Stark effect broadening of hydrogen lines. I. Single encounters. L. SPITZER, jun. (Physical Rev., 1939, [ii], **55**, 699—708).—Mathematical. N. M. B.

Luminous zones at cathodes in glow discharges. H. SPORN (Z. Physik, 1939, **112**, 278—304).—A general and microphotometric examination of the conditions in the glow at cathodes coated with Li_2O, Na_2O, and MgO. L. G. G.

Structure of the Be I line λ 4573 A. S. MROZOWSKI (Physical Rev., 1939, [ii], **55**, 798—799).—High-precision investigations do not support any asymmetrical structure of the 4573 A. line as reported by Parker (A., 1935, 1). The weak component of the Be II line 4673 A. found by Kruger (A., 1933, 1219) is probably due to a foreign line. N. M. B.

Isotope displacement in the boron spectrum. S. MROZOWSKI (Z. Physik, 1939, **112**, 223—233).—Both lines of the B I doublet 2497/8 A. show an asymmetry on the short-wave side due to a shift of the ^{11}B line by -0.17 cm.$^{-1}$, the intensity ratio in the doublet being 2.04 ± 0.08. The B II line shows two components separated by 0.877 cm.$^{-1}$ The sp. isotope displacements are -0.37 cm.$^{-1}$ (B I) and 0.734 cm.$^{-1}$ (B II), and the isotope concn. $^{11}B/^{10}B$ is 3.95 ± 0.01. L. G. G.

Band spectra in nitrogen at atmospheric pressure. Source of band spectra excitation. O. R. WULF and E. H. MELVIN (Physical Rev., 1939, [ii], **55**, 687—691).—The construction and action mechanism of a special type of ozoniser working at atm. pressure and room temp. for band spectra excitation are described. N_2 bands $A \rightarrow X$ were photographed in emission under resolution allowing measurement of rotational structure. Calc. and measured rotational data, tabulated for the (0—6), (0—5), (1—5), and (1—4) bands, are in satisfactory agreement. The characteristics of this source and of a high-current, low-voltage arc are compared. N. M. B.

Stark effects in the sodium arc spectrum. W. OLBERS (Ann. Physik, 1938, [v], **33**, 708—722).—The Stark effects of the terms $6P$ to $8P$, $5S$ to $8S$, and $4D$ to $8D$ of Na have been measured. The P terms show a quadratic effect $\propto n^7$ (n = principal quantum no.) in accordance with the theory of Unsöld. The anomaly in the displacements of the (PP) lines in discharges of high c.d. and pressure (cf. Bartels, A., 1933, 107) is due to the inapplicability of the theory of the Stark effect to disturbances in the irregular field of the arc. O. D. S.

Identification and the origin of atmospheric sodium. R. BERNARD (Astrophys. J., 1939, **89**, 133—135; cf. A., 1938, I, 543).—A criticism (cf. A., 1938, I, 377). L. S. T.

Spectra of potassium, calcium, scandium, and titanium. L. W. PHILLIPS (Physical Rev., 1939, [ii], **55**, 708—709; cf. A., 1937, I, 485; Whitford, A., 1935, 2).—Data and classifications for 67 lines of the Al-like spectra of K VII and Ca VIII and of the Si-like spectra of Ca VII, Sc VIII, and Ti IX are tabulated. All known term vals. for these ions are listed. Approx. estimated ionisation potentials are Ca VII 127 v., and Sc VIII 158 v. N. M. B.

Emission band spectrum of chlorine. III. Continua. W. H. B. CAMERON and A. ELLIOTT (Proc. Roy. Soc., 1939, **A, 169**, 463—469; cf. A., 1938, I, 283).—An investigation of the spectrum of Cl excited by active N led to the discovery of a no. of new diffuse bands associated with the continuum having max. intensity at λ 2580 A. These are considered to be due to the neutral Cl_2 mol. G. D. P.

Zeeman effect of the forbidden lines of potassium. F. A. JENKINS and E. SEGRÈ (Physical Rev., 1939, [ii], **55**, 545—548; cf. A., 1939, I, 166).—The Zeeman effect of the lines S—S and S—D, absorbed in K vapour in an electric field of ~2000 v. per cm., was investigated with a magnetic field of 27,000 gauss. The lines $4S$—$14S$ to $7S$—$19S$ showed no effect except for a slight broadening of the last few lines. The Zeeman patterns for $4S$—$12D$ to $4S$—$15D$, with the magnetic field perpendicular to the electric field and to the direction of observation, were resolved. They agree with the predicted pattern and show qualitatively the expected intensities. N. M. B.

Arc spectrum of vanadium in the violet. (MISS) C. E. MOORE (Physical Rev., 1939, [ii], **55**, 710—713; cf. Meggers, A., 1936, 1310).—Data and classifications for 263 lines in the region 2173—1848 A. are tabulated. Six new odd terms and 33 new miscellaneous odd levels have been found. N. M. B.

Effect of foreign gases on the continuous absorption spectrum of bromine. N. S. BAYLISS and A. L. G. REES (Nature, 1939, **143**, 560).—HCl, HBr, CO_2, O_2, and N_2 increase the intensity of the main absorption continuum of Br without altering the general shape of the absorption curve. The A and B components are equally affected, and there is practically no shift in the position of the max. at 4150 A. With HCl and CO_2, the increase in intensity is $\propto$ the partial pressure of the foreign gas. The ultra-violet absorption continuum between 3300 and 2500 A. is affected to a much greater extent by HCl or HBr. L. S. T.

Self-reversal of spectral lines. L. SIBAIYA (Proc. Indian Acad. Sci., 1939, **9**, A, 219—223).—From measurements on reversed lines obtained from cooled hollow-cathode sources (Ag, Cu, Mo, Au, etc.) it is concluded that the extent of self-reversal in the various lines of a given multiplet is not the same but that the ratio of the extent of self-reversal of two or more lines of a multiplet remains const. and independent of experimental conditions. The self-reversals in the two components of the same arc lines are unequal but the reversal ratio is const. and independent of experimental conditions. A theoretical explanation is advanced.   W. R. A.

Spectrum of singly-ionised tellurium (Te II). K. R. RAO (Nature, 1939, **143**, 376).—In the spectrum of Te II the lines $\nu\nu$ 86,096, 82,742, 78,447 have been identified as forming the fundamental combination $5p^4 S - 6S^4 P$ which has permitted the extension of the scheme into the region of longer $\lambda\lambda$. The structure is analogous to that of Se II.   L. S. T.

Nuclear spin of iodine. IV. New type of hyperfine structure deviation from the interval rule. S. TOLANSKY (Proc. Roy. Soc., 1939, A, **170**, 205—222; cf. A., 1939, I, 1).—Eight terms in the I^+ spectrum are found to show deviation from the interval rule in their hyperfine structure. They can be fitted to a cubic interaction formula. Analysis is given for 13 newly classified lines.   G. D. P.

Electric quadrupole moment of the iodine nucleus. K. MURAKAWA (Z. Physik, 1939, **112**, 234—241; cf. A., 1938, I, 335).—From the separation of the $(5s)(5p)^5 \ ^3P_2$ fine structure terms, the quadrupole moment of ^{127}I is 0.8×10^{-24}.   L. G. G.

Quadrupole moment and magnetic moment of the $^{127}_{53}I$ nucleus. T. SCHMIDT (Z. Physik, 1939, **112**, 199—207).—From hyperfine structure of the $5p^4 6s^4 P_{3/2}$ and $_{5/2}$ I I spectrum the quadrupole moment for $^{127}_{53}I$ is -0.5×10^{-24} and the magnetic moment 2.8 nuclear magnetons.   L. G. G.

Spectral series in neutral tungsten, W I, and limitations on the possibility of determining spectroscopic ionisation potentials. O. LAPORTE and J. E. MACK (Physical Rev., 1937, [ii], **52**, 249).—The identification of $5d^4 6s^7 s^7 D_{12345} \ ^5 D_{04}$ and $5d^4 6s 8s^7 D_4$(?) leads to the series limit val. W I $5d^4 6s^2 \ ^5 D_0$ (normal state)—W II $5d^4 6s^6 D_4 = 7.84$ v. The tentative val. for the ionisation potential is 7.6 ± 0.2 v.   L. S. T.

Structure of the arc spectrum of tungsten, W I. J. E. MACK and O. LAPORTE (Physical Rev., 1937, [ii], **52**, 254).   L. S. T.

Behaviour of the continuous radiation from mercury at high densities. R. ROMPE, P. SCHULZ, and W. THOURET (Z. Physik, 1939, **112**, 369—376).—The intensity of the continuous emission spectrum from the Hg discharge is measured photometrically over the density range $0.5 - 1.5 \times 10^{20}$ atoms per c.c. and current range 4—12 amp. The intensity of radiation $\propto I^{3/2}$, and nearly $\propto d$. Results are in accord with theory (Unsöld), and indicate a lowering of the excitation voltage at higher d and c.d.   L. G. G.

Zeeman effect of hyperfine structure in intermediate fields. L. SIBAIYA and T. S. SUBBARAYA (Proc. Indian Acad. Sci., 1939, **9**, A, 211—218).—The Zeeman effect of the hyperfine structure of the 5461 A. Hg line at field strengths ≯4000 gauss has been studied, and particularly the satellite $+0.753$ cm.$^{-1}$ arising from the transition $7^3 S_1 f = 3/2 \rightarrow 6^3 P_2 f = 3/2$ in ^{199}Hg. Experimental data agree well with theory.   W. R. A.

Spectrum of Pb$_2$. L. NATANSON (Acta Phys. Polon., 1939, **7**, 275—278).—The band spectrum of Pb$_2$ has been obtained by passing an electrodeless discharge through a SiO$_2$ tube containing Pb vapour at 850°. 13 band heads between 4700 and 3700 A. have been measured and found to be higher members of the series observed in the region 4600—5200 A. by Shawhan (cf. A., 1935, 1292) using thermal excitation.   J. A. K.

Normal and subnormal ratios and divisions of the glow discharge at a flat, semi-conducting electrode of heated glass. K. WOLF (Z. Physik, 1939, **112**, 96—106).—Using a cathode of heated glass, the electrode resistance, cathode fall, and general distribution of the discharge were investigated in air and H$_2$ at various voltages and gas pressures.   H. C. G.

Sputtering from slightly conducting films formed in the discharge on heated glass. K. WOLF (Z. Physik, 1939, **112**, 148—158; cf. preceding abstract).—Slightly conducting films several μ. thick were produced on heated plane glass cathodes by the glow discharge in air, H$_2$, and Hg vapour. Under certain conditions these films give a sputtering discharge which passes smoothly into the ordinary glow discharge with increasing film thickness, lower temp., or increasing c.d.; dependence of the phenomenon on these factors has been investigated.   H. C. G.

High-pressure arcs in common gases in free convection. C. G. SUITS (Physical Rev., 1939, [ii], **55**, 561—567).—An oscillographic method is described for measuring the electric gradient E (v. per cm.), c.d. I (amp. per sq. cm.), and total voltage e (v.) as a function of current i in the discharge. Results are given and plotted for arcs in the range 0—10 amp. with free convection in N$_2$, A, and He at 1—50 atm., and for air, CO$_2$, and steam at atm. pressure. Determinations of n and B in $E = Bi^{-n}$ and of m in $E = B_0 p^m$ were obtained.   N. M. B.

Explanation of the lines in the spectrum of the solar corona. W. GROTIAN (Naturwiss., 1939, **27**, 214).—It is suggested that the spectrum lines of the solar corona may be explained as forbidden lines of highly ionised atoms.   A. J. M.

Influence of chemical binding and crystal structure on X-ray absorption edges. R. LANDSHOFF (Physical Rev., 1939, [ii], **55**, 631—636; cf. A., 1938, I, 346).—An attempt is made to explain the positions and fine structures of X-ray absorption edges, so far as these are not explained by Kronig's theory, by considering that they arise from transitions into a series of discrete states in which the electron is trapped in the region of surplus positive charge

which is created by the ejection of the electron from the inner shell of the parent ion. A model in which the electron is bound to the positive ions in the neighbourhood of the parent ion is used to calculate the energy of the trapped states. Data for Cl⁻ and S⁻⁻ in several compounds are given and discussed.
N. M. B.

Ionisation of mercury. T. McFADDEN (Physical Rev., 1939, [ii], **55**, 797).—Investigations with a modified space-charge tube give results in general agreement with those recently reported (cf. Nottingham; Bell, A., 1939, I, 168). N. M. B.

Townsend ionisation coefficients in Cs–Ag–O photo-tubes filled with argon. W. S. HUXFORD (Physical Rev., 1939, [ii], **55**, 754—762).—An attempt is made to account for the amplification of photo-currents at low c.d. on the basis of Townsend's theory, assuming secondary electron emission by positive ions. Using special sealed-off tubes having parallel plates at various separations, and a const. gas pressure, vals. of the Townsend coeffs. α and γ were determined at each field val. by simultaneous solution of the Townsend equations for two plate separations. Measured vals. of the striking potentials of the glow discharge are in quant. agreement with the positive ion mechanism assumed. The photosensitivity of the compound Cs cathodes increases with increase of bombarding ion current.
N. M. B.

Time changes in emission from oxide-coated cathodes. J. P. BLEWETT (Physical Rev., 1939, [ii], **55**, 713—717; cf. Becker, A., 1932, 208).—The decay of electron emission when emission-limited current is drawn from an oxide cathode (BaO–SrO) was studied as a function of anode voltage, anode current, cathode temp., and tube temp. It is concluded that the decay is due to a transport of Ba or O by electrolysis and diffusion. The val. deduced for the heat of diffusion is 17 ± 5 kg.-cal., or ~0·7 ev. Other observed time variations in emission are discussed. N. M. B.

Total secondary electron emission from tungsten and thorium-coated tungsten. E. A. COOMES (Physical Rev., 1939, [ii], **55**, 519—525; cf. A., 1939, I, 2).—The secondary electron emission from polycryst. W covered with unimol. films of Th evaporated on to it from a thoriated W filament, investigated for a primary electron energy range of 100—1000 v., showed no change in the val. of the coeff. with thoriation for primary energies <200 v., but decreased at higher voltages with increasing amounts of Th on the target. Treatment with O₂ released from the thoriated W filament caused an increase in the work function and also in the secondary emission coeff.
N. M. B.

Influence of gases on the secondary emission of certain metals. N. CHLEBNIKOV (Tech. Phys. U.S.S.R., 1938, **5**, 593—618).—Apparatus for measuring the " coeff. of secondary emission," σ, is described. The metals examined were deposited by distillation in vac. on a Ta plate. Freshly deposited Be or Mg gave $\sigma_{max.}$ ~0·9 with primary beam voltage ~300 v. Brief exposure to O₂ increased $\sigma_{max.}$ to 2—3; H₂ and He also increased σ but the effect was more complicated.

The emission from pure Ta was similarly influenced by traces of residual gases; outgassing reduced $\sigma_{max.}$ from 2·2 to 1·2. A theory of the mechanism of emission has been developed to explain the results. The resistance of thin films of Be, Ni, W, and Ag increases sharply on exposure to O₂ and slightly with H₂. J. A. K.

Secondary electron emission from oxide-coated cathodes. N. MORGULIS and A. NAGORSKI (Tech. Phys. U.S.S.R., 1938, **5**, 848—863).—The secondary electron emission from a (Ni)–BaO, Ba–Ba cathode is < that from a Cs₂O cathode, but does not show a time lag even when cold. The energy distribution of the secondary electrons was determined at different temp. Thermo-electronic emission is > secondary emission at 600° K. and a device for separating the two effects is described. The secondary emission increases considerably with rise of temp. particularly above 600° K. and the increase is almost unaffected by the energy of the primary electrons (400—1000 v.). A. J. M.

Absolute light yield, excitation functions, and intensity relations in helium, neon, and argon spectra excited by atomic collision at velocities from 0 to 4500 volts. V. NEUMANN (Ann. Physik, 1939, [v], **34**, 603—624).—The processes Ne → Ne, He → He, A → A, He → A, and H → Ne, He, and A have been investigated. In each case excitation by similar atoms is the most efficient. Results are compared with those for excitation by electron collision. O. D. S.

Measurement of the excitation function of metals of high b.p. on excitation by electron collision. H. FUHRMANN (Ann. Physik, 1939, [v], **34**, 625—643).—By means of a new apparatus the excitation functions for electron collision of lines in the spectra of Tl (cf. Strohmeier, A., 1937, I, 590), Ag, and Pb have been measured. Ag shows characteristics similar to Tl and Na. Contrary to expectation, the singlet and triplet lines of Pb, which has a triplet ground term, do not show a reversal in their characteristics as compared with those of Cd, Zn, and Hg.
O. D. S.

Fluctuation of thermionic current and the " flicker " effect. M. SURDIN (J. Phys. Radium, 1939, [vii], **10**, 188—189).—Mathematical. The fluctuation of the thermionic current of the " flicker " effect can be attributed to the fluctuation in the no. of free electrons in the metal. W. R. A.

Scattering of fast electrons and of cosmic-ray particles. E. J. WILLIAMS (Proc. Roy. Soc., 1939, A, **169**, 531—572; cf. A., 1938, I, 224).—The relativistic theory of nuclear scattering is discussed and corrections are applied for the effects of finite nuclear size and the shielding of the nucleus by the at. electrons. The average deflexions due to multiple scattering of fast electrons in thin metal foils and of cosmic-ray particles in metal plates are calc. The theoretical results are in agreement with experiment on the scattering of cosmic-ray particles; reference is made to the bearing of the cosmic-ray results on the existence of " heavy electrons." The scattering of million-v. electrons by Al foil is in agreement with

the theory but that of 10-Mv. electrons by Pb foil is $\ll$ the theoretical vals. G. D. P.

Mass of the mesotron. Y. NISHINA, M. TAKEUCHI, and T. ICHIMIYA (Physical Rev., 1939, [ii], **55**, 585—586; cf. A., 1938, I, 57).—Investigations on a Pb bar mounted in a Wilson cloud-chamber showed the track of a negatively charged particle of range 6·15 cm. for which the calc. mass is $(170\pm9)m$, where m is the mass of the electron. The corr. val. of a result previously reported is $(180\pm20)m$. N. M. B.

New effect in the asymmetry of radiation from hydrogen positive rays in an electric field. R. GEBAUER (Naturwiss., 1939, **27**, 228).—The Stark effect components of the H_β and H_γ lines in an electric field were observed simultaneously with two spectral apparatus in opposite directions, both perpendicular to the positive rays and to the direction of the field. When the field was made slightly inhomogeneous asymmetry of the components was observed, the width of the short-wave component being $>$ that of the long-wave component when viewed in one direction, and the reverse in the opposite direction. The effect is not a Doppler effect. A. J. M.

Determination of the mobilities of gaseous ions. (MLLE.) E. MONTEL (Compt. rend., 1939, **208**, 1141—1144).—A new method has been devised for the determination of the mobilities of gaseous ions in which the ions, produced by X-ray irradiation, are subjected to the influence of an electric field and the current produced by their displacement is amplified and measured. W. R. A.

Production of ions in the auroral glow. J. KAPLAN (Physical Rev., 1937, [ii], **52**, 257).—Hypothetical. L. S. T.

Classification and correspondence of the chemical elements and their compounds. R. LAUTIÉ (Bull. Soc. chim., 1939, [v], **6**, 677—683).—An arrangement of the periodic table corresponding with electronic structures. F. J. G.

Mases of ^{6}Li, ^{7}Li, ^{8}Be, ^{9}Be, ^{10}B, and ^{11}B. S. K. ALLISON (Physical Rev., 1939, [ii], **55**, 624—627).—Vals. are deduced with the help of energy release data in the two modes of disintegration of Be under proton bombardment (cf. A., 1939, I, 172). The introduction of the revised electronic charge makes changes $<0.07\%$ in the accepted range–energy curve for α-particles. Assuming $H = 1.00813 + 0.00002$, $D = 2.01473 \pm 0.00002$, and ^{4}He $= 4.00386 \pm 0.00006$, the deduced masses are ^{6}Li $= 6.01670 \pm 0.00012$, ^{7}Li $= 7.01799 \pm 0.00011$, ^{8}Be $= 8.00753 \pm 0.00013$, ^{9}Be $= 9.01474 \pm 0.00014$, ^{10}B $= 10.01579 + 0.00022$, and ^{11}B $= 11.01244 \pm 0.00019$. These masses are compared with several observed nuclear reactions and mass-spectrographic doublets. N. M. B.

Mass of the normal litre and compressibility of gaseous carbon monoxide. At. wt. of carbon. E. MOLES and M. T. SALAZAR (Congr. int. Quim. pura apl., 1934, 9, II, 217—224; Chem. Zentr., 1937, i, 1115).—The at. wt. val. 12.007 ± 0.001 is obtained, the ratio ^{12}C : ^{13}C being 100 : 1. A. J. E. W.

Determination of the at. wt. of lead by the Richards–Hönigschmid method. I. Preparation of chemically pure silver as a standard for determination of the at. wt. of lead. V. M. PERMJAKOV (J. Gen. Chem. Russ., 1938, **8**, 1881—1886).—Ag containing 0·3—0·5 p.p.m. of Ca is prepared by the method of Hönigschmid (Mitt. Inst. Radiumforsch. Wien, 1914, **56**, 5; 1916, **86**, 10), with minor modifications. R. T.

Constancy of ^{40}K. A. K. BREWER (Physical Rev., 1939, [ii], **55**, 669).—Investigations on K minerals of various ages and from various sources support the conclusions of Smythe (cf. A., 1939, I, 171) that the ^{39}K/^{40}K abundance ratio is comparatively const. throughout nature. N. M. B.

Enrichment of xenon isotopes and their detection. W. GROTH (Naturwiss., 1939, **27**, 260—261).—The Hertz diffusion process and the Clusius separation method were used simultaneously in the separation of Xe isotopes. A Clusius separation tube 1 m. long can be as effective as 12 Hertz diffusion pumps, and a better separation was effected if the diameter of the tube was decreased to 0·5 cm. With wire temp. of 1200° and 1650° the variation in the at. wt. of the fractions collecting at the "light" and "heavy" ends of the apparatus was plotted against time. The thermal conductivity method was used for the analysis of the fractions and differences >1 at. wt. unit were obtained. A. J. M.

Isotopic constitution of hafnium, yttrium, lutecium, and tantalum. A. J. DEMPSTER (Physical Rev., 1939, [ii], **55**, 794—795).—Photographs of ions obtained from a high-frequency spark showed a new isotope ^{174}Hf, with intensity 0·3% of the total; there was also indication of a possible ^{172}Hf. No confirmation could be obtained of ^{177}Lu and ^{179}Ta, nor of a Y isotope of at. mass 91. N. M. B.

Isotopic abundance and at. wt. of europium. H. LICHTBLAU (Naturwiss., 1939, **27**, 260).—The isotopic abundance of Eu has been determined; ^{151}Eu : ^{153}Eu $= 96.3 \pm 1.2 : 100$. No other isotopes were discovered, and if present cannot be $>0.4\%$. The mean mass no. is $152.019 \pm 6 \times 10^{-3}$. Using Dempster's val. for the packing fraction, and converting to the chemical scale, the at. wt. of Eu is 151·95 ± 0.01, or using Aston's val. for the packing fraction the val. is 151.92 ± 0.03. A. J. M.

Radioactivity of glass, porcelain, and mica. S. GAWRONSKI (Acta Phys. Polon., 1939, **7**, 253—271). —By a counter method weak natural radioactivity has been detected in insulator porcelain, two glasses, and three different micas. The nature of the rays was examined by measurement of the absorption in thin sheets of Cu and Al. The radiations from porcelain and Indian mica were found to be homogeneous and corresponded in penetrating power with the β-radiation of K. The other materials gave inhomogeneous radiations which were approx. separated and identified as follows : Fischer glass, Ra (γ), K (β), and Ra-B (γ); Thuringer glass, U-X_2 (β and γ), and Ra-B (γ); East African mica, K (β) slightly inhomogeneous; Madagascar mica, Th-C'' (β) and Ra (β). J. A. K.

Actinium series of radioactive elements and their influence on geological age measurements. A. V. GROSSE (Physical Rev., 1939, [ii], **55**, 584—584). —A confirmatory discussion of the results of Nier (cf. A., 1939, I, 169) and an examination of discrepancies. N. M. B.

Energy loss of high-energy β-rays in lead. J. J. TURIN and H. R. CRANE (Physical Rev., 1937, [ii], **52**, 247).—Using β-rays from ^{8}Li, cloud-chamber measurements of the loss of energy of electrons in passing through Pb have been extended to incident energies of 11 Me.v. For 0·5 mm. of Pb, average losses are 50% > predicted vals. L. S. T.

β-Ray spectrum of radium-E. L. H. MARTIN and A. A. TOWNSEND (Proc. Roy. Soc., 1939, **A**, **170**, 190—205).—A magnetic β-ray spectrometer is described. The β-ray spectrum of a source of Ra-E in equilibrium with Ra-D was investigated, special attention being paid to the effect of back-scattering in the source support and absorption in the window of the counter. The results cannot be explained by the Fermi theory or the modification of Konopinski and Uhlenbeck. G. D. P.

γ-Rays of radium-E. J. A. GRAY (Physical Rev., 1939, [ii], **55**, 586—587).—Curves for the absorption in Al of the soft γ-rays of Ra-E and for the production of X-rays in Al by the fast and slow β-rays from Ra-E are given and discussed. N. M. B.

γ-Rays from boron and beryllium under proton bombardment, and from lithium under deuteron bombardment. W. G. SHEPHERD, R. O. HAXBY, and J. H. WILLIAMS (Physical Rev., 1937, [ii], **52**, 247).—Under proton bombardment, B emits a hard γ-ray. The resonance observed at 180 kv. has been confirmed. No γ-rays harder than background X-rays from the accelerating tube have been observed from Be bombarded by 200-kv. protons. The γ-ray from Li under deuteron bombardment has an energy of 400±25 kv. L. S. T.

Intensity distribution in Compton scattering of γ-rays. Z. BAY and Z. SZEPESI (Z. Physik, 1939, **112**, 20—28).—A method of greatly increased accuracy for measuring the angular distribution of secondary radiation excited by γ-rays is described. Results are given for Al between the angles 50° and 140°; these agree with vals. calc. from the formula of Klein and Nishina. H. C. G.

Nuclear effect and scattering of γ-rays. Z. BAY and G. PAPP (Z. Physik, 1939, **112**, 86—91).— Intensity distribution of scattered radiation arising from the incidence of γ-radiation from Ra on sheets of Pb and Al is independent of the angle. Comparison between nuclear scattering and Compton scattering shows the experimental results to agree with the calculations of Jaeger and Hulme and of Klein and Nishina. H. C. G.

Gamma radiation from $^{198}_{79}$Au. G. J. SIZOO and C. EIJKMAN (Physica, 1939, **6**, 332—336).—The γ-radiation contains a hard component with an energy of ~2·5 Me.v., and an intensity of ~0·02 quantum per disintegration. L. J. J.

Low-energy neutrons from the deuteron-deuteron reaction. E. HUDSPETH and H. DUNLAP (Physical Rev., 1939, [ii], **55**, 587—588; cf. Bonner, A., 1938, I, 339).—Using a cloud chamber containing H_2 and EtOH vapour and a D_3PO_4 target, the low-energy neutron spectrum was obtained. The intensity ratio of the high- and low-energy groups is ~1 : 16. N. M. B.

Neutron–proton scattering cross-section. L. SIMONS (Physical Rev., 1939, [ii], **55**, 792—793).—In view of the divergence of calc. and experimental vals., measurements were made with different thicknesses of H_2O as a proton scatterer and I and Ag as detectors. The corr. mean free path of the resonance neutrons in H_2O was 0·91 cm., corresponding with a proton cross-section of 14.8×10^{-24} (cross-section for O = 3.3×10^{-24} sq. cm.). The discrepancy with Cohen's val. (cf. A., 1939, I, 172) is discussed. N. M. B.

Production of photo-neutrons from a source with Ra-γ + Be. Z. OLLANO (Nuovo Cim., 1938, **15**, 541—550).—Measurements have been made of the no. of neutrons obtainable from various Ra-γ + Be sources. The mean collision cross-section for the process in which the hardest γ-rays of Ra liberate neutrons from Be is $2.0 \pm 0.3 \times 10^{-27}$ sq. cm. O. J. W.

Scattering of neutrons by iron. R. F. BACHER (Physical Rev., 1937, [ii], **52**, 248).—The scattering of Rh resonance neutrons by thick and thin Fe scatterers above a detector on a paraffin cylinder has been investigated. The albedo effect contributes largely to the scattering. For 5·4 cm. of Fe, the ratio of absorption to scattering cross-section is 0·22. L. S. T.

Distribution of particles of disintegration of nitrogen under the action of fast neutrons. Resonance levels of the ^{15}N nucleus. J. THIBAUD and P. COMPARAT (J. Phys. Radium, 1939, [vii], **10**, 161—170).—A detailed account of work already noted (cf. A., 1938, I, 427, 489; 1939, I, 53). W. R. A.

Scattering of fast neutrons of different energy. H. AOKI (Physical Rev., 1939, [ii], **55**, 795; cf. A., 1939, I, 171).—Curves for the scattering cross-section of 32 elements for D + D and Li + D neutrons of energies 2·1—2·8 Me.v. at various angles to the incident deuteron are given and discussed. N. M. B.

Emission of neutrons during the artificial disintegration of uranium nuclei. Possibility of chain reaction. C. HAENNY and A. ROSENBERG (Compt. rend., 1939, **208**, 898—900).—With the aid of a hexane-ionisation chamber (A., 1938, I, 289) it has been shown that a neutron beam tends to increase in intensity during passage through a large amount of U. The effect is attributed to secondary emission of neutrons from disintegrated nuclei replacing the absorbed primary neutrons. The chain effect obtained suggests the possibility of using U to intensify weak sources of neutrons and of producing appreciable quantities of the transmutation products. J. W. S.

Delayed neutron emission which accompanies fission of uranium and thorium. R. B. ROBERTS, L. R. HAFSTAD, R. C. MEYER, and P. WANG (Physical Rev., 1939, [ii], **55**, 664).—Further evidence shows

that direct neutron emission, and not photodisintegration, is responsible for the delayed neutrons produced by neutron bombardment of U (cf. A., 1939, I, 235). The measured cross-section for the production of delayed neutrons by Li-neutron bombardment of U (high-energy neutrons) was $\sim 4 \times 10^{-26}$ sq. cm. which is $\sim$ one half the cross-section for fission when fast Rn–Be neutrons are used. Delayed neutrons were observed from $Th(NO_3)_3$ which had been activated by fast Li neutrons. The intensity was $\sim\frac{1}{4}$ of that observed from U ; the period was $\sim$ the same as that of delayed neutrons from U. N. M. B.

γ-Rays from uranium activated by neutrons. J. C. Mouzon, R. D. Park, and J. A. Richards, jun. (Physical Rev., 1939, [ii], **55**, 668).—Integral curves for runs of photographs obtained when U nitrate in a Pb envelope was bombarded with neutrons in a cloud-chamber filled with air and EtOH vapour in a magnetic field are given, together with the corresponding curve for the Pb in absence of U. Results indicate that the γ-rays above 4 or 5 Me.v. are associated with the fission process and are probably emitted by the excited products of the ruptured U nucleus.
N. M. B.

Cross-sections of metallic uranium for slow neutrons. M. D. Whitaker, C. A. Barton, W. C. Bright, and E. J. Murphy (Physical Rev., 1939, [ii], **55**, 793).—Since cross-sections obtained by investigations on elements and on their compounds are liable to differ, measurements of the transmission of U metal for slow neutrons are reported. The results obtained are : total cross-section $23\cdot1\pm0\cdot5 \times 10^{-24}$; capture cross-section $11\pm3 \times 10^{-24}$; scattering cross-section $12\pm3 \times 10^{-24}$ sq. cm. N. M. B.

Production of neutrons in uranium bombarded by neutrons. H. L. Anderson, E. Fermi, and H. B. Hanstein (Physical Rev., 1939, [ii], **55**, 797—798).—Preliminary experiments with a Rn + Be source of neutrons and with photo-neutrons emitted from a block of Be irradiated with γ-rays from Ra support the view that neutrons are emitted by U under neutron bombardment. N. M. B.

Instantaneous emission of fast neutrons in the interaction of slow neutrons with uranium. L. Szilard and W. H. Zinn (Physical Rev., 1939, [ii], **55**, 799—800; cf. preceding abstract).—Using photo-neutrons liberated from a Be block by the γ-rays of Ra and slowed down by paraffin wax, together with a He-filled ionisation chamber and amplifier detector, an emission of fast neutrons in the U fission process was found. Replacement of the He chamber with an ionisation chamber lined with U_3O_8 allowed an estimation of ~ 2 neutrons per fission to be made. Indications were obtained that the no. of neutrons due to delayed emission must be very small (cf. Roberts, A., 1939, I, 235).
N. M. B.

Artificial radioactivity. IV. K. Diebner and E. Grassmann (Physikal. Z., 1939, **40**, 297—314; cf. A., 1938, I, 381).—Further results to the end of 1938 are reviewed.

Radioactivity of ^{8}Li. C. Kittel (Physical Rev., 1939, [ii], **55**, 515—519; cf. Rumbaugh, A., 1937,

I, 5).—The continuous distribution of α-particles, which is not given correctly by the Konopinski–Uhlenbeck theory, observed in the β-decay of ^{8}Li is examined theoretically on the Fermi theory of β-decay and is accounted for by an approx. form of this theory. The abnormally small val. found for Fermi's const. g for the β-decay process classes the process as improbable. N. M. B.

Internal conversion electrons from ^{80}Br. G. E. Valley and R. L. McCreary (Physical Rev., 1939, [ii], **55**, 666; cf. Segrè, A., 1939, I, 169).—The negative electron spectra of $^{78, 80, 82}$Br produced by proton bombardment of thin Se films were examined in the region 13—150 e.kv., and showed two strong lines of electrons at 44 ± 1 and $33\cdot5\pm1$ e.kv., and a much weaker line at $21\cdot5\pm2$ e.kv. The 44 and 33.5 lines belong to ^{80}Br (4.4 hr.), and agree with L and K conversion in Br of a γ-ray of ~ 45 e.kv.; the 21.5 line belongs either to ^{80}Br (4.4 hr.) or to ^{82}Br (33 hr.) and is the result of either L conversion of a 23-e.kv. γ-ray or K conversion of a 34-e.kv. γ-ray. N. M. B.

Excited states of nuclei. F. J. Wisniewski (Acta Phys. Polon., 1939, **7**, 245—252).—γ-Rays of energies 4, 6.9, and 12 Me.v. are observed during the reactions $^7_3Li + ^1_1H = 2^4_2He$ and $^6_3Li + ^1_1H = ^3_2He + ^4_2He$. From theoretical calculations of the energies of excited states of nuclei, these rays have been ascribed to ^{7}Li, ^{4}He, and ^{6}Li, respectively. J. A. K.

Coincidence investigations of the nuclear transformation of boron by protons. K. Fink (Ann. Physik, 1939, [v], **34**, 717—739).—Coincidence measurements indicate that ^{8}Be formed in the process ^{11}B (p, α) ^{8}Be disintegrates spontaneously into two α-particles. The results of absorption measurements on the α-particles formed cannot be interpreted on the assumption that disintegration is isotropic with respect to the centre of gravity of the ^{8}Be nucleus. Coincidence measurements for the process ^{11}B (p, α) $\alpha\alpha$ also indicate a non-isotropic disintegration.
O. D. S.

Short-range α-particles from ^{19}F + ^{1}H. W. B. McLean, R. A. Becker, W. A. Fowler, and C. C. Lauritsen (Physical Rev., 1939, [ii], **55**, 796).— The γ-ray spectrum from the bombardment of ^{19}F by protons of energies $\not> 750$ kv. consists of a single line at $6\cdot0\pm0\cdot2$ Me.v., and a first resonance at 330 kv. (cf. Hafstad, A., 1936, 1313). The range distribution curve of particles produced by the bombardment of CaF_2 (^{19}F) with 350-kv. protons is consistent with the assumption that the group consists of α-particles due to the reaction ^{19}F + ^{1}H $\rightarrow$ (^{20}Ne) $\rightarrow$ ^{16*}O + ^{4}He + Q; ^{16*}O $\rightarrow$ ^{16}O + $h\nu$. The calc. val. of $Q = 1\cdot74\pm0\cdot10$ Me.v. so that the excited state of O involved lies 6.2 Me.v. above the ground state, in good agreement with the observed γ-ray energy. N. M. B.

Radioactivity produced in sulphur and phosphorus by fast neutrons. J. Cichocki and A. Soltan (Acta Phys. Polon., 1939, **7**, 240—244; cf. A., 1938, I, 489).—Fast neutrons from Li + D induce in S a radioactivity of half-life 2.6 hr. found chemically to be $^{31}_{14}$Si formed by $^{34}_{16}$S + $^1_0n = ^{31}_{14}$Si + $^4_2$He. The activity is identical with that produced by the reaction $^{31}_{15}$P + $^1_0n = ^1_1$H + $^{31}_{14}$Si (half-life 157·1 $\pm$

1·0 min.) The half-life of $^{30}_{15}P$ produced by $^{31}_{15}P + ^1_0n = 2^1_0n + ^{30}_{15}P$ is 130·6±1·5 sec., and that of $^{32}_{15}P$ from $^{32}_{16}S + ^1_0n = ^{32}_{15}P + ^1_1H$ is 14·33±0·2 days.
                                                          J. A. K.

Excitation functions of the transformations $^{27}_{13}Al$ (α ; n) $^{30}_{15}P$ **and** $^{10}_{5}B$ (α ; n) $^{13}_{7}N$. A. SZALAY (Z. Physik, 1939, **112**, 29—44).—The transformations were produced by α-particles of 5·3 Me.v. in an apparatus embodying a spherically symmetrical arrangement about an approx. point source of a prep. of Po. Abs. yields of the transformation products, and resonance energies of the transformations, were determined and compared. A selection rule for the branching transformation of the intermediate nucleus, ^{31}P, is established.
                                                          H. C. G.

Chemical separation of isomeric ^{80}Br **atoms.** L. J. LE ROUX, C. S. LU, and S. SUGDEN (Nature, 1939, **143**, 517—518).—The addition of a few % of NH_2Ph to an org. bromide before irradiation with slow neutrons gives a large increase in the amount of radio-Br which can be extracted subsequently by H_2O or dil. acid. The capture γ-rays disrupt or activate the C-Br linking and facilitate the reaction $RBr + NH_2Ph = NH_2RPh^+ + Br^-$. This reaction gives a large separation of the ^{80}Br isomerides, and a curve showing the separation obtained when 5% of NH_2Ph are added to $C_2H_4Br_2$ irradiated with slow neutrons from $RaSO_4 + Be$ is given. The hydrolysis of $Bu^\alpha Br$ under the conditions described also gives a marked separation of the isomeric ^{80}Br atoms. These results confirm the finding of Segrè et al. (A., 1939, I, 169) and DeVault and Libby (ibid., 173) that the isomeride of ^{80}Br with a half-life of 4·5 hr. decays by a γ-ray change to an isomeric ^{80}Br emitting β-rays with a half-life of 18 min.
                                                          L. S. T.

Wave-length relationship of nuclear photo-effects : the radioactive isotopes of selenium. W. BOTHE and W. GENTNER (Z. Physik, 1939, **112**, 45—64).—An electrostatic generator and canal-ray tube for operation at 1000 kv. are described. Nuclear photo-effects were examined and relative yields determined for a series of elements using the γ-radiation from ^{11}B (p ; γ) ^{12}C. Spurious effects arising from neutrons were eliminated by control experiments. Nuclear γ-absorption spectra are essentially continuous and, in general, the absorption increases with increasing $h\nu$. The apparent reaction cross-section of Cu with γ-radiation from ^7Li (p ; γ) ^8Be is 2·3 times < that with γ-rays from ^{11}B (p ; γ) ^{12}C. Mixture ratios of the two ^{80}Br isomerides are 0·9 with the Li radiation and 2·6 with B radiation. The 4·5-hr. ^{80}Br isomeride is possibly a metastable excited state of the 18-min. isomeride and its proportion increases with increase in excitation of the ^{81}Br intermediate nucleus from which ^{80}Br results by neutron emission. Nuclear photo-effects with Se produce two radioactive isotopes. Their decay curve corresponds with the two known half-life periods of 17 and 57 min. They result from neutron emission and have masses 75, 79, or 81. Snell's Br (2·4-hr.) isotope cannot arise from Se activated by either photo-effect or slow neutrons ; it may be derived from a third Se isotope of unknown period, produced in very small quantity.
                                                          H. C. G.

New periods of radioactive tin. J. J. LIVINGOOD and G. T. SEABORG (Physical Rev., 1939, [ii], **55**, 667).—The Sn ppt. prepared by bombardment of Sn with 5-Me.v. deuterons contains activities of half-lives 9 min., 40 min., 26 hr., 10 days, ~70 days (all negative), and <400 days (sign unknown). Possible identifications are discussed ; the most probable are 9 min. ^{125}Sn, 70 days ^{113}Sn. The previously reported ^{121}Sn (24 hr.) is probably in error (cf. A., 1936, 1315). A chemical separation for Sn after activation of Cd with 16-Me.v. He ions gives a ppt. containing activities 70 days (sign unknown), 25 min., 3 hr., and 13 days (all negative).
                                                          N. M. B.

Radioactive tellurium : further production and separation of isomers. G. T. SEABORG, J. J. LIVINGOOD, and J. W. KENNEDY (Physical Rev., 1939, [ii], **55**, 794; cf. A., 1939, I, 233).—The constituents of three isomeric pairs were separated chemically by the method of Segrè (cf. ibid., 169) ; in each case the short-period grows from the long-period activity. Prolonged bombardment of I with fast neutrons from Li + D produces ^{127}Te (90 days and 10 hr.) ; these activities are produced with much greater intensity by deuteron bombardment of Te. ^{131}Te (1·2 days and 25 min.) are produced by deuteron bombardment of Te, and ^{129}Te (30 days and 70 min.) are similarly produced. Activation of Sb with 8-Me.v. deuterons or with 4-Me.v. protons gives ^{121}Te (120 days).
                                                          N. M. B.

Radiations from radioactive substances: ^{198}Au, ^{152}Eu, ^{106}Ag, ^{64}Cu, **and** ^{13}N. J. R. RICHARDSON (Physical Rev., 1939, [ii], **55**, 609—614).—The γ-radiation from ^{198}Au and ^{152}Eu was investigated with a H_2-filled cloud-chamber in a magnetic field. ^{198}Au (2·7 days) shows three lines with energies 70, 280, and 440 kv., and relative intensities 0·15, 1·0, and 1·2. The β-spectrum has an inspection upper limit of 0·83 Me.v., and the distribution shows that the 440-kv. γ-radiation is internally converted with a coeff. of 0·1 ; thus the 70-kv. radiation is probably entirely K radiation emitted after internal conversion. The ^{152}Eu γ-distribution shows three main groups of 40 kv., 0·3 and 0·9 Me.v. The 40-kv. radiation is ascribed to the K radiation of Sm emitted as a consequence of the orbital electron capture process in ^{152}Eu. ^{106}Ag (8 days) shows evidence for the K-electron capture process, the electron spectrum consisting probably of secondary electrons from the γ-radiation following the capture process. Comparison of the distribution of electrons ejected from a Pb radiator and from ^{64}Cu by a thin source of ^{13}N indicates the presence of a 280-kv. γ-ray from ^{13}N with the relative probability of ~0·4 quantum per positron.
                                                          N. M. B.

Energy distribution of the products of irradiation of uranium with neutrons. G. VON DROSTE (Naturwiss., 1939, **27**, 198).—Four, instead of the two expected, groups of particles have been found as products of the irradiation of U with neutrons, the investigation being carried out by a thyratron and confirmed by an oscillograph method. The approx. max. energies of the groups are 33, 56, 71, and 95 Me.v.
                                                          A. J. M.

Products of irradiation of uranium with neutrons. I. NODDACK (Naturwiss., 1939, **27**, 212—

213).—The possibility of the disintegration of a nucleus into two nuclei lower in the periodic table was mentioned by the author in 1934. A. J. M.

Transmutations of uranium and thorium nuclei by neutrons. E. BRETSCHER and L. G. COOK (Nature, 1939, **143**, 559—560).—Layers of U and Th oxides have been bombarded by a mixture of fast and slow neutrons from Li + D, and the active substances deposited on glass plates ~1 mm. away have been investigated. With U, half-lives of 86 min. have been assigned to Ba, of 4 hr. and 40 hr. to La, and of 16 min., 75 min., and 72—76 hr. to elements of the " trans-U " type. The 16-min. and 72—76-hr. activities are due to recoiling fragments of the bursting U nucleus; they are not " trans-U " elements from U by a chain of β-processes. With Th, the recoil activities on the plates show many periods, some of which have been classified into groups according to their chemical behaviour. L. S. T.

Droplet fission of uranium and thorium nuclei. M. A. TUVE (Science, 1939, **89**, 202—203).—The detection of the high-energy recoil particles demanded by the hypothesis of droplet fission of the U nucleus (A., 1939, I, 233) is described. The yields from Th and U exposed to Li + D neutrons at 10^3 kv. are similar in magnitude. No effect was observed from Bi, Pb, Tl, Hg, Au, Pt, W, Sn, or Ag. The U fissions appear to be produced by different processes for fast and slow neutrons, the fast-neutron process requiring >0·5 Me.v. but <2·5 Me.v. for effective operation. For Th, only the fast-neutron process is effective; it requires between 0·5 and 2·5 Me.v. L. S. T.

Dissymmetry of the rupture of uranium. G. BECK and P. HAVAS (Compt. rend., 1939, **208**, 1084—1086).—A general explanation of the rupture of U by neutrons into two non-identical nuclei is advanced. Beyond the range of nuclear radiations the only forces acting on the nuclei are coulombic forces. The probability of rupture becomes considerable only when the kinetic energy at this distance is positive. From this viewpoint nuclei with $Z = 37$ to 55 may be produced by the rupture. The ratio of λ_2, the period of rupture produced by neutrons, to λ_1, the period of spontaneous disintegration of $^{238}_{92}U$, gives the increased probability of rupture. W. R. A.

