\pm$0·001, n_Z 1·542$\pm$0·001, occurs in greenish-yellow aggregates of micaceous plates disseminated throughout gypsite. The analysis, CaO 18·31, Na_2O 7·31, UO_3 30·27, CO_2 13·71, SO_3 9·61, H_2O 19·95, insol. 1·06, total 100·22%, corresponds with $3CaCO_3,Na_2SO_4,UO_3,10H_2O$. (I) is sol. in acid and in H_2O at room temp.; on treatment with H_2O for 15 hr. at 85°, it is decomposed leaving an insol. residue of calcite and a yellow U compound. (I) is strongly fluorescent in ultra-violet light, but is not appreciably phosphorescent. It is only weakly radioactive for its high U content. L. S. T.

Sulphate incrustations in the Copper Queen Mine, Bisbee, Arizona. H. E. Merwin and E. Posnjak (Amer. Min., 1937, **22**, 567—571).—The disposition and conditions of growth of these sulphates at the surface of the rock impregnated with Cu-bearing sulphides and pyrite are described. They consist of coquimbite, voltaite, roemerite, rhomboclase, copiapite, chalcanthite, and kornelite.
L. S. T.

Morphology of monazite. R. L. Parker (Amer. Min., 1937, **22**, 572—580). L. S. T.

Paragenesis and colour of fluorite in the English Pennines. K. C. Dunham (Amer. Min., 1937, **22**, 468—478).—The relationships between fluorite and its associated minerals in the N. Pennines are discussed. The purple and green varieties crystallised at a higher temp. than the amber.
L. S. T.

Carminite and associated minerals from Mapimi, Mexico. W. F. Foshag (Amer. Min., 1937, **22**, 479—484).—The carminite occurs in minute crystals in cavities in either scorodite or arseniosiderite, and also forms heavy masses mixed with cerussite, anglesite, and plumbojarosite. The analyses given indicate the formula PbO,Fe_2O_3,As_2O_5,H_2O. Carminite is dark carmine-red in colour, pleochroic, biaxial, positive with α 2·070, β 2·070, and γ 2·080, and parallel elongation. The scorodite, As_2O_5 48·96, Fe_2O_3 34·20, Al_2O_3 1·60, CaO 0·54, MgO 0·22, H_2O 14·53, insol. 0·12, total 100·17% [F. A. Gonyer], has α 1·787, β 1·795, and γ 1·810. The analysis given for the arseniosiderite agrees with the formula $3CaO,2Fe_2O_3,2As_2O_5,6H_2O$.
L. S. T.

Silicate–water systems: the "osmotic pressure" of silicate melts. R. W. Goranson (Amer. Min., 1937, **22**, 485—490).—Theoretical. The evaluation of the solubility of H_2O in silicate melts when the hydrostatic pressure is not the same on the two phases, H_2O and silicate solution, is discussed. Data for the system albite–H_2O solution are given and discussed in relation to volcanic activity and to the behaviour when heated of rock glasses of high H_2O content.
L. S. T.

Vein quartz pseudomorphs of cross-fibre asbestos in Virginia. L. R. Thiesmeyer (Amer. Min., 1937, **22**, 701—719).—A discussion of the fibrous habit indicates that some minerals are commonly asbestiform owing to intramol. forces peculiar to them, whilst others acquire it through special conditions of growth. Fibrous quartz is more common than is generally supposed; it is not restricted to any type of rock, mineral assemblage, or location, and it is always of secondary origin. Occurrences are described. L. S. T.

Accessory minerals of igneous rocks. J. H. Taylor (Amer. Min., 1937, **22**, 686—700).—Methods of separating the heavy accessory minerals of igneous rocks are discussed. The tabulated data for the Mourne Mountains granite complex show that the degree of variation between the accessory mineral suites from the four intrusions is of the same order as that between different samples of any one of the intrusions, as regards both the occurrence of mineral species and their varietal characteristics. Both the nature of the zircon and the quantity of fluorite present appear to be considerably affected by the distance from the roof of the intrusion. L. S. T.

Pyroxmangite from Invernessshire, Scotland. C. E. Tilley (Amer. Min., 1937, **22**, 720—727).—Pyroxmangite from Glenelg has SiO_2 47·44, Al_2O_3 0·66, Fe_2O_3 1·45, FeO 15·02, MnO 28·25, MgO 4·56, CaO 3·00, total 100·38% [(Miss) H. Bennett], α 1·732, β 1·735, and γ 1·750, *d* 3·63. The relations existing between Mn-bearing compounds in the system $MnSiO_3$–$FeSiO_3$–$CaSiO_3$, and between pyroxmangites and Mn–Fe–Ca slags are discussed. L. S. T.