Further products of uranium cleavage. P. ABELSON (Physical Rev., 1939, [ii], **55**, 670).—Disintegration products of U have been found as follows : Sb (<15 min.) → Te (72 hr.) → I (2·5 hr.) and ^{131}I (8 days). Te (40 min.) → I (54 min.). Te (1 hr.) → I (22 hr.). Sb (4·6 hr.) → ^{129}Te (70 min.). Sb (5 min.) and Sb (40 min.). Separations and identifications are described and discussed. N. M. B.

Production of neutrons by cosmic rays. G. COCCONI and V. TONGIORGI (Naturwiss., 1939, **27**, 211).—The experiments of Froman *et al.* (A., 1939, I, 55) have been repeated, but the occurrence of neutrons to the extent of 30% of the hard component of cosmic rays could not be confirmed. If the effect is real it is ≪ this. A. J. M.

Variation of [cosmic-ray] shower intensity and mesotron disintegration over a period. J. BARNÓTHY and M. FORRÓ (Z. Physik, 1939, **112**,

208—214).—Observations of shower intensity together with barometer, temp., and magnetic effects during one year are examined. Differences between barometer and temp. effects on the vertical and shower intensities are explained on the basis of mesotron decomp. H. C. G.

Are there multiple charged primary particles in cosmic radiation ? M. S. VALLARTA (Physical Rev., 1939, [ii], **55**, 583).—The explanation of the latitude effect for large cosmic-ray bursts as reported by Jesse (cf. A., 1939, I, 236) gives rise to the possibility that the primary particles responsible for the effect may carry a multiple of the electron charge and have large mass. Other explanations are briefly discussed. N. M. B.

Hard component of cosmic radiation. A. BRAMLEY (Physical Rev., 1937, [ii], **52**, 248).—The abnormally low radiation losses of the penetrating particle responsible for this component are discussed. L. S. T.

Frequency of cosmic-ray showers produced in different metals. J. C. STEARNS and D. K. FROMAN (Physical Rev., 1937, [ii], **52**, 254—255).— The frequency of shower production in Pb, Sn, Cu, Fe, Zn, and Al has been determined. The no. of showers per atom is approx. ∝ (at. no.)^2 L. S. T.

Effects of time and meteorological factors on the intensities of cosmic-ray primaries and showers. D. K. FROMAN and J. C. STEARNS (Physical Rev., 1937, [ii], **52**, 255).—The hourly counting rate of a set of triple-coincidence Geiger–Müller counters has been observed for ~3000 hr. in counting ~190,000 showers from Pb, and for ~1500 hr. in counting ~160,000 vertical primary rays. An equation connecting counting rate with local time, atm. pressure, temp., humidity, and the earth's magnetic field is given. L. S. T.

Asymptotic orbits of primary cosmic rays. A. BAÑOS, jun. (Physical Rev., 1939, [ii], **55**, 621—623).—A comparison of results with those of Lemaître (cf. A., 1936, 774). N. M. B.

Penumbra at geomagnetic latitude 20° and the energy spectrum of primary cosmic radiation. R. A. HUTNER (Physical Rev., 1939, [ii], **55**, 614—620).—The method previously described (cf. A., 1939, I, 175) for obtaining the penumbra is applied to various energies. Variation of the penumbra with energy and the relation of intensity to energy distribution are examined. N. M. B.

Shallow tracks [produced] by cosmic rays. A. SHDANOV (Compt. rend. Acad. Sci. U.R.S.S., 22, 163—165).—At. disintegrations produced by cosmic rays have been studied by the photographic technique previously employed (A., 1939, I, 236). By measuring the lengths of the proton tracks and the curvature of the mesotron tracks the momenta of the various particles have been determined and the conservation of momentum established for a no. of collisions. It is suggested that in addition to Bohr's liquid drop theory of nuclear disintegration other processes play a part in the interaction of cosmic rays and matter. T. H. G.

Stopping power of hydrogen at very low energies. F. T. ROGERS, jun. (Physical Rev., 1939, [ii], **55**, 588).—From a cloud-chamber experiment on the binding energy of the deuteron (cf. A., 1939, I, 176) the calc. val. for the stopping power of H_2 for protons of energies $\leqslant 0.22$ Me.v. is ~ 0.35 (air $= 1$).   N. M. B.

Ionising radiation emitted by ordinary metals. J. A. REBOUL (Ann. Physique, 1939, [xi], **11**, 353—458).—The ionisation of a gas in a closed vessel is not due to a sp. radioactivity of the metal of the walls of the vessel, but is due partly to cosmic rays, and partly to a characteristic radiation of the metal, comprising one or two bands, emitted under the influence of cosmic rays. The radiation emitted by common metals has been investigated, and shown to consist of waves of λ comparable with that of soft X-rays, and possibly of positive and negative particles emitted from the surface with low velocities. The effect of the radiation on the photographic plate has also been investigated. The assumption that the effect is due to the formation of H_2O_2 at a metallic surface in contact with damp air does not explain all the facts, particularly the effects observed in atm. of H_2, N_2, and CO_2 and in vac. The formation of H_2O_2 may, however, play a subsidiary part in certain cases, and H_2O_2 may be produced by the radiation itself.
                    A. J. M.

Scattering of radiation by the magnetic electron. W. FRANZ (Ann. Physik, 1938, [v], **33**, 689—707).—Mathematical. The formula of Klein and Nishina (cf. A., 1929, 373) is generalised to include scattering by electrons of any spin before or after the scattering process. For magnetised Fe the influence of the direction of magnetisation on the intensity of twice scattered X- or γ-rays should be detectable by experiment.   O. D. S.

Physical possibilities of stellar evolution. G. GAMOW (Physical Rev., 1939, [ii], **55**, 718—725).—The evolution of gaseous bodies, caused by physical processes in their interior and serving as energy sources, is considered with reference to observed states of stars.   N. M. B.

(A) E Region of the ionosphere, (B) during the total solar eclipse of 1 Oct., 1940. E. O. HULBURT (Physical Rev., 1939, [ii], **55**, 639—645, 646—647).—(A) Observations for the years 1930—1938 of the diurnal variation of the max.-with-height val. of the equiv. electron density agree closely with the theory that, in daylight, the ionisation is caused by solar radiation absorbed exponentially in a relatively quiet terrestrial atm.

(B) Data for a suggested exact test of the theory are examined.   N. M. B.

Advances in nuclear physics as a result of progress in apparatus and methods. J. MATTAUCH (Naturwiss., 1939, **27**, 185—195, 201—205).—A review dealing with the development of the knowledge of the structure of the nucleus with particular reference to the apparatus employed.   A. J. M.

Deviation of light atomic nuclei from the Hartree oscillator model. S. WATANABE (Z.

Physik, 1939, **112**, 159—198).—Various deviations and their causes are examined mathematically.
                    H. C. G.

Conception of surface tension in nuclear physics. J. SOLOMON (Compt. rend., 1939, **208**, 896—898).—Theoretical.   J. W. S.

Atomic nuclei. G. P. HARNWELL (J. Franklin Inst., 1939, **227**, 443—459).—A review.   A. J. M.

Structure of nuclei. F. J. WISNIEWSKI (Acta Phys. Polon., 1939, **7**, 207—213).—Theoretical calculations of mass defects of H, He, Li, and Be nuclei.
                    J. A. K.

Binding energy of the ^{16}N nucleus. B. RADZINSKI (Acta Phys. Polon., 1939, **7**, 231—239).—Theoretical. The calc. binding energy is within 3.5% of the experimental val.   J. A. K.

Analysis of nuclear binding energies. W. H. BARKAS (Physical Rev., 1939, [ii], **55**, 691—698).—An analysis of the fine structure of the mass defect curve with special reference to the nuclear symmetry character leads to satisfactory empirical curves for functions in Wigner's theory (cf. A., 1937, I, 440). Deductions on nuclear shells and binding energies of known and unknown unstable nuclei are made, and computed and observed vals. of ~ 150 at. masses are tabulated.   N. M. B.

Binding energies of light nuclei. W. A. TYRRELL, jun., K. G. CARROLL, and H. MARGENAU (Physical Rev., 1939, [ii], **55**, 790).—On the basis of a method of calculation previously given (cf. A., 1939, I, 6) upper bounds to the second-order perturbation energy for ^5He, ^6He, ^6Li, and ^7Li are obtained and divergences from Hartree approximation results are discussed.   N. M. B.

Mass of the mesotron and of other elementary particles. A. PROCA and S. GOUDSMIT (Compt. rend., 1939, **208**, 884—887).—The relationship between the observed mass of a particle at rest and its material mass, spin, and charge distinguishes between elementary particles with and without material mass. Application of the relation indicates that the mass of the mesotron is ~ 100 times that of the electron.
                    J. W. S.

Electric quadrupole moment of the deuteron. R. F. CHRISTY and S. KUSAKA (Physical Rev., 1939, [ii], **55**, 665).—Mathematical. The val. assumed by Kellogg (cf. A., 1939, I, 176) is corr. on the basis of theoretical spin–orbit interaction considerations.
                    N. M. B.

Molecular beam resonance method for measuring nuclear magnetic moments. Magnetic moments of ^6_3Li, ^7_3Li, and $^{19}_9F$. I. I. RABI, S. MILLMAN, P. KUSCH, and J. R. ZACHARIAS (Physical Rev., 1939, [ii], **55**, 526—535; cf. A., 1938, I, 172, 293).—A detailed account of a new method previously reported. Vals. found for ^7Li, ^6Li, and ^{19}F are 3.250, 0.820, and 2.622 nuclear magnetons, respectively.
                    N. M. B.

Determination of the signs of nuclear magnetic moments by the molecular beam method of magnetic resonance. S. MILLMAN (Physical Rev., 1939, [ii], **55**, 628—630; cf. preceding abstract).—It is shown that the method determines the sign of a

nuclear moment even though an oscillating perturbing field is substituted for the rotating field required by theory. The sign is obtained from an asymmetry in the resonance curve introduced by the end effects of the oscillating field. The signs for ^{6}Li, ^{7}Li, and ^{19}F were found to be positive, in agreement with known results.   N. M. B.

Nuclear magnetic moment of beryllium. P. KUSCH, S. MILLMAN, and I. I. RABI (Physical Rev., 1939, [ii], **55**, 666—667).—From experiments on NaF,BeF$_2$ and KF,BeF$_2$, using the mol. beam magnetic resonance method, the val. of g, the ratio of the magnetic moment to the angular momentum of a nucleus, is 0.783 ± 0.003 for $^9_4$Be, referred to that of ^{7}Li ($g = 2.167$). The sign of the moment is found to be negative (cf. preceding abstract). In the absence of any reliable val. for the spin no definite val. can be ascribed to the moment of the nucleus, and possible vals. are discussed. The most probable spin is 3/2, giving -1.175 nuclear magnetons for the moment.   N. M. B.

Magnetic moment in ferromagnetic alloys. I. Activation and the elementary moment. R. FORRER (J. Phys. Radium, 1939, [vii], **10**, 181—187). —A detailed account of work already noted (cf. A., 1939, I, 70, 131).   W. R. A.

Self-consistent field for doubly ionised chromium. R. L. MOONEY (Physical Rev., 1939, [ii], **55**, 557—560).—Full calc. data for Cr III in the configuration $(3p)^6(3d)^4$ are tabulated.   N. M. B.

Spectroscopic and free electron values of e/m. J. A. BEARDEN (Physical Rev., 1939, [ii], **55**, 584).— Contrary to the classification of Birge (cf. A., 1939, I, 56), the X-ray refraction measurement (cf. *ibid.*, 6) is in reality a free electron result, and a consequent regrouping of the two sets of vals. reveals the original discrepancy of results as obtained by the two methods. The average val. recommended for calculations, with probable error sufficient to include both sets of results, is $(1.7591 \pm 0.0008) \times 10^7$ abs. e.m.u.   N. M. B.

Binary method for the determination of the constants of radiation. B. ALEXANDROV and A. COURTENER (Tech. Phys. U.S.S.R., 1938, 5, 437— 446).—All previous methods for the determination of radiation consts. have involved knowledge of the temp. of the surface of the radiating body. In a new method proposed, two receivers at different temp. are directed towards the same object. By solving the equations for the exchange of radiant energy between each receiver and the radiator the temp. of the latter can be eliminated.   T. H. G.

The electron in the radiation field. O. SCHERZER (Ann. Physik, 1939, [v], **34**, 585—602).— Mathematical.   O. D. S.

Temperature equilibrium and temperature measurement in flames. H. WOLFHARD (Z. Physik, 1939, **112**, 107—128).—Mol. conditions in hydrocarbon flames were investigated by spectrographic emission and absorption methods. The rotation of C$_2$ mols in a welding flame shows a Maxwell distribution and indicates a max. temp. of 5180° K. OH absorption bands are very strong and may be used to determine flame temp. Perturbation of the OH

mol. in flames and excitation states of the C$_2$ mol. are discussed.   H. C. G.

NH bands in the night sky spectrum. J. KAPLAN (Physical Rev., 1939, [ii], **55**, 583).—The λ 3360 band in the afterglow spectrum of N$_2$ is identified as due to NH. It is proposed to identify the λ 3374 and λ 3361 bands in the night sky spectrum as the two Q branches of the (0, 0) and (1, 1) bands of NH at λ 3360 and λ 3370. There is evidence of direct combination of at. N and H in the high-pressure afterglow, and of the existence of at. N in the upper atm.   N. M. B.

Band spectrum attributed to NBr. A. ELLIOTT (Proc. Roy. Soc., 1939, **A**, **169**, 469—475).—The spectrum of the afterglow of N containing Br vapour was photographed in the range 6500 to 5400 A. The vibrational structure of the observed band system is analysed and it is concluded that the bands are emitted by the mol. NBr.   G. D. P.

Possible presence of cyanogen bands in spectra of red aurora of type B. R. BERNARD (Compt. rend., 1939, **208**, 1165—1167; cf. A., 1939, I, 229).— The spectrum of a mixture of N$_2$ and C, produced by electronic bombardment, contains bands due to CN superimposed on those of N$_2$. This spectrum is very similar to auroral spectra of type B and it is concluded that it is the presence of CN mols. in the atm. which gives rise to this type of auroral spectrum.   W. R. A.

New ultra-violet band system of silver iodide. N. METROPOLIS (Physical Rev., 1939, [ii], **55**, 636— 638; cf. Brice, A., 1931, 1211; Mulliken, A., 1937, I, 223).—A new system in the region 2100—2500 A. was photographed in absorption at 700—900°. At higher temp. the system is overlapped by strong continuous absorption advancing from shorter λλ. The bands degrade to the red and form sequences; the most intense bands are near 2230 A. An additional new system at 2150 A. was found, and expressions for band heads of the two systems are given.   N. M. B.

Spectra produced by electric discharges in carbon monoxide. A. CICCONE (Nuovo Cim., 1938, **15**, 532—540).—The conditions under which the Ångström, Swan, and high-pressure bands (cf. A., 1929, 964) appear in the spectrum of a discharge tube containing pure CO are described. With a very pure gas the high-pressure bands can be obtained alone. They are probably due to the CO mol.   O. J. W.

Absorption spectra of carbon dioxide and carbon oxysulphide in the vacuum ultra-violet. W. C. PRICE and D. M. SIMPSON (Proc. Roy. Soc., 1939, **A**, **169**, 501—512).—In the case of CO$_2$ the electronic series converging to the lowest $^2\Pi g$ state of CO$_2^+$ have been identified and the ionisation potential is found to be 13.73 v. Certain weaker bands not of the Rydberg type were observed. The spectrum of COS is intermediate between those of CO$_2$ and CS$_2$, the differences being attributable to the lack of symmetry of the mol.   G. D. P.

Coupling of vibrations with electronic levels in rare-earth compounds. J. P. HOWE and W. S. HERBERT (J. Chem. Physics, 1939, **7**, 277—278).—The absorption spectra of the solid anhyd. and hydrated

acetylacetonates of Pr and Nd have been observed in the near infra-red and visible at 78°, 120°, 193°, and 298° K. Plates taken at 120° K. showed progressions of weak diffuse bands separated by approx. const. intervals of 82 cm.$^{-1}$ (Pr) and 103 cm.$^{-1}$ (Nd) which are interpreted as vibrational vv. Application of the Franck–Condon principle explains the intensity of the bands.   W. R. A.

Absorption band of formaldoxime at 9572 A. L. R. ZUMWALT and R. M. BADGER (J. Chem. Physics, 1939, **7**, 235—237).—CH_2:N·OH in the vapour state at 100° is monomeric and gives a single O–H band at 9572 A. (10,444·1 cm.$^{-1}$) with a structure seemingly that of a symmetrical rotator and a P–R branch separation of 31·0 cm.$^{-1}$ J vals. have been assigned to the lines and the probable vals. of two nearly equal moments of inertia have been computed. The structure of CH_2:N·OH is discussed and, from the data available, it is concluded that it is most probably planar.   W. R. A.

Uric acid and cyanuric acid. The carbamyl group.—See A., 1939, II, 286.

Absorption of ultra-violet light by some organic substances. XLVIII. J. CHOLEWIŃSKI and L. MARCHLEWSKI. **XLIX.** [Sorbose.] L. **Some azines.** W. BEDNARCZYK and L. MARCHLEWSKI (Bull. Acad. Polonaise, 1938, **A**, 519—523, 524—528, 529—540).—XLVIII. Data for indigotin in $CHCl_3$ and for indirubin in EtOH and in $CHCl_3$ are recorded.

XLIX. Sorbose has an absorption max. at 2780—2800 A. similar to that of fructose (A., 1938, I, 59). Glucosone has also been examined.

L. On heating a solution of alloxazine (I) with an equiv. amount of o-$C_6H_4(NH_2)_2$,2HCl and a large excess of NaOAc a *ureide* (II), m.p. 238—239°, is formed. Neutral and acid solutions of (I) give almost identical spectra and presumably (I) has the same (probably heterocyclic) structure in both media. Absorption curves are also given for (II) in neutral and in alkaline solutions, (I) in alkaline solution, indophenazine in EtOH, and o-aminophenylhydroxyquinoxaline in EtOH.   W. R. A.

Influence of temperature on ultra-violet absorption of benzene. M. AUBERT and T. D. GHEORGHIU (Ann. Off. nat. Combust. liq., 1938, **13**, 473—499).—Absorption spectra from 2380 to 2680 A. obtained at 23°, 120°, 200°, 300°, and 400° confirm the work of Henri and Cartwright (A., 1935, 805). The mechanism of predissociation is discussed.
    R. B. C.

Absorption spectra and constitution of benzene derivatives. V. 3-Hydroxy- and 3 : 5-dihydroxy-benzaldehyde. N. A. VALJASCHKO and M. M. SCHTSCHERBAK (J. Gen. Chem. Russ., 1938, **8**, 1399—1427).—The absorption spectra of m-OH·C_6H_4·CHO and 3 : 5-$(OH)_2C_6H_3$·CHO in EtOH, EtOH–NaOEt, and EtOH–HCl are compared with those of PhCHO, PhOH, and m-$C_6H_4(OH)_2$. The results agree with those expected on the basis of the theory of quantum resonance.   R. T.

Analysis of the near ultra-violet electronic transition of benzene. H. SPONER, G. NORDHEIM, A. L. SKLAR, and E. TELLER (J. Chem. Physics, 1939, **7**, 207—220).—Using data from various sources the absorption spectrum of gaseous C_6H_6 from 2200 to 2800 A. has been analysed. The vibrational structure agrees with selection rules for a forbidden transition ($^1A_{1g} \rightarrow {}^1B_{2u}$) rendered possible when E_g^+ vibrations distort the mol. This view is substantiated by comparison with the absorption spectra of solid C_6H_6, of C_6D_6, and with the fluorescence spectra of C_6H_6 and C_6D_6.   W. R. A.

Spectrographic study of the action of alkalis on resorcinol. I—III.—See A., 1939, II, 259.

Structure and absorption spectra of hydroxytriphenylmethane dyes. Isomeric forms of hydroxyfuchsones.—See A., 1939, II, 260.

Effect of temperature and coupling on the intensity of infra-red harmonics. F. MATOSSI (Physikal. Z., 1939, **40**, 323—331).—Deviations from the normal behaviour of the intensity of infra-red harmonics in the spectra of silicates are ascribed to the effect of coupling with neighbouring oscillators. The dispersion theory of anharmonic linear coupled oscillators taking damping into account is developed. It is shown that coupling should exert a marked effect on the intensities of harmonics, the effect being dependent on the degree of coupling. An anomalous decrease in intensity of the first harmonic should occur where the oscillators have common atoms, as in the silicates. The two components of the first harmonic produced by coupling have different intensities. The absorption coeff. k usually increases with temp. in the neighbourhood of the first harmonic. At a frequency near the absorption max. k is independent of temp. From the displacement of the max. of k with temp. the const. of the anharmonic binding is calc. This is confirmed by experiments with BaO.
    A. J. M.

Perpendicular vibrations of the ammonia molecule. E. F. BARKER (Physical Rev., 1939, [ii], **55**, 657—662).—Absorption patterns of the 2, 3, and 6 μ. bands are examined. The vibration frequency ν_2 is identified by means of the combination bands $\nu_2 \pm \nu_3$ at 2·2 and 4 μ., and the numerical val. of ν_2 is fixed at 3415 cm.$^{-1}$ The fundamental band is recognised in the weak complex background of the absorption at 3 μ. The second perpendicular fundamental band at 6 μ. is partly resolved; the indicated val. of ν_4 is 1628 cm.$^{-1}$ The parallel component of $2\nu_4$ is found at 3220 cm.$^{-1}$, and two pairs of parallel combination bands $\nu_1 + \nu_3$ at 4270 and 4303 cm.$^{-1}$ and $2\nu_4 + \nu_3$ at 4177 and 4217 cm.$^{-1}$ N. M. B.

Infra-red and Raman spectra of polyatomic molecules. VI. Triborine triamine. B. L. CRAWFORD, jun., and J. T. EDSALL (J. Chem. Physics, 1939, **7**, 223—232).—Liquid $B_3N_3H_6$ (0·3 c.c. used) exhibits 14 Raman displacements, of which four are polarised. The infra-red spectrum (2·5—24·5 μ.) of the vapour consists of 19 bands. The mol. symmetry D_{3h} has been assigned and the mol. should therefore have 20 distinct internal vibrations (10 doubly degenerate), of which 14 are planar and 6 involve vibrations perpendicular to the plane. Of the 20, 14 should be Raman-active, 10 infra-red-active (7 com-

mon with Raman active), and 3 inactive in both spectra. $B_3N_3H_6$ is iso-electronic with C_6H_6; similarities between the symmetry classes of their normal vibrations are illustrated. A normal co-ordinate treatment has been carried out to determine the force consts., to assist in the assignment of fundamentals, and to permit calculation of the three inactive vv. Ascertained vv are assigned and compared with those of C_6H_6. From the comparison the assignment of the frequencies of C_6H_6 made by Lord and Andrews (A., 1939, I, 175) is preferred to that made earlier (A., 1936, 1322). A Raman displacement of 938 cm.$^{-1}$ has high-frequency satellites attributable to mols. containing ^{10}B; the magnitude of isotopic shifts has been calc. From the assignments made, thermodynamic properties of $B_3N_3H_6$ from 298·1° to 1000° K. have been calc. and, combined with v.p. data, yield $S_{298}^\circ (l) = 51·0$, $S_{326}^\circ (l) = 53·4$ (b.p., 326° K.), $[(F° - E_0°)/T]_{298} (l) = -62·5$ g.-cal./mol./degree.

                                W. R. A.

New Coriolis perturbation in the methane spectrum. III. Intensities and optical spectrum. W. H. J. CHILDS and H. A. JAHN (Proc. Roy. Soc., 1939, A, 169, 451—463; cf. A., 1939, I, 119).—The explanation of the fine structure of the infra-red absorption band of CH_4 at 1306 cm.$^{-1}$, in terms of a tetrahedral mol., is completed. The theoretical spectrum agrees well with observation. The structural complexity of the overtone band at 9047 cm.$^{-1}$ is explained.   G. D. P.

Vibrational assignments in ethane. E. F. BARKER (J. Chem. Physics, 1939, 7, 277).—For H bond deformation frequencies an assignment alternative to that given by Crawford et al. (A., 1939, I, 8) is proposed.   W. R. A.

Infra-red absorption spectra and approximate force constants of propene and allene. L. G. BONNER and R. HOFSTADTER (Physical Rev., 1937, [ii], 52, 249).—Under pressure conditions ranging from 35—700 mm. gaseous C_3H_6 shows bands at 6211, 4386, 3021, 2309, 2008, 1815, 1634, 1435, 1183, 984, and 906 cm.$^{-1}$, and allene at 6289, 4525, 3086, 2392, 1961, 1678, 1381, 1143, 1033, and 840 cm.$^{-1}$ Approx. force consts. calc. for C:C are 10·0 and 9·54 × 10^5 dynes per cm. from C_3H_6 and allene, respectively. For propene, the C·C force const. is 3·8 × 10^5 dynes per cm.   L. S. T.

Infra-red and Raman spectra of molecules. A. CICCONE (Nuovo Cim., 1938, 15, 482—521).— A comprehensive review of the theory of infra-red and Raman spectra and of their application in investigating the structure of di- and poly-at. mols.   O. J. W.

Infra-red absorption spectra of high mol. wt. hydrocarbons and of some heterocyclic compounds. P. LAMBERT and J. LECOMTE (Compt. rend., 1939, 208, 1148—1150).—The infra-red absorption spectra (525—1400 cm.$^{-1}$) of two groups of related compounds, obtained in CS_2 solution, in thin solid layers, or in powder form, have been compared : (a) indene (I), indole, coumarone, thionaphthen (II), and hydrindene ; (b) anthracene (III), 2-methylanthracene (IV), 2 : 3-benzanthracene (V), acridine (VI), xanthine (VII), and thiodiphenylamine (VIII).

The majority of the bands do not undergo displacement on passing from (I) to (II) ; a notable exception is the strong 714 cm.$^{-1}$ band of (I) which is displaced to 562 cm.$^{-1}$ Owing to the presence of polymerisation products (II) shows many more bands than the others. For all the mols. in (a) the infra-red max. correspond generally with weak Raman displacements and vice versa. (III) and (V) have D_{2h} symmetry ; this explains the correspondence of the lines observed in their spectra. (IV), however, which has a plane of symmetry, also exhibits this correspondence. (VI), (VII), and (VIII) have symmetry C_{2v}, and their absorption spectra therefore show max. corresponding with this symmetry as well as those of (III) to which they are chemically related.   W. R. A.

Absorption spectra of fats in the infra-red region. V. G. VAFIADI (J. Gen. Chem. Russ., 1938, 8, 1447—1453).—A no. of fats (natural and hardened) were studied, for λλ 1—9 μ. The results suggest that the no. of OH groups falls during polymerisation, but rises during oxidation.   R. T.

Fine structure of residual rays. M. BLACKMAN (Z. Physik, 1939, 112, 256; cf. A., 1934, 3).—A correction.   L. G. G.

Raman effect in relation to crystal structure. S. BHAGAVANTAM and T. VENKATARAYUDU (Proc. Indian Acad. Sci., 1939, 9, A, 224—258).—A theory of normal oscillations of crystal lattices is developed and appropriate selection rules for Raman and infrared spectra are given. The theory is applied to typical cubic (diamond, rock-salt) and trigonal crystals (calcite, $NaNO_3$, corundum) and, for comparison, aragonite and KNO_3. In crystals of low symmetry (e.g., gypsum and anhydrite) splitting of degenerate modes occurs. Comparison of the Raman spectra of free mols. and the corresponding crystals of Hg_2Cl_2 is made. The directional excitation of Raman effect in calcite and $NaNO_3$ is discussed. The low-frequency " wings " observed with solid org. substances are lattice oscillations, either translational or rotational, and can be explained without postulating any special mechanism.   W. R. A.

Raman effect and the potential function of the ethylene molecule. M. DE HEMPTINNE and C. MANNEBACK (Proc. Indian Acad. Sci., 1939, 9, A, 286—302).—A review of existing theories and experimental data, and an extension in which account is taken of interaction terms in the potential function and of anharmonicity. The spectra of the various isotopic analogues are discussed.   W. R. A.

Measurements of intensity of some Raman lines. M. KOWALEWSKI (Acta Phys. Polon., 1939, 7, 279—284).—The relative intensities of Raman lines from CS_2, CCl_4, $CHCl_3$, CH_2Cl_2, and C_2Cl_4 have been measured by a microphotometer method. There is no simple relation between the intensity and the nature of the vibrations concerned ; some of the results are not in agreement with those predicted from empirical rules.   J. A. K.

Raman effect in difluorochloromethane. G. GLOCKLER and J. H. BACHMANN (Physical Rev., 1939, [ii], 55, 669).—Data for 13 Raman shifts at $-55°$ are reported.   N. M. B.

Raman effect of fluorotrichloromethane. G. GLOCKLER and G. R. LEADER (J. Chem. Physics, 1939, **7**, 278—279).—At $\sim 0°$ $CFCl_3$, when excited by eight concentric Ne–Hg lamps, exhibits Raman displacements of 243·7, 349·5, 397·5, 535·3, 833·2, and 1067·2 cm.$^{-1}$ W. R. A.

[Raman] spectra of β-tetralone and β-indanone. D. BIQUARD (Compt. rend., 1939, **208**, 1096—1098; cf. A., 1938, I, 435).—The Raman line characteristic of $C\cdotO$ is feebler than in the α-isomerides, due to the CH_2 which separates the aromatic ring from CO. The absorption spectra are found nearer the ultra-violet in the β- than in the α-compounds.
J. L. D.

Raman effect of certain cyclanones. M. GODCHOT and (MLLE.) G. CAUQUIL (Compt. rend., 1939, **208**, 1065—1067).—The Raman spectra of *cyclo*heptanone, 4-methyl- and 2-ethyl-*cyclo*heptanones, *cyclo*octanone and methyl*cyclo*octanone, acetyl*cyclo*hexane, and 5-acetyldimethyl*cyclo*hexanes are recorded and discussed.   W. R. A.

Luminescence of water when subjected to ultrasonic vibrations. I. G. POLOTZKI (J. Gen. Chem. Russ., 1938, **8**, 1691—1695).—Exposure to ultrasonic vibrations of H_2O saturated at 1 atm. with air, N_2, or O_2, but not with H_2 or CO_2, or at pressures of 10 or 1140 mm., caused luminescence, of which about half was in the ultra-violet region. In the case of air, the H_2O contained finally HNO_2 0·166, HNO_3 0·159, and H_2O_2 0·151 mg.-%.   R. T.

Influence of an electric field on the shape of emission bands in electro-photo-luminescence. G. DESTRIAU and LOUDETTE (Compt. rend., 1939, **208**, 891—893).—The intensity (I) of the photo-luminescence excited by an electric field is related to the effective applied sinusoidal potential (V) by $I = Ae^{-B/V}$. The coeff. A is const. but B varies with λ. For ZnS–Mn and ZnS–CdS phosphors emission becomes stronger at short $\lambda\lambda$, the corresponding bands becoming deformed and displaced towards shorter λ, whilst for ZnS–Cu phosphors the reverse holds.
J. W. S.

Spectral variation of the photosensitivity of visual purple. E. E. SCHNEIDER, C. F. GOODEVE, and R. J. LYTHGOE (Proc. Roy. Soc., 1939, **A**, **170**, 102—112).—The bleaching of visual purple was studied in the range 4200—5600 A. It is concluded that the quantum efficiency, *i.e.*, the no. of chromophoric groupings decomposed per quantum absorbed, is approx. unity. The bearing of the results on the relation between visual purple and scotopic vision is discussed.   G. D. P.

Fluorescence of compounds containing manganese. J. T. RANDALL (Proc. Roy. Soc., 1939, **A**, **170**, 272—293).—A large no. of compounds has been investigated at temp. between 90° and 20° K. The fluorescence spectrum was recorded by a quartz spectrograph, both ultra-violet light and cathode rays being used to excite fluorescence. In the pure Mn halides the red fluorescence is a property of all Mn atoms in the crystals. Four classes of solids containing Mn as impurity are recognised.   G. D. P.

Luminescence and absorption of ZnS–MnS mixed crystals. F. A. KRÖGER (Physica, 1939, **6**, 369—379).—Measurements of absorption and emission of ZnS crystals containing 0·1—50% MnS, illuminated in the visible and near ultra-violet, have been made at room temp., −180°, and −253°. An absorption band system practically identical with that of pink MnS is found at all compositions, together with two band systems identical with those of pure ZnS. Illumination in the latter regions gives both phosphorescence and fluorescence, in the former only fluorescence. All emission observed is in two bands, with maxima 5850 and ~ 6200 A., ascribed to two electronic transitions in Mn^{++}. The effects of temp. and activator concn. on emission intensity are recorded.   L. J. J.

Chemiluminescence of organic compounds. H. H. HATT (J. Proc. Austral. Chem. Inst., 1939, **6**, 88—101).—A lecture.

Chemiluminescence of dimethyldiacridylium nitrate. B. TAMAMUSHI and H. AKIYAMA (Trans. Faraday Soc., 1939, **35**, 491—494).—The luminescence of dimethyldiacridylium nitrate (I) in alkaline solution increases rapidly with rise of temp., but is extinguished in absence of O_2. The luminescence is connected with a reduction reaction, since it appears strongly on addition of a reducing agent, provided that the solution has first undergone oxidation. The fact that OsO_4 and PbO_2 intensify the luminescence occurring when (I) is oxidised by H_2O_2 is attributed to reaction with H_2O_2 and consequent rise of temp. It is suggested that at higher temp. a free radical is formed and undergoes oxidation by mol. O_2 to an unstable peroxide. The reduction of this peroxide to (I) by H_2O_2 or other reducing agent is attended by the luminescence.   J. W. S.

Phosphorescence, self-extinction, and sensitising action of organic substances. H. KAUTSKY and H. MERKEL (Naturwiss., 1939, **27**, 195—196).—Org. substances capable of fluorescence may also be made to phosphoresce under certain conditions of interaction between excited and unexcited mols. (collision, association). Examples of various systems which illustrate this are given. In systems of high fluorescence efficiency, the org. substance is predominantly in the unimol. state. Increase of pressure, or adsorption, gives increased phosphorescence in these systems, since it increases the frequency of collision and association. In systems which fluoresce only slightly the mols. are usually associated in dil. solution. Increase in concn. usually diminishes the phosphorescence so that a small degree of association seems to favour phosphorescence. At low temp. the phosphorescence is of longer λ than the fluorescence. At room temp. the two may become the same if the energy difference between the two types of emission can be accounted for by thermal collision. In this case phosphorescence can be converted into fluorescence by slight warming. The sudden change of long-λ phosphorescence into short-λ fluorescence may be brought about by the rapid addition of O_2 to an evacuated phosphorescing adsorbate. The formation of fluorescing products by photochemical reaction, and sensitisation, are considered.   A. J. M.

Quantitative treatment of photo-electric primary and secondary currents. R. HILSCH and R. W. POHL (Z. Physik, 1939, **112**, 252—255).— Corrections are applied to previous work (A., 1938, I, 120).   H. C. G.

Variation of the electrochemical potential in the cuprous oxide rectifier. E. LANGE (Physikal. Z., 1939, **40**, 230—232).—The change in the electro-chemical potential in a Cu_2O rectifying film with electron defect is considered.   A. J. M.

Volta contact e.m.f. J. NICOL (Proc. Physical Soc., 1939, **51**, 550).—A single Au leaf is suspended from an insulated rod and cap so as to hang exactly mid-way between the upturned ends of Cu and Zn strips connected externally. On approaching an ebonite/fur rod to the cap the leaf moves towards the Zn; a glass/silk rod causes movement towards the Cu.   N. M. B.

Theory of [electrical] breakdown. W. ROGOW-SKI (Naturwiss., 1939, **27**, 302—303).—The relation-ships to be expected in a discharge when the produc-tion of back electrons is due to surface ionisation of positive ions (γ-effect), or to photo-electric action (ϵ-effect), or to a combination of the two, are discussed (cf. A., 1938, I, 108).   A. J. M.

Breakdown voltage in mercury vapour. B. KLARFELD and L. GUSJEVA (Tech. Phys. U.S.S.R., 1938, **5**, 425—430).—The ignition of a discharge between plane Ni electrodes in Hg vapour has been investigated for vals. of $p_0.d$ (i.e., v.p. reduced to $0°\times$ distance between plates) less than that corresponding with the min. ignition p.d. It has been found that at a crit. val. of p_0d the ignition p.d. suddenly becomes 10—15 times as large. The shape of the experimental breakdown curve is explained by the way in which the no. of electrons released from the cathode at the impact of each positive ion depends on the velocity of the latter.   T. H. G.

Effect of temperature on electric currents in paraffin. W. SCILOWSKI (Acta Phys. Polon., 1939, **7**, 214—230).—The electrical conductivity of paraffin has been studied from 17° to 45°. Measurements of current–time and current–potential and the effect of irradiation with γ- and X-rays are recorded. The results obtained are complicated by the existence simultaneously of two conduction processes, and by the fact that the initial and later currents are not affected in the same way by temp.   J. A. K.

Effect of molecular form on dielectric relax-ation. A. BUDÓ, E. FISCHER, and S. MIYAMOTO (Physikal. Z., 1939, **40**, 337—345).—The effect of the shape of the mol. and the position of its dipoles on the dielectric relaxation time has been investigated. The dielectric loss of dil. solutions of o-$C_6H_4Cl_2$, and 1 : 8- and 2 : 3-dichloroanthraquinone in C_6H_6 was deter-mined. The 2 : 3-derivative has a greater loss than the 1 : 8-derivative although it has a smaller moment. The dielectric loss varies linearly with concn. The above mols. are ellipsoidal and differ from each other in the direction of the moment with respect to the axis of the ellipsoid. The results agree with those obtained by calculation based on Perrin's theory. A short

derivation of the Perrin formula, corresponding with the Debye derivation for spherical mols., is given.   A. J. M.

Dielectric relaxation of molecules with dipole groups capable of free rotation. E. FISCHER and F. C. FRANK (Physikal. Z., 1939, **40**, 345—352).—The effect of the presence of freely rotatable polar groups on the magnitude of the dielectric relaxation time has been determined for p-xylylene dichloride and di-bromide and CH_2PhCl. Improved thermostatic methods were used. The relaxation times of the above mols. which contain groups capable of free rotation are $<$ those of mols. of approx. the same size with fixed dipoles (e.g., o- and p-$C_6H_4Cl_2$). The effect can be explained by the introduction of two viscosity factors, one covering the rotation of the whole mol., the other that of the rotating group. Experimental vals. of these factors agree well with the magnitudes of the mol. and polar groups.   A. J. M.

Dielectric constants of ammonium chloride and fluoride at the transition points. R. SCHUL-VAS-SOROKINA and V. JEVDOKIMOV (Tech. Phys. U.R.S.S., 1938, **5**, 473).—It is suggested that the trans-ition points of polymorphous salts due to changes of structure are associated with the radii of the elements. For the NH_4 halides they should be proportional only to the radii of the anions since the radius of the cation is const. This relationship was found to hold for NH_4I, NH_4Br, and NH_4Cl. Extrapolation indicates that NH_4F should have a transition point at −27°. This has been observed experimentally by investigat-ing the variation of ϵ with temp. using the high-frequency bridge method. At −30° ϵ_{NH_4Cl} increases sharply by 10% and at −27° that of NH_4F by 25%.   T. H. G.

Dielectric polarisation. W. HÜCKEL (Österr. Chem.-Ztg., 1939, **42**, 161—168).—A lecture.

Vapour-phase electric dipole moments of thionyl chloride, sulphuryl chloride, dimethyl sulphone, and thiophosgene. I. E. COOP and L. E. SUTTON (Trans. Faraday Soc., 1939, **35**, 505—511).—From measurements of the dielectric consts. of the vapours over wide temp. ranges the dipole moments (μ) of $SOCl_2$, SO_2Cl_2, Me_2SO_2, and $CSCl_2$ are found to be 1.44 ± 0.005, 1.795 ± 0.005, 4.44 ± 0.1, and 0.28 ± 0.02D., respectively. The at. polarisations of $SOCl_2$ and SO_2Cl_2 are 3—4 c.c. and 4.1—5.7 c.c., respectively, cor-responding with 13.5—20 and 19—27% of the electron polarisation, respectively. The higher vals. obtained from solution measurements (Smith, A., 1932, 1190) may be due to the small temp. range used. Com-parison of the vals. of μ for $SOCl_2$ and Me_2SO_2 provides no support for the view that $SOCl_2$ and SO_2Cl_2 are resonance hybrids similar to $COCl_2$. μ for $CSCl_2$ is $<$ for $COCl_2$. The reasons for this are discussed.   J. W. S.

Dipole moments of cis- and trans-azobenzenes and of some related compounds. G. S. HARTLEY and R. J. W. LE FÈVRE (J.C.S., 1939, 531—535).— Dielectric-polarisation data for cis- and trans-$(NPh)_2$, p-$(N\cdot C_6H_4Me)_2$ (I), and benzene- and toluene-azo-β-naphthol in C_6H_6 solution at 25° are recorded. The data for $(NPh)_2$ indicate that the equilibrium com-position in sunlight corresponds with 22% of cis- and

78% of *trans*-compound. The moment of (I) is ~ 0 but it increases under the influence of sunlight; the normal compound is, therefore, the *trans*-form. In the case of the two dyes no evidence of photochemical inversion has been obtained. C. R. H.

Dielectric polarisation data for the allegedly isomeric 4 : 4'-dihydroxyazobenzenes of Will-stätter and Benz. I. Dostrovsky and R. J. W. Le Fèvre (J.C.S., 1939, 535—537).—The moments of both forms in dioxan solution appear to be identical and of the order to be expected for the *trans*-modification. C. R. H.

Dipole moments, especially of anthraquinone derivatives, with reference to the inner molecular induction effect. E. Fischer and F. Rogowski (Physikal. Z., 1939, **40**, 331—337).—The dipole moments of 1- and 2-chloro- and 2 : 3- (I) and 1' : 8-dichloro-anthraquinone have been determined in dil. solution in C_6H_6, dioxan, and $COMe_2$. The vals. calc. by vector addition from the C–Cl moment of PhCl do not agree with the observed vals., but the deviations can be explained by the moment induced by a C·Cl linking attached to the C_6H_6 ring in the remainder of the mol. In (I) the C_6H_6 ring bearing the two Cl shows the same o-effect as in o-$C_6H_4Cl_2$. The dipole moments of anthraquinone, o-$C_6H_4Cl_2$, o-$C_6H_4Br_2$, p-xylylene dichloride and dibromide in C_6H_6 are also recorded. A. J. M.

Dipole moment and configuration of arseno-benzene. R. J. W. Le Fèvre and C. A. Parker (J.C.S., 1939, 677).—Arsenobenzene has a very small moment and consequently the mol. is symmetrical and, by analogy with stable $(NPh)_2$, is the *trans*-form. C. R. H.

Molecular volumes in crystallo-chemistry. I. I. Zaslavski (J. Gen. Chem. Russ., 1938, **8**, 1008—1021).—The distance d between the atoms of crystals is expressed by $d = k(v/n)^{\frac{1}{3}}$, where $k = 1.326$ for metals and inert gases, 0.9—1.2 for semi-metals (Si, Ge, As, Se, Sn, etc.), 0.3—0.9 for metalloids (H, N, O, P, S, Cl, etc.), and 1.045—1.290 for various cryst. types, v is the mol. or at. vol., and n is the no. of atoms in the mol. The crystal type of series of salts is a function of v, changing from one type to another when v exceeds a certain crit. val. Salts having a crit. val. of v tend to exhibit polymorphism. R. T.

Refractive index of methane in the infra-red. R. Rollefson and R. J. Havens (Physical Rev., 1937, [ii], **52**, 249).—The n of CH_4 has been measured from 1 to 15 μ. The variation of n in the neighbourhood of the 3.3 and 7.7 μ. bands shows the ratio of the intensities of these bands to be ~ 2.3. L. S. T.

Refraction and dispersion of liquid phosphorus. T. Piech and T. Nayder (Bull. Acad. Polonaise, 1939, A, 428—437).—Vals. from 44° to 65° and various $\lambda\lambda$ are recorded and discussed. For n_D the val. is given by $n = 2.11038 - 0.000790$. W. R. A.

Theory of optical activity. E. U. Condon, W. Altar, and H. Eyring (Physical Rev., 1937, [ii], **52**, 254).—A single electron moving quantum-mechanic-

ally in a field of suitable dissymmetry suffices to make a medium containing such mols. show optical activity. L. S. T.

Analysis of the rotatory dispersion of tartaric acid and a view on the origin of its optical activity. Optical activity and chemical structure in tartaric acid. VII. Y. Tsuzuki (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, **35**, 425—434).—The optical rotatory dispersions in the visible region of dicinnamoyl- (I), dibenzoyl- (II), and di(phenylacetyl)-tartaric anhydride (III) in dioxan have been measured and are shown to be simple; their dispersion ratios, α 4358/α 5461, and characteristic λ are respectively, 2.284, 1.845, 1.818 and 3253, 2545, 2447 A. Absorption spectra measurements in the ultra-violet show absorption max. at 2840 A. for (I) and 2700 A. for (II); the complete absorption band for (III) could not be measured, but the max. is estimated to be <2660 A. The results indicate that the positive partial rotation of tartaric acid and its derivatives is due to the contribution of the OH and the negative partial rotation to the CO_2H. D. F. R.

Optical rotatory powers of (+)-γ-methyl-*n*-heptane.—See A., 1939, II, 238.

Theory of the Cotton–Mouton effect in quantum mechanics. T. Neugebauer (Z. Physik, 1939, **112**, 257—277).—Theoretical. L. G. G.

Thermal variation of the magnetic birefringence of polar liquids. A. Piekara (Compt. rend., 1939, **208**, 1150—1152).—Theoretical (cf. *ibid.*, 990). W. R. A.

Structure of the so-called " alkali tetroxides." A. Helms and W. Klemm (Z. anorg. Chem., 1939, **241**, 97—106).—The results of Kassatotschkin and Kotov (A., 1936, 1054) on the crystal structure of K " tetroxide " have been confirmed, and the corresponding Rb and Cs compounds found to have also the CaC_2 structure. They are to be formulated KO_2, RbO_2, and CsO_2, and to be designated " dioxides." The lattice consts. are as follows : KO_2, a 5.70, c 6.75 A.; RbO_2, a 6.00, c 7.03 A.; CsO_2, a 6.28, c 7.24 A. They have $\rho = 2.15$, 3.06, and 3.80, respectively, and for RbO_2 and CsO_2 $10^6\chi = 42.2$ at $-183°$ and 13.0 at 20°, and 27.3 at $-183°$ and 9.3 at 20°, giving mol. moments ~ 1.9, in agreement with the val. for KO_2 (A., 1936, 148). The configurations, crystal radii, and mol. vols., of the O_2^{1-} and O_2^{2-} ions are compared. F. J. G.

Spatial configuration of platinous and palladous complexes. K. A. Jensen (Z. anorg. Chem., 1939, **241**, 115—133).—The principal evidence in favour of the non-planar configuration is the work of Reihlen *et al.* (A., 1931, 924, 1167; 1933, 74; 1935, 1132; 1936, 84); some of this has been repeated. The experimental result, that *bis*-(3-methyl-2-amino-methyl-4-ethylquinoline)-Pt^{II} bromocamphorsulphon-ate has a lower rotation than that calc. from its bromo-camphorsulphonate content, is confirmed, and it is shown that when the Pt^{II} complex is pptd. as picrate or platinichloride the rotation of the filtrate rises to the calc. val., but on the other hand a similar increase of the rotation to the calc. val. is brought about,

without pptn., by addition of anions which form stable Pt^{II} complexes. It follows that the low rotation of the bromocamphorsulphonate is to be explained by its containing complex-bound bromocamphorsulphon- ate ions, and not by optical acitvity of the complex Pt^{II} cation. The nature of the suggested bromocamphor- sulphonato-complex, and evidence for its presence, are discussed, and also the possibility of alternative interpretations of other results of Reihlen. It is concluded that there now remains no valid evidence in favour of the non-planar configuration for Pt^{II} and Pd^{II} complexes. F. J. G.

Determination of force fields from scattering in the classical theory. F. C. HOYT (Physical Rev., 1939, [ii], **55**, 664—665).—Mathematical.
N. M. B.

Quantum-mechanical calculation of the lattice energy of sodium chloride. R. LANDSHOFF (Physical Rev., 1937, [ii], **52**, 246).—Using a wave function in the form of a determinant of single-electron wave functions, the calc. lattice energy of the NaCl crystal is 182 kg.-cal. per mol., and the lattice distance 2·78 A. L. S. T.

Calculation of equilibrium internuclear dis- tances for diatomic hydrogen, hydrides, and deuterides in ground and excited states. C. H. D. CLARK and J. L. STOVES (Phil. Mag., 1939, [vii], **27**, 389—403).—Equilibrium internuclear distances of a no. of hydride di-atoms have been calc., using four previously suggested formulæ. The vals. are com- pared with each other and with experimental data. HH, HD, DD, and various deuterides have been treated by the same method and the influence of isotopes is discussed. W. R. A.

Calculation of the frequencies and " gauches " fundamental modes of vibration of molecules of deuterethylene, $C_2H_xD_y$ $(x + y = 4)$. E. BER- NARD and C. MANNEBACK (Ann. Soc. Sci. Bruxelles, 1939, [i], **59**, 113—124).—In previous calculations the " gauches " frequencies (i.e., those perpendicular to the plane of the mol.) have been neglected. These have now been calc. for C_2H_4, C_2D_4, C_2H_3D, C_2HD_3, and cis-, trans-, and as-$(CHD)_2$. W. R. A.

Calculation of the potential functions and fundamental frequencies of the molecules, $C_2H_xD_y$ $(x + y = 4)$. Y. L. TCHANG (Ann. Soc. Sci., Bruxelles, 1939, [i], **59**, 125).—Errata (cf. A., 1938, I, 299). W. R. A.

Theory of liquid structure. J. HIRSCHFELDER, D. STEVENSON, and H. EYRING (Physical Rev., 1937, [ii], **52**, 246). L. S. T.

Nature of foam. IV. Phase inversion and foaming of emulsions consisting of acetic acid, ethyl ether, and water. T. SASAKI (Bull. Chem. Soc. Japan, 1939, **14**, 63—72; cf. A., 1939, I, 141, 196).—The heterogeneous system $AcOH–Et_2O–H_2O$ is divided into three parts, oil-in-water region (i), water-in-oil region (ii), and phase inversion zone (iii). Frothing occurs in (ii) but not in (i). In (iii) either (i) or (ii) may be produced, according to the method of shaking. D. F. R.

Organic parachors. (II) Temperature and (III) constitutive variations of parachors of a series of tertiary alcohols. (MISS) K. OWEN, O. R. QUAYLE, and E. M. BEAVERS (J. Amer. Chem. Soc., 1939, **61**, 900—905; cf. A., 1939, I, 11).— γ and parachors are determined for 16 tert.-alcohols at 25°, 35°, 45°, 55°, and 65°. The parachors increase $\sim 0·2\%$ for each rise of 10°. Vals. are calc. for CH_2 substituted in each position of $CRR'R''·OH$; the vals. are more regular as the chain becomes longer, i.e., the constitutive effect is the greater, the nearer the alcohol is to $Bu^{\gamma}OH$. R. S. C.

Derivation of the formula for the total scatter- ing of X-rays from a general crystal. G. G. HARVEY (Physical Rev., 1937, [ii], **52**, 248).—A formula for the intensity of total scattering of X-rays in any direction has been derived for a general triclinic crystal having any no. of atoms in the unit cell. L. S. T.

Diffusion of X-rays by crystals and micro- crystalline materials. A. GUINIER (Compt. rend., 1939, **208**, 894—896).—The coeff. of diffusion has been measured for various angles ($\not> 45°$) after passage through diamond, graphite, Al, Cu, Ag, Ni, and Au. No discontinuities are detectable in the diffusion curve. Contrary to theory, diffusion increases near diffraction lines and does not become zero at very low diffusion angles. J. W. S.

Significance of crystal habit. J. D. H. DONNAY (Amer. Min., 1938, **23**, 168—169).—A discussion.
L. S. T.

Structure of polished metallic surfaces. S. DOBIŃSKI (Physikal. Z., 1939, **40**, 232—233).—A reply to Plessing (A., 1938, I, 503). The difference between the results of Dobiński (A., 1937, I, 227) and those of Plessing cannot be due to insufficient form- ation of the polished surface under C_6H_6. The reversi- bility of the process of oxidation of a metal, $M_x + O_y \rightleftharpoons M_xO_y$, is discussed. A. J. M.

Structure of polished metallic surfaces. E. PLESSING (Physikal. Z., 1939, **40**, 233—234).—A reply to Dobiński (preceding abstract). Further experiments uphold the previous conclusion that the difference in the X-ray diagrams of metals polished in air and below C_6H_6 is not due to oxidation.
A. J. M.

Crystal growth of sodium chloride on galena. M. C. F. BEUKERS (Rec. trav. chim., 1939, **58**, 435— 447).—The orientation of NaCl cryst. on a cleavage face of galena which had been treated in various ways, e.g., etched, polished, or roughened, has been ob- served microscopically and compared with electron diffraction patterns of the surface prior to crystall- isation. Good orientation of NaCl generally occurred on surfaces showing a definite diffraction pattern.
C. R. H.

Iron crystal orientation on magnetite reduced by hydrogen. N. BUINOV, M. JURAVLEVA, A. KOMAR, and G. TSCHUFAROV (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 27—28).—At 500° the (001) axes of the Fe_3O_4 and Fe crystals are parallel. The Fe orientation disappears on prolonged reduction.
L. J. J.

X-Ray study of lattice distortion in copper, nickel, and rhodium. G. W. BRINDLEY and P. RIDLEY (Proc. Physical Soc., 1939, **51**, 432—448; cf. A., 1938, I, 439).—The nature of lattice distortion in filed powders of Cu, Ni, and Rh, face-centred cubic metals, is investigated with reference to measurements of widths and intensities of X-ray reflexions. The effect of extinction on the reflected intensities is discussed in detail and from the magnitude of the extinction mean crystal sizes are estimated. Lattice distortion causes a decrease of reflected intensity, becoming more marked in the order Rh → Ni → Cu; the broadening of the reflexions increases in the reverse direction, which is that of increasing hardness. Results are discussed in relation to lattice distortion theories. It is shown that with distortions of a non-periodic type, changes of reflected intensity may occur as a result of irregular displacements of the atoms and a broadening may occur as a result of a change in the mean crystal parameter throughout an entire grain. Vals. of the lattice energies associated with these changes are calc. and compared with vals. obtained by direct methods; results indicate that the energy of a distorted metal resides mainly in the at. displacements rather than in macroscopic stresses extending over entire grains. N. M. B.

Crystal structures of metallic scandium. K. MEISEL (Naturwiss., 1939, **27**, 230).—Debye diagrams obtained with metallic Sc show the existence of both a cubic close-packed, and a hexagonal close-packed, lattice. The former has a 4·532±0·005 A., ρ 3·20± 0·01, at. vol. 14·1; the latter, a 3·30±0·01 A., c 5·23± 0·01 A., ρ 3·02±0·04, at. vol. 14·9. Sc fits in satisfactorily with its neighbours in the periodic system as regards cryst. structure. A. J. M.

Crystal structure of palladous chloride, PdCl$_2$. A. F. WELLS (Z. Krist., 1938, **100**, 189—194).—By X-ray analysis, the rhombic cell has a 3·81, b 3·34, c 11·0 A.; $ρ_{calc.}$ 4·20; 2 mols. per cell; space-group $Pnmn$—D_{2h}^{12}. Complete at. parameters and interdistances yield a novel structure, according with cleavage, n, and X-ray intensities, of plane $(PdCl_2)_\infty$ chains (rhombus links; Pd—Cl 2·31 A., axial angle Cl–Pd–Cl 87°) parallel to b and packed like the C-chain skeleton in rhombic n-paraffins. Inter-chain distance (Cl—Cl) is 3·65 A. I. McA.

Crystal structure of K$_2$HgCl$_4$,H$_2$O. C. H. MACGILLAVRY, J. H. DE WILDE, and J. M. BIJVOET (Z. Krist., 1938, **100**, 212—220).—By X-ray analysis, the rhombic cell containing 4 mols. has a 8·27, b 11·63, c 8·89 A.; ρ 3·39; space-group $Pbam$. General considerations and detailed analysis of rotation, oscillation, and Sauter X-radiograms yield complete at. parameters. The structure consists of deformed HgCl$_6$ octahedra (confirming HgCl$_2$ mols.) sharing edges to form "towers" linked by K and H$_2$O. The K atoms have different functions in the structure. The rôle of Hg in simple and complex salt halides is reviewed. I. McA.

Crystal structure of cubic yttrium fluoride, YF$_3$. W. NOWACKI [with appendix by G. BECK and W. NOWACKI] (Z. Krist., 1938, **100**, 242—250).—YF$_3$ pptd. by NaF has ρ 4·02 (cf. A., 1938, I, 440).

Statistical at. distributions are discussed on the basis of indexed estimated X-ray intensities. YF$_3$ pptd. by HF gives a stable non-cubic form (ρ 5·2) persisting on heating at 800—1000°. From chemical and X-ray analyses, YF$_3$ in molten NaF forms the *compound* NaYF$_4$, ρ 4·21. I. McA.

Crystal structure of the bromostannates A$_2$SnBr$_6$. (A = Cs, Rb, NH$_4$, K). G. MARKSTEIN and H. NOWOTNY (Z. Krist., 1938, **100**, 265—271; cf. Ketelaar, A., 1937, I, 604).—From single-crystal and powder X-ray analysis, the Cs, Rb, and NH$_4$ salts are face-centred cubic with a 10·81, 10·64, and 10·59 A., respectively; $Z = 4$; ρ 4·52, 4·21, and 3·54, respectively. The K salt is pseudo-cubic tetragonal with a 7·43, c 10·61 A.; ρ 3·81; probable space-group D_4^5—$C422_1$. At. parameters determined show slight deviation in at. interdistances from theory; these are discussed in terms of co-ordination no., and ionic size and form. I. McA

Sulphates of the magnesium series. M. DELÉPINE and P. LEBEAU (Ann. Chim., 1939, [xi], **11**, 247—358).—The sulphates of the series Mg, Mn, Fe, Co, Ni, Cu, Zn, and their hydrates, have been studied by means of X-rays. The great similarity of the powder photographs for the salts of each type shows that the well-known isomorphism of the higher hydrates extends to the lower hydrates and the anhyd. salts. MnSO$_4$,3·5H$_2$O is described. The following parameters are recorded. MgSO$_4$,6H$_2$O, a 10·0, b 7·10, c 24·0 A.; CoSO$_4$,6H$_2$O, a 9·90, b 7·10, c 23·8 A.; NiSO$_4$,6H$_2$O, a 9·90, b 7·07, c 23·8 A.; ZnSO$_4$,6H$_2$O, a 9·95, b 7·05, c 24·0 A. (all have 8 mols. in the unit cell); MnSO$_4$,5H$_2$O, a 6·2, b 10·7, c 6·1 A. (with 2 mols. in the unit cell); MgSO$_4$,4H$_2$O, a 5·89, b 13·6, c 7·73 A.; MnSO$_4$,4H$_2$O, a 5·97, b 13·8, c 7·87 A.; FeSO$_4$,4H$_2$O, a 5·90, b 13·5, c 7·74 A.; CoSO$_4$,4H$_2$O, a 5·82, b 13·3, c 7·60 A.; NiSO$_4$,4H$_2$O, a 5·80, b 13·2, c 7·65 A.; ZnSO$_4$,4H$_2$O, a 5·86, b 13·4, c 7·75 A. (all with 4 mols. in the unit cell); MgSO$_4$,H$_2$O, a 6·81, b 7·71, c 13·3 A.; MnSO$_4$,H$_2$O, a 6·74, b 8·10, c 13·3 A.; FeSO$_4$,H$_2$O, a 6·71, b 8·03, c 13·0 A.; CoSO$_4$,H$_2$O, a 6·60, b 7·87, c 12·8 A.; NiSO$_4$,H$_2$O, a 6·57, b 7·80, c 13·0 A.; CuSO$_4$,H$_2$O, a 6·80, b 7·90, c 12·6 A.; ZnSO$_4$,H$_2$O, a 6·64, b 7·80, c 13·2 A.; (all with 8 mols. in the unit cell); MgSO$_4$, a 4·82, b 6·72, c 8·35 A.; MnSO$_4$, a 4·86, b 6·81, c 8·58 A.; FeSO$_4$, a 4·82, b 6·81, c 8·67 A.; CoSO$_4$, a 4·65, b 6·66, c 8·46 A.; NiSO$_4$, a 4·62, b 6·51, c 8·49 A.; CuSO$_4$, a 4·88, b 6·66, c 8·32 A.; ZnSO$_4$, a 4·71, b 6·73, c 8·51 A. (all with 4 mols. in the unit cell). From the parameters the mol. vol. is calc., and it is shown that vals. so obtained are more reliable than those based on pyknometric determinations of ρ. The mol. vols. of the anhyd. salts and of the hydrates of each type increase in the order Ni, Co, Cu, Zn, Fe, Mg, Mn. The apparent mol. vol. of the H$_2$O increases from ~11 c.c. for the first mol. to ~18 c.c. for the seventh, but the increase is not linear. The square root of the mol. vol. of a hydrate is a linear function of the no. of H$_2$O mols. The crystal parameters of the whole series of anhyd. salts and hydrates are all ~ one of four fundamental parameters or an integral multiple of one of them. These are 5·0 A. (P), 6·0 A. (Q), 6·7 A. (R) and 7·7 A. (S). R occurs in all the anhyd. salts and all hydrates

except the pentahydrate, and also in Ca, Sr, Ba, and Pb sulphates, but not in other salts of the Mg series nor in sulphates of other valency-types. It is associated with the group $M^{II}SO_4$. *P* occurs in the anhyd. salt and in some of the hydrates, and also in a no. of sulphates of other valency-types, but in no other salts of the Mg series. It is associated with the SO_4'' ion.　　　　　　　　　　　　　　F. J. G.

Reciprocal and Bravais lattice of gypsum. W. F. DE JONG and J. BOUMAN (Z. Krist., 1938, **100**, 275—276; cf. Wooster, A., 1937, I, 17).—From an *X*-radiogram of gypsum, obtained with a moving-film spectrometer (A., 1938, I, 234) for the zero reciprocal lattice plane with reference to the *b* axis, reorientation of the unit cell to give *a* 5·63, *b* 15·15, *c* 6·23 A., β 113° 50′, *Z* 4, is proposed. The relation of these results to those of Bragg, Wooster, and Onorato is indicated.　　　　　　　　　　　　　I. McA.

X-Ray analysis of the crystal structure of Na_2BeF_4. G. S. SHDANOV and N. G. SEVASTIANOV (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 170).—Material obtained by recrystallising a solution of BeF_2 containing excess of NaF has been examined by Laue and rotation photographs. It is orthorhombic with *a* 10·9, *b* 6·6, *c* 4·9 A., d_4^{20} 2·45, and there are 4 mols. per cell. The Laue symmetry agrees with the orthorhombic bipyramidal class previously suggested.　　　　　　　　　　　　　T. H. G.

Crystal structure of long-chain normal paraffin hydrocarbons. "Shape" of the methylene group. C. W. BUNN (Trans. Faraday Soc., 1939, **35**, 482—491).—*X*-Ray investigation indicates that normal paraffins containing chains of >130 C are orthorhombic, with a_0 7·40, b_0 4·93, and c_0 2·534 A., and space-group *Pnam*. The C—C distance is 1·53 A. and the valency angle between C·C linkings 112°. Electron-density diagrams indicate that the electron cloud is extended in the plane of the three C nuclei.　　　　　　　　　　　　　J. W. S.

Valency angles. III. Determination by means of X-rays of the binding angle at the sulphur atom in a diphenyl sulphide derivative. R. KOHLHAAS and A. LÜTTRINGHAUS (Ber., 1939, **72**, [*B*], 897—906).—The crystal structure of 4 : 4′-dihydroxydiphenyl sulphide decamethylene ether has been studied. The space-group is $P2_1/m$ (C_{2h}^2), with 2 mols. in the unit cell, and *a* 11·99, *b* 9·644, *c* 10·93 A., β 56·96°. Application of Fourier analysis gives the complete structure, except for the position of the decamethylene chain, and a diagram is given. The distance $C_{aromatic}$—S is 1·71±0·04 A., and the angle between the S valencies is 112·4±1·5°.　F. J. G.

Crystal structure of condensed ring compounds. VII. 3 : 4-Benzphenanthrene, $C_{18}H_{12}$, and three hexahydro-derivatives. J. IBALL (Z. Krist., 1938, **100**, 234—241; cf. A., 1938, I, 502).—Cell elements, ρ, *Z*, and optical data are determined for 3 : 4-benzphenanthrene (I), its 1 : 2 : 9 : 10 : 11 : 12-H_6-derivative (II), and for the 2-keto- and 2-keto-1 : 1-dimethyl derivatives of (II). (I) is rhombic, the others are triclinic. *X*-Ray data are inconclusive, but measurements of diamagnetic anisotropy (by

K. LONSDALE) confirm the stereochemical *cis* configuration for (II).　　　　　　　　　I. McA.

X-Ray and thermal examination of unsymmetrical mixed triglycerides.—See A., 1939, II, 240.

Crystal structure of cyanogen halides. I. Structure of cyanogen iodide. J. A. A. KETELAAR and J. W. ZWARTSENBERG (Rec. trav. chim., 1939, **58**, 448—452).—ICN has d^{18} 2·84. It forms a lattice of separate mols. and not an ionic lattice. The rhombohedral unit cell has *a* 4·44±0·02 A., α 101° 24′±10′; probable space-group C_{3v}^5. C. R. H.

Structure and thermal properties associated with some hydrogen bonds in crystals. I. The isotope effect. II. Thermal expansion. J. M. ROBERTSON and A. R. UBBELOHDE (Proc. Roy. Soc., 1939, **A**, **170**, 222—240, 241—251).—I. The effect of substituting D for H in CO_2H and OH groups has been investigated by measuring changes of lattice parameter. In all cases an expansion is observed, being largest for $H_2C_2O_4,2H_2O$ (I) and small for *o*-$C_6H_4(CO_2H)_2$ and β-resorcinol. Intermediate vals. are observed for $NaHCO_3$, succinic and benzoic acids, and α-resorcinol. A marked directional effect is found in (I) and a tentative explanation is put forward.

II. The thermal expansion of NaCl, (I), $D_2C_2O_4,2D_2O$, $C_6H_4(OH)_2$, and $C_6H_4(OD)_2$ was measured by *X*-ray methods in the temp. range 90—290° K. Anisotropy of expansion is observed in crystals containing OH and H bonds; the expansion of D crystals is < that of H crystals.　　G. D. P.

Structure of oxamide. L. MISCH and A. J. A. VAN DER WYK (Arch. Sci. phys. nat., 1938, [v], **20**, Suppl., 96—98).—Larger crystals of $(CO·NH_2)_2$ than those ordinarily obtained were prepared by boiling for long periods a suspension in H_2O or $HCO·NH_2$. *X*-Ray examination of the crystals gives *a* 5·18, *b* 3·63, *c* 5·65 A., α 66° 5′, β 84°, γ 64°; one mol. in the unit cell. The atoms are arranged chiefly in a plane parallel to *ac*. The crystals were also examined by the method of Patterson. There is mutual attraction of NH_2 and O in the plane *ac*, which causes an increase in the C—C distance. This is estimated at 1·65 A. instead of the normal 1·53 A.　　　A. J. M.

Width of rings formed by electron-diffraction. G. P. THOMSON and M. BLACKMAN (Proc. Physical Soc., 1939, **51**, 425—431).—Mathematical.　　　　　　　　　　　　　N. M. B.

Electron asymmetry in the atoms of zinc crystals. G. E. M. JAUNCEY and E. M. McNATT (Physical Rev., 1937, [ii], **52**, 256).—The diffuse scattering of *X*-rays from single crystals of Zn at room temp. has been measured at various scattering and orientation angles, and used to calculate the true at. structure factors. The differences found for these vals. give a measure of the electron asymmetry.　　　　　　　　　　　　　L. S. T.

Electron-diffraction investigation of methylacetylene, dimethylacetylene, dimethyldiacetylene, methyl cyanide, diacetylene, and cyanogen. L. PAULING, H. D. SPRINGALL, and K. J. PALMER (J. Amer. Chem. Soc., 1939, **61**, 927—937).—An

electron diffraction study of gaseous CH:CMe (I), (:CMe)₂ (II), (·C:CMe)₂ (III), (·C:CH)₂ (IV), C₂N₂ (V), and MeCN (VI) leads to the following vals. for interat. C—C distances in A. : single bond adjacent to triple bond, 1·46±0·02 (I), 1·47±0·02 (II) and (III), 1·49±0·03 (VI); triple bond, 1·20±0·03 (I), 1·20±0·02 (III), 1·19±0·03 (IV); single bond between two conjugated triple bonds, 1·38±0·03 (III), 1·36±0·03 (IV), 1·37±0·02 (V); C≡N, 1·16±0·03 (V), 1·16±0·03 (VI). The decrease below the normal val. of 1·54 A. for a single bond adjacent to a triple bond found for the methylacetylenes and MeCN is due partly to a change in single-bond radii (by ~0·02 A.) but chiefly to the assumption of partial double-bond character by the single bond. The vals. found for a single bond between two conjugated triple bonds indicate that this bond has ~40% double bond character, the amount of conjugation being ~ twice that for systems involving double bonds and benzene rings.

W. R. A.

Electron diffraction investigations of trimethylamine oxide and dimethyl sulphone and their bearing on the lengths of co-ordinate links. M. W. LISTER and L. E. SUTTON (Trans. Faraday Soc., 1939, 35, 495—505).—Electron diffraction measurements indicate that in NMe₃O the C—N bond length is 1·54±0·03 A., 0·07 A. > the sum of the normal covalent radii, and the N—O length is 1·36±0·03 A., exactly the sum of the normal single-bond radii. The N atom appears to have a greater radius when 4-covalent than when 3-covalent, the shortening of the NO bond being probably due to the effective charges at its two ends. The lengths of the C—S bonds in Me₂SO₂ are 1·90±0·03 A., 0·09 A. > in Me₂S, and the S—O bond lengths are 1·44±0·03 A. It is considered that the latter are double bonds, and that the extra contraction is connected with their stability.

J. W. S.

Diffraction of electrons by anthracene. A. CHARLESBY, G. I. FINCH, and H. WILMAN (Proc. Physical Soc., 1939, 51, 479—528).—Diffraction gives results in agreement with structure as determined by X-rays. In addition to the normal characteristic multispot pattern, another pattern consisting of areas or islands of diffuse scattering appear superimposed, and this pattern is shown to be due to mols. which, although oriented with respect to the beam, have no definite phase relationship with each other. The diffuse area pattern is thus virtually equiv. to that which would be given by a gaseous stream of oriented mols. flowing past the electron beam. Methods for determining the crystal orientation from a consideration of the normal electron-diffraction pattern features are developed, and it is shown that the diffuse area pattern is due to mols. which, although in or near their normal positions and orientations, are acting as independent scattering groups. An extension of the Debye theory to mol. lattices shows that the new patterns can be explained on the supposition that the mols. vibrate thermally, as almost rigid units, about their mean positions in the lattice.

N. M. B.

New method of creating electrification. (SIR) A. FLEMING (Proc. Physical Soc., 1939, 51, 402—406).

—If pure dry SiO₂ powder of uniform grain size falls on a perforated metal plate or gauze of Zn, Cu, Ni, or Fe so as to fall through the apertures and not accumulate on the metal, the powder becomes electrified negatively and the metal positively, although bulk SiO₂ is easily electrified positively. The effect is also shown by powdered S. There is evidence that the effects are not due to piezo-electrification.

N. M. B.

Dynamic measurement of the elastic, electric, and piezoelectric constants of Rochelle salt. W. P. MASON (Physical Rev., 1939, [ii], 55, 775—789).—The consts. were determined at low field strengths by measuring the resonant frequencies and impedance of vibrating crystals. The resonant and antiresonant frequencies are found experimentally to be considerably below the natural mechanical resonant frequency of the crystal, in disagreement with the usual derivation of the frequencies of a piezoelectric crystal. Assuming that the piezoelectric stress ∝ the charge density on the electrodes rather than ∝ the potential gradient as usually assumed, theoretical frequencies in agreement with experiment are obtained. This derivation and the measured frequencies supply vals. for the piezoelectric consts. The elastic consts. measured dynamically show some differences from those measured statically; in the case of piezoelectric consts. the differences are large, and this may be attributed to the finite relaxation time for the piezoelectric elements.

N. M. B.

Electrical conductivity, light transmission, and structure of thin gold films. D. A. WAS (Physica, 1939, 6, 382—389).—The crystallisation of Au films deposited by evaporation on to glass or quartz plates is accompanied by an increase in electrical conductivity and light transmission. The crit. thickness below which crystallisation does not occur is ~5 mμ. on clean outgassed glass or quartz, and less on quartz or on glass which has not been outgassed.

L. J. J.

Relation of the true structure of thin gold films to the structure as shown by electron diffraction. D. A. WAS (Physica, 1939, 6, 390—392).—Electron diffraction shows cryst. structure in Au films of all thicknesses from <2 mμ. upwards. Electrical conductivity measurements (cf. preceding abstract) show that this is due to crystallisation induced by the impact of electrons.

L. J. J.

Very thin sheets of platinum. P. ROUARD (Compt. rend., 1939, 208, 1146—1148).—Extending previous work (cf. A., 1937, I, 228; 1938, I, 303), the phase change of light (λ = 3660, 4046, 4358, 5461, and 5780 A.) observed on reflexion from thin Pt sheets (1·6—17·9 mμ. thick) deposited on plane glass plates by cathodic sputtering has been determined. The data are compared with theoretical predictions.

W. R. A.

Influence of dissolution by an acid of the surface of bismuth and zinc crystals on their mechanical properties. M. CLASSEN-NEKLUDOVA (Tech. Phys. U.S.S.R., 1938, 5, 827—835).—Removal of the surface defects of single crystals of Bi by dissolution in acids during the process of deformation

causes an increase in their mechanical strength up to 270%. There was also an increase in the degree of plastic elongation. Preliminary dissolution and subsequent extension in air does not cause any appreciable change in the mechanical properties of single crystals of Bi, indicating that primary defects do not of themselves exert any considerable effect on the strength. No definite results were obtained when similar experiments were carried out with single crystals of Zn. Artificial scratches appear to have no effect on the place at which fracture of single crystals of Zn occurs, even at −180°. A. J. M.

Influence of temperature on the elasticity and on the rupture of crystals. J. EKSTEIN (Compt. rend., 1939, 208, 1098—1100).—Mathematical. W. R. A.

Plastic deformation of rock-salt under constant compressive forces. M. STAMATIU (Bull. Acad. Sci. Roumaine, 1938, 20, 24—30).—The effect of time on the deformation of rock-salt subjected to const. compressive forces is represented graphically. Under such forces rock-salt undergoes elastic and plastic deformations, the latter increasing with time. The results are discussed in relation to the behaviour of rock-salt in mines. L. S. T.

Non-cubic growth of single crystals of silver by condensation from vapour. J. H. HOWEY (Physical Rev., 1939, [ii], 55, 578—581).—The condensation of Ag vapour on solidified spherical drops of Ag produces straight thin single-crystal needles of Ag under certain conditions, and is a process continuous with the formation of the drops by condensing the vapour in vac. on an Fe surface cooling from above the m.p. of Ag to an equilibrium temp. just below the m.p. The shape and cryst. orientation of the needles indicate that they are the result of a nucleus growing by condensation much more rapidly in a certain (110) direction than in other directions, including other (110) directions. N. M. B.

Stabilisation velocity of glassy selenium. F. ISHIKAWA and H. SATO (Bull. Inst. Phys. Chem. Res. Japan, 1939, 18, 143—149).—The stabilisation velocity of glassy Se, measured by a differential gas dilatometer, is very low at 60° and increases with temp., 60% transformation into metallic Se occurring in 33 hr. at 75°. F. H.

Polymorphism of lead [mon]oxide. J. LE BOURGEOIS (Bull. Soc. chim., 1939, [v], 6, 614—620). —There are three modifications, one pink (γ) and two yellow (β and α). γ is stable up to 150°, but transformation into β does not occur below ~570°, whilst β is stable from 150° to 700—800°, but can be metastable at room temp. and up to its m.p., 886°. α is formed slowly from β at 800° and rapidly at the m.p. of β. Its m.p. is 894°, and on cooling it is not transformed into β but persists in a metastable state down to 250°, when it is transformed into γ. F. J. G.

Growth on alkali halide crystals. H. MORGENSTERN (Z. Krist., 1938, 100, 221—227; cf. Ernst, A., 1937, I, 447).—The development of the surface morphology of single-crystal spheres of LiF, NaCl, KCl, KBr, and KI immersed in aq. solution at 29°,

and prepared by grinding crystals obtained from the melt by Kyropoulos' method, is described. I. McA.

Regular growth of pp'-dihydroxydiphenyl on calcite and on sodium nitrate. J. WILLEMS (Z. Krist., 1938, 100, 272—274; cf. Royer, A., 1933, 213).—Given favourable geometric lattice conditions, regular overgrowth of org. crystallites on an inorg. support still requires an ionisable solute. $(C_6H_4 \cdot OH)_2$ ppts. almost amorphously from oxy-solvents on glass; on calcite or $NaNO_3$ it deposits in crystallites of elliptical cross-section, singly or in crossed pairs, showing characteristic epitaxy. I. McA.

Peltier effect demonstration with approximate measurement. A. CAMPBELL (Proc. Physical Soc., 1939, 51, 545—546).—Three strips of two metals are soldered consecutively and bent into a U so that the junctions are adjacent in the two legs of the U. On passing a current the heating of one junction and cooling of the other is shown by a thermopile placed between the junctions. Approx. measurement is made by balancing the cooling at one junction against the heating effect of a current in a small adjacent resistance coil. N. M. B.

Magnetism and chemistry. W. KLEMM (Chem.-Ztg., 1939, 63, 333—335).—A review.

Reversible magnetisation in ferromagnetics. W. F. BROWN, jun. (Physical Rev., 1939, [ii], 55, 568—578).—Mathematical. The equations of the statistical domain theory are derived without the use of the artificial simplified Heisenberg model. N. M. B.

Magnetic susceptibility of mercury and of some dilute alkali amalgams. S. R. RAO and S. ARAVAMUTHACHARI (Proc. Indian Acad. Sci., 1939, A, 9, 181—209).—For liquid Hg $\chi_{at.} = −33·3 \times 10^{-6}$, suggesting that the Hg atoms exist in the liquid state as $Hg^{\cdot\cdot}$ ions. χ for Na, K, and Rb, and their dil. amalgams have been measured. For very low concns. addition of Li causes an increase in χ_{Hg}, whilst addition of Na, K, and Rb decreases it. The initial fall of χ is probably due to dispersion of alkali atoms, each atom being surrounded by a group of Hg atoms forming a " complex " atom of lower χ. To explain the initial rise for Li amalgams it is assumed that the Li atoms are unable to penetrate the Hg groups, until a higher concn. is reached. A broad min. occurs in χ of Na amalgams at a concn. approx. corresponding with the compound $NaHg_{16}$. W. R. A.

Specific coefficient of magnetisation of oxyhæmoglobin.—See A., 1939, III, 622.

Magnetic susceptibility and related properties of rare-earth crystals. W. G. PENNEY and G. J. KYNCH (Proc. Roy. Soc., 1939, A, 170, 112—129).—A theoretical investigation shows that it is impossible to reconcile current interpretations of the absorption spectra and sp. heat measurements with the magnetic properties of hydrated rare-earth crystals. G. D. P.

Principal magnetic susceptibilities of neodymium sulphate octahydrate at low temperatures. L. C. JACKSON (Proc. Roy. Soc., 1939, A, 170, 266—271).—The measurements were carried out in the temp. range 14—290° K. All three suscep-

tibilities obey the law $\chi(T + \Delta) = $ const. above 120° K.; at low temp. one of the principal susceptibilities tends to become independent of T, whilst the other two increase more rapidly than they do at higher temp. The magnetic ellipsoid rotates through a considerable angle as the temp. falls, the anisotropy increasing from 11% to 70% between 290 and 14° K. (Cf. preceding abstract.) G. D. P.

Influence of elastic stresses on the initial susceptibility of monocrystals. M. DECHTJAR (Tech. Phys. U.S.S.R., 1938, **5**, 676—684).—Experiments on monocrystals (thin narrow laminæ) of meteorite Fe, containing 8% Ni and 0·5% Co, show that (i) Akulov's tensor of magnetic susceptibility χ of deformed cubic crystals is correct, (ii) the changes in the magnitude of the initial χ caused by the influence of elastic stresses depend on the sequence of application of these stresses and the strength of the magnetic field, and (iii) the demagnetisation of a ferromagnetic substance under load does not follow the usual course. W. R. A.

Electronic theory of the electrical equilibrium of metallic conductors. D. CASTELLUCCIO (Nuovo Cim., 1938, **15**, 473—476).—Mathematical.
O. J. W.

Tantalum. (A) Resistance, emissivities, and m.p. (B) Rate of evaporation. L. MALTER and D. B. LANGMUIR (Physical Rev., 1939, [ii], **55**, 743—747, 748—749; cf. Utterback, A., 1932, 565).—(A) The relation between true and brightness temp. was determined by pyrometric observations on the inside and outside of a long thin-walled tube heated electrically. Potential leads of fine W wire welded to Ta filaments permitted a determination of the electrical properties as a function of temp. The m.p. found is 3269° K. from the electrical properties at the m.p., as given by the extrapolated temp.-electrical property relations.

(B) The rate of evaporation at const. temp., determined by measuring the change of resistance and change of wt. of uniform filaments, is given by $\log_{10} M = 7·86 - 39,310/T$, where M is the rate of evaporation in g. per sq. cm. per sec. N. M. B.

Electrical phenomenon of a palladium filament occluding hydrogen. K. HIROTA and J. HORIUTI (Proc. Imp. Acad. Tokyo, 1939, **15**, 10—12). —A Pd wire of 8 μ. diameter and 1·0 cm. length had initial resistance of 13·18 Ω. On continuous evacuation of H_2 for 864 hr. a min. resistance of 11·35 Ω. was obtained, which then increased to the const. val. 25·77 Ω. The cycle was repeated by the stepwise admission of H_2. F. J. L.

Variation of the specific resistance of platinum with cross-section. L. RIEDEL (Ann. Physik, 1938, [v], **33**, 733—736).—Measurements on Pt wire of 15·7 μ. diameter show that the sp. resistance at 0° is > that of the compact metal by <1%, in contradiction to Reuter (A., 1938, I, 19). The mean free path of the conduction electrons is <100 mμ.
O. D. S.

Electrical resistance of nickel amalgams. L. F. BATES and J. H. PRENTICE (Proc. Physical Soc., 1939, **51**, 419—424; cf. A., 1938, I, 70).—The resistances of a series of Ni amalgams of concn. 0·013—0·246 g. Ni per 100 g. Hg, measured over the range 20—300°, showed a marked permanent change beginning at ~225° coinciding with a change from diamagnetic to strong and permanent ferromagnetic properties. Since ferromagnetic Fe or Co in amalgams can be conc. and removed by a magnetic field, a method of determining Co in mixed solutions of Co and Ni salts is suggested. N. M. B.

Electrical resistance and thermo-e.m.f. of the two allotropic modifications of thallium. E. ROSENBOHM (Physica, 1939, **6**, 337—352).—For pure Tl in an atm. of H_2 the allotropic transition at 232° is marked by an abrupt fall of 4·3% in the resistance. The effect is less marked, and the transition is displaced to lower temp., in the presence even of small amounts of O_2 and N_2. Hysteresis effects are in all cases small, but are more marked with slightly oxidised Tl. The transition coincides with a flat max. in the temp. coeff. of the thermo-e.m.f. (measured against Cu). L. J. J.

Supersonic dispersion in air. W. H. PIELEMEIER (Physical Rev., 1937, [ii], **52**, 244). L. S. T.

Fresnel diffraction phenomena at ultrasonic waves and their evaluation by Mascart's method. F. MAHLER (Ann. Physik, 1939, [v], **34**, 689—716).— The Fresnel diffraction of light waves (λ 0·646 to 0·480 μ.) by standing ultrasonic waves (λ^x 0·5 to 0·58 mm.) has been investigated. Results agree with theory derived by Mascart's approximation method.
O. D. S.

Dispersion of ultrasonic waves in liquids. F. MATOSSI (Physikal. Z., 1939, **40**, 294—297).—The discrepancies between the results of Hiedemann et al. (A., 1936, 1453) and of Dutta (A., 1938, I, 184) have been investigated. The results of Dutta were reproduced at 27°. At room temp., however, there was an increase in the ratio of the velocity of ultrasonic waves in H_2O and PhMe with increasing frequency. Under certain conditions dispersion effects could be reproduced even at room temp. depending on the coupling of the vibrating quartz with the transmitter. The more intense was the sound wave, the greater was the dispersion effect. With very slight coupling the effect disappeared. It is concluded that no dispersion effect can be found in the frequency region 10^7 Hz. for H_2O or xylene. A. J. M.

Effect of ultra-sounds on supercooled water. I. SOKOLOV (Tech. Phys. U.S.S.R., 1938, **5**, 619—621).—Water supercooled to −6°, which remained liquid after vigorous shaking, crystallised when subjected to ultra-sounds, the velocity of crystallisation increasing with the energy supplied, but being apparently independent of the frequency. J. A. K.

Supersonic velocity in gases and vapours. VIII. Supersonic velocity in air, steam, carbon dioxide, and carbon disulphide. S. K. K. JATKAR (J. Indian Inst. Sci., 1939, **22**, A, 93—110).—The velocity of sound v in air, steam, CO_2, and CS_2 has been measured at different frequencies in narrow tubes at different temp. and 685 mm. pressure. The sp. heats, calc. from v, are in good agreement with those calc. from spectroscopic data. W. R. A.

Thermal measurements in liquid hydrogen. H. GUTSCHE (Z. physikal. Chem., 1939, **184**, 45—58). —C_p data for liquid H_2 between 20° and 40° K. and between 10 and 100 atm., and data for the heat change during the expansion of liquid H_2 over the same range of pressure and for the sp. heat under the saturation pressure, are recorded and discussed. C. R. H.

Specific heat, enthalpy, entropy, and dissociation of technical gases. E. JUSTI (Feuerungstech., 1938, **26**, 313—322).—Sp. heats calc. for ideal gases from spectroscopic data are converted by means of various equations of state to the actual condition at a pressure of 1 atm. The difference between the mean and true sp. heats for ideal and practical conditions (1 atm.) are tabulated from 0° to 1000° for N_2, H_2, O_2, NO, CO, CO_2, N_2O, SO_2, H_2O, air, CH_4, C_2H_2, C_2H_4, C_2H_6, and C_6H_6. R. B. C.

Specific heat of iron from 1·1° to 20·4° K. W. H. KEESOM and B. KURRELMEYER (Physica, 1939, **6**, 364).—For a sample of very pure Fe, $C = 0·00120T + 0·00000472T^3$ g.-cal. per mol. per degree, corresponding with a characteristic temp. 462° K. L. J. J.

Liquid structure and entropy of vaporisation. J. H. HILDEBRAND (J. Chem. Physics, 1939, **7**, 233—235).—Comparison of the entropies of vaporisation of 24 liquids at temp. corresponding with the same vapour vol. indicates that the factors tending to produce an ordered arrangement in a liquid are (a) chemical association, (b) dipole orientation, and (c) geometrical shape. The significance of (c) is discussed in connexion with the entropy of solution. W. R. A.

Atomic heat of nitrogen in various nitrides. II. S. SATOH (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, **35**, 385—398; cf. A., 1938, I, 507).— The at. heats of N in Mg, Ti, P, Be, Mn, Th, Zn, and Li nitrides at 25°, 100°, 300°, and 500° have been calc. from measurements of the mol. heats of the nitrides, and the at. heats of the elements concerned. The at. heat of N is low in nitrides of elements of small at. no. Including previously determined vals. from nitrides of B, Al, Si, Ca, V, Mo, and Ta, the mean at. heat of N in nitrides is 3·1, 3·7, 5·1, and 6·1 at 25°, 100°, 300°, and 500°, respectively. D. F. R.

Specific heats of thorium nitride, lithium nitride, and zinc nitride. S. SATOH (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, **35**, 182—190). —The mean C_p of Th_3N_4 and Li_3N has been measured over the temp. intervals 0—99·5°, 0—305·3°, and 0—500·3° by the ice calorimeter. The true C_p of Th_3N_4 is given by $C_p = 0·04895 + 4·436 \times 10^{-5}θ - 1·384 \times 10^{-8}θ^2$ and of Li_3N by $C_p = 0·5127 + 7·226 \times 10^{-4}θ - 1·193 \times 10^{-7}θ^2$. The mean C_p of Zn_3N_2 has been measured over the temp. intervals 0—99·6°, 0—305·3°, and 0—419·2°, true C_p being given by $C_p = 0·1142 + 8·926 \times 10^{-5}θ + 1·151 \times 10^{-8}θ^2$. F. H.

M.p. of barium molybdate. H. A. LIEBHAFSKY. E. G. ROCHOW, and A. F. WINSLOW (J. Amer. Chem. Soc., 1939, **61**, 969—970).—Ba molybdate (I), pptd. from an aq. NH_3 solution of NH_4 molybdate by $BaCl_2$, was melted in a Pt crucible in air and slowly cooled.

The m.p. is 1480±5°. Pt was not attacked and there was no indication of decomp. of (I). On melting in vac. the surface of (I) darkens, some evaporation occurs, partial decomp. occurs, and the m.p. is approx. the same as in air. W. R. A.

Melting as a disorder phenomenon. F. C. FRANK (Proc. Roy. Soc., 1939, **A**, **170**, 182—189).— The Bragg and Williams theory of order–disorder transformations is applied to melting. There are crit. temp. above and below the m.p. which limit the range of existence of the metastable, superheated and supercooled, states. The m.p. lies close to the upper crit. point so that it is impossible to superheat a crystal but a considerable degree of supercooling may be necessary to start crystallisation in a liquid. The paper is non-mathematical. (Cf. A., 1939, I, 248.) G. D. P.

Adiabatic demagnetisation of potassium chromic alum. H. B. G. CASIMIR, W. J. DE HAAS, and D. DE KLERK (Physica, 1939, **6**, 365—368).—The entropy of K Cr alum as a function of the magnetic temp. (T_m) from 1° to 0·033° K. has been determined. The results are in agreement with Hebb and Purcell's theory (A., 1937, I, 353) for all temp. between 0·07° and 1° K.; in this range the relation between T_m and T is given with an accuracy of 0·01° K. The Stark splitting is 0·27° K. L. J. J.

Liquid versus vapour temperature. E. M. LITTLE (Physical Rev., 1937, [ii], **52**, 255—256).— When temp. is defined as $\propto$ the average kinetic energy of translation of the mols. the temp. of a liquid and vapour in equilibrium are not the same. The vapour temp. may be $\frac{2}{3}$ the liquid temp. Spectroscopic and not thermometric methods must be used to detect this temp. difference. L. S. T.