[Crystallographic] re-orientation of römerite. C. W. Wolfe (Amer. Min., 1937, **22**, 736—741).
L. S. T.

Hastingsite in theralite from the Crazy Mountains, Montana. J. E. Wolff (Amer. Min., 1937, **22**, 742—744).—Hastingsite (I), SiO_2 48·51, TiO_2 1·32, Al_2O_3 6·60, Fe_2O_3 4·09, FeO 9·48, MnO 0·19, MgO 14·79, CaO 5·60, Na_2O 6·01, K_2O 2·20, H_2O+ 1·47, total 100·26% [F. A. Gonyer], has the constitution $(Na,K)_2Ca(Mg,Fe^{II},Fe^{III},Al,Ti)_5(Al,Si)_8(OH)_2O_{22}$ in which $Mg/Fe^{II} = 2{\cdot}8$, $Al/Fe^{III} = 2{\cdot}5$, and $Na/K = 4{\cdot}2$. Optical properties of (I) and an analysis of theralite are given. L. S. T.

Manganiferous prochlorite from Hawleyville, Conn. W. M. Agar and E. H. Emendorfer (Amer. J. Sci., 1937, [v], **34**, 77—80).—Veins of pink albite with bunches of dark green chlorite occur in granitised sediments. The chlorite shows unusual interference tints, perhaps due to the presence of Mn (MnO 0·4, FeO 24·7%). The albite also contains Mn (MnO 0·03, Fe_2O_3 0·43%). L. J. S.

Radioactivity of the Deccan traps. I. Basalts. V. S. Dubey and M. P. Bajpai (Amer. J. Sci., 1937, [v], **34**, 24—29).—As determined by the dissolution method (in HF + H_2SO_4) these basalts contain on an average Ra 0·56 × 10^{-12} g. per g. and Th 0·59 × 10^{-5} g. per g., with little variation in successive lava flows. The results are rather lower for Ra and higher for Th than those obtained by the fusion method by Poole and Joly (1924). These rocks are richer in Ra and Th than older rocks of the same character.

L. J. S.

Floor of the Arabian Sea. J. D. H. Wiseman and R. B. S. Sewell (Geol. Mag., 1937, **74**, 219—230).—Chemical analyses of three sub-marine basalts are recorded and compared with the average of the Deccan Trap in India. The Ra content of these sub-marine basalts is approx. one half of that of the land basalts. L. S. T.

Replacement breccias of the Lower Keechelus. G. E. Goodspeed and H. A. Coombs (Amer. J. Sci., 1937, [v], **34**, 12—23).—The rocks of the Keechelus formation of Tertiary age in the Cascade Ranges of Washington have been thought to be of pyroclastic origin. They show dark brown fragments of sedimentary rock in a greyish-green matrix which also contains remnants of sedimentary material. Analyses of these two portions show an increase of SiO_2 and K_2O and a decrease of Fe_2O_3, FeO, MgO, and CaO in the matrix, the composition of which is very similar to that of a dacite. It is suggested that sandy shales invaded by granodiorite and intensely folded underwent recrystallisation replacement by a process of additive hydrothermal metamorphism. L. J. S.

Titanite and tilasite. (The relationship of the silicates to the phosphates and arsenates.) H. Strunz (Z. Krist., 1937, **96**, 7—14).—Powder photographs gave for tilasite, $MgCaFAsO_4$, a_0 6·66 b_0 8·95 c_0 7·56, β 121°, space-group probably C_c^2. Goniometrically titanite, $TiCaOSiO_4$, is very similar, and it has the same space-group; the two compounds are isotypes. The relationships between SiO_4, PO_4, and AsO_4 in such compounds are summarised.

B. W. R.

Tantalite deposits in S.W. Uganda. Anon. (Bull. Imp. Inst., 1937, **35**, 180—184).—Grains and crystals of tantalite, often associated with cassiterite, occur in quartz veins not far from intrusive masses of granite. L. J. S.

Hyperalkaline rocks of Egypt. G. Andrew (Bull. Soc. Franç. Min., 1936, **59**, 338—346).