Reference temperatures for physical and physico-chemical magnitudes of [chemical] compounds. G. L. VOERMAN (Congr. int. Quim. pura apl., 1934, **9**, II, 483—484; Chem. Zentr., 1937, i, 1104).—The use of the c. scale and of 20° as a standard temp. is recommended, and other reference temp. are proposed. A. J. E. W.

Formation of an amorphous (vitreous) modification of water by condensation of vapour at low temperature. L. STARONKA (Rocz. Chem., 1939, **19**, 201—212).—A transparent coating forms in a glass tube at < —175° (liquid N) through which a slow current of damp air is passed. The deposit becomes opaque at about —130°, and this change is associated with evolution of ≮5·7 g.-cal. per g. of the ice. The internal energy of the condensate formed at < —170° is about 100 g.-cal. per g. higher than that of the condensate formed at > —170°. The new product is considered to be a vitreous modification of H_2O. R. T.

Symmetry number and thermodynamic functions for molecules having double minimum vibrations. K. S. PITZER (J. Chem. Physics, 1939, **7**, 251—255).—Energy levels and thermodynamic functions for a double min. vibrational degree of freedom are discussed with special reference to NH_3. A simple formula is given for the range of validity of the classical expressions for rotational heat capacity

and entropy and the symmetry no. of double min. vibrators is considered.　　W. R. A.

Equations of state. G. WOOLSEY (J. Chem. Educ., 1939, **16**, 60—66).—A discussion.　L. S. T.

Differences in vapour pressures and molecular heats of ortho- and para-hydrogen and deuterium. K. SCHÄFER (Z. physikal. Chem., 1939, **42**, **B**, 380—394).—Mathematical. Energy proper vals. of H_2 in the condensed state have been estimated using quantum-mechanical perturbation theory; different vals. are obtained for the perturbation of o- and p-H_2.　　W. R. A.

Saturation pressure of water vapour between 73° and 130°. H. MOSER and A. ZMACZYNSKI (Physikal. Z., 1939, **40**, 221—229).—A static method (using a glass-membrane manometer) and a dynamic method have been used to determine the saturation pressure of H_2O vapour in the above temp. range. The following formulæ were obtained : $p - 760 = 27 \cdot 12912(\theta - 100) + 0 \cdot 400793(\theta - 100)^2 + 3 \cdot 04131 \times 10^{-3}(\theta - 100)^3 + 1 \cdot 1241 \times 10^{-5}(\theta - 100)^4$, for θ between 73° and 130°, and $\theta - 100 = 3 \cdot 68608 \times 10^{-2}(p - 760) - 2 \cdot 0073 \times 10^{-5}(p - 760)^2 + 1 \cdot 625 \times 10^{-8}(p - 760)^3 - 1 \cdot 61 \times 10^{-11}(p - 760)^4$, for p between 680 and 800 mm.　　A. J. M.

Vapour pressure of solid salts. I. Vapour pressure of mercuric halides and thermodynamic calculations. Z. SHIBATA and K. NIWA. **II. Vapour pressure of alkali halides and thermodynamic calculations.** K. NIWA (J. Fac. Sci. Hokkaido, 1938, **2**, 183—200, 201—221).—I. V.p. of $COPh_2$ (35—55°), $HgCl_2$ (45—70°), $HgBr_2$ (50—75°), and red HgI_2 (60—90°) have been determined by Knudsen's effusion method. Heats of sublimation, free energy change, entropy, and chemical const. are calc.

II. Similar measurements have been made with all the alkali halides except LiF, LiBr, LiI, NaI, RbF, RbBr, CsF, and CsI. These data and those of other workers for the salts named are used for calculating the thermodynamical quantities.　　F. L. U.

Vapour pressure of thorium acetylacetonate by radioactivity measurements. R. C. YOUNG, C. GOODMAN, and J. KOVITZ (J. Amer. Chem. Soc., 1939, **61**, 876—878).—By means of a gas-saturation method, which employs non-radioactive N_2 and counts the α-particles carried over by the N_2, the v.p. of Th acetylacetonate (I) at 1000° is $3 \cdot 2 \pm 0 \cdot 3 \times 10^{-4}$ mm. The amount of sublimed (I) was calc. by washing out the apparatus with EtOH acidified with HCl, evaporating the solution on a Pt foil, and counting the no. of α-particles from the deposit of basic Th chloride. An improved prep. of (I) is given.　W. R. A.

Critical constants of ethane. J. A. BEATTIE, G. J. SU, and G. L. SIMARD (J. Amer. Chem. Soc., 1939, **61**, 924—925).—The v.p. of C_2H_6 at 25° is $41 \cdot 38$ atm. The crit. consts. are $t_c = 32 \cdot 27° \pm 0 \cdot 01°$, $p_c = 48 \cdot 20 \pm 0 \cdot 02$ normal atm., $v_c = 0 \cdot 148 \pm 0 \cdot 0015$ l. per mol. ($4 \cdot 93$ c.c. per g.), $d_c = 6 \cdot 76 \pm 0 \cdot 07$ mols. per l. ($0 \cdot 203$ g. per c.c.).　　W. R. A.

Specific gravity change per degree of temperature.—See A., 1939, II, 237.

Density of pure deuterium oxide. H. L. JOHNSTON (J. Amer. Chem. Soc., 1939, **61**, 878—880).—After correcting for the presence of ^{18}O and other factors which are discussed, d_{25}^{25} of D_2O is $1 \cdot 10763 \pm 0 \cdot 00005$.　　W. R. A.

Thermal and electrical conductivity of iron at high temperatures. R. W. POWELL (Proc. Physical Soc., 1939, **51**, 407—418).—Results previously reported (cf. A., 1934, 1163) are confirmed by two independent methods. The thermal conductivity of Armco Fe, determined to ~1000° by an abs. method in which heat flowed radially from the centre to the circumference of a thick-walled cylinder, decreases steadily with rise of temp. through the magnetic transformation region to a min. val. of $0 \cdot 065$ near the α–γ transformation point. Electrical resistivity was measured up to 1430°, and the Lorenz function evaluated over the experimental thermal conductivity range; from 200° to 800° it has unusually high vals. ($0 \cdot 72 \pm 0 \cdot 02 \times 10^{-8}$), but decreases steadily above the magnetic transformation point to $0 \cdot 60 \times 10^{-8}$ at 1000°. The Lorenz function of γ-Fe is thus in fair agreement with the val. $0 \cdot 58_6 \times 10^{-8}$ indicated by Sommerfeld's theory.　　N. M. B.

Amorphous state. XIV. Thermal conductivity of amorphous bodies within the range of softening. E. KUVSCHINSKI (Tech. Phys. U.S.S.R., 1938, **5**, 491—498).—Data for rosin (I) and phenolphthalein (II) afford no evidence for the presence of a break in the thermal conductivity (k) curve within the range of softening. $k = 0 \cdot 00024$ g.-cal./degree. cm. sec. for (I) over the range 20—90°, and $k = 0 \cdot 000335$ g.-cal./degree. cm. sec. for (II) over the range 35—115°.　　C. R. H.

Compressibility of gaseous ethane in the high density region. J. A. BEATTIE, G. J. SU, and G. L. SIMARD (J. Amer. Chem. Soc., 1939, **61**, 926—927).—Vals. for the compressibility of gaseous C_2H_6 at densities from 5—10 mols. per l. have been determined at 25° intervals between 50° and 275°.　W. R. A.

Kinetic theory expression for the viscosity of a gas. K. S. G. DOSS (Current Sci., 1939, **8**, 109).—The η of a gas can be expressed by $\pi^{-1}(MRT/\pi)^{\frac{1}{2}}N^{-1}d^{-2}$, where d is the diameter of the mol.; it is practically the same as the accurate expression derived by Chapman (A., 1916, ii, 416).　　L. S. T.

Calculation of surface viscosity from experimental results. J. J. HERMANS (Physica, 1939, **6**, 313—320).—Harkins and Kirkwood's formula (A., 1938, I, 186) for a rectangular slit also applies to a canal formed by mica plates resting on the surface, as in Joly's experiments (ibid., 77).　　L. J. J.

Influence of electric field on the viscosity of liquids. H. MENZ (Ann. Physik, 1939, [v], **34**, 740—760).—A capillary viscosimeter for the comparison of viscosities in high electric fields (20 kv. per cm.) is described. The effect of static and alternating field, up to 600 Hz., on the viscosity of C_6H_6, Et_2O, PhCl, and CCl_4 has been investigated. In the pure liquids the effect is very small but on saturation of Et_2O and PhCl with H_2O an increase of viscosity with field is observed with characteristic polarisation

effect and dependence on frequency. This increase is ascribed to the transference of velocity by ions moving at right angles to the direction of flow.
O. D. S.

Amorphous state. XIII. Viscosity, electrical conductivity, and dielectric losses in alcohols and glycerol. P. KOBEKO, E. KUVSCHINSKI, and N. SCHISCHKIN (Tech. Phys. U.S.S.R., 1938, **5**, 413—424).—The variation of η, sp. resistance r, ϵ, and dielectric loss ϵ' with temp. have been studied for Pr^{a}OH, Bu$^\beta$OH, and glycerol over wide temp. ranges. Measurements of η have been made over a range of 10^{-2}—10^{10} poises, and of ϵ and ϵ' at 50 and 1000 Hz. Relaxation times τ have also been evaluated. It is found that $\log \eta$, $\log r$, and $\log \tau$ are not rectilinear functions of $1/T$ but that the temp. coeffs. which are equal at the same temp. rise with fall of temp. η, r, and τ are proportional to each other when temp. varies.
T. H. G.

Dependence of viscosity of long-chain fatty acids on temperature and degree of unsaturation. G. B. RAVITSCH (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 34—36).—For C_{18} acids the viscosity decreases linearly with increasing I val. A general equation for the effect of temp. is given, and data in agreement for a no. of C_{18} acids are recorded.
L. J. J.

Thermal diffusion of water vapour–hydrogen mixtures. Z. SHIBATA and H. KITAGAWA (J. Fac. Sci. Hokkaido, 1938, **2**, 223—239).—The changes in composition of H_2O vapour–H_2 mixtures due to thermal diffusion in a temp. gradient have been determined between room temp. (cold) and each of 10 different temp. from 201° to 1021° (hot). The relation $\log (p_A/p_B)_{hot} = n \log (p_A/p_B)_{cold} + const.$ is valid over the whole range (p = partial pressure). n is a const. depending on temp. but not on composition. The results are used to calculate some quantities occurring in Chapman's theory (cf. A., 1924, ii, 823).
F. L. N.

Parachors of binary mixtures. F. ISHIKAWA and T. ATODA (Bull. Inst. Phys. Chem. Res. Japan, 1939, **18**, 150—161).—[P] for the systems C_6H_6–EtOH (I), PCl_3–C_6H_6 (II), and $POCl_3$–C_6H_6, measured at 25°, agree with those calc. from vals. for solute and solvent by $[P] = (1 - x)[P]_1 + x[P]_2$ where x is the mol. fraction of solute. The max. deviation from the calc. val. is -1 obtained with (I). $[P]$ for (I) and (II) is expressed more accurately by $[P] = a + bx$.
F. H.

Total and partial pressures of binary solutions of the butyl alcohols in benzene at 25°. B. B. ALLEN and S. P. LINGO [with W. A. FELSING] (J. Physical Chem., 1939, **43**, 425—430).—Data are presented in tabular and graphical form. Departures from Raoult's law follow the order Bu^{a}OH<Bu$^\beta$OH <CHMeEt·OH<Bu$^\gamma$OH. This transition is attributed to increase of polarity as the H atoms of the carbinol C atom are replaced by Me.
J. W. S.

Density and refractive index of aqueous furfuraldehyde solutions. S. MOLIŃSKI, F. NOWOTNY, and W. CAŁUS (Przemysł Chem., 1939, **23**, 30—32).—d and n are recorded for the system furfuraldehyde (I)

–H_2O, at 20°. Pure (I) has b.p. 161·75°, d 1·1614, and n 1·52624.
R. T.

Specific heat, density, and vapour pressure in the system methyl alcohol–water–lithium chloride. E. L. TSCHERNIAK (J. Gen. Chem. Russ., 1938, **8**, 1341—1352).—Sp. heat- (25° and 50°), ρ-, and v.p.-composition curves are given for the system MeOH–H_2O–LiCl ([LiCl] = 1 g.-mol. per l. of solvent).
R. T.

Viscosity in binary liquid systems. L. H. BIRD and E. F. DALY (Trans. Faraday Soc., 1939, **35**, 588—592).—ρ-, η-, and mol. polarisation–composition curves have been determined for binary mixtures containing highly purified cis- and $trans$-decalin and tetralin, and in a few cases C_6H_6, $C_{10}H_8$, and CCl_4. A semi-empirical formula is derived from Macleod's viscosity equation, using vol. fractions instead of mol. fractions. The formula breaks down for mixtures containing tetralin, and an explanation of this is offered. η is not necessarily a function of ρ or "free space" alone. Consts. for the purified liquids are: cis-decalin, ρ_4^{35} 0·8834±0·0001, n_D^{20} 1·4806±0·0002, b.p. 195·6±0·2°/762 mm.; $trans$-decalin, ρ_4^{35} 0·8598± 0·0001, n_D^{20} 1·4704±0·0002, b.p. 187·95±0·2°/766·5 mm.; tetralin, ρ_4^{35} 0·9573±0·0001, n_D^{20} 1·5425±0·0002, b.p. 206·8±0·2°/759 mm.
F. L. U.

Viscosity determinations of slag systems. J. R. RAIT, Q. C. M'MILLAN, and R. HAY (J. Roy. Tech. Coll., 1939, **4**, 449—466).—The systems CaO–SiO_2, MnO–SiO_2, and CaO–Al_2O_3–SiO_2 have been studied. The first of these shows a min. in the η-composition isothermals at the compound CaO,SiO_2. The variation of η with composition in the other systems is not a continuous function.
T. H. G.

Pressure–temperature phase diagram of Na–K alloys and the effect of pressure on the resistance of the liquid phase. C. H. KEAN (Physical Rev., 1939, [ii], **55**, 750—754).—The phase diagram of the binary system Na–K as a function of pressure, temp., and composition is plotted from determinations, at 0—150° and up to 10,000 kg. per sq. cm., of the pressures at which discontinuities occur in resistance isotherms of Na–K mixtures in various proportions. The composition of the eutectic in the subsystem solid Na–solid Na_2K–liquid is almost independent of pressure over the range, but that of the eutectic solid K–solid Na_2K–liquid moves from ~67 at.-% K at atm. pressure to 59% at 10,000 kg. per sq. cm. The rise of m.p. with pressure is markedly less for the alloys than for the pure metals; the rise of m.p. produced by 10,000 kg. per sq. cm. for the first eutectic is 42° (68° for pure Na); the corresponding rise for the second eutectic is 42° (105° for pure K). Some data for the relative resistance of the liquid alloys as a function of pressure are given.
N. M. B.

Effect of silver on the gold–copper superlattice, AuCu. R. HULTGREN and L. TARNOPOL (Amer. Inst. Min. Met. Eng., Tech. Publ., 1939, No. 1010, 10 pp.; Met. Tech., 1939, **6**, No. 1).—Assuming that superlattice formation is due to attraction between unlike atoms and differences in at. size, it is shown theoretically that substitution of Ag for Au in the AuCu superlattice should lower the crit. temp. of

ordering. Experiments confirm this prediction. The orthorhombic, pseudotetragonal phase is stable over a wider temp. range than has been supposed. At lower temp. the tetragonal cell is found. The pseudotetragonal cell of the orthorhombic phase has a b/a ratio slightly >1. As the temp. of anneal falls, toward the region of stability of the tetragonal phase, the b/a ratio increases. Apparently the transformation from orthorhombic to tetragonal does not take place gradually. At room temp. the b/a ratio increases with time. The resistance of the orthorhombic phase shows that the mechanism of ordering is not as simple as has been supposed. There is a small decrease in at. vol. just above the transformation temp. At low temp. the time necessary to attain equilibrium is longer than the hitherto accepted val.
R. B. C.

Volatility of silver, in relation to the nature of the atmosphere, the temperature, and the composition of binary silver alloys. I. N. PLAKSIN and A. J. BRECHSTEDT (J. Gen. Chem. Russ., 1938, **11**, 1556—1563).—The rate of volatilisation of Ag at temp. $>1000°$ in air is $>$ in $CO_2 >$ in $N_2 >$ in coal gas; it is greater for Sb and Cu than for other alloys (with Au, Sn, or Pt). The effect is ascribed to lowering of the surface tension of molten Ag by dissolved Ag_2O or by other metals.
R. T.

Influence of nickel on the solubility limits of the α-phase in copper–aluminium alloys. V. GRIDNEV and G. KURDJUMOV (Metallwirts., 1936, **15**, 229—231, 256—259; Chem. Zentr., 1937, i, 1098).—Addition of 2% of Ni to Cu–Al alloys (82—98% Cu) reduces the solubility (s) of Al in Cu and displaces the boundary of the α-phase region from 9·8 to 8·6% Al; the eutectoid line is raised from 570° to 605°. s is independent of temp. below the eutectoid decomp. temp. Increase of the Ni content to 4% causes no further shift of the α-region boundary or the eutectoid line, owing to inducement of a hardening process. The eutectoid point is displaced to higher Al contents by addition of Ni.
A. J. E. W.

Reversible transformation in copper–aluminium alloys.—See B., 1939, 498.

Intermediate phases in the aluminium–copper system after slow cooling. A. J. BRADLEY, H. J. GOLDSCHMIDT, and H. LIPSON (J. Inst. Metals, 1938, **63**, Advance copy, 447—459).—The phase sequence for slowly-cooled Al–Cu alloys containing 16—30% Al has been determined by X-ray analysis; the structures of alloys with compositions between Cu_9Al_4 and CuAl are all derived from a body-centred cubic lattice by the omission of varying nos. of atoms and consequent changes in symmetry. The three γ-structures are closely related and no two-phase regions exist between them; γ (Cu_9Al_4), cubic, exists between 16 and 18·8% Al, γ_1 ($Cu_{32}Al_{19}$) between 18·8 and 20·7% Al, and γ_2 (Cu_3Al_2) between 20·7 and 22·5% Al. The structures of γ_1 and γ_2 deviate slightly from cubic symmetry and the superlattices differ from each other and from γ. The ζ (Cu_4Al_3) and η (CuAl) phases are totally distinct and are separated from adjacent phases by definite two-phase regions; the low-temp. forms of these phases are probably monoclinic (21 atoms) and orthorhombic (20 atoms per

unit cell) respectively, and have structures related to that of Ni_2Al_3.
A. R. P.

System aluminium–zinc. W. GUERTLER, H. KRAUSE and F. VOLTZ (Metallwirts., 1939, **18**, 97—100).—Alloys containing 20—50% Al have been examined microscopically and by thermal analysis. New vals. for the solidus temp. have been obtained, and it is shown that the solidus curve running from the m.p. of Al cuts the 380° eutectic horizontal at approx. 17% Al. This explains the finding by the authors and others of α crystals in alloys containing 20—30% Al.
C. E. H.

X-Ray investigation of cobalt–aluminium alloys. A. J. BRADLEY and G. C. SEAGER (J. Inst. Metals, 1939, **64**, Advance copy, 509—516).—The following intermetallic compounds have been detected by X-rays in the Co–Al system : CoAl, Co_2Al_5, Co_2Al_{13} or Co_2Al_9, Co_4Al_{13}, and $CoAl_3$. CoAl is body-centred cubic, a 2·8565 A., and dissolves both Co and Al with linear reduction in a. Co_2Al_5 is hexagonal, D_{6h}^4, $C6/mmc$, with 28 atoms in the unit cell, whilst the other compounds have complex structures which have not yet been resolved. Al dissolves in the cubic form of Co, but not in the hexagonal, and tends to stabilise the cubic structure on cooling; prolonged annealing at 320° of such alloys produces pptn. of CoAl and reversion of the cubic Co to the hexagonal form.
A. R. P.

Variation of electrical resistance of (A) tin–zinc and (B) lead–antimony alloys at low temperature. E. KURZYNIEC (Bull. Acad. Polonaise, 1939, **A**, 489—497, 498—518).—(A) The ratios r of the resistances at the temp. of liquid H_2 and of liquid N_2 to the resistance at 0° have been measured for various Sn–Zn alloys tempered at 190°. For the lower temp. small additions of Zn to Sn cause a great increase in r. The max. val. of r is attained for ~ 2 at.-% Zn; r then decreases almost linearly with increased Zn content up to pure Zn. r varies in a similar way for the higher temp. but the max. val. is attained for 2—4 at.-% Zn.

(B) r vals. have also been obtained for Pb–Sb alloys tempered at 225°. Contrary to theoretical expectations, small additions of Pb to Sb cause a marked increase in r. It is inferred that for systems in which mixed crystals are formed small additions of one constituent must cause a marked increase in r, but that the converse is not necessarily true. The sp. conductivity isotherms have also been calc. for Pb–Sb alloys at −252·9° and −195·9°.
W. R. A.

System iron–zinc. II. F. HALLA, R. WEIL, and F. GÖTZL (Z. Metallk., 1939, **31**, 112—113; cf. A., 1938, I, 612).—A detailed account of work already noted (A., 1939, I, 251).

Electronic diffraction in the surface layers of metal alloys. V. KASSATOCHKIN (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 37—38).—A comparison of electron- with X-ray-diffraction patterns shows absence of the γ-phase in surface layers of steels, and of the β-phase in those of brass, as a result of surface strains produced in polishing with emery. L. J. J.

Magnetic stability. R. GOLDSCHMIDT (Helv. Phys. Acta, 1936, **9**, 635—636; Chem. Zentr., 1937,

i, 1101).—The dependence of μ on the magnetisation and hysteresis losses in two Fe alloys is studied. Magnetic stability is shown only by a hard alloy.   A. J. E. W.

Two series of mixed crystals between Hume-Rothery compounds in the ternary system silver–copper–zinc. K. MOELLER (Naturwiss., 1939, **27**, 167).—X-Ray and microscopic investigations show that two series of mixed crystals between Hume-Rothery compounds can exist in the Ag–Cu–Zn system. The ε-phases of the Ag–Zn and Cu–Zn systems (hexagonal close packing) are linked by a ternary mixed crystal series. The γ-phases of the Ag–Zn and Cu–Zn systems (space-centred cubic lattice, with 52 atoms in the cell) also form ternary mixed crystals.   A. J. M.

Magnesium ternary systems. H. BAUR (Metall-wirts., 1939, **18**, 145—149, 164—166).—Existing information on the constitution of ternary alloy systems containing Mg is reviewed.   C. E. H.

Vapour pressure of zinc in brasses. R. HARGREAVES (J. Inst. Metals, 1939, **64**, Advance copy, 603—612).—Within the single-phase fields the v.p. of Zn in brass, Al brass, and Ni brass can be expressed in the form : $\log P = -B/T + A$, where A and B are consts. By using the vals. of Zn v.p. at suitable temp. the heats of sublimation of Zn from various brasses have been calc. by means of the reaction isochore. The effects of Zn volatilisation on the surface structure have also been examined.   A. R. P.

X-Ray study of slowly cooled iron–copper–aluminium alloys. I. Alloys rich in iron and copper. A. J. BRADLEY and H. J. GOLDSCHMIDT (J. Inst. Metals, 1939, **65**, Advance copy, 157—169).—The equilibria in the Fe- and Cu-rich fields of the system have been determined by X-ray powder photographs of slowly-cooled alloys ; in this range there are 3 phases, as well as 3 two-phase fields and 1 three-phase field. The α-phase field includes the face-centred cubic Al–Cu alloys from 0 to 20 at.-% Al and from 0 to 2·5% Fe. The β-phase field consists of 3 regions ; with small amounts of Al the atoms are randomly distributed on a body-centred cubic lattice, but near FeAl₃ there is a superlattice in which alternate corners are occupied by Al atoms (β_1), and near 50 at.-% Al the cube centres are Fe or Cu and the corners Al (β_2). The β and β_1 fields occupy successive narrow strips along the Fe–Al edge of the system, but the β_2 field broadens into a wide area about the 50% Al line and terminates at the composition FeCu₄Al₅. In the 2- and 3-phase fields, increasing the Al content results eventually in overlapping of the 310 line of the body-centred and 400 line of the face-centred cubic patterns and finally in the coincidence of the 930 line of the γ-phase with these two lines.   A. R. P.

Copper-rich nickel–aluminium–copper alloys. II. Constitution of the copper–nickel-rich alloys. W. O. ALEXANDER (J. Inst. Metals, 1938, **63**, Advance copy, 425—445 ; cf. B., 1937, 922).—The structure of Cu–Ni alloys with 1—35% Al has been examined by thermal, micrographic, and X-ray methods and the results are shown in pseudo-binary diagrams for

const. Ni contents of 3, 6, 10, 20, and 40%. At high temp. the equilibria are controlled by the following facts : primary separation of NiAl containing dissolved Cu, isomorphism of Cu₃Al and NiAl above and their immiscibility below 750°, presence of a eutectic valley between the Ni–Al and Cu–Al binary alloys along which α + Ni₃Al first separate and then, below 1250°, α + NiAl. At lower temp. NiAl and Ni₃Al retain Cu in solid solution and extend their phase-formation influence right into the Cu corner of the ternary system to alloys containing only Ni 3, Al 3 and Ni 3, Al 1%, respectively.   A. R. P.

Magnetic studies in the ternary system Fe–Ni–Al. J. L. SNOEK (Physica, 1939, **6**, 321—331).—Measurements of the inner demagnetisation and of the saturation vals. of alloys containing equimol. proportions of Ni and Al, both quenched from 1200° and cooled at varying rates to 500°, indicate the presence of a non-magnetic phase in all the annealed alloys from 10 to 100% NiAl. In the quenched specimens with 80—100% NiAl the basic alloy is non-magnetic. Hence, in contrast to the results of Bradley and Taylor (A., 1938, I, 74, 449) the two-phase area extends over the whole of the Fe–NiAl line, which is one of its main conodes. This is substantiated by the curve of saturation vals. against % NiAl, which is continuous in all cases, and linear in the annealed specimens. The phases are Fe₂ and NiAl, both body-centred, but small amounts of a face-centred phase are formed on slow cooling.   L. J. J.

Iron–carbon–aluminium alloys.—See B., 1939, 493.

The brittle σ-phase in the ternary system iron–chromium–manganese. P. SCHAFMEISTER and R. ERGANG (Arch. Eisenhüttenw., 1938—9, **12**, 507—510 ; cf. B., 1937, 563).—Published data have been extended to cover all compositions in the system at 700°. Mixes were melted for 0·5 hr. at 1200°, then for 8 hr. at 800° after quenching, and finally for a long period at 700°. The isotherm is similar to those for the system Fe–Cr–Ni (A., 1939, I, 252), but owing to the greater solubility of Mn in Fe–Cr (35%) the pure σ-phase extends to 64% Mn.   R. C. M.

Low-temperature transformation in iron–nickel–cobalt alloys.—See B., 1939, 493.

Release of air dissolved in water. A. G. SILLITTO (J. Roy. Tech. Coll., 1939, **4**, 421—426).—A graph of the solubility of " air " (2 vols. N₂ and 1 vol. O₂) at a total pressure of 760 mm. has been computed from the ordinary graph (for atm. pressure of 760 mm.). It is shown that the vol. of " air " released on warming a solution which is saturated at a lower temp. is much less than that expected from the graph. This saturation persists for many hr. It is reduced if the surface of the flask is contaminated by air. The rôle of air bubbles in promoting boiling and " singing " is noted and these phenomena are discussed.   T. H. G.

Aqueous solubilities of unsaturated alcohols. P. M. GINNINGS, (MISS) E. HERRING, and (MISS) D. COLTRANE (J. Amer. Chem. Soc., 1939, **61**, 807—808). —The aq. solubilities (s) of 7 unsaturated alcohols at

20°, 25°, and 30° have been determined and are > those of corresponding saturated alcohols. When the C:C and OH groups are close together at the centre of a compact mol. s is greatest, but diminishes with increase of mol. wt. and temp.   W. R. A.

Solubility of ethers in solutions of strong acids. G. Lejeune (Compt. rend., 1939, **208**, 1225—1227; cf. A., 1929, 1375).—The solubility of Et_2O in H_3PO_3 and $HClO_4$ is in approx. parallelism with the no. of doubly-linked O in the acid mol.; H_2SO_4 (assuming two such atoms) is anomalous. Cryoscopic measurements on $HClO_4$ solutions show that no definite compound is formed, and association of Et_2O and acid mols. is probably a polar effect. The increase of the Et_2O-solubility with the acid concn. does not commence until a certain crit. concn. is reached, suggesting that Et_2O mols. replace a deficiency in the H_2O associated with each acid mol. The effect of acids on the solubility is much smaller with Pr_2O, and cannot be detected with Bu_2O.   A. J. E. W.

Molecular forces and solvent power. R. G. Larson and H. Hunt (J. Physical Chem., 1939, **43**, 417—423).—The solubilities (s) of NaCl, NaBr, NaI, KCl, KBr, and KI in $Pr^{\alpha}OH$, $Pr^{\beta}OH$, $Bu^{\alpha}OH$, $Bu^{\beta}OH$, sec.-BuOH, and n-C_5H_{11}·OH have been determined at 25°. The dielectric consts. (ε) of the alcohols, determined at ~3000 cycles per sec., are 30·2, 24·14, 20·08, 18·55, 16·98, 17·32, 15·77, and 13·77, respectively. Plots of log s against the ε, [P], and mol. vol. of the solvents give, with a few exceptions, smooth curves for each solute.   J. W. S.

Effect of grinding on solubility of mineral substances.—See B., 1939, 554.

Radio-cobalt as indicator for determining the solubility of Co(OH)₃. I. B. N. Cacciapuoti and F. Ferla (R.C. Atti Acad. Lincei, 1938, [vi], **28**, 385—388).—The solubility of $Co(OH)_3$ prepared as in ordinary analytical processes is 0·01046 mg. per l. Co was determined by measuring the activity of an added artificially radioactive isotope.   O. J. W.

Solubility of mercuric chloride in aqueous solutions of several chlorides. H. C. Thomas (J. Amer. Chem. Soc., 1939, **61**, 920—924).—The aq. solubility of $HgCl_2$ at 25° ranges (10 determinations) from 0·27003M. to 0·2701₆M. The solubilities of $HgCl_2$ at 25° in solutions of HCl, LiCl, $CaCl_2$, $AlCl_3$, $LiCl$-$CaCl_2$, and $LiCl$-$AlCl_3$ of various concns. are recorded. In the concn. range corresponding with the solid phase $HgCl_2$ the $HgCl_2Cl'$ complex is of the same nature in all the solutions.   W. R. A.

Solubility of bone in biological fluids.—See A., 1939, III, 488.

Velocity of dissolution of aluminium in sodium hydroxide solution.—See B., 1939, 506.

Passivity of iron and steel in nitric acid solution. XXVI. Y. Yamamoto (Bull. Inst. Phys. Chem. Res. Japan, 1939, **18**, 162—170).—The extent of attack of Fe and steel in the passive state by HNO_3 increases with concn., being very rapid when $[HNO_3]$ is >94% due to the low $[H_2O]$ failing to render Fe completely passive.   F. H.

Test of Polanyi's theory of adsorption by means of adsorption measurements on glass and wood charcoal with different gases below the critical temperature. W. van Dingenen (Physica, 1939, **6**, 353—363; cf. A., 1938, I, 76, 450; 1939, I, 139).—Published data for O_2, CO, H_2, and D_2 on glass and charcoal and data recorded for A, O_2, and N_2 on charcoal in the region 90—55° K. give temp.-independent adsorption potential curves in agreement with Polanyi's theory. Heats of adsorption calc. on the basis of this theory are in satisfactory agreement with vals. calc. by the Clapeyron–Clausius relation from the adsorption isotherms. CO on charcoal, however, gives different potential curves above and below 61·5° K., and the difference between H_2 and D_2 potential curves is anomalous.   L. J. J.

Densities of vapours adsorbed on charcoal. J. D. Danforth and T. de Vries (J. Amer. Chem. Soc., 1939, **61**, 873—876).—The average densities d of CCl_4 and $COMe_2$ adsorbed on a steam–CO_2-activated coconut charcoal have been determined at 30°. The large val. of d observed for small amounts of adsorbed material indicates that a small portion of the C surface possesses very large forces of attraction for the adsorbed mols. As more material is adsorbed d decreases rapidly to a min., but increases as the equilibrium pressure is increased, finally attaining the val. for the normal liquid. The data suggest that 15—20% of the surface area of the C contains active centres to which the vapour is first adsorbed. As the equilibrium pressure increases the less active centres are covered with a layer of d < that of the normal liquid. Finally, further increase of pressure causes the mols. to move laterally to make room for other adsorbed mols., producing an increase in the average d.   W. R. A.

Statistical theory of the adsorption of double molecules. T. S. Chang (Proc. Roy. Soc., 1939, **A**, **169**, 512—531).—A theoretical investigation of the case when a diat. mol. is adsorbed without dissociation, so that the two atoms of the mol. are accommodated on neighbouring sites. It is found that if the forces between the mols. are attractive there will be a crit. temp. at which the fraction of adsorption will exhibit a discontinuity.   G. D. P.

Surface chemistry of the platinum electrode. B. Ershler and A. Frumkin (Trans. Faraday Soc., 1939, **35**, 464—467).—Methods of investigating the adsorption of gases and ions on Pt electrodes are discussed. Ershler's method (A., 1938, I, 624) using only a very small quantity of solution minimises the depolarising action of traces of dissolved gases and permits observation of the effect of adsorbed substances on the H-charging curve. Curves are given showing the effect of traces of Na_3AsO_4 on the charging characteristic in N-Na_2SO_4, 0·02N. in H_2SO_4.   J. W. S.

Optical sensitising of silver halides by dyes. I. Adsorption of sensitising dyes. S. E. Sheppard, D. H. Lambert, and R. D. Walker (J. Chem. Physics, 1939, **7**, 265—273; cf. A., 1938, I, 151, 579). —Basic cyanine dyes are completely and irreversibly adsorbed from aq. solution by AgBr, but the velocity of adsorption is greatly reduced by the presence of

gelatin. Dye mols. are held by the hydrophilic ionisable part of the mol., the hydrophobic part being in solution as a primary monolayer. A second monolayer may be formed with reversed orientation. Calculations of the adsorption-density at saturation for a primary monolayer agree with "edge-on" adsorption of the dye mols. in approx. close-packed assemblies. At least two states of aggregation must be assigned to the adsorbed dye, in agreement with the data of Leermakers et al. (cf. A., 1938, I, 151). They are provisionally regarded as uni- and multi-mol. Erythrosin and other acid dyes, which contain non-adsorbed hydrophilic groups, are incompletely and reversibly adsorbed, and appear to be oriented similarly to the cyanine dyes.   W. R. A.

Radioactive method for determining ionic adsorption at crystal surfaces. I. L. IMRE (Kolloid-Z., 1939, **87**, 12—21; cf. A., 1938, I, 25, 299).—Using Th-B as indicator, the true adsorption of Pb$\cdot\cdot$ on $PbSO_4$ has been measured and found to agree with calc. vals. Addition of EtOH increases the adsorption.   F. L. U.

Adsorption in the solid phase. S. DOBIŃSKI and A. JAGIELSKI (Bull. Acad. Polonaise, 1938, **A**, 423—427; cf. A., 1939, I, 22).—The surfaces of Pb–Sb, Zn–Sn, Cu–Ca, Ag–Cd, Cu–Al–Ni (I), and Al–Cu–Ni–Mg (II) alloys have been investigated by electron-diffraction methods. Assuming that the vals. of γ for solid metals are in the same order as for molten metals, the metal of lowest γ will be adsorbed at the surface of the others. Thus Sb, Sn, Ca, Cd are adsorbed at the surface of Pb, Zn, Cu, Ag, respectively. In (I) and (II) Al and Mg respectively have the lowest γ.   W. R. A.

Comportment of the palladium–hydrogen system toward alternating electric current. G. A. MOORE (Trans. Electrochem. Soc., 1939, **75**, Preprint 22, 257—287).—The electrostatic capacity exhibited by Pd–H is attributed to the existence of the H in narrow rifts in the Pd, the whole forming a highly conc. condenser. The H within the rifts is highly ionised and itself acts as an oscillatory conductor. At a const. high H content the conductance of the system increases on passing from d.c. to a.c. of gradually increasing frequency; also the conductor exhibits a natural frequency of electrical oscillation dependent on the dimensions of the rifts. The changes in the dimensions of the rifts, and in the amount of H occluded in them, are traced under different conditions.   J. W. C.

Thickness of air-formed oxide films on iron. W. H. J. VERNON, F. WORMWELL, and T. J. NURSE (J.C.S., 1939, 621—632).—The thickness of air-formed oxide films on high-purity Fe and mild steel has been estimated from chemical analysis of films stripped from the metal by treatment in absence of air in a solution of I in anhyd. MeOH. The data, supplemented by determination of the total O in the surface by Sloman's vac. fusion method, are correlated with gravimetric determinations of the O absorbed. Data are recorded for the invisible and coloured films produced on heating the specimens in air at various temp.   J. W. S.

Influence of oxide film on aluminium on chemical and electrochemical behaviour of the metal.—See B., 1939, 505.

Spreading of oil on surface of water. BARRILLON and P. WOOG (Ann. Off. nat. Combust. liq., 1938, **13**, 223—286).—Apparatus which measures the rate and extent of film formation from a given quantity of oil on a calm or rippled H_2O surface is described. Experiments with a large no. of oils and H_2O of p_H 7·3 showed that animal and vegetable oils, particularly cod and linseed oils, give the best and mineral oils the poorest films. The order of efficiency of the oils is not the same for calm and rippled conditions. Attempts to correlate film formation with mol. wt., interfacial tension, unsaturation, and total acidity were unsuccessful.   R. B. C.

Rubbed films of barium stearate and stearic acid. L. H. GERMER and K. H. STORKS (Physical Rev., 1939, [ii], **55**, 648—654; cf. A., 1938, I, 347). —Films of Ba stearate (I) and of stearic acid (II) on polished Cr and on smooth natural faces of SiC crystals give, after rubbing with clean lens paper, electron diffraction patterns by the reflexion method. Well-rubbed films give patterns of a single layer of mols. axially normal to the surface, the hydrocarbon chains of (I) being more precisely oriented than those of (II), as is the case for unrubbed single layers of mols. of (I) and (II) deposited by the Langmuir–Blodgett method. Thickness of rubbed films on Cr is found, by the Blodgett optical method, to be the same as that of unrubbed single layers of mols. Lightly rubbed films of (I) may be thicker than a single layer, and, after rubbing, the axes of the hydrocarbon chains still stand normal to the surface, but lateral arrangement is less regular. In the case of (II), mols. left on top of the first layer after light rubbing in one direction lie inclined at ~8° to the surface, point against the rubbing direction, and are arranged in crystals having a structure different from that of the film before rubbing; they are completely removed by very light rubbing in the opposite direction.   N. M. B.

Properties and structure of protein films. I. LANGMUIR (Proc. Roy. Inst., 1939, **30**, 483—496). —A lecture.

Spreading of proteins. J. VAN ORMONDT (Chem. Weekblad, 1939, **36**, 262—265).—A survey of published work.   F. L. U.

Very dilute films of proteins. Attempt to determine mol. wts. J. GUASTALLA (Compt. rend., 1939, **208**, 1078—1080).—The surface pressures of very dil. films of ovalbumin (I), hæmoglobin (II), and gliadin (III) on 0·01N-HCl at 19° have been measured as a function of surface concn. The following mol. wts. have been deduced: (I) 40,000; (II) 12,000; (III) 27,000.   W. R. A.

"Surface elasticity" of protein films. I. Egg-albumin. J. B. BATEMAN and L. A. CHAMBERS (J. Chem. Physics, 1939, **7**, 244—250).—The limiting area A_0 and " surface elasticity," $M_s (= -A.dF/dA)$, of egg-albumin films have been measured as a function of the p_H of the substrate. The M_s–F curves are of characteristic form with a well-defined max., $(M_s)_{max}$. A_0 shows a sharp max. near the isoelectric point

($\sim$1·45 sq. m. per mg.), falling off steeply to both acid and alkaline sides and rising again near p_H 2 and 11·7. Such large variations are not manifest in $(M_s)_{max.}$–p_H curves, and for the p_H range studied the observed elasticities are due to a unimol. film of true limiting area $\sim$1·0 sq. m. per mg. The low vals. of A_0 observed at certain vals. of p_H are due to unspread material which does not contribute to the mechanical properties of the film. The val. of M_s–F curves for the characterisation of protein films is emphasised.

W. R. A.

Existence of two forms of protein surface films. M. JOLY (Compt. rend., 1939, **208**, 975—976).—Surface films maintained at low pressure during prep. (type A) are characterised by small η and by reversible F–A relations. Type B films, produced when the pressure is allowed to rise during formation, have higher η, which increases to a const. val. in several hr., and rises with temp. Their F–A curves show hysteresis, and the films change reversibly to rigid and elastic two-dimensional gels when subjected to a certain crit. compression. F–A and η curves are affected by change of p_H. The two types also differ in electrical properties and in surface concn.

A. J. E. W.

Electric forces at the interface of two dielectrics. B. KAMIEŃSKI (Rocz. Chem., 1938, **18**, 600—613).—The curve relating potential at the air–water interface of aq. org. acids (AcOH, $EtCO_2H$, $PrCO_2H$, BzOH, and salicylic acid) or bases ($CH_2Ph\cdot NH_2$, piperidine, C_5H_5N, α- and β-picoline, collidine, lepidine, and quinaldine) with p_H shows a point of inflexion at a p_H numerically equal to the pK of the acid or base. In the case of amphoteric electrolytes the potential–p_H curves pass through a max. or min.

R. T.

Adhesion in detergence. R. C. PALMER and E. K. RIDEAL (J.C.S., 1939, 573—577).—The adhesion of particles of carborundum and $CaCO_3$ ($\sim$20 μ.) to SiO_2 surfaces has been studied in presence of dil. solutions of paraffin-chain salts by an adaptation of von Buzágh's method (A., 1929, 645; 1930, 685). Measurements were made with and without hydrophobic coatings on either the cell walls or the particles. Except when both the cell wall and the particles are clean, adhesion at first decreases with increasing detergent concn., but when micelle formation commences the adhesion no. increases again. It is concluded that min. adhesion occurs when the particles and the surface are each covered with a unimol. film of detergent, and that at higher concn. the particles are cemented to the surface by a micelle-like structure. In accord with this view the min. adhesion is attained at a lower concn. the greater is the chain-length of the salt, and this concn. is also reduced by addition of NaCl.

J. W. S.

Surface activity of antipyrine and of its 4-alkyl derivatives. A. GIACALONE and D. DI MAGGIO (Gazzetta, 1939, **69**, 122—129).—Solubility and surface tension measurements have been made with aq. solutions of antipyrine and of its Pr^β, Bu^β, and isoamyl derivatives. The surface activity, and probably also the pharmacological action, increases with the length of the alkyl chain. The surface

tension data confirm Traube's rule. Pyramidone has a surface activity $>$ that of antipyrine. O. J. W.

Water-in-oil emulsions. II. Interfacial and surface activities of magnesium and calcium oleates and the rôle played by these soaps in the stabilisation of water-in-oil emulsions. R. C. PINK (J.C.S., 619—621; cf. A., 1938, II, 428).—The prep. of anhyd. *Ca oleate* is described. The effect of various concns. of Mg and Ca oleates in the C_6H_6 on the interfacial tension (γ) between C_6H_6 and H_2O has been studied by the drop-wt. method. The great decrease in γ observed at low oleate concns. is an important factor in the stabilisation of H_2O-in-oil emulsions. The surface tension of H_2O is considerably lowered, and that of C_6H_6 slightly increased, by both salts. J. W. S.

Permeation, diffusion and dissolution of gases in organic polymerides. R. M. BARRER (Trans. Faraday Soc., 1939, **35**, 628—643).—Permeability consts. (P), diffusion consts. (D), and solubilities (s) have been determined for He, A, H_2, and N_2 in eight rubber-like polymerides. The consts. vary with temp. according to $P = P_0e^{-E/RT}$, $D = D_0e^{-E_1/RT}$, and $s = s_0e^{-\Delta H/RT}$. Vals. of E, E_1, ΔH, D_0, and s_0 are calc. E ranges from 6·5 to 10·7, E_1 from 8·7 to 11·9, and heats of dissolution (ΔH) from $-0·5$ to -2 kg.-cal. per mol. All the gases for which s could be measured dissolve exothermically. The vals. of s are approx. the same as for the respective gases in org. liquids, but the decrease of entropy is 4—5 units $>$ when they dissolve in liquids, corresponding with the greater restriction of mobility in the polymerides.

F. L. U.

Activated diffusion in membranes. R. M. BARRER (Trans. Faraday Soc., 1939, **35**, 644—656).—Activated diffusions are classified into sp., in which there is special affinity of the solute for the medium (H_2–Pd), and non-sp. which involve van der Waals forces chiefly (He–SiO_2 gel etc.). Data on diffusion of gases in rubber-like polymerides (cf. preceding abstract) are treated theoretically, and elastic displacement on a mol. scale is shown to enable the energy barrier encountered on diffusion to be largely reduced. For such membranes, unlike rigid membranes (inorg. glasses), the activation energy is insensitive to the mol. size of the solute. Vals. of D_0 in the equation $D = D_0e^{-E/RT}$ for 80 different systems cover a range of $\sim$10²—10⁻⁶, decreasing in the order rubbers $>$ liquids $>$ crystals. F. L. U.

Dielectric constants of some strong dilute uni-univalent electrolytes at various temperatures. M. WIERZBICKI (Bull. Acad. Polonaise, 1938, A, 413—422).—The change in dielectric const. $\Delta\epsilon$ of dil. aq. solutions (0·0005—0·001N.) of LiCl, KNO_3, RbCl, and CsCl at 0° and 10° agrees with the Debye–Falkenhagen theory. At greater concns. (0·002—0·003N.), however, and for all concns. at 18° and 25°, marked deviations from the theory occur. The experimental results can be expressed by $\Delta\epsilon = \Delta\epsilon_{DF} - K\gamma$ ($\Delta\epsilon_{DF} = $ change of D according to theory, and $\gamma = $ normality of electrolyte), where K is a coeff. increasing with increasing temp. and with the at. no. of the elements Li, K, Rb, and Cs. The data for KNO_3

are identical with those obtained for KCl by Jeżewski (cf. Z. Physik, 1927, **43**, 442). W. R. A.

Viscosity of dilute solutions of *o*-nitrobenzoic acid. A. BANCHETTI (Annali Chim. Appl., 1939, **29**, 88—90).—In dil. solutions (0·0004—0·01M.), $\eta = 1 + 0·0029\sqrt{c} + 0·392c$, *i.e.*, in accordance with the formula for strong electrolytes (cf. A., 1936, 1336).
F. O. H.

Viscosity of dilute solutions of long-chain molecules. II. M. L. HUGGINS (J. Physical Chem., 1939, **43**, 439—456; cf. A., 1938, I, 616).—Theoretical derivations are given for the general equation relating the η of a dil. solution with the dimensions and arrangement of the atoms in the component mols., and for the special equations applying to rigid chain mols. which are rod-like or are randomly kinked.
J. W. S.

Direct observation of emulsification. W. CLAYTON and J. F. MORSE (Chem. and Ind., 1939, 304—306).—Stages in the formation of emulsions, *e.g.*, formation of drops, then cylinders, and, when $l > \pi d$, globules, are studied by dispersing Wood's metal (Bi 15, Pb 8, Cd 4, Sn 4 pts. by wt.; m.p. 66°) in boiling H_2O, and cooling suddenly. I. C. R.

Problems of stability in hydrophobic colloidal solutions. I. Interaction of two colloidal metallic particles. General discussion and applications. II. Interaction of two colloidal metallic particles : mathematical theory. S. LEVINE (Proc. Roy. Soc., 1939, **A**, **170**, 145—164, 165—182).—I. The method of calculating the interaction energy of two colloidal particles as a function of their separation is described. The Debye–Hückel theory of electrolytes is used. The electrical forces are found to be repulsive at small separations but to become attractive at large separations. The van der Waals attractive energy is calc. for a particular case; the total energy has a max. val. when the particles are nearly in contact and this max. is the controlling factor in coagulation, its val. diminishing with electrolyte concn. It is shown that the use of the approx. Debye–Hückel equation cannot explain the Schultz–Hardy rule. The energy min. which occurs where the electrical forces vanish is characteristic of all hydrophobic sols containing spherical particles; thixotropy and related phenomena are associated with this min. A method of calculating the osmotic pressure from the interaction energy is indicated.
II. Mathematical. G. D. P.

Theory of double refraction of non-spherical colloids in an ultrasonic field. S. OKA (Kolloid-Z., 1939, **87**, 37—43).—Mathematical. Formulæ relating double refraction of dil. suspensions of discoid particles to the intensity (I) of an applied ultrasonic field are derived. Saturation effects are obtained for high vals. of I. F. L. U.

Theory of double refraction in flowing solutions of colloids and large molecules. A. PETERLIN and H. A. STUART (Z. Physik, 1939, **112**, 1—19). —The existing continuum theory of double refraction in flowing solutions or suspensions is reviewed critically and is further developed for rotation ellipsoids in suspension. Application of the theory to

determination of size, form, and optical consts. of the particles is discussed; limitations of the theory arising from the initial assumptions are indicated.
H. C. G.

Determination of size and form, also the electrical, optical, and magnetic anisotropy, of submicroscopic particles by means of induced double refraction and internal friction. A. PETERLIN and H. A. STUART (Z. Physik, 1939, **112**, 129—147).—A theoretical development of previous work (preceding abstract). The treatment embraces particles of mean radius 10—50,000 A. H. C. G.

Influence of frequency on the electro-optical effect in colloids. F. J. NORTON (Physical Rev., 1939, [ii], **55**, 668—669).—A 1% suspension of particles of centrifuged colloidal clay of size ~1500 A., subjected to alternating electric fields of 30—12,000 cycles, showed a very strong Kerr effect (cf. Mueller, A., 1939, I, 257). There is a min. at 630 cycles, in the case of white and yellow bentonite, at which there is no light-response to the voltage applied. On d.c. at frequencies below the min. there was negative double refraction, and, above the min., positive double refraction. V_2O_5 sol showed a flat frequency characteristic of positive double refraction.
N. M. B.

Electro-optical effects in bentonite colloids. H. MUELLER (Physical Rev., 1939, [ii], **55**, 792).— Continuation of work previously reported (cf. A., 1939, I, 257) shows that a sol of concn. ~1% becomes negatively birefringent for a.c. fields of 60 and 500 cycles. On dilution the effect diminishes rapidly and vanishes at a crit. concn. depending on the field frequency; below the crit. concn. the sols become positively birefringent, results agreeing with those of Norton (cf. preceding abstract). The crit. frequency for the disappearance of birefringence increases with the concn. of the sol. The birefringence consists in general of two parts, one const., and the other vibrating with twice the frequency of the field; both parts vanish at the same concn. For conc. solutions the alternating part is negligible; for dil. solutions the const. part disappears according to the laws of a relaxation effect. The discovery of the alternating part enables bentonite to be used in light shutters and stroboscopes. N. M. B.

Osmotic pressure of solutions of polysaccharide derivatives. I. New form of osmometer. II. Osmotic pressure of derivatives of lichenin, inulin, glycogen, starch, and starch dextrin. S. R. CARTER and B. R. RECORD (J.C.S., 1939, 660—664, 664—675).—I. An osmometer which works on the counter-pressure principle and is suitable for measurements on materials of mol. wt. 3000—10^6 dissolved in org. solvents is described. Suitable membranes are prepared by soaking cellulose film prepared by the viscose process ("Viscacelle") in suitable $EtOH$-H_2O mixtures and then keeping it for ≮4 hr. in abs. $EtOH$ to remove H_2O.
II. The osmotic pressures (Π) of methylated and acetylated lichenin, inulin, glycogens, starches, and starch dextrin have been determined in $CHCl_3$ and CCl_4 solution at various concns. (c). In each case Π increases with increasing c more rapidly than is demanded

by the van 't Hoff law. The deviation is greater for solutions in $CHCl_3$ than for solutions in CCl_4, but in both cases the solutions obey the Ostwald relationship $\Pi = ac + bc^n$, where a, b, and n are consts. for any particular solute and solvent. By extrapolating the curves of Π/c against c to $c = 0$ the particle wts. are deduced. These are $\gg$ the size of the fundamental chains as determined by Haworth's end-group method except in the cases of inulin and perhaps lichenin, where the units are identical.

J. W. S.

Dependence of flow of benzopurpurin sols on dimensions of capillary. W. Z. DANEŠ (Kolloid-Z., 1939, **87**, 43—57).—Measurements of the apparent η of 0·75% sols of benzopurpurin 4B were made at 18° at different rates of flow (v) in capillaries 1·5—54 cm. long and 0·04—0·09 cm. in diameter. The changes in η at high v are attributed to disintegration of the particles. The apparent η tends to a const. val. in long and narrow capillaries at high v.   F. L. U.

Plastic flow of dispersions and a new approach to the study of plasticity. P. S. ROLLER (J. Physical Chem., 1939, **43**, 457—489).—The plastic resistance of dispersions is distinguished from the viscous resistance, which depends on rate of deformation, and hence measurement of plasticity on the basis of viscous resistance is deemed to be wrong in principle. The plasticity of a no. of dispersions has been studied by measurement of the plastic flow, in which two const. factors are identified, the coeff. of retinence ($\varkappa$) and yield val. (p_0). $\varkappa$ is of the greater importance in determining the stress at practical deformations and is const. for any particular system, whereas p_0 varies with the concn. of liquid present. Liquid retention is defined as the % of liquid phase present at a specified yield val., and generally increases with increase of plasticity. The view that the rigidity of a dispersion is due to the total force of attraction between the particles of the disperse phase is supported by the observation that variations in intrinsic attractive force, electrokinetic potential, solvation, dispersivity, and particle shape affect the plasticity and cohesion in the manner anticipated.   J. W. S.

Viscosity of agar and saponin mixtures. R. G. RUYSSEN and J. ROWAN (Natuurwetensch. Tijds., 1939, **21**, 76—78).—η has been measured for 0·1% agar and saponin sols and various mixtures at p_H 3·3, 5·0, 7·5, and 8·5. Although both sols are negatively charged the vals. for η are $<$ additive, especially in acid media (p_H 5·0 and 3·3). In no case was coacervation observed even on addition of 5% of EtOH.   S. C.

Atom groups in radio-colloids. (MLLE.) C. CHAMIÉ (Compt. rend., 1939, **208**, 1300—1301; cf. A., 1931, 591).—After prolonged centrifuging, solutions of Po in conc. HCl still contain groups of Po atoms, which are detected photographically after deposition on a layer of paraffin wax; such groups are not obtained in solutions of radio-crystalloids (Th active deposit). It is suggested that formation of radio-colloid aggregates in solvent media is governed by a probability law, so that even in strongly acid solutions the probability of formation of Po aggregates is finite.   A. J. E. W.

Colloidal complex cyanides of heavy metals. O. C. HUIN (J. Chim. phys., 1939, **36**, 62—70).—Contrary to present ideas, insol. ferrocyanides (Fe^{III}, Ag, Cu, and UO_2), ferricyanides (Cu and Ag), and ruthenocyanides (Cu) produced by pptn. are not at any stage pure substances of simple composition. Their composition varies continuously with changes in the relative proportions of reactants and even with dilution of the reagents. The pptd. Cu and Ag ferricyanides show less variation in composition than do the ferrocyanides and ruthenocyanide and their colloidal properties are less marked.   F. H.

Presence of two types of micelle in aqueous solutions of soaps. J. STAUFF (Naturwiss., 1939, **27**, 213—214).—Change of aggregation of micelles in aq. solutions of soaps can be detected by X-ray investigations and by determining the velocity of formation of nuclei with respect to concn. X-Ray photographs of 0·25N-Na palmitate solutions at 70° show the existence of rings of smaller diameter than those due to solid Na palmitate. Below this concn. the rings disappear; above it they increase in intensity with concn. The X-ray interference is produced by colloid particles, and it is inferred that at concns. $>$0·25N. two types of particle are present. The curve of velocity of crystal formation against concn. shows a definite change of direction between 0·1 and 0·25N., which is ascribed to a change in the state of aggregation. The formation of "large" and "small" micelles is discussed.   A. J. M.

Influence of silicates on the effectiveness of dilute aqueous detergents in forming thermodynamically stable colloidal solutions of otherwise insoluble dyestuffs. J. W. McBAIN and T. M. Woo (Kolloid-Z., 1939, **87**, 74—78).—Addition of various brands of Na silicate to an aq. solution of a detergent raises the "dye no." (cf. A., 1938, I, 194), *i.e.*, modifies the distribution of an insol. dye between an org. solvent and the aq. phase in favour of the latter. The distribution is also affected by the p_H, 10·6—10·7 being the val. most favourable to aq. solubility. The materials used were Turkey-red oil, PhMe, and aq. solutions of various detergents.

F. L. U.

Solubility of celluloses in alkalis.—See B., 1939, 470.

Solubility and swelling of high polymerides. J. N. BRÖNSTED and K. VOLQVARTZ (Trans. Faraday Soc., 1939, **35**, 576—579).—A study of equilibria in systems consisting of a highly polymerised polystyrene fraction as one component and Et, Pr^α, Pr^β, Bu^α, Bu^β, or *iso*amyl laurate as the other shows that the phases in equilibrium are a swelled mixture and a pure component (ester). There is evidence of a crit. temp. at which the solubility of ester in the swelled phase is infinite. The entropy of swelling is negative.   F. L. U.

Highly polymerised compounds. CCXI. Solubility of substances of high mol. wt. VI. State of the solvent in the system acetone–cellulose nitrate at low and high concentrations (0·1 to 75%). G. V. SCHULZ (Z. physikal. Chem., 1939, **184**, 1—41).—At low concns. [0·1—5% of cellulose

nitrate (I)] the entropies of dilution and mixing are the same, and the normal behaviour of such solutions enables mol. wt. determinations to be made. The free energy of the solvent, ΔF, decreases with increasing mol. wt. of (I) at such concns., but at higher concns. (20—75%) ΔF is independent of the mol. wt. and depends solely on the concn. The ratio of the heat of dilution, Δw, to ΔF increases from 0·9 for low concns. to 1·20 for high concns. and is ~1·0 for 33—55% of (I). This range of high concns. (20—75%) can be further divided at 45% of (I) since below this concn. log Δw is $\propto$ concn., whereas above 45% log Δw increases much more rapidly. The data are discussed with reference to theories of solvation.
C. R. H.

Lyophilic properties of cellulose and its derivatives. V. Dependence of surface charge of viscose on age. K. KANAMARU, T. KOBAYASI, and M. SEKI (Kolloid-Z., 1939, I, 62—68; cf. A., 1937, I, 360).—The surface charge on viscose sols changes from negative to positive at about the time when the η of the sols reaches a min. Both properties are affected in the same sense by changes in composition. The results are in better agreement with the view that the ripening process consists in desolvation than with that which regards it as a homogenisation due to delayed xanthation.
F. L. U.

Mol. wt., unimolecular layers, and general structure of proteins. G. T. PHILIPPI (Chem. Weekblad, 1939, **36**, 266—274).—An account and discussion of published work.
F. L. U.

" Intraglobular " reactions and the cyclol structure of proteins. N. GRALÉN and T. SVEDBERG (Nature, 1939, **143**, 519—520).—The sedimentation const. of the ovalbumin–diketopiperazine complex is $3 \cdot 62 \times 10^{-13}$, which is slightly $>$ the val., $3 \cdot 55$, for ordinary ovalbumin (I). The diffusion const. is $6 \cdot 6 \times 10^{-7}$ as compared with $7 \cdot 76 \times 10^{-7}$ for (I). This reduction indicates an increase in vol. of the particle, probably by interaction between the glycine ester and the free NH_2 or CO_2H on the surface of the protein mol. Talmud's experiments (A., 1939, II, 42) thus do not support the cyclol hypothesis of protein structure.
L. S. T.

Influence of salts on the m.p. of gelatin jellies. J. H. C. MERCKEL and P. W. HAAYMAN (Kolloid-Z., 1939, **87**, 59—62; cf. A., 1937, I, 240).—The m.p. of a 10% gelatin jelly is lowered by Na salts in the increasing order : $Cl' < BrO_3' < ClO_3' < Br' < NO_3' < I' < CNS'$, and is raised by H_2PO_2', the effect in every case increasing linearly or nearly so with concn. A quant. relationship between lyotropic no. and the salt concn. needed to reach a given m.p. is found, similar to that observed for swelling (ibid., 564).
F. L. U.

Lyotropic series. II. Adsorption of salts on gelatin. A. R. DOCKING and E. HEYMANN (J. Physical Chem., 1939, **43**, 513—529).—The adsorption of salts on isoelectric gelatin follows the order $KCNS > KI > KBr > KNO_3 > KCl > KOAc > K$ tartrate $= K_2SO_4$, $LiI > LiBr > LiCl > Li_2SO_4$, $LiCl > NH_4Cl > NaCl > KCl$, and $BaCl_2 > CaCl_2 > SrCl_2 > MgCl_2$, and ranges from strong positive adsorption with I', CNS', and $Cu^{..}$ to strong negative adsorption with $(NH_4)_2SO_4$, $MgSO_4$, K_2SO_4, and Li_2SO_4. The solubility of gelatin is decreased by K_2SO_4 and KOAc and increased by other salts in the order $KCl < KBr < KNO_3 < KCNS$. Alkaline-earth chlorides increase the solubility in the order $MgCl_2 < CaCl_2 < SrCl_2 < BaCl_2$, but alkali-metal chlorides all have an equal effect. From the negative adsorption of sulphates the min. hydration of gelatin is calc. to be 0·6—0·7 g. of H_2O per g. The results are in accord with Katz's theory (A., 1933, 462).
J. W. S.

Electrical conductance of sols and gels and its bearing on the problem of gel structure. I. Gelatin. R. TAFT and L. E. MALM (J. Physical Chem., 1939, **43**, 499—512).—A gradual decrease in conductivity (κ) occurs during the sol–gel change in gelatin (I) at 25° and 30°, the max. changes being $\div 4$ —8%. No abrupt change is observed. The κ of aq. KCl and KCNS is reduced by the presence of (I), but, excepting at very low concn., is the same in both the sol and gel states. This result is interpreted as evidence in favour of the fibrillar structure of (I) gels. KCNS shows a relatively greater decrease in κ in presence of (I) than does KCl, indicating a greater adsorption of the CNS' ion.
J. W. S.

Elasticity and viscosity of highly polymerised compounds. W. KUHN (Angew. Chem., 1939, **52**, 289—301).—A general theoretical discussion. The properties in question are determined by the magnitudes of the partial moduli of elasticity and the relaxation times (λ) of the various species present. Highly polymerised compounds are distinguished from simpler substances by the much wider range of λ vals. pertaining to the former.
F. L. U.

Molecular assemblage and crystallite orientation as causes of rubber-like elasticity. W. KUHN (Kolloid-Z., 1939, **87**, 3—12; cf. A., 1938, I, 558).—Mathematical. The observed modulus of elasticity of a substance containing both flexible filamentous mols. and rigid rod-shaped crystallites is the sum of a no. of partial moduli, that due to the tendency to thermal disorientation of the crystallites being $E = 9RTp/5M$ ($p =$ wt. of crystallites per c.c., $M =$ their mean mol. wt.).
F. L. U.

Borrowed periodicities derived from the spontaneous periodic precipitation of silver chromate by localised substitution. S. VEIL (Bull. Soc. chim., 1939, [v], **6**, 700—702).—A phenomenon similar to that already reported (A., 1938, I, 455) occurs when a mixed solution of $AgNO_3$ and $Pb(NO_3)_2$ is placed on gelatin impregnated with K_2CrO_4, the rings of Ag_2CrO_4 first formed being replaced by $PbCrO_4$.
F. J. G.

Supersaturated solutions of metallic silver. II. R. E. LIESEGANG (Z. wiss. Phot., 1938, **37**, 259—261; cf. A., 1939, I, 78).—Diffusion of $AgNO_3$ into gelatin gels containing $FeSO_4$ gives a uniform black colour when the $FeSO_4$ is dil., as the $AgNO_3$ is not hindered by reduction, but with more conc. $FeSO_4$ various bandings up to the limiting case of palest orange colouring. It appears probable that very high supersaturation of Ag is possible in some cases without nuclei; this is of course not the case in photography.
J. L.

Formation of spirals in precipitates in jellies. R. E. LIESEGANG (Kolloid-Z., 1939, **87**, 57—58).— Examples of spiral pptn. are given and its causes discussed.   F. L. U.

Variation of cataphoretic velocity of silver halides in presence of dyestuffs. M. K. INDRA (J. Indian Chem. Soc., 1939, **16**, 15—18).—The cataphoretic velocity v of AgX (X = Cl, Br, I) generally increases with increasing amounts of acidic indicators (eosin, fluorescein, Me-violet). The time lag observed before the attainment of the final v is discussed.   W. R. A.

Relationship of skin permeability to electrophoresis of biologically active materials into the human living skin.—See A., 1939, III, 514.

Electro-osmosis in gelatin as a function of the concentration of the gel and the nature of the combined ion. J. SWYNGEDAUW (Compt. rend. Soc. Biol., 1939, **130**, 62—64).—The quantity of H_2O transported by the ion (Na·, K·, or Li·) decreases as the concn. of the gel increases and at a high concn. of gelatin is of the order of the coeff. of the hydration of the ion.   H. G. R.

Streaming potentials on barium sulphate and ion antagonism. R. RUYSSEN (Natuurwetensch. Tijds., 1939, **21**, 79—90).—Negative $BaSO_4$ crystals suitable for streaming potential measurements are prepared by slow pptn. from $BaCl_2$ and K_2SO_4 solutions at a high dilution. The electrokinetic potential curve for $BaCl_2$ shows the typical course of adsorption of an ion determining the potential. At low concns. there is antagonism between KCl and $BaCl_2$, which cannot be explained on ionic activity. At higher concns. excess of KCl has a discharging effect and desorption and replacement of the Ba·· ion must be assumed.   S. C.

Study by the Raman effect of the balanced reactions in formation of mercuric chlorobromide and bromocyanide. (MLLE.) M. L. DELWAULLE (Compt. rend., 1939, **208**, 999—1002).—The following vals. of equilibrium consts. for the reactions $HgBr_2$ + $HgX_2 \rightleftharpoons 2HgBrX$ are deduced by a Raman method, which is described : X = Cl, 2·0±0·2 ; CN, ~0·2. HgBrCN does not exist in the cryst. state.   A. J. E. W.

Reduction of cuprous and cobalt chlorides by deuterium. J. R. PARTINGTON and R. P. TOWNDROW (Trans. Faraday Soc., 1939, **35**, 553—559).— Equilibrium consts. for each of the four reactions H_2 (D_2) + Cu_2Cl_2 ($CoCl_2$) $\rightleftharpoons 2HCl$ (DCl) + 2Cu (Co) have been determined between 400° and 500°. Vals. of K for the homogeneous reaction $2DCl + H_2 \rightleftharpoons 2HCl + D_2$ are calc. from the results and compared with data from other sources. Vals. of ΔU for the reductions are also calc.   F. L. U.

Reactions of tertiary bases with polyhalogenoparaffins.—See A., 1939, II, 238.

Measurement of p_H by means of the glass electrode and the hydrolysis of copper sulphate. H. HAGISAWA (Bull. Inst. Phys. Chem. Res. Japan, 1939, **18**, 275—284).—A standard buffer solution and a given solution are placed respectively in the inner and outer parts of the glass bulb, and then reversed, thus eliminating the asymmetric potential of the glass electrode. The relationship between p_H and dilution (V) of the $CuSO_4$ is given by $p_H = 3·5200 + 0·6717 \log V$.   D. F. R.

Reduction of the alkalinity of hypochlorite solutions with sodium hydrogen carbonate. A. OSOL and J. R. COX (J. Amer. Pharm. Assoc., 1939, **28**, 148—151).—Determinations of the p_H of aq. NaOH– and Na_2CO_3–$NaHCO_3$ preps. indicate that the alkalinity (due to NaOH) of aq. NaOCl is reduced by $NaHCO_3$ owing to formation of Na_2CO_3 and not to suppression of the ionisation of NaOH by the added Na·.   F. O. H.

"Acids" and "bases" in liquid melts. Determination of oxygen-ion concentration. H. LUX (Z. Elektrochem., 1939, **45**, 303—309).—The p.d. between a Rh and a Au electrode in a eutectic of Na_2SO_4–K_2SO_4 at 950° has been measured during the addition of increasing amounts of Na_2O. Measurements with strongly alkaline melts could not be made owing to attack of the crucible. Even with less alkaline melts the data are qual. only, on account of the vaporisation of Na_2O. The experimental difficulties are described and the data are briefly discussed in reference to the definition "base" $\rightleftharpoons$ "acid" $+$ O".   C. R. H.

Titration curve of methionic acid. P. M. BREWSTER and G. L. JENKINS (J. Amer. Pharm. Assoc., 1939, **28**, 144—146).—The acid behaves as a strong, dibasic acid, analogous to H_2SO_4 ; a break in the curve at p_H 11—11·5 is probably due to decomp. or mol. rearrangement.   F. O. H.

Thermodynamic dissociation constants of oxalic acid. H. N. PARTON and R. C. GIBBONS (Trans. Faraday Soc., 1939, **35**, 542—545).—From measurements on cells of the type Pt|quinhydrone (saturated), $H_2C_2O_4$ (m_1), KHC_2O_4 (m_2), KCl (m_3)| AgCl|Ag and Pt|quinhydrone (saturated), KHC_2O_4 (m_1), $K_2C_2O_4$ (m_2), KCl (m_3)|AgCl|Ag the second dissociation const. of $H_2C_2O_4$ at 25°, 30°, and 35° is calc. as 5·012, 4·787, and 4·488 × 10^{-5}, respectively, and the first dissociation const. as ~0·050 at 25°.   J. W. S.

Thermodynamic dissociation constants of oxalic acid in water and methanol–water mixtures. H. N. PARTON and A. J. C. NICHOLSON (Trans. Faraday Soc., 1939, **35**, 546—550 ; cf. preceding abstract).—The e.m.f. between H electrodes and Ag–AgCl electrodes have been measured in solutions containing various concns. of $NaHC_2O_4$, $Na_2C_2O_4$ (or $H_2C_2O_4$), and NaCl in H_2O and in 10% and 20% aq. MeOH. In aq. solution the first dissociation const. is 0·0457, 0·0550, and 0·0531 at 25°, 30°, and 35°, respectively, and hence has probably a max. val. at ~32°. The dissociation consts. in H_2O–MeOH mixtures at 25° are in approx. agreement with theory.   J. W. S.

Dissociation constants of isomeric halogeno- and nitro-benzoic acids. H. O. JENKINS (J.C.S., 1939, 640—643).—It is shown that for each of these series of acids the thermodynamic dissociation const. of the substituted acids (K_s) is related to the dissociation const. of BzOH (K_u) and the electrical intensity

at the O·H bond due to the substituent dipole (*F*) by the relation $\log_e K_s = \log_e K_u - \beta F$. β is a const. for any substituent, but varies with the nature of the substituent. Accord with this law indicates that *o*-acids have normal dissociation consts. J. W. S.

Dielectric properties and ionisation constants of amino-acids. W. CARR and W. J. SHUTT (Trans. Faraday Soc., 1939, **35**, 579—587; cf. A., 1938, I, 245).—ϵ has been measured for aq. solutions of glycine, glycylglycine, alanine, and $NH_2 \cdot [CH_2]_5 \cdot CO_2H$ over a p_H range extending to either side of the isoelectric points, and acid and basic dissociation consts. have been calc. from the results. Similar measurements with taurine and $p\text{-}NH_2 \cdot C_6H_4 \cdot SO_3H$ indicate that these exist entirely as zwitterions only over a very narrow p_H range. F. L. U.

Activity coefficient of strong electrolytes in concentrated solutions. II. S. ABE (Bull. Inst. Phys. Chem. Res. Japan, 1939, **18**, 260—274; cf. A., 1937, I, 411).—Activity coeffs. calc. according to a previously published theory are compared with experimental results in the cases of NaCl, HCl, $ZnSO_4$, and $CaCl_2$. D. F. R.

Activity coefficients of ammonium chloride in liquid ammonia at 25° H. W. RITCHEY and H. HUNT (J. Physical Chem., 1939, **43**, 407—416).—The difference in v.p. between pure liquid NH_3 and solutions of NH_4Cl in NH_3 (0·005—0·9M.) has been measured at 25°, and the activity coeff. of NH_4Cl deduced. The results accord with the Debye–Hückel theory only at very low concns. Combining the results with e.m.f. measurements and the free energies of formation of NH_4Cl, TlCl, and NH_3 (A., 1934, 735; 1936, 31), the standard potentials of Tl|TlCl, Zn|$ZnCl_2,6NH_3$, and Cd|$CdCl_2,6NH_3$ electrodes at 25° are deduced. J. W. S.

Cacodylates of zinc. III. Properties. R. TIOLLAIS and H. PERDREAU (Bull. Soc. chim., 1939, [v], **6**, 631—638; cf. A., 1938, I, 455).—The solubility curve of $Zn(Me_2AsO_2)_2$ has been determined. The stable solid phases are heptahydrate below 25°, monohydrate from 25° to approx. 60°, and anhyd. salt at higher temp. At room temp., dehydration of the heptahydrate affords monohydrate in an atm. of 6·3—11 mm. of H_2O vapour and anhyd. salt in an atm. of <2·5 mm. In air, the heptahydrate affords the monohydrate at 25°, and this affords the anhyd. salt at 40°. F. J. G.

Cacodylates of cadmium. R. TIOLLAIS, H. PERDREAU, and L. BERTHOIS (Bull. Soc. Chim., 1939, [v], **6**, 638—646).—*Cd cacodylate*, $Cd(Me_2AsO_2)_2$, and *hydrates* with 1, 2, 7, and $10H_2O$ have been obtained. The solubility curve has five sections representing the stability ranges of the hydrates and the anhyd. salt, viz., <14°, 14—22°, 22—51°, 51—56°, and >56°. On exposure to air at room temp. the higher hydrates afford dihydrate, whilst at 43° and 50° the products are monohydrate and anhyd. salt, respectively. The partial pressures of H_2O under which the hydrates are stable at room temp. are as follows : $10H_2O$, 13·3—13·9 mm.; $7H_2O$, 12·7—13·3 mm.; $2H_2O$ ~1—12·7 mm.; $1H_2O$ ~0·1—1 mm. F. J. G.

Solubility curves of boric acid and sodium borates. W. C. BLASDALE and C. M. SLANSKY (J. Amer. Chem. Soc., 1939, **61**, 917—920).—The aq. solubilities of H_3BO_3, $Na_2B_4O_7,xH_2O$ ($x = 10, 5, 4$), $NaB_5O_8,5H_2O$, and $NaBO_2,xH_2O$ ($x = 4, 2$) have been determined at 5° intervals between 0° and 100°. The transition temp. of the various hydrates are $Na_2B_4O_7$: $10 \rightarrow 5H_2O$, metastable, 60·8°; $10 \rightarrow 4H_2O$, stable, 58·5°; $NaBO_2$: $4 \rightarrow 2H_2O$, stable, 54°. $NaB_5O_8,5H_2O$ readily forms supersaturated solutions above ~2° and is still stable at temp. considerably <2° in presence of a slight excess of Na_2O. W. R. A.

Thermal equilibrium between niobium tetroxide and water. P. SÜE (Compt. rend., 1939, **208**, 1088—1090).—The reaction, $Nb_2O_4 + H_2O \rightleftharpoons Nb_2O_5 + H_2 + Q$, has been investigated between 985° and 1170°; it is completely reversible. The mean val. of Q is 18·2 kg.-cal. The heat of formation of Nb_2O_4 has been computed as 387 kg.-cal. W. R. A.

System $FeO\text{-}TiO_2$. J. GRIEVE and J. WHITE (J. Roy. Tech. Coll., 1939, **4**, 441—448).—Thermal analysis and microscopic examination show that the system includes two compounds, $2FeO,TiO_2$ (pseudobrookite) and FeO,TiO_2 (ilmenite), and three eutectics. The formation of the compounds has been confirmed by *X*-ray methods, which also indicate that the TiO_2 separates out from the melts as rutile. T. H. G.

Hydrogenation and atomic exchange of benzene. R. K. GREENHALGH and M. POLANYI (Trans. Faraday Soc., 1939, **35**, 520—542).—The hydrogenation and at. exchange reactions of C_6H_6 with H_2–D_2 mixtures, and the equilibration of *para*-H on Pt, Ni, and Cu surfaces have been studied in both the liquid and gaseous phases. The mechanisms of the changes are discussed and the results are compared with those obtained with C_2H_4 (A., 1937, I, 469). J. W. S.

Systems chrysene–1 : 2-benzanthracene and 1 : 2-benzanthracene–triphenylene. M. G. STURROCK and T. LAWE (Canad. J. Res., 1939, **17**, B, 71—74).—The liquidus–solidus curves of the systems are given. They provide a convenient method for the evaluation of the % composition of these mixtures. D. F. R.

Ternary systems of liquids showing component separation phenomena. E. JÄNECKE (Z. physikal. Chem., 1939, **184**, 59—85).—Phase diagrams for binary and ternary mixtures of C_6H_{14}, $HCO \cdot NH_2$, and $PhNO_2$ have been constructed and are discussed with reference to the general analysis of phase diagrams of heterogeneous liquid mixtures. C. R. H.

System mercuric cyanide–mercuric chloride–methyl alcohol. Formation of an additive compound of mercuric chloride and methyl alcohol, and detection of a chlorocyanide by the Raman effect. F. FRANÇOIS (Compt. rend., 1939, **208**, 1002—1004).—The ternary solubility curves for the system at 14° and 50° consist of two branches corresponding with deposition of $Hg(CN)_2$ and $HgCl_2$ (50°) or $HgCl_2,1\cdot5MeOH$ (I) (14°); no mixed crystals occur (cf. A., 1938, I, 518). (I) loses MeOH in an atm. free from the vapour; $HgCl_2$ absorbs MeOH from the-

saturated vapour. MeOH solutions of $HgCl_2 + Hg(CN)_2$ give Raman lines due to $HgCl_2$, $Hg(CN)_2$, and HgClCN (304, 346 cm.$^{-1}$).　　A. J. E. W.

B.p. depression by non-volatile substances in ternary systems. II. Behaviour of concentrated solutions of cobaltous chloride and sodium nitrate in water. M. CENTNERSZWER and (MLLE.) H. ŁADZIŃSKA. **III. Concentrated solutions of calcium nitrate in water.** M. CENTNERSZWER and (MLLE.) K. ŻOŁĄTKOWSKA. **IV. Properties of "isozeonic" solutions.** M. CENTNERSZWER (Bull. Acad. Polonaise, 1938, A, 438—448, 449—455, 456—465; cf. A., 1936, 936).—II. The addition of various non-volatile third components to a conc. aq. solution of a hydrate-forming salt lowers the mol. b.p. elevation until beyond a crit. concn. the b.p. is actually depressed. There must, therefore, for each such third component, be a crit. concn. which produces no alteration of b.p.; this yields an "isozeonic" solution, the composition of which depends on the nature of the third component. Non-hydrated third components do not display this behaviour. Whilst aq. $CoCl_2$ solutions to which LiCl, NaCl, KCl, $BaCl_2$, $NiCl_2$, and glucose are added display the above behaviour, an aq. solution of $NaNO_3$ does not, as is to be expected since it does not form a hydrate. Results contrary to theory were found for aq. $Na_2S_2O_3$, probably because the concns. of third component were not sufficiently high.

III. The influence of addition of KNO_3, $NaNO_3$, and glucose on the b.p. of conc. aq. $Ca(NO_3)_2$ has been studied in terms of the formation of "isozeonic" solutions.

IV. The representation and thermodynamics of "isozeonic" solutions are discussed.　　W. R. A.

Reciprocal salt pair $CoSO_4 + (KCl)_2 = CoCl_2 + K_2SO_4$. I. A. BENRATH and G. RITTER (J. pr. Chem., 1939, [ii], 152, 177—189).—The 0°, 38°, 50°, 75°, and 99·5° isotherms for the system have been determined. In addition to known compounds, $CoCl_2,KCl,2H_2O$ and $CoSO_4,K_2SO_4,4H_2O$ occur as solid phases.　　F. J. G.

Isomorphous replacement in hydrated salts. I. Systems $CoCl_2$–$CuCl_2$–H_2O; $CdCl_2$–$NiCl_2$–H_2O; $CdCl_2$–$CoCl_2$–H_2O. H. BASSETT, J. H. HENSHALL, G. A. SERGEANT, and R. H. SHIPLEY. **II. System NaCl–$CdCl_2$–H_2O and the formation of solid solutions in the systems NaCl–$CdCl_2$–$NiCl_2$–H_2O and NaCl–$CdCl_2$–$CoCl_2$–H_2O.** H. BASSETT, J. H. HENSHALL, and G. A. SERGEANT (J.C.S., 1939, 646—653, 653—660).—I. The system $CoCl_2$–$CuCl_2$–H_2O at 25° shows only the hydrates $CoCl_2,6H_2O$ and $CuCl_2,2H_2O$. The system $CdCl_2$–$NiCl_2$–H_2O at 25° shows the hydrates $CdCl_2,2·5H_2O$, $CdCl_2,H_2O$, and $NiCl_2,6H_2O$ and the double salts $4CdCl_2,NiCl_2,10H_2O$, $2CdCl_2,NiCl_2,12H_2O$, $2CdCl_2,NiCl_2,6H_2O$, and $3CdCl_2,2NiCl_2,14H_2O$ of invariant composition. There are also two series of solid solutions. The system $CdCl_2$–$CoCl_2$–H_2O at 25° contains the hydrates $CoCl_2,6H_2O$, $CdCl_2,2·5H_2O$, and $CdCl_2,H_2O$, and the double salts $4CdCl_2,CoCl_2,10H_2O$ and $2CdCl_2,CoCl_2,12H_2O$. A metastable phase of composition $CdCl_2,2CoCl_2,12H_2O$ may be an end no.

of a series of solid solutions, as in the corresponding Ni compound. Solid solutions of the type $(Cd,Co)Cl_2,2·5H_2O$, corresponding with the second series of solid solutions with the Ni system, can be obtained only in presence of NaCl.

II. Large amounts of NaCl can enter isomorphously into solid solutions of the type $(Cd,Ni)Cl_2,2·5H_2O$ until all the Ni and some of the Cd have been replaced. The replacement is also accompanied by a steady decrease in the H_2O content and the final result is the compound $2NaCl,CdCl_2,3H_2O$, also found as a double salt in the system NaCl–$CdCl_2$–H_2O. Similar behaviour is found when Ni is replaced by Co, but the solid solutions $(Cd,Co)Cl_2,2·5H_2O$ cannot be obtained free from Na. The structures of the various double salts are discussed. The system NaCl–$CdCl_2$–H_2O also indicates the existence of the *compound* $3NaCl,4CdCl_2,14H_2O$.　　J. W. S.

System CaO–P_2O_5–NaOH–H_2O. P. SCHLÄPFER and R. LEHNER (Przemysł Chem., 1938, 22, 482—490).—A nephelometric method allowing the determination of 10—450 g. of Ca is described; it depends on pptn. of Ca as oleate from buffered aq. gelatin. Electrometric and X-ray studies show that the only stable solid phase forming in the system CaO–P_2O_5–NaOH–H_2O at $p_H \ll 5·9$ is $3Ca_3(PO_4)_2,Ca(OH)_2$ (I), which readily adsorbs $Ca^{\cdot\cdot}$ from alkaline, and PO_4''' from acid, solutions. The solubility of (I) in H_2O and aq. NaOH at 20—350° was determined; it falls with rising [NaOH].　　R. T.

Calorimetry and thermochemistry. W. A. ROTH (Z. Elektrochem., 1939, 45, 335—343).—A review of recent work.

Calculation of heat of reaction from equilibrium constants at two temperatures; new heats of ionisation of organic acids. A. W. WALDE (J. Physical Chem., 1939, 43, 431—438).—The equations of Douglas and Crockford (A., 1935, 304) are extended to apply to reactions for which the heat of reaction is expressed by $\Delta H = a + bT + cT^2 + dT^3 + eT^4$. The theory is applied to the calculation of the heats of ionisation of org. acids from their dissociation const. (K). No general relation exists between ΔH and K; the relationships in isolated series are discussed. Resonance energy increases ΔH for certain substituted benzoic acids.　　J. W. S.

Equilibrium $P_4 \rightleftharpoons 2P_2$ in phosphorus vapour. G. WÉTROFF (Compt. rend., 1939, 208, 903—905).—The heat of dissociation (q) of P_2 into atoms, as deduced from the band spectrum, is 115·45 kg.-cal., and hence the concn. of P atoms at 1200° is negligible. From the results of Preuner and Brockmöller (A., 1912, ii, 1145) it is deduced that q for $P_4 \rightarrow P_2$ at 1000—1200° is 41 kg.-cal. Taking 45 ± 4 kg.-cal. as a mean val. for q at this temp., the val. for 0° K. is 50 ± 4 kg.-cal. The heats of evaporation of white and red P into P_4, P_2, and P are also deduced.　　J. W. S.

Heat of dilution in the system caoutchouc-toluene. K. H. MEYER, E. WOLFF, and C. G. BOISSONAS (Przemysł Chem., 1938, 22, 441—444).—The heat of dilution of solutions of caoutchouc in

PhMe is derived from the temp. coeff. of the osmotic pressure of such solutions, for the range 24·4—35·6°.
R. T.

Heat of vaporisation of water at 80° from aqueous phosphoric acid of various concentrations. K. I. ZAGVOZDKIN (J. Appl. Chem. Russ., 1938, **11**, 1543—1547).—The latent heat of vaporisation of H_2O rises from 553·5 for 12·65% to 583·5 g.-cal. per g. for 58·22% H_3PO_4, and the heat of dilution rises over the same concn. range from 0·9 to 30·9 g.-cal. per g.
R. T.

Heat of hydrolysis of sulphur monochloride. A. C. BATALIN and I. A. SCHTSCHERBAKOV (J. Gen. Chem. Russ., 1938, **8**, 1394—1398).—The heat of hydrolysis of S_2Cl_2 at 24·881° is 35 kg.-cal. per g.-mol. The reaction is of the first order when the $[H_2O]$ is $> 30[S_2Cl_2]$.
R. T.

Entropy of ionisation in solutions of low dielectric constant. E. SWIFT, jun. (J. Amer. Chem. Soc., 1939, **61**, 973).—Consideration of recorded data (cf. Bent et al., A., 1938, I, 142; Swift, ibid., 401) on the conductivity of various org. compounds in Et_2O indicates that a generalisation about the constancy of ΔS in Et_2O cannot be made except when the ions compared are of approx. the same diameter.
W. R. A.

Extrapolation of conductance data for the univalent nitrates and iodates by means of the extended Onsager–Shedlovsky equation. A. R. GORDON (J. Chem. Physics, 1939, **7**, 221—222).—Mathematical. The extended Onsager–Shedlovsky equation (cf. A., 1934, 735) allows the extrapolation of conductance data for uni-univalent nitrates and iodates. Anomalies in the conductance of these salts at low concns. are explained.
W. R. A.

Electrical conductivities of dilute solutions of sodium dodecyl sulphate in ethyl alcohol–water mixtures at 20°. A. F. H. WARD (J.C.S., 1939, 522—530).—The equiv. conductivities (Λ) of 0·0001—0·01M. solutions of $C_{12}H_{25}\cdot SO_4Na$ in various EtOH–H_2O mixtures have been determined at 20°, and the val. of Λ_0 for each mixture of solvents is derived. Walden's rule ($\Lambda_0\eta = $ const.) is approx. obeyed by the $C_{12}H_{25}\cdot SO_4'$ ion but not by the $Na^{\cdot}$ ion. The solvation of the ions has been estimated by various methods. Plots of Λ against $\sqrt{c}$ ($c = $ concn. of solute) yield straight lines at low vals. of c. The slope of these lines is in accord with the val. deduced from the Onsager equation except in mixtures containing 80—100% of EtOH, where the solute is incompletely ionised, or 10—50% of EtOH, where the observed slopes are abnormally low. Over this latter range of [EtOH] the solubility of $C_{12}H_{25}\cdot SO_4Na$ is very high, probably owing to the presence of both hydrophilic and hydrophobic groups in the solute mol.
J. W. S.

Equivalent conductivity of sodium cholestenonesulphonate. E. KUHR (Ber., 1939, **72**, [B], 930—932).—With increasing concn., Λ falls off rapidly to a min. at 0·02—0·04N., then slowly increases to a max. at ~0·3N., and then again decreases slowly.
F. J. G.

Transport number, conductivity, and viscosity of solutions of hydrogen chloride in mixed

solvents. I. I. SHUKOV and G. F. DNEPROV (J. Gen. Chem. Russ., 1938, **8**, 1476—1482).—The transport no. of Cl' in aq. org. solvents (0·1N.·HCl) rises as the [EtOH] exceeds 10 and the $[(CH_2\cdot OH)_2]$ 20 mol.-%, but is not affected by glycerol (up to 35%). The η of the aq. solvents is lowered by addition of HCl. The conductivity falls with increasing concn. of org. solvents.
R. T.

Dissolution potential. Aluminium in presence of different gases. (MLLE.) N. GOLDOWSKI (Compt. rend., 1939, **208**, 1086—1088).—The influence of the composition and the R.H. of the surrounding gas on the dissolution potential (V) has been investigated for pure Al. An Al cylinder, cleaned in the appropriate gas (air, SO_2, and dry and damp O_2, H_2, CO_2), was left in contact with the gas for ~10 min. before being dipped in the electrolyte (1% NaCl) at 30°. The p.d. between the Al and a calomel electrode was then measured over a period of 12—24 hr. The data indicate that the metal surface undergoes two alterations : (i) the Al adsorbs the gas as a surface layer, and (ii) the electrolyte acts on the surface layer with a consequent change in V.
W. R. A.

Chromate–chromic electrode potential. S. A. DURBAN and D. J. BROWN (J. Physical Chem., 1939, **43**, 491—493).—Measurements on the $Cr(ClO_4)_3$, CrO_3, $HClO_4|Pt$ half-cell indicate that the reversible oxidation potential at 25° is 1·195±0·010 v. The reaction in the half-cell is $HCrO_4' + 7H^{\cdot} + 3e \rightleftharpoons Cr^{\cdots} + 4H_2O$.
J. W. S.

Oxidation–reduction potential of iodine. II. Influence of dissolved substances on the redox potential of iodine. A. I. RUSANOVA (J. Gen. Chem. Russ., 1938, **8**, 1286—1295).—The potential of I in KI increases with rising [NaCl] up to 2N., above which it falls; NaBr has the reverse effect. The [I] can be determined from the redox potential of its solutions in aq. KI. The potential is unaffected by varying the p_H from 2·9 to 9.
R. T.

Introduction of extraneous solutes into aqueous potassium iodide solution, and its electrostatic consequences. (MLLE.) S. VEIL (Compt. rend., 1939, **208**, 1306—1307).—The e.m.f. of the cell Ag|KI (satd.)|Pt (0·73 v.) is reduced by saturation of the KI solution with HgI_2 (0·10) or AgI (0·57 v.), but is scarcely affected by adding PbI_2 (0·74 v.). This shows that PbI_2 has the least perturbing influence on the structure of the KI solution; the large reduction with HgI_2 is due to formation of HgI_4''.
A. J. E. W.