L. S. T.

Boehmite. S. Goldsztaub (Bull. Soc. Franç. Min., 1936, **59**, 348—350).—Comparison of the *X*-ray diagrams of lepidocrocite and artificial boehmite gives for the latter *a* 3·78, *b* 11·8, and *c* 2·85 A.

L. S. T.

Dehydration curves of minerals. H. Longchambon (Bull. Soc. Franç. Min., 1936, **59**, 145—161).—Factors affecting the dehydration curves of minerals are discussed. The method described involves heating the mineral in air, saturated at 15°, at regularly increasing temp. and automatically recording the loss in wt. that results. Curves for kaolinite, steatite, and polygorskite are reproduced. L. S. T.

Serpentine minerals. (Mlle.) S. Caillère (Bull. Soc. Franç. Min., 1936, **59**, 163—326).—Theories of serpentinisation and previous work on the properties of the serpentines are first briefly reviewed. The physical and chemical properties of the following samples from different localities are described: antigorite, metaxite, picrolite, schweitzerite, dermantine, picrosmine, bowenite, williamsite, deweylite, and chrysotile. Chemical analyses are summarised. The action of heat on these minerals and their dehydration in a vac. are discussed, together with *X*-ray analyses of the original minerals and of the products formed after heating. Numerous ferriferous and nickeliferous types of serpentines are also studied in detail, and an attempt at classification of the serpentine minerals has been made. L. S. T.

Petrology of katungite. A. Holmes (Geol. Mag., 1937, 74, 200—219).—Petrography and petrogenesis are discussed and new chemical analyses given.

L. S. T.

Minerals containing rarer elements. Allanite found in Kanbe village, Mara Prefecture. J. Takubo and H. Ukawa (J. Chem. Soc. Japan, 1935, **56**, 1523—1525).—The composition is $Ca_2(AlOH)(Al,Ce,Fe)_3(SiO_4)_3$. Ch. Abs. (*e*)

Helium, radium, and thorium in beryllium minerals of the U.S.S.R. E. S. Burkser, N. P. Kapustin, and V. V. Kondoguri (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 193—198).—The He content of Be minerals from the Mariupol region is considerably > the total accumulated He production from the U and Th elements contained in them, the ratio of excess He : Be content being approx. const. Hahn's view (A., 1934, 1326) of the γ-ray disruption of the Be nucleus is thereby strengthened.

J. S. A.

Geochemical connexion between helium, lead, and radium occurrences in German salt deposits. H. J. Born (Kali, 1936, **30**, 41—45; Chem. Zentr., 1936, i, 3482).—The occurrence of He is sylvine and rock-salt is interpreted as indicating that both may be of secondary origin from deep H_2O bearing Ra in solution. Ra is not found in H_2O with $[SO_4'']$ >0·2, but the [Ra] increases with the Ca and Li. The presence of SO_4'' in deep H_2O indicates dilution with surface H_2O. J. S. A.

Crystal structure and twinning. H. Strunz (Fortschr. Min., 1936, **20**, 63; Chem. Zentr., 1936, i, 3478).—Twinning may be conditioned by a layer of inhomogeneity. Diopside twins may form on lamellæ of pure $Mg_2Si_2O_6$, epidotite on lamellæ of zoisite.

J. S. A.

Lava from Demavend (Persia). A. Scherillo (Period. Min., 1935, 6, 221—225; Chem. Zentr., 1936, i, 3294).—Petrological data are recorded. J. S. A.

Petrology of Alaid volcano, N. Kurile. H. Kuno (Japan. J. Geol., 1935, **12**, 153—162).—The lavas of Alaid Island are of several kinds of olivine-basalt. Those of Taketomi Island consist of a single kind of olivine-anorthite-basalt. Ch. Abs. (*e*)

Natural sulphidic iron-copper ores, and genetic conclusions. H. Borchert (Fortschr. Min., 1936, **20**, 32; Chem. Zentr., 1936, i, 3481—3482).—The cubanite (I)–Cu pyrites (II) segregation occurs at 235°, forming a lamellar structure of 40% of (II) with

60% of chalcopyrrhotine, which is metastable below 255°. Ore deposits of the Sudbury type contain no (I) owing to the complete separation of (I) into magnetic pyrites and (II) on slow cooling. Valeriite undergoes similar change above 255°. J. S. A.