Influence of CN' concentration on the deposition potential of Ni" at a dropping mercury electrode, and on the height of the diffusion wave of the latter. J. P. GOCHSCHTEIN and V. A. POKROVSKI (J. Gen. Chem. Russ., 1939, **8**, 1465—1469).—The potential of a Hg anode in aq. $NiCl_2$ changes from positive to negative as the [KCN] of the solution is raised from 0·02 to 0·1N. The height of the Ni" polarographic wave is const. only in presence of excess of KCN, in which case it varies according to the length of time the solution is exposed to the air.
R. T.

Polarisation e.m.f. in electrolysis of fused carnallite. I. G. Schtscherbakov, A. A. Schtscherbakov, and B. F. Markov (J. Appl. Chem. Russ., 1938, **11**, 1584—1588).—The polarisation potential of fused carnallite rises slightly with increasing c.d., and considerably with diminishing [MgCl₂]. The results for the system MgCl₂–KCl do not differ from those for carnallite.   R. T.

Polarisation of galvanic cells. E. Toporescu (Compt. rend., 1939, **208**, 1004—1005).—Hg from the cell Hg|conc. aq. ZnSO₄|Zn, after slow polarisation, contains Zn, to which the polarisation phenomena are due.   A. J. E. W.

Polarisation of the electrolytic liberation of oxygen from nickel–iron and nickel–cobalt alloys in alkaline solution. G. Grube and W. Gaupp (Z. Elektrochem., 1939, **45**, 290—296).—The variations of anode potential, E, of rolled and annealed Ni–Fe and Ni–Co alloys in 7N-KOH at 60° for c.d. 0·0005—0·075 amp. per sq. cm. have been determined, together with the variations over a week of E of the rolled alloys at 0·025 and 0·05 amp. per sq. cm., respectively. E increases with c.d. and is greater for annealed than for rolled alloys. For Ni–Co alloys containing < ∼70% of Co, E remains const. for a given c.d., but with increase in Co content E diminishes. For Ni–Fe alloys, E is ∼ const. between 30% and 70% of Fe. Below 30% and above 70%, E is respectively < and > the const. val. E increases with time for rolled Ni–Co and Ni–Fe alloys, but if the % of Ni in the latter is small the increase rapidly becomes a decrease.   C. R. H.

Depolarisation potentials of phenyl alkyl ketones in acid, neutral, and basic media at the dropping mercury cathode. W. C. Davies and D. P. Evans (J.C.S., 1939, 546—554).—The depolarisation potentials (V) of the ketones COPhR (R = Me, Et, Prᵃ, Prᵝ, or Buᵃ) have been measured by Heyrovský's method using solutions in EtOH–H₂O mixtures containing LiCl, LiOH, or LiCl + HCl. The polarograms indicate that V is less negative in acid than in neutral or alkaline solutions. V varies irregularly in acid solution, but in alkaline solution it attains higher negative vals. with increasing length of the n-alkyl chain, whilst the $sec.$ alkyl in COPhPrᵝ has a still larger effect. The variations of the heights of the waves given by COPhMe in alkaline solution and by H˙ and COPhMe in acid solution have been studied for various [COPhMe]. The results are discussed with reference to possible mechanisms of the reduction of the ketones.   J. W. S.

Fundamental studies with the dropping mercury electrode. I. Ilkovič equation of polarographic diffusion currents. J. J. Lingane and I. M. Kolthoff (J. Amer. Chem. Soc., 1939, **61**, 825—834).—Using the dropping Hg electrode, the diffusion current consts., K, of Tl˙, Pb˙˙, Cd˙˙, Zn˙˙, IO₃′, and Fe(CN)₆′′′ have been determined in 0·1N-KCl solution at 25°. For the metal ions the diffusion current is ∝ the concns. of ions in the range 10⁻⁴ to 10⁻²M., whilst for IO₃′ and Fe(CN)₆′′′ ions this proportionality holds for 2 × 10⁻⁴ to 10⁻³M., and 2 × 10⁻⁴ to 5 × 10⁻³M., respectively. K for Tl˙, Pb˙˙, and IO₃′

agrees with the vals. obtained from the Ilkovič equation (A., 1935, 305); for Zn˙˙ and Cd˙˙ K is > calc. vals. by 5 and 8%, respectively, due possibly to the existence of a considerable fraction of CdCl˙ and ZnCl˙ ions in the presence of excess of Cl′ ions, and K for Fe(CN)₆′′′ is 8% < the calc. val. due possibly to some chemical interaction between the ions and the Hg which would decrease the no. of Fe(CN)₆′′′ ions available for electro-reduction and hence decrease K. The Ilkovič equation appears to be essentially correct.   W. R. A.

Polarographic current–voltage curves with dropping amalgam electrodes. J. J. Lingane (J. Amer. Chem. Soc., 1939, **61**, 976—977).—Using the polarographic technique with dropping amalgam electrodes, anodic current–voltage curves can be obtained with characteristics similar to those obtained with the dropping Hg electrode. This is illustrated with reference to data obtained with an approx. 0·01% Cd amalgam dropping into an air-free 0·1N-KCl solution containing 0·04M-CdSO₄. The anodic section of the curve shows a prominent max. similar to that obtained with the reduction of metal ions at the dropping Hg electrode, which is followed by a diffusion current ∝ amalgam concn. Addition of Me-red eliminates the anodic max. and gives a well-defined wave with a const. diffusion current. This effect of Me-red (as for the common cathodic max.) is caused by phenomena on the solution side of the amalgam–solution interface.   W. R. A.

Effect of alternating current on the element Pb|H₂SO₄|Pt. J. Kamecki and M. Wierzbicki (Rocz. Chem., 1939, **19**, 249—258).—The strength of the current arising in the cell Pb|aq. H₂SO₄|Pt rises, whilst time elapsing before discharge of the cell falls, as the [H₂SO₄] is raised from 0·2 to 5N. During and after passage of an a.c. (c.d. 0·5—2 amp. at 1—5·3 v.) a d.c. arises; this is due to de-passivation of the Pb, by removal of the PbSO₄ coating, in the case of 0·2—0·5N-H₂SO₄, and to a rectifying effect in that of 5N-H₂SO₄.   R. T.

Chemical kinetics. R. Piontelli (Chim. e l'Ind., 1939, **21**, 131—139).—A lecture, summarising modern theories of uni- and bi-mol., catalytic and chain reactions.   O. J. W.

Solution of an equation occurring in the theory of consecutive reactions. A. L. Selikowitz (J. Chem. Physics, 1939, **7**, 278).   W. R. A.

Explosion limits of the hydrogen–oxygen mixture. O. Oldenberg and H. S. Sommers, jun. (J. Chem. Physics, 1939, **7**, 279).—Above the "upper" explosion limit in the reaction between H₂ and O₂ is a "third" limit (I). The reaction has been investigated at pressures between 47 and 77 cm. and between 540° and 575°, using Pyrex vessels coated with KCl to slow down the reaction. Several hundred experiments have been made and not one vessel has been shattered. (I) has an inhibition period; at a given temp. explosion will occur in a certain pressure range and the higher is the pressure the shorter is the inhibition period. In clean Pyrex (I) takes place at lower temp. than with KCl-coated Pyrex and (I) occurs at lower pressures in vessels of large diameter. The

theory of (I), proposed by Lewis and von Elbe, approx. accounts for the experimental phenomena. W. R. A.

Methods for determining rate of chemical reactions in the gas phase. C. G. SILCOCKS and M. W. TRAVERS (Trans. Faraday Soc., 1939, **35**, 656—665).—Experimental technique is described, with special reference to (1) heating a known mass of gas or vapour without material time or temp. lag in starting or stopping the process, and (2) analysing the contents of the reaction vessel. F. L. U.

Reaction between nitric oxide and nitrogenous free radicals. C. H. BAMFORD (Trans. Faraday Soc., 1939, **35**, 568—576; cf. A., 1939, II, 100).—In the reaction between NO and NH_3 illuminated with a Hg arc N_2 is produced in nearly quant. yield. NO with N_2H_4 vapour under the same conditions gives N_2O and NH_3. The results are explained by the reaction of NO with the free radicals produced by photolysis thus : $NH_2 + NO = N_2 + H_2O + 104$ kg.-cal.; $N_2H_3 + NO = N_2O + NH_3 + 75$ kg.-cal. F. L. U.

Kinetics of hydrocarbon decomposition. M. W. TRAVERS (J. Amer. Chem. Soc., 1939, **61**, 977).—A reply to the criticism of Steacie (cf. Chem. Rev., 1938, **22**, 311). W. R. A.

Kinetics of oxidation of methane. I. Intermediate products. W. STARONKA and L. CZERSKI (Rocz. Chem., 1939, **19**, 259—276).—2·2 : 1 and 1 : 1 CH_4–O_2 mixtures were heated at 460—483°. The yield of CH_2O is max. (0·5—0·8 ml. per 100 ml. of gas mixture) after 0·5—1 min., varying little thereafter. That of MeOH is max. (0·7—1·4 ml.) after 0·8—1·8 min., thereafter falling more or less abruptly. The highest yields of MeOH are obtained by low-temp. oxidation of CH_4-rich mixtures. CH_2O is not initially produced by oxidation of MeOH. The results support the view that oxidation of CH_4 in absence of contact substances is a chain reaction, preponderatingly homogeneous, although stoicheiometrically heterogeneous. R. T.

Thermal decomposition of ethane by addition of foreign gases. L. KÜCHLER and H. THIELE (Z. physikal. Chem., 1939, **42**, B, 359—379).—The thermal decomp. of C_2H_6 under various experimental conditions, and with addition of foreign gases (He, A, H_2, N_2, CO, CO_2, CH_4), has been investigated by following the val. of the unimol. velocity coeff. with pressure. C_2H_6 decomposes partly by radical chains and partly by a chain-free mechanism. The activation energy of the total decomp. is 76·4 kg.-cal.; that of the chain-free decomp. is 77·0 kg.-cal. A scheme of decomp. of C_2H_6 in which the initial stage is formation of 2 CH_3 radicals is discussed. W. R. A.

Theory of absolute reaction rates and the polymerisation of ethylene. F. P. JAHN (J. Amer. Chem. Soc., 1939, **61**, 798—800).—The rate of polymerisation of C_2H_4 at 250—400° is interpreted according to the theory of Wynne-Jones and Eyring (A., 1935, 1205). R. S. C.

Detonation of mixtures of pentane and hexane with air in tubes. K. I. SCHTSCHOLKIN (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 111—112).—The behaviour of a mixture of 45% C_5H_{12} and 55% C_6H_{14} with air has been investigated at initial pressures of 1—10 kg. per sq. cm. and 20—500° in a rapid automatic apparatus devised to carry out the test during the interval preceding spontaneous combustion. F. R. G.

Pyrogenic reactions of condensation of hydrocarbons. VI. Thermo-polymerisation of *cyclo*hexene. VII. Thermo-polymerisation of *n*-octene. M. S. NEMTZOV, T. V. NIZOVKINA, and E. A. SOSKINA (J. Gen. Chem. Russ., 1938, **8**, 1303—1313, 1314—1325).—VI. The chief product obtained by heating *cyclo*hexene at <430° is *cyclo*hexyl-Δ^1-*cyclo*hexene. The reaction velocity is not altered in presence of Fe or small amounts of O_2, but is greatly increased by P_2O_5. The reaction is of the second order. Its velocity is expressed by $\log k = 12·18 - 10{,}250/T$, with an activation energy $E = 47{,}000 \pm 2000$ g.-cal.

VII. A mixture of Δ^α- and Δ^β-octene similarly yields chiefly a dimeride, of undetermined structure. The reaction velocity is $\log k = 10·54 - 8900/T$ ($E = 40{,}500 \pm 2000$ g.-cal.). The by-products are *iso*-hydrocarbons, C_{12} compounds, and higher polymerides, but not cyclic compounds. R. T.

Mechanism of reactions between alkali metal atoms and methyl and phenyl halides. M. G. EVANS and E. WARHURST (Trans. Faraday Soc., 1939, **35**, 593—606; cf. A., 1938, I, 145).—The method of potential energy surfaces is used to calculate the activation energies of reactions Na + RX = NaX + R. Comparison of calc. with experimental vals. for the Me halides indicates that the simplified method used is justified. Similar treatment of the Ph halides gives vals. of the right order, but more subject to uncertainty arising from lack of precision in the data. F. L. U.

Kinetics of the thermal decomposition of the methylamines. A. G. CARTER, P. A. BOSANQUET, C. G. SILCOCKS, M. W. TRAVERS, and A. F. WILSHIRE (J.C.S., 1939, 495—506).—The decomp. of NMe_3 at 380—440° yields CH_4 and CH_2:NMe, with a little H_2 and C_2H_6. The curves of formation of CH_4 are of unimol. type, and the Arrhenius equation is obeyed, E being ~59 kg.-cal. The rate of formation of CH_4 is diminished by packing the tube and increased by addition of He. The following chain mechanism is proposed : $NMe_3 = Me\cdot + NMe_2\cdot$; $NMe_3 + Me\cdot = CH_4 + \cdot CH_2\cdot NMe_2$; $\cdot CH_2\cdot NMe_2 = Me\cdot = CH_2$:$NMe$. The rate of production of C_2H_6 increases with time in the earlier stages and appears to be zero at zero time. It is a secondary process, probably not the direct union of 2 Me·, but involving Me· together with some other intermediate substance. The decomp. of $NHMe_2$ at 420—440° yields CH_4, CH_2:NMe, NH_2Me, and a little H_2. The rate of formation of CH_4 and its temp. coeff. ($E \sim 56$ kg.-cal.) are ~ those in the decomp. of NMe_3, and the formation of CH_4 is much retarded by packing the tube. The process is more complex than the decomp. of NMe_3, but probably involves a similar chain mechanism. The rate of decomp. of NH_2Me becomes comparable with those of the other two amines only at

temp. 100° higher, and E is considerably less, probably ~45 kg.-cal. The reaction is very complex, and surface effects are marked. It probably involves three successive stages, H_2 being a product of the first, CH_4 of the second, and HCN of the third. The resemblances between NMe_3 and $NHMe_2$ on the one hand, and NH_2Me and NH_3 on the other, are noteworthy.   F. J. G.

Mechanism of oxidation of organic compounds with selenium dioxide. IV. Kinetics of oxidation of ketones. N. N. MELNIKOV and M. S. ROKITSKAJA (J. Gen. Chem. Russ., 1938, **8**, 1369—1381).—The velocity of oxidation of ketones by SeO_2 rises with increasing enolisation of the ketones, and falls with increasing mol. wt.; for the same mol. wt. it is greater for n- than for branched-chain radicals, and greater for cyclic than for other ketones. In the series 1 : 2-, 1 : 3-, and 1 : 4-dimethyl$cyclo$hexanone the velocity rises in the order given.   R. T.

Application of constant sulphite solution to the study of the reaction between sulphurous acid and iodic acid. A. HENDERSON and W. P. McCULLOCH (J.C.S., 1939, 675—676).—When the wts. of SO_3'' and HIO_3 are const., and the total wt. of solution (K) is varied, the time of reaction (t) is given by $t/K^2 = aK^2 + bK + c$, a, b, and c being consts.   F. J. G.

Reactions in concentrated sulphuric acid. XIV. Decomposition of acetylene, especially at higher temperatures. J. MILBAUER and L. FRITSCH (Chem. Obzor, 1939, **14**, 1—5, 25—30).—Decomp. of C_2H_2 in conc. H_2SO_4 at 100—300° has been studied photocolorimetrically and by measuring the SO_2 liberated. The following reactions take place at room temp. : $nC_2H_2 \rightarrow C_{2n}H_{2n}$; $C_{2n}H_{2n} \rightarrow CH:C·C:C·$ . . . ·C:CH + H_{2n-2}; $2C_{2n}H_2 \rightarrow nC_4 + 2H_2$; $2C_2H_2 \rightarrow C_4 + 2H_2$. At higher temp. the reactions are : $C_4 + 4H_2SO_4 \rightarrow 4CO + 4SO_2 + 4H_2O$; $CO + H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$; $H_2 + H_2SO_4 \rightarrow 2H_2O + SO_2$. The relative effects on the absorption and velocity of decomp. at higher temp. of C_2H_2 in H_2SO_4, for which $HgSO_4$ is the most effective and $(NH_4)_2SO_4$ is a definite negative catalyst, of the reagents $HgSO_4$, SeO_2, Ag_2SO_4, TeO_2, V_2O_5, MoO_3, $CuSO_4$, $Sn(SO_4)_2$, $(NH_4)_2SO_4$, and alkali sulphates are discussed in detail.   F. R.

Kinetics of esterification of normal fatty acids. R. A. FAIRCLOUGH and C. N. HINSHELWOOD (J.C.S., 1939, 593—600).—Experiments with a mechanical model, in which steel balls represent mols., suggest that increasing incompatibility of packing with the solvent mols. might lead to an increase of the no. of collisions between solute mols. Accordingly this effect has been sought in the esterification of long-chain fatty acids, which, in solution in the alcohol and with the undissociated acid as its own catalyst, is bimol. with respect to the acid. In EtOH, for a no. of normal acids (from C_2 to C_{22}), E is approx. const. (14,800—15,200 g.-cal.), whilst k decreases from C_2 to C_4, then increases with increasing chain-length. In $cyclo$hexanol E decreases from 16,600 g.-cal. for C_2 to approx. 15,000 g.-cal. for C_4 and higher acids, whilst k shows a similar but smaller increase. On the other hand, in the H-catalysed reaction in MeOH

E decreases from 12,450 for C_2 to 11,600 for C_3, and then remains approx. const., k also remaining approx. const. for acids with >3 C. The increase of k for the higher acids when the catalyst is the undissociated acid may therefore be attributed to the increase of Z as predicted from the model.   F. J. G.

Kinetics of alkaline hydrolysis of some γ-lactones. D. S. HEGAN and J. H. WOLFENDEN (J.C.S., 1939, 508—510).—The rates of hydrolysis by NaOH of valerolactone and phthalide in H_2O and in EtOH–H_2O mixtures, and of 5-aminophthalide and butyrolactone in H_2O, have been determined at a no. of temp. The vals. for E range from 10,800 to 16,100 g.-cal., and those for log PZ from 7·46 to 10·54. The plot of $1\sqrt{E}$ against log PZ for all of the reactions is a single straight line, the slope of which is ~ those found by Fairclough and Hinshelwood (A., 1937, I, 313) for the alkaline hydrolysis of MeOAc and MeOBz in mixed solvents. The work of Tasman (A., 1927, 1186) is criticised.   F. J. G.

Hydrolysis of triphenylmethyl chloride in dioxan.—See A., 1939, II, 211.

Entropies and energies of activation of ionic reactions. Kinetics of the alkaline fading of bromophenol-blue in isodielectric media. E. S. AMIS and V. K. LA MER (J. Amer. Chem. Soc., 1939, **61**, 905—913).—The kinetics of fading of bromophenol-blue in H_2O, MeOH, and EtOH solutions containing 0·003—0·09N-NaOH at 5°, 25°, and 45° have been investigated. The mechanism of the reaction and factors (e.g., temp., ionic strength, dielectric const.) influencing the entropy and energy of activation are discussed.   W. R. A.

Ether-like compounds. XXIII. Saponification of the trichloroacetic esters. H. H. PALOMAA, E. J. SALMI, and R. KORTE (Ber., 1939, **72**, [B], 790—797).—The rates of hydrolysis of a no. of esters, $CCl_3·CO_2R$, and, for comparison, of the acid hydrolysis of the Me and Et esters of $EtCO_2H$ and of Pr^aCO_2H, in H_2O and in aq. dioxan, have been studied. The former reactions, which are not catalysed by acid, are much retarded by dioxan, whilst the latter are slightly accelerated by dioxan. The temp. coeffs. for 10° in the former reactions are ~1·7, in agreement with vals. found for alkaline hydrolysis and in contrast with the vals. (2·3 for ester-like and 4 for ether-like hydrolysis) found in acid-catalysed reactions. A further resemblance between the aq. saponification of the esters $CCl_3·CO_2R$ and alkaline saponification is seen in the influence of the alkyl radicals, the rate decreasing markedly in the order R = Me, Et, Pr^a, Bu^a. The following have been prepared : $CCl_3·CO_2Bu^a$, b.p. 102—103°/17 mm., $CCl_3·CO_2·[CH_2]_3·OMe$, b.p. 104—104·5°/10 mm., $CCl_3·CO_2·[CH_2]_4·OMe$, b.p. 109·5—110°/6 mm., $CCl_3·CO_2·[CH_2]_2·Br$, b.p. 97·0—97·7°/ 5 mm., $CCl_3·CO_2·[CH_2]_3·Cl$, b.p. 97·0—97·7°/3 mm.   F. J. G.

Absolute values of the velocity constants in the formation of semiquinone. G. KORNFELD (J. Chem. Physics, 1939, **7**, 274—276).—From the mechanism proposed previously (A., 1939, II, 153) for the autoxidation of quinol and its homologues a

lower limit can be calc. for the abs. val. of the velocity coeff. of the formation of semiquinone ions from quinone and doubly-charged quinol ions. W. R. A.

Reducing action of ascorbic acid on mercuric chloride. R. INDOVINA and F. MANFROI (Gazzetta, 1939, **69**, 117—121).—The reaction $2HgCl_2 + C_6H_8O_6 = C_6H_6O_6 + Hg_2Cl_2 + 2HCl$ takes place quantitatively and kinetic measurements show that it is of the third order. O. J. W.

Velocity of dissolution of comminuted substances. X. Dissolution of tartaric acid and sugar in water. W. JACEK (Rocz. Chem., 1939, **19**, 243—248).—The velocity of dissolution of tartaric acid and sucrose in H_2O at 17·5—21° has been determined. R. T.

Active oxides and reactions of solids. CXV. Velocity of dissolution of alumina, in relation to its previous treatment. G. F. HÜTTIG, G. MARKUS, and E. FRANZ [with O. HNEVKOVSKY] (Przemysł Chem., 1938, **22**, 375—380).—The velocity of dissolution of Al_2O_3 in HCl falls as the temp. at which it had been heated rises (850—1100°). The debyeograms correspond with γ-Al_2O_3 at 850°, and with admixture of α-Al_2O_3 at 950°, whilst after 6 hr. at 1000° or 1 hr. at 1100° only α-Al_2O_3 is found. The velocity of dissolution curves, with varying proportions of Al_2O_3 to acid, are consistent with the view that the oxides consist chiefly of sparingly sol., with an admixture of readily sol., forms. R. T.

Velocity of dissolution of aluminium in sodium hydroxide solution.—See B., 1939, 506.

Oxidation of beryllium and of nickel at high temperatures. H. N. TEREM (Bull. Soc. chim., 1939, [v], **6**, 664—672).—The oxidation of Ni powder at 850—1050° follows the equation of Valensi (A., 1936, 434) with an energy of activation 55,260 g.-cal. With Be powder under the same conditions S-shaped curves of autocatalytic type are obtained, the later parts of which can be fitted to an equation of the Valensi form, giving an energy of activation 41,446 g.-cal. F. J. G.

Interchange reaction of the oxygen atom between inorganic anions and water. T. TITANI and K. GOTO (Bull. Chem. Soc. Japan, 1939, **14**, 77—85).—Measurements with H_2O containing ^{18}O and K_2SO_4, KNO_3, $NaClO_3$, K_2CO_3, KH_2AsO_4, KH_2PO_4, and $KHSO_4$ show that the O interchange reaction is catalysed both by $H^·$ and OH'. The mechanism of the reaction resembles that of the saponification of esters (A., 1938, I, 251, 635). In acid solution and at high temp. the intermediate formation of the anhydride mol. is suggested. D. F. R.

Acid–base catalysis in gas reactions. II. Decomposition of various organic compounds. R. P. BELL and R. LE G. BURNETT (Trans. Faraday Soc., 1939, **35**, 474—481; cf. A., 1937, I, 250).—The rate of decomp. of $CHMe(OAc)_2$ and of diacetone alcohol (I) is not catalysed by HBr, the decomp. of (I) being also unaffected by NH_3 and piperidine. The thermal decomp. of dioxan and of MeCHO and the depolymerisation of trioxymethylene (II) are accelerated by HCl and HBr. The rate of depoly-

merisation of (II) in decalin solution, catalysed by HBr, is of the first order with respect to both (II) and HBr, and has a steric factor of $\sim 10^{-10}$. The effect of surfaces and non-ionising solvents on acid–base catalysis, and the relative catalytic effects of HCl and HBr, are discussed theoretically. J. W. S.

Kinetics and mechanism of redox reactions. III. Kinetics of oxidation of Fe^{II} by chlorate. V. F. STEFANOVSKI and A. M. ZANKO (J. Gen. Chem. Russ., 1938, **8**, 1717—1726).—With high [H_2SO_4] the velocity of oxidation of Fe^{II} by $ClO_3' \propto [ClO_3']$ and [$Fe^{··}$]; the temp. coeff. is 2·73. In presence of OsO_4 catalyst the velocity of the reaction is expressed by $K[Fe^{··}]^2[H_2SO_4][OsO_4]^b/[Fe^{···}]^a$, and in presence of Fe^{III} by $K[Fe^{··}]^2[H_2SO_4]$. R. T.

Effect of porphyrin, cholate, phosphate, and citrate on the autoxidation of linoleic acid in buffer solution. K. HINSBERG and G. LAHN (Biochem. Z., 1939, **300**, 301—312; cf. A., 1937, II, 175). —In presence of PO_4''' buffer and Na cholate hæmatoporphyrin (I) inhibits the autoxidation of linoleic acid. The effect is counteracted by C_5H_5N, which, alone, has a slight inhibitory effect. EtOH alone has no inhibitory effect but, in very small amounts, it accelerates the onset of inhibition by (I). When citrate replaces PO_4''' as buffer (I) acts more slowly and C_5H_5N alone stimulates the autoxidation. In the absence of cholate the effect of (I) is less and the max. is sooner attained. When no buffer is present the autoxidation is not affected by (I) or by C_5H_5N but is stimulated when both are added together and is very greatly accelerated by EtOH. In presence of PO_4''' and cholate the autoxidation is scarcely affected by hæmin or by C_5H_5N but is inhibited by C_5H_5N + hæmin. C_5H_5N + hæmin has less effect when cholate is absent and very little effect when buffer is also absent. When citrate replaces PO_4''' as buffer and cholate is present, inhibition of the autoxidation by hæmin is increased by adding C_5H_5N; in the absence of cholate the effects are less pronounced. Possibly C_5H_5N and (I) yield a complex having catalytic properties different from those of (I). The oxidation–reduction potential of hæmin is altered when it is converted into hæmin–C_5H_5N complex. W. McC.

Autoxidation of linoleic acid in presence of porphyrins. K. HINSBERG and H. NOWAKOWSKI (Biochem. Z., 1939, **300**, 313—324).—During the autoxidation, in presence of Na cholate, the total O_2 uptake is greater in PO_4''' than in citrate buffer but the accompanying fall in p_H is greater in citrate than in PO_4''' buffer and the period of induction is longer. The min. amounts of coproporphyrin-III, proto-, deutero-, and *iso*uro-porphyrin which inhibit the autoxidation of 0·84 g. of the acid in PO_4''' buffer are $\sim 0·05$, 0·05, 0·14, 0·05 mg. the corresponding vals. in citrate buffer being $\sim 0·05$, 0·007, 0·04, and 0·05 mg. The total O_2 uptake is the same with all the porphyrins. When equal wts. of the porphyrins are used, the degree of inhibition, as measured by the length of the induction period, decreases in the order hæmato-, proto-, deutero-, copro-, and *iso*uro-porphyrin. C_5H_5N counteracts the effect of the porphyrins. W. McC.

Organic catalysts. Synthetic carboxylases.—See A., 1939, II, 283.

Influence of ketones on the Cannizzaro–Tischtschenko reaction.—See A., 1939, II, 244.

Velocity of hydrogenation of isomeric olefines. S. P. LAGEREV and M. M. ABRAMOV (J. Gen. Chem. Russ., 1938, 8, 1682—1684).—The velocity of hydrogenation (Pt-black catalyst) of $CHMe:CHPr^{\alpha}$, $CHMe:CHPr^{\beta}$, and $CMe_2:CMe_2$ falls in the order given.　　R. T.

Copper–nickel catalyst for hydrogenation of fats.—See B., 1939, 512.

Correlation of adsorption and catalytic activity. I. Hydrogen adsorption on zinc–chromium catalysts. F. RUMFORD (J. Roy. Tech. Coll., 1939, 4, 427—440).—The relation between adsorption and catalytic activity is discussed. Catalytic mixtures of ZnO and CrO_3 in different proportions are first reduced by heating in MeOH vapour and then their adsorption of H_2 is measured. The variation of catalytic activity and adsorption with temp. is also studied.　　T. H. G.

Catalytic exchange of hydrogen. C. HORREX, R. K. GREENHALGH, and M. POLANYI (Trans. Faraday Soc., 1939, 35, 511—520).—The interchange of H and D atoms between H_2 and H_2O, cyclohexane (I), iso-C_5H_{12} (II), C_6H_6, and HCl on a Pt catalyst has been studied at 40—105°. C_6H_6 exchanges more rapidly with H_2 than do (I) and (II), but the exchanges with H_2O proceed at equal rates. This is attributed to the fact that C_6H_6 is attacked chemically by H_2 but not by H_2O. (I) and (II) exchange with H_2O more rapidly than with H_2 gas, but exchange with one another less rapidly. (I) also exchanges less rapidly with HCl. The conversion of para-H, and the exchanges between H_2 and H_2O or HCl in presence of hydrocarbons, proceed much more rapidly than the exchanges with the hydrocarbon mols.　　J. W. S.

Catalytic exchange of deuterium and hydrogen in hydrocarbons. S. R. CRAXFORD, G. H. TWIGG, and E. K. RIDEAL (Nature, 1939, 143, 472—473).—The primary act in the catalytic exchange between D_2 and olefines is the addition and not the loss of a H atom (cf. A., 1939, I, 270). With saturated hydrocarbons, catalytic exchange, degradation, and dehydrogenation all appear to involve H in the chemisorption process.　　L. S. T.

Organic catalysts for removal of carbon monoxide from formamide.—See A., 1939, II, 249.

Genesis of skeleton [hydrogenation] catalysts. —See B., 1939, 513.

Retarding action of addition of hexamethylenetetramine [on dissolution of aluminium].—See B., 1939, 506.

Contact sulphuric acid manufacture. Chromium oxide catalyst.—See B., 1939, 478.

Synthesis of paraffins from carbon monoxide and hydrogen on cobalt catalysts.—See B., 1939, 462.

Copper–zinc–chromium methyl alcohol catalyst.—See B., 1939, 462.

Nickel, cadmium, and lead sulphides as catalysts in the vapour-phase reduction of nitrobenzene.—See B., 1939, 463.

Catalysts for hydrogenation of coal.—See B., 1939, 454.

Electrolytic formation of persulphate. V. With alternating current superimposed on direct current. R. MATSUDA and T. NISHIMORI (Bull. Chem. Soc. Japan, 1939, 14, 72—77; cf. A., 1936, 436; 1937, I, 37, 525, 626).—In the electrolysis of $10N$-H_2SO_4 with 0·1 amp. a.c. superimposed, a greater d.c. current efficiency is obtained by using a diaphragm. The efficiency is increased by replacing the H_2SO_4 by small amounts of $K_2SO_4 > (NH_4)_2SO_4 > Na_2SO_4$; it is also increased by increasing $[SO_4]$ but to a smaller extent than with d.c. alone. Variation of the a.c. has little effect.　　D. F. R.

Separation of the two phosphides of vanadium by electrolysis of fused mixtures. M. CHÊNE (Compt. rend., 1939, 208, 1144—1146).—Using a melt of V_2O_5 in alkali phosphates (with suitable amounts of metal halides) as electrolyte, cryst. V phosphides are obtained but their separation from the phosphates is difficult. The best results are obtained with the following electrolytes : $HPO_3 + \frac{1}{15}V_2O_5 + MgCl_2 + 2LiCl$ at 800° (I), $HPO_3 + \frac{1}{15}V_2O_5 + 2MgCl_2 + LiCl$ at 850° (II), $Li_3PO_4 + \frac{1}{10}V_2O_5 + 2LiF$ at 900° (III), and $Li_3PO_4 + \frac{1}{15}V_2O_5 + LiF + MgF_2$ at 900° (IV). The melts are electrolysed in a C crucible (cathode) with a C anode, and the product yields the phosphides on treatment with warm dil. HCl (phosphides insol.). (I) and (II) yield PV whilst (III) and (IV) yield PV_2. Both form metallic needles, d^0 4·0 (PV) and 4·5 (PV_2). They are acid-resisting, but are decomposed by alkalis and alkali salts in the fused state.　　W. R. A.

Electrolytic formation of bismuth peroxide. M. HAÏSSINSKY and A. SANIÉLÉVICI (J. Chim. phys., 1939, 36, 54—61).—Anodic deposition of BiO_2 occurs on electrolysis of $Bi(NO_3)_3$ in aq. K_2 tartrate or in aq. HNO_3 using a Pt anode and a Pt or Au cathode. During electrolysis in tartrate solution the initial deposit redissolves and in aq. HNO_3 a period of induction generally elapses before deposition. The period of induction and speed of deposition $\propto$ c.d., acidity of solution, and $[Bi'']$, the optimum conditions being : c.d. 2·5—3 ma. per sq. cm. using 1·5 mg. of $Bi(NO_3)_3$ per c.c. of 20% HNO_3, temp. $\not> 20°$. BiO_2 is not formed in a primary electrolytic reaction but probably arises from the action of liberated O_3.　　F. H.

Bright electrodeposition of cobalt.—See B., 1939, 507.

Anodic dissolution of alloys.—See B., 1939, 507.

Analogies between electrolytic and chemical methods of reduction. Experiments with sorbic acid.—See A., 1939, II, 241.

Electrochemical reduction of sugars.—See B., 1939, 537.

Electrolytic preparation of 5 : 7-di-iodo-8-quinolinol.—See B., 1939, 463.

Effect of X-rays on water. C. PIFFAULT (Compt. rend. Soc. Biol., 1939, **130**, 43—44).—H_2O_2, with simultaneous production of H_2, is formed in H_2O during intensive X-irradiation. H. G. R.

Decomposition of steam by X-rays. P. GÜNTHER and (FRL.) L. HOLZAPFEL (Z. physikal. Chem., 1939, **42, B**, 346—358).—A detailed account of work already noted (A., 1939, I, 88). W. R. A.

Source of cadmium resonance radiation of high intensity. Cadmium-photosensitised reaction of hydrogen and ethylene. E. W. R. STEACIE and R. POTVIN (Canad. J. Res., 1938, **16, B**, 337—340).—The Cd lamp described, similar in construction to a high-voltage Hg lamp, gives strong emission of the Cd 3261 A. line, whilst the 3404, 3466, and 3612 A. lines are relatively weaker and the 2288 A. line is entirely filtered out. In 3261 A. radiation and in the presence of Cd vapour, polymerisation of C_2H_4 occurs in C_2H_4-H_2 mixtures, but not in pure C_2H_4. In mixtures of high $[C_2H_4]$ the rate of reaction is approx. $\propto$ the partial pressure of H_2. The mechanism of the activation of the C_2H_4 mols. is discussed. J. W. S.

Photo-oxidation of nitrite ion by bromine. A. E. CALLOW, R. O. GRIFFITH, and A. McKEOWN (Trans. Faraday Soc., 1939, **35**, 559—568; cf. A., 1939, I, 31).—The photochemical reaction between Br and NO_2' in presence of a large excess of Br' has been studied at 0° and 10° with $\lambda\lambda$ 436 and 365 mμ. The quantum yield is $\sim$0·2 and nearly independent of experimental conditions, so that it probably represents the efficiency of photo-dissociation of Br_3'. The results suggest that the rate is determined entirely by the rate of primary production of Br atoms. The presence of traces of NO_2' reduces the quantum yield of the Br-oxalate photo-reaction nearly to the val. for the Br-NO_2' reaction. An explanation is offered. F. L. U.

Theory of the Schwarzschild effect. (A) KIENLE. (B) A. NARATH (Z. wiss. Phot., 1938, **37**, 282—283, 283; cf. Narath, A., 1938, I, 631).—Polemical. J. L.

Latent image formation at low temperatures. W. F. BERG (Trans. Faraday Soc., 1939, **35**, 445—458; cf. A., 1939, I, 89).—Measurements at 20°, 90°, and 293° K. indicate that changes in light absorption account for only a small fraction of the loss in sensitivity of photographic emulsions at low temp. The results support the view that ionic movements are essential to formation of the latent image (Gurney and Mott, A., 1938, I, 260). It is suggested that the low temp. causes trapping of electrons, mainly in the lattice but also to some extent in the sensitivity specks, and that these electrons recombine with Br atoms when the material becomes warm. J. W. S.

Photochemical changes in manganese glasses. —See B., 1939, 483.

Influence of nitric oxide on the photo-decomposition of methyl iodide. T. IREDALE (Trans. Faraday Soc., 1939, **35**, 458—463; cf. A., 1937, I, 370).—The quantum yield of I produced by irradiating MeI with a Hg-vapour lamp is increased greatly by the presence of NO. It is considered that the NO unites with the Me radical produced, forming MeNO, and thereby prevents the reproduction of MeI. A kinetic equation is derived to explain the results. J. W. S.

Photolysis of aldehydes and ketones in presence of iodine vapour. E. GORIN (J. Chem. Physics, 1939, **7**, 256—264).—The photolysis of $COMe_2$ takes place through a free radical mechanism involving primarily the splitting off of a Me radical. Using unfiltered Hg radiation the efficiency (η) is 1 and only a trace of CO is detected. With $\lambda = 3130$ A. η is slightly < 1 due to inactivation of excited $COMe_2$ mols. by collision. The following scheme for the chain photolysis of CH_2O is proposed in preference to that of Akeroyd and Norrish (cf. A., 1936, 1077) : $CH_2O + h\nu \rightarrow H + HCO$, $HCO \rightarrow H + CO$, $H + CH_2O \rightarrow H_2 + H + CO$, $H + HCO \rightarrow H_2 + CO$, and $H + H \rightarrow H_2$. In the photolysis of COMeEt, the primary reaction consists in the splitting off of a Me or Et radical. W. R. A.

Photolysis of acetyl bromide. D. H. ETZLER and G. K. ROLLEFSON (J. Amer. Chem. Soc., 1939, **61**, 800—806).—The photolysis of AcBr has been investigated at 2537 and 2652 A. No significant change in the efficiency ($\sim$0·5) at the two $\lambda\lambda$ has been observed. The products are CO, CH_4, Br_2, MeBr, and $C_2H_4Br_2$, and a pressure increase of 100% is observed. The photodecomp. therefore probably proceeds by way of a combination of $CH_3 \cdot COBr \rightarrow CH_3Br + CO$ with $4CH_3 \cdot COBr \rightarrow Br_2 + 4CO + 2CH_4 + C_2H_4Br_2$ or $4CH_3 \cdot COBr \rightarrow 4CO + 2CH_2Br_2 + 2CH_4$. In presence of NO, the pressure increase is less and finally becomes a pressure decrease. This decrease is due to pptn. of RNO (R = Me, Ac, Br). W. R. A.

Photochemical decomposition of aromatic ketones : the phenyl radical.—See A., 1939, II, 266.

Photochemical bromination of trans-dichloroethylene and the bromine-sensitised photodecomposition of dichlorodibromoethane. K. L. MÜLLER and H. J. SCHUMACHER (Z. physikal. Chem., 1939, **42, B**, 327—345).—The photochemical formation and Br-sensitised decomp. of $(CHClBr)_2$ has been investigated, using light of λ 546 mμ., at different pressures and at temp. between 90° and 130°. The influences of $[(CHCl)_2]$, [Br], light intensity, pressure, and temp. on the velocity of formation have been studied. Reaction mechanisms and quantum yields are given and activation energies of the reactions involved have been computed. The heat of reaction for the addition of Br to $(CHCl)_2$ is 17·3 kg.-cal., and the molar heat of vaporisation of $(CHClBr)_2$ is 11·1 kg.-cal. W. R. A.

Photochemical reaction between chlorine and trichlorobromomethane. H. J. SCHUMACHER (Z. physikal. Chem., 1939, **42, B**, 324—326).—An alternative mechanism to that proposed by Vesper and Rollefson (A., 1934, 976) is postulated. This mechanism does not involve Cl_3 formation and requires for CCl_4 formation : (i) $Cl_2 + h\nu = Cl + Cl$; (ii) $Cl + CCl_3Br = CCl_3 + BrCl$; (iii) $CCl_3 + Cl_2 = CCl_4 + Cl$. W. R. A.

Photochemical oxidation of trichlorobromomethane sensitised by bromine and by chlorine. W. FRANKE and H. J. SCHUMACHER (Z. physikal. Chem., 1939, **42, B**, 297—323).—The kinetics of the Br- and Cl_2-sensitised photo-oxidation of CCl_3Br at between 313 and 436 mμ. have been investigated in the gas phase. The relationship between the reaction velocity and $[CCl_3Br]$, the influences of light intensity, of $[Br]$ or $[Cl_2]$, of $[O_2]$, of reaction products, and of total pressure, temp. coeffs., and quantum yields have been studied. Velocity equations and chain mechanisms are given for both reactions.   W. R. A.

Quantum efficiency of photosynthesis. F. R. RIEKE (J. Chem. Physics, 1939, **7**, 238—244).—Repetition of the experiments of Warburg and Negelein (cf. A., 1923, i, 718) on the photosynthesis in suspensions of unicellular green algæ yields a max. quantum efficiency of 1/4·22 for the yellow Hg line in good agreement with their val. of 1/4·4 for the same radiation.   W. R. A.

Hydrogen–bromine reaction under the influence of α-particles from radon. E. F. OGG (J. Physical Chem., 1939, **43**, 399—406).—The reaction between H_2 and Br under the influence of α-particles from Rn has been studied at 40—300° by determination of the increase of the HBr produced as compared with the pure thermal reaction. The average temp. coeff. at 40—192° of the reaction induced by α-particles is 1·07 per 10°. The apparent velocity of the reaction decreases at $> 200°$ owing to the decomp. of HBr formed thermally. The no. of HBr mols. formed per ion pair (M/N) is $\ne 2$, so it is inferred that reaction does not proceed by a clustering mechanism. For the decomp. of HBr by α-particles at ∼30°, M/N is ∼3. Evidence is obtained that during HBr synthesis at 35° $M/N \propto$ the amount of Rn decomposed   J. W. S.

Preparation of pure neon.—See B., 1939, 480.

Heavy water. G. KILDE (Dansk Tidsskr. Farm., 1939, **13**, 69—92).—A review of the chemistry of D.   M. H. M. A.

Separation of isotopes by fractional distillation of water.—See B., 1939, 449.

Preparation of sodium hexametaphosphate.—See B., 1939, 478.

Influence of cations in aqueous solution on the growth of crystals. T. YAMAMOTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, **35**, 228—289).—Cations influence the growth of crystals of the alkali halides more than do anions in leading to the production of large transparent crystals instead of the small opaque crystals obtained from pure solutions. The influence of 36 cations on the form, growth rate, and transparency of crystals of Na, K, Rb, Cs, Li, and NH_4 chlorides, KBr, KI, K_2SO_4, and $KClO_3$ is discussed, photomicrographs being given. The extent of contamination of crystals by Cd, Pb, Bi, Mn, Cr, Co, and Ni is determined. Cations which exert a catalytic effect on crystal growth stabilise supersaturated solutions of such crystals. The methods of growth and their influence on the appearance of crystals are discussed.   F. H.

Preparation and concentration of radioactive gold. V. MAJER (Chem. Listy, 1939, **33**, 130—132).—$Na_3[Au(S_2O_3)_2]$ is bombarded with thermal neutrons from a Rn + Be source, to yield ^{198}Au. The product is shaken with Hg, which preferentially absorbs ^{198}Au (8-fold concn.). Alternatively, alkaline aq. $NaAuO_2$ is activated as above, when ^{198}Au is conc. on the ppt. forming.   R. T.

Neutral and basic beryllium carbonates. G. VENTURELLO (Gazzetta, 1939, **69**, 73—86).—A thermal and X-ray study of various basic Be carbonate preps. shows that these substances have not a definite composition. $BeCO_3,4H_2O$ has a hexagonal structure with a 5·12, c 15·77 a.   O. J. W.

Reactions in the solid state at high temperatures. XXII. Intermediate states which occur in the formation of magnesium titanate from magnesium oxide and titanium dioxide in the solid state. W. JANDER and G. LEUTHNER (Z. anorg. Chem., 1939, **241**, 57—75).—Mixtures of MgO and TiO_2 (rutile modification) were heated to various temp., and the products studied by means of X-rays, and with respect to their rate of dissolution in various reagents, catalytic activity for the combustion of CO and the decomp. of N_2O, and sorptive power for H_2O vapour and for dissolved dyes. For temp. of ignition increasing up to 400° the sorptive power decreases and the catalytic activity and rate of dissolution increase slightly. Thereafter the sorptive power, catalytic activity, and rate of dissolution all increase rapidly with rising temp. of ignition to a max. for products heated at approx. 550°, and then decrease again to a min. at ignition temp. of 700—800°, the sorptive and catalytic powers showing a further max. for products heated at approx. 950°. The combination of MgO and TiO_2 is very slow; it becomes chemically detectable in 6 hr. at 700°. The first X-ray lines of $MgTiO_3$ appear at 800°, but combination is still incomplete after 6 hr. at 1200°. The intermediate stage at 550° corresponds with penetration of the TiO_2 surface by individual MgO mols., giving a disrupted and highly active surface, which on further heating becomes consolidated by incipient combination. The second max. of surface activity for ignition temp. of approx. 950° may represent a similar disruption of the newly-formed $MgTiO_3$ surface by penetration of MgO or TiO_2 mols. (present in excess as combination is not complete), this being a first stage in the formation of Mg_2TiO_4 or of $MgTi_2O_5$, or it may, since combination is so slow, merely represent the increase in amount of freshly-formed, and so highly active, $MgTiO_3$ surface.   F. J. G.

Reaction of zinc salts with alkalis. A. I. NIKURASCHIN (J. Gen. Chem. Russ., 1938, **8**, 1454—1464).—Potentiometric study showed that the reactions taking place during progressive addition of alkali are : $ZnCl_2$ or $ZnSO_4 \rightarrow ZnCl_2,3Zn(OH)_2$ or $ZnSO_4,3Zn(OH)_2 \rightarrow Zn(OH)_2$. The curves for direct and back titration do not coincide, owing to the slowness of the reaction $ZnSO_4,3Zn(OH)_2 + 2OH' \rightarrow 4Zn(OH)_2 + SO_4''$. When $ZnCl_2$ is added to conc. NaOH, the first product is Na_2ZnO_2, which with further $ZnCl_2$ gives $Zn(OH)_2$, and this reacts with Na_2ZnO_2 to yield insol. $NaHZnO_2$.   R. T.

Alunite. VI. Y. ASADA (Bull. Inst. Phys. Chem. Res. Japan, 1938, **17**, 1300—1368).—The thermal decomp. of $K_2SO_4,Al_2(SO_4)_3,24H_2O$ and of $Al_2(SO_4)_3$ has been investigated.   A. J. M.

Precipitation of hydroxides and related phenomena. T. KATSURAI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, **35**, 191—227).—The progress of hydrolysis of $AlCl_3$, $MnCl_2$, $NiCl_2$, $CoCl_2$, $CrCl_3$, and $Pb(NO_3)_2$ at temp. $>100°$ during autoclaving was followed nephelometrically, an expression relating concn. of colloid with turbidity being deduced. X-Ray analyses of the product of hydrolysis obtained on heating aq. $FeCl_3$ at 120—180° and of $Fe(OH)_3$ dehydrated by ageing or by heating at 100° show the structures to be identical with that of hæmatite. Hydrolysis of $FeCl_3$, $AlCl_3$, and $CrCl_3$ is retarded by $NaCl$ or $BaCl_2$. Nephelometric and photometric studies during the addition of aq. NH_3 to aq. $FeCl_3$ show that for λ 6150 A. the light absorption follows the Lambert–Beer law with respect to $[NH_3]$ up to a max. turbidity. The different properties of the hydroxide pptd. from a mixture of Fe·· and Fe··· according to the method of prep. are described. A hydrosol of Fe_3O_4 is prepared by means of ultrasonic waves. Autoclaving of gels is used to prepare artificially the minerals northupite ($MgCO_3,Na_2CO_3,NaCl$) and tychite ($2MgCO_3,2Na_2CO_3,Na_2SO_4$). The decomp. of solutions of $K_3Fe(CN)_6$ and $K_4Fe(CN)_6$ and the coagulation of $Fe(CN)_6''''$, Ag halide, and As_2S_3 sols above 100° have been studied. Solid salts which on grinding together give gels are tabulated and their properties discussed.   F. H.

Light of combustion of metals and alloys. II. J. A. M. VAN LIEMPT and J. A. DE VRIEND (Rec. trav. chim., 1939, **58**, 423—432).—Previous work (cf. A., 1937, I, 195) has been extended to the examination of Th, Ti, Al–Zr, Al–Mg–Zr, Al–Ti, Al–Ca, and Al–Li. The system of expressing light intensity is discussed and compared with the German system.   C. R. H.

Ammoniates of gallium and indium trifluorides. W. KLEMM and H. KILIAN (Z. anorg. Chem., 1939, **241**, 93—96).—By extraction of $GaF_3,3H_2O$ and $InF_3,3H_2O$ with liquid NH_3, the *triammoniates* $GaF_3,3NH_3$ and $InF_3,3NH_3$ have been obtained. They take up no further NH_3 at −78°, but their dissociation isothermals indicate the existence of *diammoniates*.   F. J. G.

Dimethylphosphates of the rare-earth metals. J. K. MARSH (J.C.S., 1939, 554—558; cf. A., 1935, 180).—Solubility data for the dimethylphosphates of Gd, Tb, Dy, Y, Er, and Yb are given. The solubilities decrease markedly with increasing temp., and differ widely from one earth to the next, decreasing with increase in at. no., especially in the Y group, and this affords a valuable method of purification. Details of the purification of Tb, Dy, and Ho are given.   F. J. G.

Separation and purification of samarium from mixtures of the rare earths by reduction to samarium(-II) chloride. A. BRUKL (Angew. Chem., 1939, **52**, 151—154).—The anhyd. EtOH solution of the rare-earth chlorides is shaken with Ca amalgam in absence of air, and the ppt. of $SmCl_2$ separated by centrifuging. Ca amalgam is conveniently obtained by direct union under 60 atm. pressure.   F. J. G.

Acidic nature and methylation of graphitic oxide. U. HOFMANN and R. HOLST (Ber., 1939, **72**, [B], 754—771).—After the most thorough oxidation, the limiting ratio of O to C (after drying) in graphitic oxide is 1 : 2·2 (approx.). Determination of replaceable H with alkali hydroxide gives results ≫ those obtained by the use of acetates, the former corresponding with H : C ∼ 1 : 8. Methylation by means of MeOH + HCl on the one hand and CH_2N_2 on the other gives results of the same order as are found with acetates and with alkalis respectively. On drying, the results with MeOH + HCl are unchanged, even when the distance between the layer-planes is too small for penetration by the reagents, whereas those with CH_2N_2 diminish. From these results it follows that most of the C atoms are attached to O atoms by their fourth valencies, probably so as to form ethylene-oxide rings, whilst some of them carry OH groups, of phenolic character, capable of reacting with CH_2N_2 and with alkali hydroxide, but not with MeOH + HCl or with OAc′, and these on drying lose H_2O, forming the ethylene-oxide ring. In addition, C atoms at the edges of the layer-planes, including the internal edges of " holes," carry CO_2H groups which can react with OAc′ and with MeOH + HCl.   F. J. G.

Preparation of carbon disulphide from methane and hydrogen sulphide.—See B., 1939, 462.

Preparation of pure metals of the titanium group by thermal decomposition of their iodides. V. Titanium. J. D. FAST (Z. anorg. Chem., 1939, **241**, 42—56).—Working details for the prep. of crude Ti by reduction of Na_2TiF_6 or of $TiCl_4$ with Na, and for its conversion into rods of pure Ti by decomp. of the iodide vapour on a hot W filament, are given. Pure Ti has a high ductility which is much impaired by traces of O or N, but not by traces of other elements. It has ρ 4·507±0·005, m.p. 1725°±10°, r 4·2 × 10⁻⁵ Ω. per cm. with a temp. coeff. 0·00546, and coeff. of linear expansion 82 × 10⁻⁷.   F. J. G.

Atmospheric oxidation of metals and alloys at different temperatures by electron-diffraction. M. BOUND and D. A. RICHARDS (Proc. Physical Soc., 1939, **51**, 256—266).—At room temp. no change ascribable to the formation of an oxide film in the case of Sn, Sb, Pb, Au, Zn, and Al was found. Cu, Fe, and Cd gave rings due to oxides. Ag gave extra rings due to AgS. Bi gave a band in the pattern on exposure to air probably due to a thin film of oxide. At high temp. films of SnO, Sb_2O_3, Cu_2O, CuO, Fe_2O_3, CdO, NiO, ZnO, and Bi_2O_3 were found.   N. M. B.

New class of ammines. Complex thiostannates. G. SPACU and A. POP (Bull. Acad. Sci. Roumaine, 1939, **21**, 52—61).—The prep. of the following *compounds* is described : $Na_4SnS_4,10H_2O$; $[Ni en_3][SnS_3]$; $[Co en_3]_4[SnS_4]_3,15H_2O$; $[Cr en_3]_4[SnS_4]_3,8H_2O$; $[Cr(NH_3)_5Cl]SnS_3$; $[Cr(NH_3)_5Cl]_2SnS_4$; $[Cr(NH_3)_5SCN]SnS_4,H_2O$; $[Cr(NH_3)_5SCN]_2SnS_4,2H_2O$. Aq. solutions of thiostannates contain both SnS_4'''' and SnS_3'' ions, their relative concn. being governed by the $[S'']$.   D. F. R.

Lead acetato-halides. E. GRILLOT (Compt. rend., 1939, **208**, 910—912).—PbI_2 is more sol. in $Pb(OAc)_2$ (I) than in H_2O, but from hydrated (I) and a little AcOH at 100°, (I) separates. From the reaction mixture, $CHCl_3$ extracts feebly sol. *Pb acetato-iodide*, $Pb_2(OAc)_3I$ (cf. A., 1935, 50). Similarly, with $PbBr_2$, *Pb acetato-bromide*, $Pb_2(OAc)_3Br$ (cf. A., 1935, 50) is formed. Either when hydrolysed affords $Pb(OH)Hal$ and AcOH. An aq. solution of $(CH_2Cl \cdot CO_2)_2Pb$ saturated with $PbCl_2$ at 56° affords *Pb chloroacetato-chloride*; the corresponding bromide and iodide are not obtained but mixtures of $CH_2Cl \cdot CO_2PbBr + CH_2Br \cdot CO_2PbCl$ and $CH_2Cl \cdot CO_2PbI + CH_2I \cdot CO_2PbCl + Pb(OH)I$, respectively, result.   J. L. D.

Preparation of lead tetra-acetate.—See A., 1939, II, 241.

Tautomerism of nitrous acid. H. KRALL (J. Indian Chem. Soc., 1939, **16**, 9—14).—Quant. study of the decomp. of (i) aq. NH_4NO_2 alone and in presence of AcOH and HCl, and (ii) HNO_2 liberated by AcOH and HCl from $NaNO_2$, in a Lunge nitrometer indicates the tautomerism $H \cdot O \cdot N \colon O \underset{acids}{\overset{bases}{\rightleftharpoons}} O \colon NH \colon O$ for HNO_2. This explains the results obtained by Macmillan and Reade (cf. A., 1930, 204) and Donald and Reade (cf. A., 1935, 337) on the simultaneous production of NO_2-compounds and nitrosoamines from certain *tert.* aromatic amines.   W. R. A.

Introduction of the azide group into complex salts.—See A., 1939, II, 250.

New class of ammines. Complex selenoantimoniates. Constitution of seleno-salts. G. SPACU, M. VANCEA, and J. DOVAL (Bull. Acad. Sci. Roumaine, 1939, **21**, 62—72).—Five complex *selenoantimoniates* have been prepared from Hofacker's salt, $Na_3SbSe_4,9H_2O$: $[Cr(NH_3)_5Cl]_3[SbSe_4]_2,6H_2O$; $[Cr en_3]SbSe_4,2H_2O$; $[Co en_3]SbSe_4,2H_2O$; $\{Cr[CO(NH_2)_2]_6\}SbSe_4,5H_2O$; $[Cr_4(OH)_6en_6][SbSe_4]_2,7H_2O$. The existence of the selenoantimonic ion is confirmed; the structure $[SbSe_4(H_2O)_2]'''$ is suggested.   D. F. R.

Heavy oxygen exchange reactions of proteins and amino-acids. W. H. MEARS and H. SOBOTKA (J. Amer. Chem. Soc., 1939, **61**, 880—886).—Exchange of O between proteins and H_2O containing high and low [^{18}O] has been investigated. Of the several different O-containing groups in proteins only CO_2H exchanges and then at p_H 2 but not in neutral solution. In neutral solution ovalbumin does not exchange whilst pepsin exchanges 13%. The significance of the data on the use of ^{18}O in metabolic studies and in the study of protein structure is discussed.   W. R. A.

Interaction of sulphur monoxide with nitrous and nitric acids. C. J. WILKINS and F. G. SOPER (J.C.S., 1939, 600—603).—HNO_2 and HNO_3 in solution in H_2SO_4 are reduced irreversibly to N_2 by SO.   F. J. G.

Reduction of sulphur dioxide by methane. J. ZAWADZKI, S. OSTROUCH, and G. KWIECIŃSKI (Przemysł Chem., 1938, **22**, 558—564).—The following reactions take place when CH_4–SO_2 mixtures are passed through porcelain tubes packed with SiO_2 :

$2CH_4 + 3SO_2 \rightarrow 2COS + S + 4H_2O$; $2COS \rightarrow 2S + 2CO$; $2COS \rightarrow CS_2 + CO_2$; $2CO + SO_2 \rightarrow S + 2CO_2$. CS_2 is not formed at $> 900°$, and at $> 1000°$ only S is formed; small amounts of COS may be formed secondarily, by recombination of CO with S, in the cooler parts of the tube.   R. T.

Reaction of sulphur trioxide with sodium chloride. D. J. SALLEY (J. Amer. Chem. Soc., 1939, **61**, 834—838).—The decomp. of a low-temp. SO_3–NaCl additive complex, formed by passing SO_3 over NaCl at ~$90°$, yields SO_2 and Cl_2 in exactly equiv. proportions for all temp. between 220° and 44° in N_2 or O_2. Using a static method the reaction between SO_3 and NaCl has been investigated at from 279° to 350° and is represented by $2NaCl + 3SO_3 = Na_2S_2O_7 + SO_2 + Cl_2$.   W. R. A.

Ammonium and substituted ammonium sulphamates. M. J. BUTLER and L. F. AUDRIETH (J. Amer. Chem. Soc., 1939, **61**, 914—915).—NH_4 sulphamate, a fine white powder, was prepared by adding sulphamic acid, $NH_2 \cdot SO_3H$, to liquid NH_3 ; it behaves as a dibasic acid in NH_3. 18 alkylamine sulphamates were prepared by the general reaction : $NH_2 \cdot SO_3H + RNH_2 \rightarrow NH_2 \cdot SO_3H,NH_2R$. Their m.p. and hygroscopicities have been determined; they are sol. in H_2O and EtOH but not in Et_2O.   W. R. A.

Insoluble tellurates. E. MONTIGNIE (Bull. Soc. chim., 1939, [v], **6**, 672—676 ; cf. A., 1935, 834).—The following have been obtained by pptn. : *Zn tellurate,* $ZnTeO_4$, and *basic tellurate,* $ZnTeO_4,3ZnO,4H_2O$ (by using excess of K_2TeO_4 and of $ZnSO_4$, respectively); *basic Zr tellurates,* $Zr(TeO_4)_2,4Zr(OH)_4$ and $Zr(TeO_4)_2,2Zr(OH)_4,H_2O$ [by using excess of $Zr(NO_3)_4$ and of K_2TeO_4, respectively]; *Th tellurate,* $(ThO)TeO_4,8H_2O$ [affords $(ThO)TeO_4,4H_2O$ at 100°]; *basic Cr tellurate,* $2Cr_2O_3,3TeO_3$; *Al tellurate,* $Al_2(TeO_4)_3$; *ceric tellurate,* $Ce(TeO_4)_2$, and *basic tellurate,* CeO_2,TeO_3H_2O [by using excess of K_2TeO_4 and of $Ce(SO_4)_2$, respectively]. On adding a Sn·· solution to an alkali tellurate a white ppt., probably Sn^{II} *tellurate,* is first formed but rapidly decomposes depositing Te.   F. J. G.

Reactions of chromates at high temperatures. VIII. 25% stage in the decomposition of calcium, strontium, and barium chromates. D. S. DATAR, V. T. ATHAVALE, and S. K. K. JATKAR (J. Indian Inst. Sci., 1939, **22**, A, 111—118).—The decomp. of mixtures of $MCrO_4$ and MCO_3 (M = Ca, Sr, Ba) in the ratio $MCrO_4 : MCO_3 = 2 : 1$ has been studied. A 25% decomp. of the chromate occurs owing to formation of $3MO,2CrO_3$ followed by formation of $12MO,6CrO_3,Cr_2O_3$.   W. R. A.

Thiocyanates of chromium diguanides.—See A., 1939, II, 251.

Hydrated sodium dimolybdate. (MME.) Z. SOUBAREW-CHÂTELAIN (Compt. rend., 1939, **208**, 1153—1154).—Na dimolybdate was prepared by adding n-HCl or ·HNO₃ to aq. Na_2MoO_4. It forms white, monoclinic, birefringent crystals of composition $Na_2Mo_2O_7,5H_2O$. H_2O is given off at 120°, and the crystals melt as anhyd. $Na_2Mo_2O_7$ at ~400°. The crystals give an X-ray diffraction pattern identical

with that obtained from $Na_2Mo_2O_7$ prepared by fusion of MoO_3 and Na_2CO_3.　　　　W. R. A.

Permolybdates. (MME.) M. E. RUMPF-NORDMANN (Compt. rend., 1939, **208**, 908—910).—By observation of the intensity of colour developed on mixing equimol. solutions of $(NH_4)_2Mo_2O_7$ and H_2O_2, each in AcOH, it is inferred that 2 mols. of $(NH_4)_2Mo_2O_7$ react with 1 mol. of H_2O_2, the product obtained being probably $(NH_4)_2Mo_2O_8$. The dissociation const. of the per-salt in AcOH of p_H 1 is $2\cdot247 \times 10^{-5}$ at 15°.　　　　J. W. S.

Expulsion of fluorine from pure fluorapatite by ignition in presence of water vapour and silica. G. TRÖMEL and W. EHRENBERG (Z. anorg. Chem., 1939, **241**, 107—114).—Pure (synthetic) fluorapatite loses no F when ignited alone or with SiO_2, but when heated in a stream of H_2O vapour it loses F at a rate which increases with rising temp. and is accelerated above (but not below) 1300° by addition of SiO_2. Complete expulsion of F can be attained at 1400° in a stream of H_2O vapour in presence of 5% of SiO_2. The small amounts of F which are lost when rock phosphate is ignited in absence of H_2O are from excess of F present as CaF_2. The expulsion of F by a stream of H_2O vapour in absence of SiO_2 takes place in two stages. The first, corresponding with about half of the F, is rapid, and the crystal structure is apparently unchanged; in the second the lines of hydroxyapatite appear and the reaction is much slower. The effect of SiO_2 is (above 1300°) to accelerate this second stage with formation of α-$Ca_3P_2O_8$ containing SiO_2 in solid solution.　　　　F. J. G.

Forms of deposited iron during the thermal decomposition of iron pentacarbonyl in the gaseous phase. D. BEISCHER (Z. Elektrochem., 1939, **45**, 310—313).—At low $[Fe(CO)_5]$, a large no. of small primary particles are formed which unite to form filiform particles. At high $[Fe(CO)_5]$, Fe vapour condenses uniformly on the primary particles to form spherical particles.　　　　C. R. H.

Preparation of pure ferrous sulphide. J. V. KARIAKIN (J. Appl. Chem. Russ., 1938, **11**, 1575—1583).—Pure FeS is obtained by passing 1 : 9 H_2S–H_2 mixture over Fe_2O_3 at 950—1050°.　　　　R. T.

Sodium, lithium, and copper ferrites, and their conversion into nitrides. R. S. HILPERT, A. HOFFMANN, and F. H. HUCH (Ber., 1939, **72**, [B], 848—853).—The reduction of Fe_2O_3 by NH_3 at 420° to Fe_2N affords a method for studying the state of combination of Fe_2O_3 in ferrites. Na_2O,Fe_2O_3 is unchanged in NH_3 at 420°, whereas the higher Na ferrites are all converted into Na_2O,Fe_2O_3 and Fe_2N. $Na_2O,5Fe_2O_3$ and higher ferrites have the α-Fe_2O_3 structure; the structures of the intermediate compounds differ both from this and from that of Na_2O,Fe_2O_3. They are only slightly, or not at all, ferromagnetic. Li_2O,Fe_2O_3 has the NaCl structure and is ferromagnetic. Higher Li ferrites, up to $Li_2O,5Fe_2O_3$ have the spinal structure and are ferromagnetic, whilst those containing still more Fe_2O_3 are less magnetisable and have the α-Fe_2O_3 structure. Their stability to aq. reagents increases markedly from Li_2O,Fe_2O_3 to $Li_2O,5Fe_2O_3$, which is almost insol.

in dil. HCl, whilst $Li_2O,6Fe_2O_3$ is again readily sol. With NH_3 at 420°, Li_2O,Fe_2O_3 is unchanged, $Li_2O,2Fe_2O_3$ yields Li_2O,Fe_2O_3 and a different nitride, Fe_3N. With $Li_2O,5Fe_2O_3$, all but one tenth of the Fe_2O_3 is converted into Fe_3N, whilst with $Li_2O,10Fe_2O_3$ all of the Fe_2O_3 is converted into a mixture of Fe_2N and Fe_3N. All Cu ferrites are completely reduced to Cu and Fe_3N by NH_3 at 420°. The way in which the product of reaction of Fe_2O_3 with NH_3 depends on the presence of small amounts of the other oxides is noteworthy.　　　　F. J. G.

Chlorosulphonate chlorides. IV. Chlorosulphonates and chlorosulphonate chlorides of metals. G. P. LUTSCHINSKI (J. Gen. Chem. Russ., 1938, **8**, 1864—1869).—The following compounds are obtained by the action of SO_3 on $CoCl_2$, $CdCl_2$, $NiCl_2$, $CuCl_2$, $ZnCl_2$, $SnCl_4$, $SnCl_2$, and UO_2Cl_2 : $Co(SO_3Cl)_2$, $Cd(SO_3Cl)_2$, $Ni(S_2O_6Cl)_2$, $Cu(S_2O_6Cl)_2$, $ZnCl \cdot SO_3Cl$, $SnCl_2(SO_3Cl)_2$, $SnSO_4(SO_3Cl)_2$, and $UO_2(SO_3Cl)_2$.　　　　R. T.

Composition of a hydrated double salt of nickel and potassium oxalates. S. R. BRINKLEY, jun. (J. Amer. Chem. Soc., 1939, **61**, 965).—An aq. solution containing 12·44% of $K_2C_2O_4$ and 3·53% of NiC_2O_4, at 30°, was dehydrated over $CaCl_2$. Crystals of the double salt $K_2Ni(C_2O_4)_2,xH_2O$ were deposited until the solution contained 23·1% and 3·1% of the salts respectively. After drying, the crystals were heated to const. wt. at 120°, losing 18·7% of their wt. (3 samples); hence the formula is $K_2Ni(C_2O_4)_2,4H_2O$.　　　　W. R. A.

Complex compounds of platinum metals with thio-, seleno-, and telluro-ethers. II. Influence of the medium on formation of *cis*- and *trans*-isomerides. E. C. FRITZMAN and V. V. KRINITZKI (J. Appl. Chem. Russ., 1938, **11**, 1610—1619).—The reaction $R_2X + (NHPr_3)_2PtCl_4 \rightarrow PtCl_2,2R_2X$ (R = Me, Et ; X = S, Se) is conducted in H_2O and in org. solvents. In H_2O a mixture of α- and β-isomerides is obtained, the proportion of β-isomeride dominating in dil., and of α-isomeride in conc., solutions; similar effects are observed in EtOH or PrOH, whilst in MeOH, $COMe_2$, or $CHCl_3$ the sole product is the α-isomeride. $(NH_4)_3MCl_6$ and R_2X in aq. EtOH yield the salts $[MCl_3,3R_2X]$ and $NH_4[MCl_4,2R_2X]$ (M = Ir, Rh ; R = Me, Et ; X = S, Se). Pt may be separated from Ir or Rh by adding R_2S to the aq. solution, when Pt is pptd., leaving Ir and Rh in solution; this is heated at 60°, when Rh is pptd.　　　　R. T.

Mixed platinum dichlorodiammines possessing a *cis*-configuration. A. GELMAN (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 107—110).—Unlike the case previously recorded (Tscherniaev and Gelman, A., 1939, I, 94), introduction of NH_3 into $NH_4[Pt,C_5H_5N,Cl_3]$ and C_5H_5N into $NH_4[Pt,NH_3,Cl]$ leads in each case to cis-$NH_4[Pt,NH_3,C_5H_5N,Cl_2]$ (conductance at 25° recorded), which with aq. NH_3 gives $NH_4[Pt,(NH_3)_3,C_5H_5N]Cl_2$, with Cl_2 followed by C_5H_5N yields $NH_4[Pt,(C_5H_5N)_2,Cl_4]$, and with $CS(NH_2)_2$ gives $PtCl_2[CS(NH_2)_2]_4$, which with K_2PtCl_4 affords $Pt[CS(NH_2)_2]_4PtCl_4$.　　　　F. R. G.

Index to literature of spectrochemical analysis. W. F. MEGGERS and B. F. SCRIBNER (Amer. Soc.

Test. Mat., 1939, 59 pp.).—A review covering 1920—1937.   R. B. C.

Identification of lines in qualitative spectrographic analysis. W. C. PIERCE, O. R. TORRES, and W. W. MARSHALL (Ind. Eng. Chem. [Anal.], 1939, **11**, 191—193).—Nine charts giving a λ scale and an Fe arc reference spectrum are reproduced for the region 2500—5150 A. Analysis lines for 47 elements in the same region are tabulated. The charts can be used with any quartz spectrograph. Directions for their use in qual. analysis are given. An enlarged image of the spectrum is projected on to the chart, and coincidences of projected lines with lines of the map serve to identify the element sought. The time and labour required for an analysis are thus considerably shortened.   L. S. T.

Testing of organic reagents for inorganic analysis. H. M. HAENDLER (J. Chem. Educ., 1939, **16**, 66—67).—Two methods for testing the suitability of org. reagents for use in drop reactions and as pptn. tests are outlined.   L. S. T.

Theories of adsorption indicators. S. G. CHAUDHURY and M. K. INDRA (J. Indian Chem. Soc., 1939, **16**, 81—88).—Cataphoretic velocities of halide particles with and without the addition of adsorption indicator are not in agreement with the theories of adsorption indicators put forward by Fajans and by Kolthoff.   W. R. A.

Determination of radon and thoron content of a closed air space. E. RUMPF, W. FOGY, and W. FRÖHLICH (Ann. Physik, 1938, [v], **33**, 723—732).—Three methods of measurement, from any two of which the Rn and thoron content of a closed air space can be calc., are described. Good agreement is obtained.   O. D. S.

Determination of hydrogen-ion concentration. —See B., 1939, 556.

Rapid determination of moisture.—See B., 1939, 450.

Determination of hydrogen peroxide and related peroxygen compounds. J. S. REICHERT, S. A. McNEIGHT, and H. W. RUDEL (Ind. Eng. Chem. [Anal.], 1939, **11**, 194—197).—Various titration, decomp., and colorimetric methods are discussed critically. Titration with $KMnO_4$ is recommended when org. matter is absent, and with $Ce(SO_4)_2$ when it is present. $TiCl_3$ is recommended for colorimetric determinations. A method based on the potentiometric titration of acid solutions of H_2O_2 with aq. $NaNO_2$ has been worked out for solutions containing coloured org. material. The above methods can also be applied to other peroxides and to perborates.   L. S. T.

Colorimetric determination of chlorine with *p*-aminodimethylaniline. D. H. BYERS with M. G. MELLON (Ind. Eng. Chem. [Anal.], 1939, **11**, 202—203).—A spectrophotometric investigation shows that Beer's law does not hold for concns. > 0.65 p.p.m., and that comparisons of colour should be made within 5 min. Optimum p_H ranges are 2·6—3·4 for concns. $\div 0.6$ p.p.m. and 3·2—4·5 for concns. $>$ this. At p_H 8—9, the purple tint changes to yellow. $Fe^{\cdots}$

increases the colour intensity, 0·1 p.p.m. being equiv. to ~ 0.01 p.p.m. of Cl_2. NO_2' decreases the colour intensity by approx. the same extent as $Fe^{\cdots}$. The method presents no advantage over that using *o*-tolidine.   L. S. T.

Potentiometric studies in oxidation–reduction reactions. IV. Oxidation with potassium chlorate. B. SINGH and S. SINGH (J. Indian Chem. Soc., 1939, **16**, 27—30; cf. A., 1937, I, 633).—KI, $FeSO_4$,$(NH_4)_2SO_4$, TlCl, As_2O_3, and K Sb tartrate can be titrated potentiometrically with standard $KClO_3$ in presence of a large excess of HCl. Addition of $KClO_3$ generally causes a steady rise in e.m.f. up to the equiv. point, at which a sharp jump in potential occurs followed by a steady rise. For As_2O_3, however, no change in e.m.f. is evident until the equiv. point is reached. KI shows two breaks in e.m.f. corresponding with (i) the total conversion of KI into I according to $6KI + KClO_3 + 6HCl = 7KCl + 3H_2O + 3I_2$, and (ii) the conversion of the liberated I into ICl at the equiv. point, $3I_2 + KClO_3 + 6HCl = KCl + 3H_2O + 6ICl$.   W. R. A.

Potentiometric studies in oxidation–reduction reactions. V. Oxidation with potassium chlorate. B. SINGH and S. SINGH (J. Indian Chem. Soc., 1939, **16**, 95—99).—Using a Pt electrode coupled with a saturated HgCl electrode $KBrO_3$, KIO_3, $KMnO_4$, and $K_2Cr_2O_7$ have been determined potentiometrically by adding to a known wt. of each salt a known excess of KI and sufficient HCl to keep its concn. $>5N$. and then titrating the excess of KI with standard $KClO_3$ in an atm. of CO_2. At the equiv. point there is a sharp rise in potential. The reactions take place in two stages; *e.g.*, with $KBrO_3$: $6KI + KBrO_3 + 6HCl = KBr + 6KCl + 3H_2O + 3I_2$; $3I_2 + KBrO_3 + 6HCl = KBr + 6ICl + 3H_2O$.   W. R. A.

Oxygen [perborate] baths and their evaluation.—See B., 1939, 554.

Constant sulphite solution. A. HENDERSON and W. P. McCULLOCH (J.C.S., 1939, 506—507).—Arrangements for keeping and manipulating a standard Na_2SO_3 solution under an atm. of pure CO_2 are described.   F. J. G.

Factors influencing the determination of sulphate as barium sulphate. H. A. FALES and W. S. THOMPSON (Ind. Eng. Chem. [Anal.], 1939, **11**, 206—213).—The effect of varying the different factors involved in the pptn. of $BaSO_4$ from solutions containing different amounts of acid and salts, mainly of K, and especially in presence and absence of KNO_3, has been determined. The results indicate that a complex ion or compound is formed in the aq. KNO_3 and retards pptn. of SO_4'' under certain conditions. In hot solutions the complex is largely broken down, and the SO_4'' quickly pptd. $BaSO_4$ pptd. from M-KNO_3 carries down KNO_3 within the ppt. at the time of pptn. Pptn. is incomplete, and at room temp. continues slowly for several days with continued contamination of the ppt. At 80—90°, the slow pptn. is eliminated. When KNO_3 is added after pptn. the $BaSO_4$ is not contaminated. Ppts. of $BaSO_4$ formed in presence of NO_3' are more sensitive to variations in the conditions of pptn. and treatment

than those formed in absence of NO_3'. Contamination appears to be distributed throughout the pptd. material. Under most conditions the presence of KNO_3 produces high results which may, in extreme cases, reach an excess of 23 wt.-%. Digestion at 80—85° effects a considerable purification of the ppt. Losses in wt. on ignition of ppts. contaminated with KNO_3 increase with an increase in contamination, and with such ppts. more reproducible and more trustworthy results are generally to be obtained by drying to const. wt. at 115° than by igniting. The presence of alkali chlorides lowers the wt. of ppt., counteracting the high effect due to NO_3'. The procedure recommended for the determination of $BaSO_4$ with a precision of 0·2% in 0·01—0·1M-nitrate requires ≯0·01M-sulphate solutions which are 0·01—0·001N. with respect to HCl, slow addition (5 min. for equiv. amounts) of 0·05M-$BaCl_2$ to the hot solution with const. stirring until a 5% excess is present, digestion at 80—90° for 12 hr., filtration and washing with 200—300 c.c. of cold H_2O, and drying to const. wt. at 110—120°. L. S. T.

Standardisation of sodium thiosulphate by copper using perchloric acid. J. J. KOLB (Ind. Eng. Chem. [Anal.], 1939, **11**, 197).—Cu is dissolved in ~11M-$HClO_4$, an equal vol. of H_2O is added, and the solution is boiled for 2 min. to expel Cl_2. After dilution to a known vol., aliquot portions are titrated with aq. $Na_2S_2O_3$ in presence of KI, using starch and a sol. thiocyanate as described by Foote (A., 1938, I, 413). [$HClO_4$] from 0·3 to 0·7N. has no effect on the titration val. In artificial light, the end-point tends to be taken too soon. The method agrees with the KIO_3 standardisation of $Na_2S_2O_3$. L. S. T.

Determination of sulphur [in steel] by combustion in oxygen.—See B., 1939, 496.

Spectrophotometric determination of nitrite, and of nitric oxide in furnace atmospheres. H. A. LIEBHAFSKY and E. H. WINSLOW (Ind. Eng. Chem. [Anal.], 1939, **11**, 189—190).—A spectrophotometric investigation shows that the determination of NO_2' by the Griess–Ilosvay reagent is an accurate colorimetric process. For [KNO_3] >0·5 µg. Beer's law is obeyed, and after the first 20 min. keeping for another 30 min. has little or no effect on the results. The reagent can be used for the determination of NO in concns. ~10 p.p.m. after conversion into $NaNO_2$ by shaking with NaOH and air under a pressure of ~1 atm. of N_2, and this method has been applied to the determination of NO in furnace gases. L. S. T.

Colorimetric determination of nitrogen in steel.—See B., 1939, 495.

Influence of certain anions on the accuracy of the titrimetric method of determining phosphoric acid in solution. A. SREENIVASAN (J. Indian Inst. Sci., 1939, **22**, A, 79—92).—Investigation of the titrimetric method of determining H_3PO_4 by $(NH_4)_2MoO_4$ shows that (i) a high temp. of pptn. of the phosphomolybdate and longer periods of keeping give higher results, (ii) in very dil. solution pptn. is incomplete and can be increased by addition of NH_4NO_3 to the reagent, (iii) the chlorides, especially the alkali salts, have a solvent effect on the ppt. (NH_4Cl excepted), (iv)

addition of sulphates, especially $(NH_4)_2SO_4$, up to 2% gives high vals. whilst at >2% low vals. are obtained, (v) free HCl or H_2SO_4 has a pronounced solvent action on the ppt., but neutralisation before pptn. gives correct results, (vi) citric acid has also a solvent effect and can be neutralised satisfactorily only up to 2%, and (vii) the presence of SiO_2 leads to high vals. W. R. A.

Determination of phosphorus in steel.—See B., 1939, 496.

Determination of phosphorus in fruits and fruit products.—See B., 1939, 545.

Determination of phosphate in phosphorites.—See B., 1939, 478.

Micro-electric deposition and determination of arsenic. S. TORRANCE (Analyst, 1939, **64**, 263—264).—The macro-method described previously (A., 1938, I, 212) is adapted to micro-amounts of As by incorporating the Lindsey–Sand micro-electrolytic apparatus and technique (A., 1935, 46). As is deposited quantitatively with Cu so long as the ratio of Cu to As is ≮4 : 1. 0·1 mg. of As is satisfactorily recovered. E. C. S.

Determination of small amounts of arsenic. W. DIEMAIR and H. FOX (Mikrochem., 1939, **26**, 343—348).—In the determination of As by the method of Gangl and Sánchez (A., 1934, 1084) increased accuracy is attained by using H_2 from a cylinder controlled by a fine-adjustment valve and adding $PtCl_2$ to the As solution to catalyse the reduction. Accuracy in the titration is increased by measuring out the ICl necessary to dissolve the As mirror, adding 1·5 c.c. of dil. HCl and 1 c.c. of 10% aq. KCN, and after ¾ hr. titrating the I formed. This solution is then used for dissolving the As mirror, the further amount of I liberated being titrated. J. W. S.

Modification of Bettendorff's arsenic test. II. Catalysed by mercury. W. B. KING and F. E. BROWN (J. Amer. Chem. Soc., 1939, **61**, 968—969; cf. A., 1933, 687).—$HgCl_2$ and Hg_2Cl_2 are equally effective in catalysing the reduction of As compounds by $SnCl_2$. The actual catalyst is probably the Hg atom formed by reduction of the Hg salt. W. R. A.

Volumetric determination of arsenic, by Ledebur's method, in sedimentary iron ores.—See B., 1939, 491.

Tetraphenylarsonium chloride as an analytical reagent. Titration by iodine. H. H. WILLARD and G. M. SMITH (Ind. Eng. Chem. [Anal.], 1939, **11**, 186—188).—The potentiometric titration of $AsPh_4Cl$ (I) by aq. I–KI according to the reaction $AsPh_4' + I_2 + I' \to AsPh_4I_3$ has been investigated. On 4—100 mg. of (I) titrations can be duplicated to within 0·02—0·03 ml. of 0·02N-I. The optimum concn. is 10—50 mg. of (I) per 100 ml., the optimum temp. 20—30°, and the solution must be saturated with NaCl just before the end-point is reached. Direct titration of (I) with I, or titration of excess of I with $Na_2S_2O_3$ in presence of starch or potentiometrically, is not possible in this case. The presence of free acid, except HNO_3, is not objectionable. Large [NO_3'] causes pptn. of $AsPh_4\cdot NO_3$. Alkalis and alkaline earths,

$Ni^{..}$, $Co^{..}$, $Cr^{...}$, $Mn^{..}$, BO_3''', HCO_3', PO_4''', OAc', SO_4'', citrate, and tartrate do not interfere. Tungstate, molybdate, CrO_4'', perrhenate, MnO_4', IO_4', ClO_4', Br', F', and all cations that form complex halide ions interfere. Interference by $Fe^{...}$ is eliminated by the addition of $H_3PO_4 + Na_2HPO_4$, but not citrate or tartrate. Citrate prevents interference by $Cu^{..}$, Sn, $Bi^{...}$, $Zn^{..}$, and $Cd^{..}$. Org. solvents must be absent.
L. S. T.

Determination of arsenic in bismuth salts.—See B., 1939, 549.

Turmeric test-papers containing boron. W. A. N. MARKWELL (Analyst, 1939, **64**, 271—272).— A batch of papers gave a strongly positive reaction for B when the solution under test was B-free, and B was detected in the papers themselves. E. C. S.

Determination of boron in boron carbide.— See B., 1939, 502.

Determination of silicon in aluminium.—See B., 1939, 504.

Determination of silicon and tungsten in ferrotungsten by the dissolution method.—See B., 1939, 496.

Photocolorimetric determination of silicon, iron, and copper in aluminium alloys.—See B., 1939, 504.

Determination of silicon carbide in carborundum.—See B., 1939, 486.

Determination of soluble silica and alumina in Portland cement.—See B., 1939, 487.

Determination of potassium with the magnesium salt of dipicrylamine. Micro-determination of potassium and a separation of potassium and sodium. R. DWORZAK and H. BALLCZO (Mikrochem., 1939, **26**, 322—342).—K can be determined satisfactorily by pptn. with the Mg salt of hexanitrodiphenylamine (dipicrylamine) (HR) if $<50\%$ excess of pure MgR_2 is used. Pptn. is preferably effected hot and the solution is kept $\sim$12 hr. before filtration. The ppt. is rinsed with the filtrate and is washed only with small amounts of pure dry Et_2O until this remains colourless. It is dried for 30 min. at 85—90° and cooled over P_2O_5. In the micro-determination solutions saturated with KR are used. In presence of a large excess of Na or Li the solution is warmed (water-bath), with addition of further aq. MgR_2 if necessary, until the KR which is at first pptd. redissolves completely. After allowing the solution to cool during 7 hr. it is kept for 3 days and then filtered, the ppt. being washed with small amounts of 0·07N-MgR_2 saturated with KR, and then with a little Et_2O before drying at 85—95° and weighing. This method permits accurate determination of K in presence of 100 times its concn. of Na. J. W. S.

[Determination of potassium in fertilisers.]— See B., 1939, 527.

Determination of sodium in water by an indirect method.—See B., 1939, 556.

Determination of calcium in cast iron.—See B., 1939, 492.

Determination of strontium in the presence of calcium. R. N. SHREVE, C. H. WATKINS, and J. C. BROWNING (Ind. Eng. Chem. [Anal.], 1939, **11**, 215).—$CaCO_3$ and $SrCO_3$ are pptd. at 50° by addition of aq. $(NH_4)_2CO_3$, and dissolved in dil. HNO_3. The solution is evaporated on a steam hot-plate and the $Ca(NO_3)_2$ extracted by $COMe_2$ in the cold after contact for 1 hr. The Sr is weighed as nitrate. Recovery of the Sr varies from 99·7 to 99·9%. L. S. T.

Hydrolytic volumetric analysis by precipitation. II. Determination of barium. E. A. KOCSIS (Acta chem., min., phys. Univ. Szeged, 1936, **5**, 149—152; Chem. Zentr., 1937, i, 1202).—Bromo-thymol-blue is preferred to Me-red as indicator in the titration of $Ba^{..}$ with K_2CrO_4; the colour-change is sharp with $>$15 c.c. of 0·1N-$BaCl_2$. The method cannot be used for determination of CrO_4'' with $Ba^{..}$. A fourfold excess of $Ca^{..}$ does not interfere.
A. J. E. W.

Determination of magnesium in water.—See B., 1939, 556.

Detection of zinc in presence of iron. G. ERÉNYI (Analyst, 1939, **64**, 271).—In applying the $Fe(CN)_6''''$ test the interference of $Fe^{...}$ due to the formation of Prussian-blue may be overcome by adding an alkali fluoride, with which $Fe^{...}$ reacts to form a non-ionised complex. E. C. S.

Determination of zinc and copper with morpholine. L. S. MALOWAN (Mikrochem., 1939, **26**, 319—321).—Morpholine ppts. Zn and Cu quantitatively from solutions of their salts and can be used for the determination of these metals, the ppts. obtained being in each case ignited and weighed as oxide. The possibility of using morpholine for general separation of ions of more electro-positive from those of more electro-negative behaviour is discussed. J. W. S.

Detection and colorimetric determination of zinc in water by dithizone.—See B., 1939, 557.

Qualitative procedure for the analysis of group II. J. L. MAYNARD, H. H. BARBER, and M. C. SNEED (J. Chem. Educ., 1939, **16**, 77—83).— The sulphides are pptd. under special conditions in aq. HCl by means of H_2S, and then treated with a specially-prepared NaHS reagent which dissolves the Sb, Hg, As, Sn, Se, Te, Mo, and Au and leaves the sulphides of Cu, Cd, Bi, Pb, Pt, Pd, Rh, Ru, Ir, Os, and small amounts of metallic Au. The insol. sulphides are examined by a slightly-modified Gilchrist–Wichers procedure (A., 1936, 180) for the Pt metals, which was found to be the most suitable for qual. analysis of this sub-group. Details of procedure are given, and the solubilities of the different sulphides in the NaHS reagent are discussed. $CH_2Ph\cdot NPhMe_2Cl$ is used to confirm Pt ($<$3 μg. of Pt per ml.). The $CS(NH_2)_2$ test for Os is satisfactory. The separation of Bi from the Au, Cu, Cd, Pt, Ir, and Rh is based on the complete pptn. of Bi from its chloride solution with $NaHCO_3$ at p_H 3 (cresol-red). Possible losses of $CdCl_2$ with pptd. NaCl are pointed out. Only relatively high [$Cd^{..}$] give a ppt. with H_2S in conc. solutions of NaCl. The analysis of the solution of the thio-salts is also detailed. Se is first separated by means of SO_2 in 12N-HCl, and then Te

and Au in 6N-HCl. Finally, the Sb and Sn sulphides are separated from As, Hg, and Mo by dissolution in 12N-HCl. Ge is omitted from the scheme, which is designed for 1—50 mg. of each element. L. S. T.

Scheme of qualitative analysis, involving the use of organic reagents. J. T. DOBBINS, E. C. MARKHAM, and H. L. EDWARDS (J. Chem. Educ., 1939, **16**, 94—98).—Group I is pptd. as usual, after reduction of any CrO_4'' and MnO_4' by the addition of HNO_3 and H_2O_2. The filtrate is heated with conc. HNO_3 to oxidise As''', Fe'', Sb''', and Sn'', and AsO_4''' and PO_4''' are pptd. in a small portion by means of NH_4 molybdate and tested for, whilst Hg'' is confirmed in a second portion by means of $SnCl_2$. Group III, consisting of Fe, Bi, Pb, Cr, Al, Sb, Sn, Cu, Co, Ni, Cd, Zn, and Mn, is pptd. by the addition of aq. $C_5H_5N–NH_4CNS$, the first seven ions as hydroxides and the last six as the insol. $C_5H_5N–CNS$ complexes, under carefully-controlled conditions of acidity. The latter, with exception of Mn, are extracted by heating with aq. $NH_3 + NH_4Cl + H_2O_2$ and portions of this solution are examined by means of the org. reagents now in use for drop reactions. The pptd. hydroxides are treated with $NaOH + Br$ to dissolve Al, Cr, Sb, and Sn and then drop reactions, in most cases, are applied for the individual ions. Group IV, Ba, Ca, and Sr, is pptd. with aq. $NH_3 + (NH_4)_2CO_3$ and analysed as usual. In group V, Mg'' is confirmed with diphenylcarbazide, Na' with Zn uranyl acetate, and K' with naphthol-yellow S. PO_4''' and AsO_4''' do not interfere under this scheme. Centrifuging is preferred to filtration for the separation of ppts., and working details and sensitivities of the tests are recorded. L. S. T.

Polarographic analysis of lead and its compounds.—See B., 1939, 479.

Rapid determination of copper in duralumin-type alloys.—See B., 1939, 505.

Microchemical analysis of brass.—See B., 1939, 498.

Spectrum analysis of brass for manganese, tin, and iron.—See B., 1939, 497.

Determination of copper and manganese in textiles.—See B., 1939, 475.