Chaidarkan mercury–antimony–fluorite deposit. A. I. Suloev and A. L. Ponomarev (Trans. All Union Sci. Res. Inst. Econ. Min. U.S.S.R., 1935, No. 71, 5—78).—The deposits are described.
Ch. Abs. (e)

The deuteric mineral sequence in the Enoggera granite, Queensland. M. J. Whitehouse (Min. Mag., 1937, **24**, 538—546).—The period of main magmatic crystallisation of the granite was followed by pegmatite formation and the initiation of cavities in rock. While the rock was still hot the deuteric period commenced, beginning with the kaolinisation of the felspars and the chloritisation of the ferromagnesian minerals. Then followed the deposition of chlorite and epidote, the pneumatolytic minerals, some calcite, prehnite, zeolites, and, finally, many of the cavities were completely filled with calcite. A chemical analysis of laumontite is given. L. J. S.

Lawsonite in glaucophane-bearing rocks from New Caledonia. G. A. Joplin (Min. Mag., 1937, **24**, 534—537).—The schists were derived from dolerite and gabbro, with alteration of the felspar to lawsonite [$CaO,Al_2O_3,2SiO_2,2H_2O$] and of the augite to chlorite and glaucophane. The lawsonite–glaucophane association in calcic rocks is analogous to the albite–epidote association in alkali rocks. L. J. S.

Occurrence of pumpellyite in New Zealand. C. O. Hutton (Min. Mag., 1937, **24**, 529—533).—Pumpellyite, $6CaO,3Al_2O_3,7SiO_2,4H_2O$, recognised by its distinctive optical characters, is an important constituent of some schists in the Lake Wakatipu region, western Otago. It has been formed together with albite by the alteration of calcic plagioclase under conditions of low-grade dynamo-thermal metamorphism. L. J. S.

Iron-rich optically-positive hypersthene from Manchuria. K. Tsuru and N. F. M. Henry (Min. Mag., 1937, **24**, 527—528).—Analysis shows FeO 41·65, MnO 5·02%, corresponding with $(Fe,Mn)SiO_3$ 88%; α 1·755, β 1·763, γ 1·773. These figures extend the plot (A., 1936, 185) showing the relation between chemical composition and the optical data.
L. J. S.

***X*-Ray studies on pyrolusite (including polianite) and psilomelane.** G. Vaux [analyses by H. Bennett] (Min. Mag., 1937, **24**, 521—526).—Polianite (MnO_2) from Platten, Bohemia, gives the same *X*-ray pattern as pyrolusite, which is tetragonal and of the rutile type with *a* 4·38, *c* 2·86 A. Psilomelane is orthorhombic with *a* 9·1, *b* 13·7, *c* 2·86 A.; detailed analyses give a formula $H_4R_2Mn_8O_{20}$, where R = Mn, Mg, Ca, Ni, Co, Cu. A certain relation exists between these unit cell dimensions and those of other Mn oxide minerals. L. J. S.

Geochemistry applied to the problems of silicosis. A. Brammall and J. G. C. Leech (Bull. Inst. Min. Met., 1937, No. 393, 9 pp.).—Extraction of biotite with cold 0·2*N*-KCl for 4 hr. removes 78% of the F, 26% of the CaO, 51% of the MgO, and 53% of the Fe_2O_3. Hydromuscovite shows considerable loss of SiO_2, alkalis, and Al_2O_3, Fe_2O_3, CaO, and MgO after extraction for 1 month with hot NaCl. The results are discussed with reference to the extraction of dusts by lung sera. J. W. S.

Granular forms of melilitic rocks. F. Rodolico (Atti R. Accad. Lincei, 1936, [vi], **24**, 471—476).—Analyses and crystallographic data are given for a melilitic rock from Pian di Celle near San Venanzo, Italy. The rock contains melilite, leucite, phlogopite, olivine, magnetite, and apatite.
O. J. W.

Metamorphic rocks at Torne Trask (Lapland). H. A. Brouwer (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 414—421). O. D. S.

Leucite and pseudoleucite. N. L. Bowen and R. B. Ellestad (Amer. Min., 1937, **22**, 409—415).—Determinations on leucites of contrasted occurrence show that leucite never has a high Na content; it can contain $\ngtr$ 1 to 1·5% Na_2O replacing K_2O. For the development of pseudoleucite, reaction with liquid magma is essential. Chemical analyses of three leucitic rocks are given. L. S. T.

Identity of penroseite and blockite. F. A. Bannister and M. H. Hey (Amer. Min., 1937, **22**, 319—324).—*X*-Ray photographs show that penroseite from Colquechaca, Bolivia, and blockite from the Hiaco mine, Colquechaca, have the same symmetry and crystal structure; the Pb content is practically const., but the Ag content varies somewhat. The microchemical analyses given confirm these conclusions, and also show Se in excess of the formula $(RAg_2)Se_2$. The variation in Ag and Pb contents is partly due to admixture with naumannite, and the true composition of penroseite remains uncertain. Penroseite and blockite can be regarded as identical minerals, and the latter name should be discarded. L. S. T.

Constitution and classification of the natural silicates. H. Berman (Amer. Min., 1937, **22**, 342—408).—The theory of the constitution of the silicates, based on the Si–O tetrahedron and the combinations with neighbouring tetrahedra revealed by *X*-ray analyses of structure, is outlined and discussed. A classification of the silicates into structural types based on the various types of linking of these tetrahedra is tabulated. The types are: silica (1 : 2); disilicate (2 : 5); metasilicate, chains (3 : 8), (4 : 11), (1 : 3) and rings ($n : 3n$); pyrosilicates (2 : 7); and orthosilicates (1 : 4), where the nos. in parentheses give the ratio of the no. of Si or Si-like atoms, including, in part, Al and Be, to the no. of O atoms or OH and F, which may replace O. The constitution of many minerals in each of these types is discussed.
L. S. T.

Crystallographic studies in the vivianite group. T. F. W. Barth (Amer. Min., 1937, **22**, 325—341).—*X*-Ray and reflexion goniometer measurements of this group are recorded. The vals. of a_0, b_0, c_0, β, and *d*, respectively, are for vivianite (I) 10·039, 13·388, 4·687, 104° 18′, 2·711; bobierite (IV), 9·946, 27·654, 4·6395, 104° 1′, 2·169; erythrite (II) 10·184, 13·340, 4·730, 105° 1′, 3·182; and annabergite (III) 10·122, 13·284, 4·698, 104° 45′, 3·231. For (I), (II), and (III), the space-group is C^3_{2h}. The names hautefeuillite and cabrerite should be discarded in favour of (IV) and (III), respectively. Optical data are given for the minerals and for the artificial products of this group. L. S. T.

Chemical composition of sepiolite (meerschaum). W. T. Schaller (Amer. Min., 1936, **21**, 202).—A crit. review of many chemical analyses shows that there is only one sepiolite, with the formula $2MgO,3SiO_2,4H_2O$, and the name parasepiolite should be discarded. L. S. T.

Anorthite from Duke Island, Alaska. J. J. Glass (Amer. Min., 1936, **21**, 201).—Unusually pure anorthite (An_{96}) occurs in a coarse-grained hornblende pegmatite. L. S. T.

***X*-Ray study of allemontite.** R. J. Holmes (Amer. Min., 1936, **21**, 202—203).—An *X*-ray study of specimens from Allemont, France, Pribram, Czechoslovakia, Atlin, B.C., and Alder Island, B.C., shows that "allemontite" (I) consists of two components, *A* and *B*, apparently identical in all the material investigated. *A* is native As or As containing in solid solution an amount of Sb insufficient to alter the *X*-ray pattern, and *B* is either a compound or a solid solution of Sb and As. The variable composition of (I) is due to the wide variation in the relative proportions of *A* and *B*. The name allemontite should be restricted to *B*. L. S. T.

Crystallography of livingstonite. W. E. Richmond, jun. (Amer. Min., 1936, **21**, 204).—Livingstonite from Huitzuco, Mexico, is monoclinic, holohedral, with $a:b:c$ 3·758 : 1 : 5·366, β 104° 10′ (goniometer), unit cell $Hg_4Sb_{16}S_{28}$ a_0 15·14, b_0 3·98, c_0 21·60 A., $a_0 : b_0 : c_0 = 3·804 : 1 : 5·427$ (*X*-ray). L. S. T.

Structure of stilpnomelane. J. W. Gruner (Amer. Min., 1936, **21**, 204—205).—*X*-Ray photographs suggest a layer structure similar to chlorite and mica with a_0 5·4, b_0 9·3, c_0 24·1 A., and a unit cell containing 2 mols. of $(OH)_{20}K(Fe^{\cdot\cdot}Mg)_9(Fe^{\cdot\cdot\cdot}Al)_{5-6}Si_{16}O_{39-40}$. The mineral is stable up to 560°, but its structure is destroyed at 740°. L. S. T.

Crystal structure of cubanite. M. J. Buerger (Amer. Min., 1936, **21**, 205).—An equi-inclination Weissenberg study gives space-group $Pcmn = V_h^{16}$; *a* 6·45, *b* 11·07, *c* 6·21 A., and 4 formula wt. per unit cell. A structure, based on a substituted wurtzite framework, is proposed. A unique feature of the structure is the occurrence of the Fe atoms in pairs; the vectors connecting the pairs have greatest components in the direction of the *b*-axis. This is probably responsible for the ferromagnetism of cubanite, the magnetic axis of which is the *b*-axis. L. S. T.

Crystal structure of valentinite. M. J. Buerger (Amer. Min., 1936, **21**, 206—207).—An equi-inclination Weissenberg study of valentinite from the Su Suergiu mine, Sardinia, and of Sb_2O_3 sublimed in an atm. of N_2, gives *a* 4·92, *b* 12·46, *c* 5·42 A., *d* 5·75, $4Sb_2O_3$ per cell; space-group $Pccn = V_h^{10}$. Positions and parameters of the Sb and O atoms are given. L. S. T.

Crystallography of valentinite (Sb_2O_3) and andorite (?) ($2PbS,Ag_2S,3Sb_2S_3$) from Oregon. W. T. Schaller (Amer. Min., 1937, **22**, 651—666).—Valentinite has $a : b : c = 0·3939 : 1 : 0·4339$. L. S. T.

Cathodo-luminescence spectra of felspars and other alkali alumino-silicate minerals. S. Iimori and J. Yoshimura (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 281—295).—Spectra from four varieties of felspar were compared with the spectra from jadeite, leucite, kunzite, lepidolite, Na_2CO_3, and K_2CO_3. and from Na and K burning in O_2. Those from the minerals were characterised by three bands, viz., red (670—620 mμ), yellow (620—510 mμ), and blue-violet (500—370 mμ). No red band was obtained with Na_2CO_3 nor a blue-violet band with Na. A tentative explanation is offered for the existence in the characteristic bands for the minerals of discrete bands corresponding with bands due to Na and K. C. R. H.

Types of pegmatites in the Archean at Grand Canyon, Arizona. I. Campbell (Amer. Min., 1937, **22**, 436—445).—Like granite, pegmatites may have formed initially in ways other than by simple intrusion. In this area three types of origin have been recognised: by magmatic intrusion; by replacement, "pegmatisation," processes; and by hydrothermal felspathisation of quartz veins. L. S. T.

Occurrence of photosensitive yellow rock-salt in Hall Salzberg. O. Schauberger (Berg- u. hüttenmann. Jb. montan. Hochschule Leoben, 1935, **83**, 115—117; Chem. Zentr., 1936, i, 3481).—The salt is decolorised in a few min. in daylight, but is stable in the dark up to 160—180°. The decolorisation is irreversible. J. S. A.

Thortveitite and magnesium pyrophosphate. F. Machatschki (Fortschr. Min., 1936, **20**, 47—49; Chem. Zentr., 1936, i, 3481).—$Mg_2P_2O_7$ is monoclinic, with *a* 13·28, *b* 8·36, *c* 9·06 A., β = 104° 11′. The *a* and *b* axes are doubled, and the hardness is much diminished, as compared with thortveitite, $Sc_2Si_2O_7$. J. S. A.

Petrological notes. I—X. S. Tsuboi (Japan J. Geol., 1935, **12**, 109—113).—Chemical and optical data are given for Japanese pyroxene, hornblende, anorthite, cummingtonite, and biotite from different sources. Ch. Abs. (*e*)

Metamorphic rocks of southern Abukuma plateau. K. Sugi (Japan J. Geol., 1935, **12**, 115—151). Ch. Abs. (*e*)

Differences in behaviour of old and new gold ore gangues. H. Borchert (Fortschr. Min., 1936, **20**, 33; Chem. Zentr., 1936, i, 3482).—Differences in the thermal conditions of gangue deposition are discussed. J. S. A.

Soil and coal formation. I. D. Sedletsky (Problems Soviet Soil Sci. Symposium, 1936, **1**, 125—134).—General discussion based on the *X*-ray structural relationships between humic acid and various kinds of coal. A. M.