Conductometric studies. II. Salts of heavy metals (mercuric and mercurous nitrate) and sodium thiosulphate. III. Salts of heavy metals (silver and lead nitrate, copper sulphate) and sodium thiosulphate. J. KAMECKI (Rocz. Chem., 1939, **19**, 213—226, 227—242).—II. Conductometric titration of $Hg(NO_3)_2$ (I) with $Na_2S_2O_3$ (II), or vice versa, does not give satisfactory results, owing to the complexity of the reactions involved. For the former case these are represented : $2(I) + 2(II) \rightarrow 2HgS_2O_3$ $(+H_2O) \rightarrow 2HgS$; $2HgS + (I) \rightarrow 2HgS,Hg(NO_3)_2 [+(II)] \rightarrow$ unknown further products. In alkaline solution a break in the titration curve takes place when 2 mols. of (II) are added per mol. of (I), corresponding with the reaction $HgO + 2(II) + H_2O \rightarrow Na_2[Hg(S_2O_3)_2]$ (III) $+ 2NaOH$. Titration of $HgNO_3$ is also unsatisfactory; the reactions are probably $2HgNO_3 + (II) + H_2O \rightarrow HgS + Hg +$

$Na_2SO_4 + 2HNO_3$; $4Hg + 8HNO_3 + 3(II) \rightarrow 3HgS,Hg(NO_3)_2 + 6NaNO_3 + 3H_2SO_4$. In alkaline solution the reactions are : $Hg_2O + 2(II) + H_2O \rightarrow Na_2[HgS_2O_3]_2 \rightarrow$ (III) $+$ Hg. Titration of (II) with $HgNO_3$ appears to involve formation of a complex salt, initially, with its subsequent decomp.

III. Conductometric titration of $AgNO_3$ (IV) with (II), at 50°, gives results slightly $<$ theory, owing to adsorption of Ag' on Ag_2S. The reactions are : (IV) $+$ (II) $\rightarrow Ag_2S_2O_3 + 2NaNO_3$; $Ag_2S_2O_3 + H_2O \rightarrow Ag_2S + H_2SO_4$. Titration of (II) with (IV) gives unsatisfactory results, owing to the slowness of attainment of equilibrium; the reactions are (II) $+$ (IV) $\rightarrow NaNO_3 + Na[AgS_2O_3]$; $Na[AgS_2O_3] + (IV) \rightarrow NaNO_3 + Ag_2S + H_2SO_4$. Titration of $Pb(NO_3)_2$ with (II), or vice versa, gives accurate results only in fairly conc. solutions, owing to the tendency of PbS_2O_3 to form supersaturated solutions; the reaction is : $Pb(NO_3)_2 + 2(II) \rightarrow 2NaNO_3 + PbS_2O_3$. The results given by conductometric titration of $CuSO_4$ with (I) are 2% high, and of the reverse titration 6% low, the reactions being, respectively, $2CuSO_4 + 2(II) \rightarrow Na_2SO_4 + Cu_2SO_4 + Na_2S_4O_6$, and $Cu_2SO_4 + 2(II) \rightarrow Na_2SO_4 + Na_2[Cu_2(S_2O_3)_2]$. R. T.

Determination of calomel in compound cathartic pills.—See B., 1939, 549.

Polarographic determination of europium in mixtures of the rare earths. L. HOLLECK (Z. anal. Chem., 1939, **116**, 161—166).—The current–voltage curves reproduced show that Eu can be determined polarographically in presence of other rare earths. The method is more selective, more sensitive, and more accurate than that of X-ray spectroscopy. The rise in the curve corresponding with $Eu''' \rightarrow Eu''$ occurs before that of Zn, which is used as reference substance. Group II metals must first be removed as sulphides, and the rare earths are best converted into chlorides after pptn. as oxalates or hydroxides. With small [Eu], the determination must be carried out in an atm. of H_2, and a dropping Hg electrode for this purpose is described. L. S. T.

Chemical analysis by artificial radioactivity. Determination of dysprosium in a fractionation of yttria earths. B. GOLDSCHMIDT and O. DJOURKOVITCH (Bull. Soc. chim., 1939, [v], **6**, 718—726).—The specimen to be tested is irradiated with slow neutrons, and the resulting activity compared with that induced in standards having a known Dy content. For specimens rich in Gd a correction for absorption can be applied. The method is sensitive to 0·25% of Dy and is a useful control in fractionation. F. J. G.

Absolute colorimetric analysis of pure aluminium and aluminium alloys.—See B., 1939, 504.

Determination of manganese in steel.—See B., 1939, 496.

Potentiometric determination of small amounts of manganese.—See B., 1939, 501.

Micro-determination of iron in metals and salts by photometric titration.—See B., 1939, 502.

Colorimetric determination of cobalt in ferronickel ores.—See B., 1939, 491.

Drop method of detection of tungsten in ores.—See B., 1939, 501.

Volumetric determination of small amounts of tin in ores, using methyl-orange.—See B., 1939, 500.

Determination of titanium in ores, using a mercury cathode.—See B., 1939, 501.

Diphenylmethane calorimeter. D. C. AVDALIAN (J. Gen. Chem. Russ., 1938, **8**, 1887—1891).—Irregularities in the action of CH_2Ph_2 calorimeters are due to polymorphous transformations of CH_2Ph_2, both at and above the m.p., which render it unsuitable for calorimetric purposes.   R. T.

Determination of the thermal conductivity and temperature conductivity from the adjustment method with the Schleiermacher tube and the plate apparatus. J. FISCHER. (Ann. Physik, 1939, [v], **34**, 669—688).—Theoretical. The calculation of conductivity for the method of measurement of Pfriem (B., 1938, 743) and Eucken and Englert (ibid., 1110) is discussed. The method can be improved by using the central wire as thermometer alone.   O. D. S.

Protective arrangement for constant-temperature apparatus heated by electricity. F. TARADOIRE (Bull. Soc. chim., 1939, [v], **6**, 739—740).—An arrangement whereby the melting of a plug of fusible material causes the breakage of a Hg contact in the heating circuit is described.   F. J. G.

Method of sensitive pressure and temperature measurement. (A) J. MAZUR. (B) S. ZAMENHOF (Acta Phys. Polon., 1939, **7**, 272, 273—274).—A discussion of priority (cf. A., 1939, I, 158).

Liquefaction of helium. A. VAN ITTERBEEK (Nature, 1939, **143**, 560).—He has been liquefied by using an apparatus based on the Simon expansion principle. Starting at a pressure of 80 atm. and a temp. of 14·6° K., 65 c.c. of liquid He were obtained. The temp. can be lowered to 3·3° K. by reducing the pressure above the He. The time required to obtain liquid He by this method is only 4 hr.   L. S. T.

New method of helium liquefaction by means of the Joule–Thomson effect. I. L. ZELMANOV (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 25—26; cf. A., 1939, I, 189).—The difficulties referred to in the previous paper can be overcome by means of an additional throttle-valve.   L. J. J.

Thermostatic bath for low-temperature viscosity determinations. E. L. BALDESCHWIELER and L. Z. WILCOX (Ind. Eng. Chem. [Anal.], 1939, **11**, 221—222).—Apparatus for determining η at low temp. is described and illustrated. A temp. control within ±0·03° down to −52° can be maintained for several hr.   L. S. T.

Linear coefficient of thermal expansion of ambroid. E. W. YETTER (Rev. Sci. Instr., 1939, **10**, 147).—The linear coeff. of expansion of ambroid (used for bushings in a high-pressure ionisation chamber) varies from 5·36 to 5·56 × 10⁻⁵ from 20° to 60°.   D. F. R.

Thermal conductance of metallic contacts. R. B. JACOBS and C. STARR (Rev. Sci. Instr., 1939, **10**, 140—141).—The thermal conductance across optically polished contacts of Ag, Au, and Cu has been measured at 25° and −195° and under pressures of from 0·2 to 2·5 kg. per sq. cm. The conductance of Cu varies linearly with pressure. Ag is the most suitable for contact work at low temp.   D. F. R.

Dew-point hygrometer for use at low temperatures. C. A. WINKLER (Canad. J. Res., 1939, **17**, D, 35—38).—A cooled non-freezing solution is circulated beneath a mirror provided with 6 thermocouples connected in series. The accuracy of the reading depends on a slow rate of approach to the dew point.   E. C. S.

Simple inexpensive turbidimeter. G. K. ASHBY (J. Lab. clin. Med., 1939, **24**, 654—655).   C. J. C. B.

Photometry. A. DRESLER (Z. Ver. deut. Ing., 1936, **80**, 1405—1408; Chem. Zentr., 1937, i, 1196).—Photometric measurements on discharge tubes by different observers, using flicker and filter methods, give widely discordant results. Physiological causes of the discrepancies are discussed. The use of barrier-layer photo-cells introduces errors of ±10%, owing to spectral sensitivity differences between the cells and the eye; the error is reduced by the use of filters.   A. J. E. W.

Preparation of carbon electrodes for spectrographic analysis. A. T. MYERS and B. C. BRUNSTETTER (Ind. Eng. Chem. [Anal.], 1939, **11**, 218—219).—A C-drilling and -cutting tool drill bit and a C-drilling and -pointing tool, made of tool steel, for the prep. of electrodes suitable for the examination of 10—25 mg. of dried plant material or 0·1 ml. of liquid are described and illustrated. Electrodes can be prepared at the rate of 2 per min.   L. S. T.

Ultra-violet spectrography. A. LAMBRECHTS (Bull. Soc. Chim. biol., 1939, **21**, 122—126).—An examination is made of the possible experimental errors associated with the technique of Henri (A., 1912, ii, 882). These errors amount to about 3—4%.   A. L.

Arc source for quantitative spectral analysis [of nickel alloys].—See B., 1939, 499.

Collector for hard X-rays. M. PIERUCCI, M. BACCARANI, and P. TEGGIA (Nuovo Cim., 1938, **15**, 529—531).—The collector consists of a large no. of coaxial cylinders formed from strips of transparent paper which are covered with small, thin plates of graphite. The collector is placed 50 cm. distant from the anti-cathode of a 180,000-v. Coolidge tube.   O. J. W.

Effective wave-lengths in optical pyrometry. F. HOFFMANN and C. TINGWALDT (Z. Instrumkde., 1939, **59**, 20—30).—Theoretical. The problem is considered in connexion with glowing-filament pyrometers with colour filters, and for spectral pyrometers.   A. J. M.

Production of optically active substances and metallic films of silver, platinum, and palladium by means of circularly polarised light. J. C.

GHOSH (J. Indian Chem. Soc., 1939, **16**, 51—62).—An address. W. R. A.

Precision measurement of lattice constants by a compensation method. H. VAN BERGEN (Ann. Physik, 1938, [v], **33**, 737—752; cf. A., 1937, I, 399).—The method of Kossel (A., 1936, 925) is developed for use with external radiation. O. D. S.

Mechanism of the hydrogen electrode process on platinum. J. HORIUTI and M. IKUSIMA (Proc. Imp. Acad. Tokyo, 1939, **15**, 39—44).—Measurements have been made with the H_2 electrode using (a) H_2 and 50% D_2O–H_2O and (b) D_2 and H_2O, and the change in [D] in the gas determined. Calculations of the reaction kinetics show that the H electrode process may be represented by $2H^+ \rightleftharpoons H + H^+ \rightleftharpoons H$–$H^+ \rightleftharpoons H_2$. D. F. R.

Durable electrode of amalgamated platinum net. F. BISKUPSKI (Pflüger's Archiv, 1938, **240**, 282—286).—The electrode consists of amalgamated Pt net enclosed in an agar gel prepared with 0·9% NaCl and Hg_2Cl_2 in excess. It has the properties of a reversible Hg electrode, i.e., small polarisability and low, almost frequency-independent ohmic resistance, without its disadvantages (e.g., KCl). H. Ro.

Electrometric indicators with the dead-stop end-point system. Applications to neutralisation and precipitation reactions. D. R. CLIPPINGER with C. W. FOULK (Ind. Eng. Chem. [Anal.], 1939, **11**, 216—218).—The method described previously (A., 1926, 927) for iodometry has been extended to neutralisation and pptn. reactions. Various substances, e.g., H_2O_2, $NaNO_2$, are used as electrometric indicators in those cases where an end-point is not given by the reactants alone. When IO_3' and I' are added to an aq. base, the anode of a polarised electrode system is depolarised by the reducing action of the I', and on titration with acid, reaction between IO_3' and I' occurs at p_H 6·67, the trace of I liberated depolarises the cathode, the current flows and is registered by the permanent deflexion of a galvanometer. Details of procedure and results for the titration of NaOH with HCl are given. In acid solution, I is used as indicator, and keeps the cathode depolarised until the first excess of alkali forms a trace of I', which then depolarises the anode, and the current flows. Data for the titration of HCl with NaOH are given. The titration of a strong acid with a weak base also gives a reproducible end-point by this method. H_2O_2 acts as a reversible indicator for the titration of acid or alkaline solutions by virtue of the sharp difference of its reduction potential in acid and alkaline solutions. In the titration of halide by $Ag^·$, $NaNO_2$ serves as indicator by keeping the anode depolarised during titrations; I' and CN' are themselves anodic depolarisers. In the titration of KCN with $Ag^·$, galvanometer deflexions corresponding with the quant. formation of $KAg(CN)_2$ and $Ag_2(CN)_2$, respectively, are observed. Mixtures of Cl' and I', or of Br' and I', can be determined by this method if the AgCl and AgBr are kept in solution by means of aq. NH_3 until the I' is pptd. The dead-stop method has the advantage of using two simple Pt wire electrodes, which seldom become poisoned, and of requiring no

reference electrode. Momentary deflexions of the galvanometer give adequate warning of the end-point, and the results are as reproducible as those obtained by accepted methods of electrometric analysis. L. S. T.

Spectral sensitivity of selenium rectifier photo-electric cells. G. P. BARNARD (Proc. Physical Soc., 1939, **51**, 222—236).—Curves showing the dependence of spectral sensitivity on the external-circuit resistance, output, temp., and on the quality of the incident radiation are given and discussed, and possible methods of colour correction are examined. N. M. B.

Apparatus for electron-diffraction at high temperatures. R. JACKSON and A. G. QUARRELL (Proc. Physical Soc., 1939, **51**, 237—243).—Apparatus and technique for the examination of surfaces by electron-diffraction up to 1200° are described. The diffraction section of the camera is H_2O-cooled, and, since no refractory material is used in the vac. chamber, a high vac. can be maintained. Patterns for FeO at 650° and 850° are reproduced. N. M. B.

Electron-lenses. O. KLEMPERER and W. D. WRIGHT (Proc. Physical Soc., 1939, **51**, 296—317).—Two methods of deriving the optical consts. and spherical aberration of electron-lens systems are described, results for a two-tube lens are reported, and the design of an electron gun for the tests is given. N. M. B.

Deuteron source for nuclear research. N. E. BRADBURY and F. BLOCH (Physical Rev., 1937, [ii], **52**, 256).—In a modification of the usual low-voltage arc in D_2 for deuteron production, a relatively high deuteron yield is obtained by using pressures of 0·1—0·4 mm. and an auxiliary cathode. Excessive gas consumption and high pumping speeds are avoided by the incorporation of an electrostatic focussing system in the arc. Gas consumption is 20 c.c. per hr., and the total power required for operation of the arc is 250 w. L. S. T.

Use of twin sources in experimental studies of thermal neutrons. G. J. THIESSEN and E. L. HARRINGTON (Physical Rev., 1937, [ii], **52**, 256).—By using two sources of Rn–Be placed at an optimum distance apart, a region of nearly uniform neutronic radiation is obtained, and the variations experienced with a single source are eliminated. L. S. T.

Continuously sensitive cloud chamber. A. LANGSDORF, jun. (Rev. Sci. Instr., 1939, **10**, 91—103).—A continuous cloud chamber is described in which supersaturation necessary for condensation of vapour on ions is maintained continuously by the diffusion of an initially warm saturated vapour through a non-condensing gas into a refrigerated region. Convection currents are avoided by diffusion downwards from a heated roof to a cold floor (cf. A., 1937, I, 536). F. J. L.

Use of the neon glow lamp for elimination of induction make shocks. J. E. THOMAS (Science, 1939, **89**, 133—134).—The Ne lamp is put in series with the secondary circuit. W. F. F.

High-performance electronic relay. R. C. HAWES (Ind. Eng. Chem. [Anal.], 1939, **11**, 222—

223).—A relay for use with a Hg thermoregulator in controlling the temp. of a water-bath is described and illustrated.   L. S. T.

National Radium Institute cyclotron and the generation of the first beams of protons and H_2^+ ions. V. RUKAVISCHNIKOV and D. ALCHAZOV (Tech. Phys. U.S.S.R., 1938, **5**, 778—788).—Energies up to 3.18×10^6 ev. for H^+ and 0.99×10^6 e.v. for H_2^+ have so far been attained with the instrument described, which is capable of giving field strengths of 18,000 oersted and 6000—12,000 e.v.   L. J. J.

Theory of the thermo-electric couple. V. KOVALENKO (Tech. Phys. U.S.S.R., 1938, **5**, 789—805).—Equations are developed for the temp. attained by the hot junction when used for the measurement of small a.c. or for radiation measurements, and for the time-lag. Consts. characterising the latter for long and short filaments are given for a no. of metals.   L. J. J.

Making beryllium targets. L. C. VAN ATTA, A. M. CLOGSTON, and H. O. PULS (Rev. Sci. Instr., 1939, **10**, 148).—An alternative to the making of Be targets by evaporation of the metal at 1500° is the beating of grains of Be into a Cu block, followed by scraping and sanding. A layer of Be 0.5 mm. thick is produced.   D. F. R.

Thermo-electric measurement of high temperatures in pressure apparatus. F. BIRCH (Rev. Sci. Instr., 1939, **10**, 137—140).—Up to 580° and 4000 kg. per sq. cm. the e.m.f. of the chromel–alumel couple is independent of pressure to within 10 μv., or 0.25°. The same pressure causes a regular decrease in the e.m.f. of the Pt–(Pt–10% Rh) couple, amounting to 16 μv., or 1.8° at 500°.   D. F. R.

Simple [inductive] capacity (impedance) bridge. J. CHLOUPEK (Chem. Listy, 1939, **33**, 145—149).—Apparatus for measurement of inductive capacity is described.   R. T.

Improved magnetostriction oscillator. W. W. SALISBURY and C. W. PORTER (Rev. Sci. Instr., 1939, **10**, 142—146).—An oscillator with an input of 2000 w. giving frequencies of from 7000 to 50,000 cycles per sec. is described.   D. F. R.

Analytical balances in quantitative micro-analysis. A. A. BENEDETTI-PICHLER (Ind. Eng. Chem. [Anal.], 1939, **11**, 226—229).—Analytical balances of a precision $\ngtr \pm 50$ μg. can be used in quant. micro-analyses when the precision required for the results is not too exacting. The method of weighing employed with microchemical balances is recommended for general use with analytical balances. The min. size of sample required for attaining a specified precision of the analytical result is treated mathematically, and the results are tabulated in a form suitable for their practical application.   L. S. T.

Apparatus for micro-analysis of gas. C. H. PRESCOTT, jun., and J. MORRISON (Ind. Eng. Chem. [Anal.], 1939, **11**, 230—233).—Apparatus and technique are described. The methods are available for H_2O, CO_2, H_2, CO, O_2, and CH_4. A complete general analysis requires 1 hr. With 5—25 cu. mm.

at n.t.p., the errors are <2% of the total sample, and for smaller samples ~5%. They appear to be due to adsorption and desorption of gas on the apparatus, particularly on the powdered reagents. Under special conditions, 0.025 cu. mm. is the limit of detection of a component; the usual limit is 0.06 cu. mm.   L. S. T.

Duplicating pipettes. F. E. HOLMES (Ind. Eng. Chem. [Anal.], 1939, **11**, 188).—Pipettes of the Ostwald–Van Slyke type with two bulbs instead of one save time and material, avoid unnecessary disturbance of a ppt., and reduce calibration errors.   L. S. T.

Growing of Rochelle salt crystals for radio experiments. C. W. CLIFFORD (J. Chem. Educ., 1939, **16**, 86—87).—Details for producing rapidly and slowly grown crystals are given. The latter averaged 3—4.5 cm. in length, and were stable for >2 years.   L. S. T.

Adsorption analysis: Tswett's chromatographic method. H. G. CASSIDY (J. Chem. Educ., 1939, **16**, 88—93).—The history and theory of the method are reviewed. Working details for an analysis are given, and criteria to aid in the choice of solvents and adsorbents are discussed. Applications and limitations of the method are described.   L. S. T.

Precipitation with hydrogen sulphide in closed vessels. J. PFANHAUSER and T. KALIŃSKI (Przemysł Chem., 1938, **22**, 448—450).—Apparatus for pptg. sulphides in a closed system is described.   R. T.

Theory of the method of Clusius and Dickel for the separation of gases. L. WALDMANN (Naturwiss., 1939, **27**, 230—231).—The theory of the method involving thermo-diffusion and thermo-siphon action for the separation of gases is developed (cf. A., 1938, I, 539).   A. J. M.

Simple laboratory shaking machine. M. C. MARKLEY (Cereal Chem., 1939, **16**, 292—293).—A cheap shaker, constructed for 24 bottles, is described and illustrated.   E. A. F.

Uses for synthetic-rubber-like substances in vacuum technique. J. STRONG (Rev. Sci. Instr., 1939, **10**, 104).—" Koroseal " (Goodrich Rubber Co.) is not attacked by oils and ages more slowly than rubber. It is suitable for gaskets for large-aperture vac. valves, vac. lines, and, since it is unaffected by Hg, for the Hg reservoir in McLeod gauges.   F. J. L.

Jena glass filter test-tubes for micro-analysis. R. NORDBÖ (Skand. Arch. Physiol., 1939, **81**, 263—264).   A. S.

Sintered-glass filters and bubblers of Pyrex. H. W. STONE and L. C. WEISS (Ind. Eng. Chem. [Anal.], 1939, **11**, 220).—The prep. of sintered-glass mats in tubing $\not> 10$ mm. external diameter is described.   L. S. T.

Improved stopcock substitute. W. G. PARKS and D. E. CARRITT (Rev. Sci. Instr., 1939, **10**, 148).—The atm. and high-vac. sides of a system are separated by a U-tube. The entrance of Hg into the bottom of the U-tube from a reservoir closes the connexion,

whilst passage of Hg into the system is prevented by sealing a Jena No. 4 sintered disc into each limb of the U-tube. D. F. R.

Design of an accurate McLeod gauge. P. Rosenberg (Rev. Sci. Instr., 1939, **10**, 131—136; cf. A., 1938, I, 539).—Details of construction of a large McLeod gauge of high sensitivity, accuracy, and precision are given. The gauge has a compression ratio (ratio of vol. of 1 mm. length of capillary to total vol.) of 2.4×10^{-7} and a precision of 0.2, 0.6, 2, and 6% at pressures of 10^{-2}, 10^{-3}, 10^{-4}, and 10^{-5} mm. of Hg respectively. D. F. R.

Discovery of Ohm's law. R. W. Pohl (Forsch. u. Fortschr., 1939, **15**, 158—159).

Historical studies on the phlogiston theory. IV. Last phases of the theory. J. R. Partington and D. McKie (Ann. Sci., 1939, **4**, 113—149; cf. A., 1938, I, 641).

History of Prussian-blue. L. J. M. Coleby (Ann. Sci., 1939, **4**, 206—211).

J. W. Gibbs. C. A. Kraus (Science, 1939, **89**, 275—282). L. S. T.

Geochemistry.

Diurnal variation of the electrical conductivity of air and of the number of ions and nuclei of condensation at the observatory of Chambon-la-Forêt. (Mlle.) O. Thellier (Compt. rend., 1939, **208**, 1167—1170).—Data for the periods 20 May— 1 November, 1938, and 5—23 February, 1939, are recorded and discussed. W. R. A.

Salinity of the waters of the Orne between Caen and the mouth (Franceville). C. F. Bœuf (Compt. rend., 1939, **208**, 916—918).—The salinity of the H_2O of the lower Orne has been determined at various locations and times. The region of transition from fresh to salt H_2O varies according to the state of the tide, but although tidal effects are observed at Caen the H_2O there is non-saline. J. W. S.

Sodium hydrogen carbonate from Searles Lake, California. W. F. Foshag (Amer. Min., 1938, **23**, 169).—$NaHCO_3$, α 1·375, β 1·505, γ 1·582, Na_2O 36·74, CO_2 51·15, H_2O 10·76, R_2O_3 0·16, CaO 0·20, insol. 0·82, total 99·33%, occurs with abundant gay-lussite at Searles Lake. " Nahcolite " from near Naples consists of burkeite and $NaCO_3,3NaHCO_3$. L. S. T.

Ish River mineral springs. Z. N. Blumschtein (Sci. Mem. State Univ. Kazan, 1938, **98**, No. 2, 5— 203).—An exhaustive description is given of the history, geology, and hydrogeology of a no. of springs on the left bank of the R. Ish, near its confluence with the R. Kama. Numerous analyses of the waters (for solid and gaseous solutes) are given, and conductivity and radioactivity data are recorded. R. T.

Western Pacific Ocean. II. Chemical composition of the oceanic salt. III. F.p., osmotic pressure, b.p., and vapour pressure of sea-water. Y. Miyake (Bull. Chem. Soc. Japan, 1939, **14**, 55—58, 58—62).—Sr in the sea-water, determined gravimetrically, is 14·4 mg. per l. and B, determined volumetrically, is 4·73 mg. per l.

III. The depression of f.p. (ΔT) of the sea-water, containing 18·54% Cl, is 1·895°. The relation between ΔT and % Cl content (C), determined by dilution of the sea-water sample and subsequent f.p. measurements, is $\Delta T = 0.102710 C$. The osmotic pressure, b.p. elevation, and v.p. have been calc. D. F. R.

Iodine value of river waters. M. Kohout (Chem. Listy, 1939, **33**, 129—130).—5 c.c. of 20% $KHCO_3$ and 5 c.c. of starch solution are added to 100 c.c. of river- and of distilled H_2O, and the solutions are titrated with 0·01N-I in KI. The I val. (mg. I per l. of H_2O) is raised in river H_2O below cellulose factories, but varies within narrow limits in other cases. R. T.

Contribution of diatoms to the sediments of Crystal Lake, Vilas Co., Wisconsin. P. S. Conger (Amer. J. Sci., 1939, **237**, 324—340).—This soft-water lake exhibits an unexpected diversity both in biological stratification and in horizontal distribution of diatoms in its sediments. Diatoms, of which 23 genera and 85 species are tabulated, and pine pollen are the chief constituents of the sediments. Chemical analyses of the lake H_2O at different depths are recorded. L. S. T.

Structure of meteorites. A. J. Bradley (Nature, 1939, **143**, 518—519).—X-Ray powder photographs of the Fe-rich end of the system Fe + Ni provide a new phase diagram which confirms the conclusion (Owen, A., 1939, I, 162) that suitable heat-treatment leads to the production of a two-phase structure in certain alloys. A typical meteoritic structure, consisting of kamacite (body-centred cubic with 6% Ni) + tænite (face-centred cubic with ~26% Ni), is the equilibrium state between 350° and 580°. A further transformation occurs at ~350°. The typical meteoritic structure is in equilibrium only between 350° and 580°, and not below 350°. Meteorites may have attained this structure by heat-treatment near the sun while encircling it in a cometary orbit. L. S. T.

Metalliferous deposits in the region of curvature of the eastern Carpathians. T. P. Ghitulescu (Bull. Acad. Sci. Roumaine, 1939, **21**, 73—80). —A new metallogenetic region, containing sulphides of Pb, Zn, and Cu, with gangue minerals such as quartz, calcite, and barytes, has been discovered. It is situated in the arc of the eastern Carpathians and is a S.E. extension of the metalliferous region east of Transylvania. D. F. R.

Isomorphic substitutions in apatite. I. D. Borneman-Starinkevitsch (Compt. rend. Acad. Sci. U.R.S.S., 1939, **22**, 113—115; cf. A., 1938, I, 421).—The author upholds his own views on the structure of apatite against those of McConnell (A., 1939, I, 284), which are considered to disregard the

chemical nature of the compound within the lattice. From his calculations it is shown that the sums of the positive and negative charges are unequal and this is regarded as unacceptable.   F. R. G.

Geology of the gold quartz veins of Cornucopia. G. E. GOODSPEED (Amer. Inst. Min. Met. Eng., Tech. Publ. 1035, 18 pp.; Min. Tech., 1939, 3).—The Cornucopia (N.E. Oregon) quartz veins form a parallel vein system traversing metamorphic and granodioritic rocks. Field and petrographic evidence indicates that the veins have been formed by hydrothermal solutions, probably alkaline. The recurrent fracturing of the veins suggests their persistence at depth.   I. C. R.

Geology of the Slana-Tok district, Alaska. F. H. MOFFIT (U.S. Geol. Survey, 1938, Bull. 904, 54 pp.).—The rocks of this district are mainly sedimentary, but include tuff beds and lava flows and many masses of intruded granitic rocks, mostly diorite and related types. Evidence of mineralisation by precious metals is discussed.   L. S. T.

Nushagak district, Alaska. J. B. MERTIE, jun. (U.S. Geol. Survey, 1938, Bull. 903, 96 pp.).—The geology of the district is described. Chemical analyses of 4 granites and 3 monzonites are recorded. No metal deposits of commercial val. have as yet been found, but the country is probably mineralised. Au occurs in small quantities at widely-separated localities.   L. S. T.

Lattice limitation of montmorillonite. S. B. HENDRICKS and C. S. ROSS (Z. Krist., 1938, **100**, 251—264; cf. Maegdefrau and Hofmann, A., 1938, I, 347).—Montmorillonite and related minerals (beidellite, nontronite, bentonite) consist of pyrophyllitic silicate layers with interpenetrating H_2O. Views differ as to the detailed structure. A review of, and further evidence from, X-ray and electron diffraction data and optical measurements show that the layers cannot be randomly oriented about their common normal, but have a preferred orientation. Results and interpretations of Hofmann are questioned.   I. McA.

Conditions of formation of nitrates in caves. F. W. FREISE (Chem. Erde, 1939, **12**, 265—273).— The nitrates derived from bat guano in limestone caves in Brazil contain 62—88% of $Ca(NO_3)_2$, with some alkali nitrates, and little $Mg(NO_3)_2$. Under certain conditions Cu and Mn nitrates are also formed.   L. J. S.

Weathering experiments on leucite. G. KRÜGER (Chem. Erde, 1939, **12**, 236—264).—Finely powdered (radius <1 μ. and 3—10 μ.) leucite was treated at $22°$ and $42°$ with solutions of p_H 0—11 (N-H_2SO_4, 0·001N-H_2SO_4, distilled H_2O, CO_2-free H_2O, NH_3 solution), the solution passing continuously through a filtering funnel or an electro-dialyser. With N-H_2SO_4 all K and Al passed into solution, leaving a residue of amorphous SiO_2. With the weaker solvents more Al was dissolved than Si, and the residue left as a film on the grains varied in composition $SiO_2 : Al_2O_3$ from 11·68 to 2·66, depending on the solvent, time of action, and temp.   L. J. S.

Cause of colour of some mineral salts. J. HOFFMANN (Chem. Erde, 1939, **12**, 208—220).—The differences in colour of $CuSO_4$ containing varying amounts of H_2O or as double salts with $NiSO_4$ and NH_3 are noted. Changes in colour shown by various substances when exposed to Ra are discussed in relation to at. structure.   L. J. S.

Basalts of Pauliberg, Burgenland. L. JUGOVICS (Chem. Erde, 1939, **12**, 158—207).—Several chemical analyses are plotted on diagrams and compared with the rocks of other regions.   L. J. S.

Influence of iron and titanium on the physical characters of garnets of the grossular-andradite series. M. T. MACKOWSKY (Chem. Erde, 1939, **12**, 123—157).—Chemical analysis with determinations of ρ, n, and a_0 are given for nine andradites from various localities. Fe_2O_3 ranges from 20·68 to 30·14, and Al_2O_3 0·13—7·53%. The physical data show a linear increase with increase in Fe_2O_3 and TiO_2. For pure andradite ($Ca_3Fe_2Si_3O_{12}$) are calc. ρ 3·750, n 1·895, a_0 12·033 A., and for pure grossular ($Ca_3Al_2Si_3O_{12}$) ρ 3·530, n 1·735, a_0 11·840 A.   L. J. S.

Weathering of igneous rocks in the Chilean desert. E. BLANCK and R. THEMLITZ (Chem. Erde, 1939, **12**, 113—122).—Chemical analyses are given of fresh granite and porphyry and of their weathering products. In one type of alteration of the granite (SiO_2 69·93%) there has been silicification (SiO_2 84·17%) with loss of alkalis. In more disintegrated material there has been loss of SiO_2 (SiO_2 54·27%) and addition of considerable amounts of CO_2, SO_3, and N_2O_5.   L. J. S.

Heavy mineral methods applied to the Pre-Cambrian rocks of the south shore of Lake Superior. S. A. TYLER and R. W. MARSDEN (Amer. Min., 1938, **23**, 180).—On the south shore of Lake Superior, pre-Huronian and Keweenawan igneous rocks can be readily distinguished by the variety of zircon, purple or colourless to yellow, present.   L. S. T.

Origin of fibrous gypsum veins in the Lykins and Morrison formations of Colorado. L. R. THIESMEYER (Amer. Min., 1938, **23**, 179—180).—The fibrous structures of these veins, which are locally abundant, are probably not the result of lateral secretion through the wall rocks. The vein material was probably supplied by the Morrison formation to downward-migrating groundwaters.   L. S. T.

Brown iron ores of Eastern Texas. E. B. ECKEL (U.S. Geol. Survey, 1938, Bull. 902, 157 pp.).— The general geology, the Fe ores, and the numerous separate deposits are described. The most abundant ore is limonite (I) (brown ore) with composition range of Fe 48—57, SiO_2 5—13, Al_2O_3 2—7, P 0·04— 0·12, S 0·02—0·10, Mn 0·15—0·30, and H_2O 10—13%. Siderite is also plentiful. The laminated and buff crumbly ores of the S. Basin contain Fe 42—48, SiO_2 10—12, Al_2O_3 8—12, P 0·10—0·25, and H_2O 12—14%. The ores appear to have been derived from the Weches greensand by the ordinary weathering processes of leaching, deposition as carbonate, and alteration to (I). Estimated reserves of comparatively high-grade ore are 15—20 $\times$ 10^7 tons. Numer-

ous chemical analyses of the Weches greensand, the brown ores, and the carbonate ores are tabulated. L. S. T.

Rock-salt in Pennsylvania. R. W. STONE (Econ. Geol., 1937, **32**, 1072).—Large supplies of salt, probably halite, are available. L. S. T.

Occurrence of large halite crystals. C. B. SLAWSON (Amer. Min., 1938, **23**, 179).—Large masses of clear, transparent halite are occasionally encountered in the rock-salt mined at Detroit. Single crystals > 2 ft. in diameter are not uncommon.
L. S. T.

Diadochite, a mineraloid from the New Idria mine, San Benito Co., California. A. F. ROGERS (Amer. Min., 1938, **23**, 178).—A yellowish-brown, resin-like, massive material from the New Idria Hg mine is amorphous, $2Fe_2O_3,3(SO_3,P_2O_5),15H_2O$, analogous to pitticite. L. S. T.

Quartz with pinacoid faces from Nathrop, Chaffee Co., Colorado. A. F. ROGERS and L. CAHN (Amer. Min., 1938, **23**, 178—179).—Minute α-quartz crystals of prismatic habit from Ruby Mt., Chappee Co., Colorado, show prominent pinacoidal faces. L. S. T.

Goldschmidtine, a new silver antimonide. M. A. PEACOCK (Amer. Min., 1938, **23**, 176—177).— *Goldschmidtine* (I), orthorhombic, $a:b:c = 0.6312:1:0.6860$, a_0 7.75, b_0 12.32, c_0 8.42 A. (I) ± 0.05 A.) a_0, b_0, $c_0 = 0.629:1:0.683$, vol. of unit cell 804 A.^{3}, ρ 6.83$\pm$0.03, mol. wt. 3328, hardness 2.5, the base-centered cell containing $Ag_{20}Sb_{10}$, has [F. A. GONYER] Ag 64.78, Sb 35.01, S 0.06, Pb, As, Cu, and Sn none, total 99.85%, and occurs with native Ag, ruby Ag, and galena on a specimen from Andreasberg, Harz. (I) differs from dyscrasite, Ag_3Sb, in all essential properties. L. S. T.

Cleavage-luminescence in mica. V. B. MEEN (Amer. Min., 1938, **23**, 174).—Mica from Kilmar, Quebec, and certain others, luminesce when split.
L. S. T.

Harmotome from Delaware Co., Pennsylvania, a barium zeolite of hydrothermal origin. A. E. MEIER and W. H. TOMLINSON (Amer. Min., 1938, **23**, 174).—Harmotome, probably of hydrothermal origin, occurs in serpentine near Glen Riddle, Pa. Associated minerals are Ba K felspars, corundum, and montmorillonite. L. S. T.

Regional granitisation and metamorphism in New England. L. W. CURRIER (Amer. Min., 1938, **23**, 168).—The origin of granites at Chelmsford-Westford, Mass., and Milford, N. H., is attributed to general intensive granitisation of schists by hydromagmatic processes. Metasomatism has developed alkali felspars, quartz, and muscovite displacing original Mg, Fe, Ca, and Ti. L. S. T.

Mineral deposits of the north-eastern part of the Humboldt range, Nevada. E. N. CAMERON (Amer. Min., 1938, **23**, 167—168).—Hypogene sulphides of the Ag-bearing veins and stockworks include pyrite, sphalerite, freibergite, Ag-bearing galena, and jamesonite, with minor amounts of arsenopyrite, stibnite (I), chalcopyrite, bournonite, and pyrargygite. Quartz (II) is the chief gangue

mineral. Calcite, barite, albite, apatite, scheelite, and epidote occur in the veins. Covellite, sooty argentite, and native Ag appear to be supergene. The commercial val. of the Ag deposits is probably due to supergene enrichment. Workable quartz-stibnite veins consist of (I) replacing and filling fractures in massive (II). Oxidation of a vein in Jackson Canyon has given workable bodies of stibiconite and (II). L. S. T.

Unweathered manganese deposits of the Batesville District, Arkansas. H. D. MISER and D. F. HEWETT (Econ. Geol., 1937, **32**, 1069; Amer. Min., 1938, **23**, 175).—The conc. bodies of $MnCO_3$ now being explored in this district appear to have been formed by the concn. of the Mn disseminated throughout the Fernvale limestone. The widespread presence of bementite, as well as of neotocite, barite, and fluorite, indicates that warm waters accomplished this concn.
L. S. T.

Silicification types along the hanging wall of the London fault, Mosquito Range, Colorado. R. D. BUTLER (Econ. Geol., 1937, **32**, 1071; Amer. Min., 1938, **23**, 167).—Dolomitic formations on this wall contain replacement ore bodies of barite-carbonate-pyrite-sphalerite-galena-tennantite. Silicification of the dolomites preceded the formation of the ore minerals. Two types of replacement SiO_2, idiomorphic and allotriomorphic, have been observed. Distribution of ore is not related to amount of silicification, but valuable ore bodies occur only within a small area where certain silicified facies are present.
L. S. T.

Crystal structure and density of delafossite. A. PABST (Amer. Min., 1938, **23**, 175—176).—A discussion. L. S. T.

Nickel content of an Alaskan troctolite. J. C. REED (Econ. Geol., 1937, **32**, 1074—1075; Amer. Min., 1938, **23**, 177).—A troctolite sill occurring on Admiralty Island, Alaska, contains ~0.18% of chalcopyrite and 0.10% of pentlandite, corresponding with 0.06% Cu and 0.025% Ni. A chemical analysis indicates Cu : Ni = 3.5 : 1. L. S. T.

Broader structural relations of the ore deposits of Central City and Idaho Springs, Colorado. T. S. LOVERING and E. N. GODDARD (Econ. Geol., 1937, **32**, 1075—1076).—The structure of the deposits is described and their origin discussed. L. S. T.

Pyrophyllite deposit in S.E. Newfoundland. J. S. VHAY (Econ. Geol., 1937, **32**, 1076—1077; Amer. Min., 1938, **23**, 180—181).—The quartz-pyrophyllite schists occurring near Manuels, Conception Bay, consist of various proportions of quartz and pyrophyllite (I) grading into large masses of nearly pure (I). (I) has been formed by hydrothermal alteration of sheared and silicified rocks. L. S. T.

Fluorite deposits in Westmoreland, New Hampshire. H. M. BANNERMAN and R. E. STOIBER (Econ. Geol., 1937, **32**, 1077—1078; Amer. Min., 1938, **23**, 166).—These deposits occur as fissure fillings in tension fractures in a granite gneiss. The fluorite is accompanied mainly by quartz, but considerable amounts of barite, calcite, dolomite, kaolin, and sericite are present. Sulphide streaks with some

malachite and smithsonite occur throughout the deposits. The veins are probably post-Palæozoic.
L. S. T.

Magmatic carbonation–carbothermal metamorphism. R. J. HOLDEN (Econ. Geol., 1937, **32**, 1078—1079).—The results of mass action of magmatic CO_2 can be recognised by the association of carbonates with chlorite, epidote, and other secondary hydrous silicates in deep veins and intrusives in katamorphic changes at depths and temp. where only anamorphic actions would be expected. Magmatic CO_2, in some cases aided by S, may produce sericitisation, propylitisation, alunitisation, silicification, and pyritisation.
L. S. T.

Platinum placers of the Goodnews Bay district, Alaska. J. B. MERTIE, jun. (Econ. Geol., 1937, **32**, 1080).—Placer Pt has been found only in a small area south of Goodnews Bay. Production for 1937 is ~5500 oz. The country rock consists of sheared and semi-schistose rocks of sedimentary and igneous origin, and lava flows, all probably Carboniferous. The chief Pt placers occur in the valley of Salmon River and in two tributaries, the Platinum and Clara Creeks. All six Pt metals are present with 68—75% of Pt, 6—13% of Ir, and 0·25—0·5% of Pd. 0·25—0·5% of Au is also recovered. Concentrates taken with the precious metals include magnetite, ilmenite, and chromite.
L. S. T.

Gold deposits of northern Oriente, Cuba. T. T. QUIRKE (Econ. Geol., 1937, **32**, 1081).—At Halguin, the deposits occur in irregular veins and disseminations, whilst near Santa Lucia, the Au occurs in rough coarse and fine grains within massive serpentine rocks, in quartz veins, in massive arsenopyrite concns., and in shatter zones. Nearly all the local gravels and other alluvium contain free Au.
L. S. T.

Gold in the Baleisk mine (Transbaikal). O. E. ZVJAGINTZEV, V. A. VOLKOVA, and E. L. PISARJEVSKAJA (Bull. Acad. Sci. U.R.S.S., 1938, Sér. Chim., 509—518).—Up to 120 m. depth, the composition, microstructure, and Ag content of the Au are const. The K content is very high in comparison with granites. All the component elements and ions have V.E.K. 0·32—1·1 kg.-cal. per mol.
L. J. J.

Origin of primary lead ores. II. A. HOLMES (Econ. Geol., 1938, **33**, 829—867).—A reply to criticism (cf. Graton, A., 1938, I, 542; Keevil, A., 1939, I, 288). Knopf's alternative suggestion (A., 1938, I, 283) that ore-Pb is a differentiate from deep-seated peridotite via basaltic granitic magmas is without foundation.
L. S. T.

Fluoride with pyrochlore structure. A. PABST (Nature, 1939, **143**, 520—521).—X-Ray investigation of ralstonite (I) gives a_0 9·87 A., space-group O_h^7—$Fd3m$. The unit cube contains 48 (F, OH), 16 (Al, Mg), 2·7 Na, and 7 H_2O. The structure is similar to that of the pyrochlore group $X_2Z_2(O,OH,F)_7$. (I) can be dehydrated without destroying the crystal lattice.
L. S. T.

Occurrence of vanadium in nature. F. HERMANN (Metallwirts., 1936, **15**, 1007—1015; Chem. Zentr., 1937, i, 814).—The natural enrichment of V in magnetites, other Fe and Mn ores, and bitumens is discussed. World sources are reviewed and classified.
A. J. E. W.

Hydrothermal formation of clay minerals in the laboratory. F. H. NORTON (Amer. Min., 1939, **24**, 1—17).—A continuation of former work (A., 1937, I, 206) and an extension to other minerals in which rates of reaction at different temp. and over various ranges of pressure of CO_2 have been determined. Albite is comparatively stable and its conversion into beidellite (?) is slow. At 300° and 500 lb. per sq. in. of CO_2, nephelite is rapidly converted almost completely into gibbsite (?), but at 275° or 325° and the same pressure, the end-product is sericite (I). Orthoclase and leucite are also converted into (I). At 300° and 250 lb. per sq. in., petallite gives a 50% conversion into a product that has an X-ray pattern similar to, but not identical with, that of kaolinite (II). At 300° and 500 lb. pressure, spodumene is converted completely into (II), and anorthite into pyrophillite (90% yield), whilst pollucite, beryl, lepidolite, and (II) remain unchanged. Below 250° and above 350°, the above parent minerals appear to be stable. The end-product is determined not only by temp., pressure, and p_H, but also by some characteristic of the parent mineral. Reaction proceeds directly to a single end-product without the formation of intermediate minerals.
L. S. T.

Adsorptive clays of the Texas Gulf Coast. A. F. HAGNER (Amer. Min., 1939, **24**, 67—108).—13 clay deposits of this coast are described, and the results of optical, chemical, and X-ray investigation of the clays are discussed. The principal mineral constituent of the clays as mined is montmorillonite (I). Many beds represent the alteration *in situ* of volcanic ash. Substantial amounts of kaolinite, halloysite, and allophane occur in some of the deposits. Much of the original material has altered sufficiently to form usable adsorptive clays. The waxy character of certain moist clays is a convenient field indication of adsorptive capacity, and the waxy clays contain more nearly pure (I) than other types which are soft, granular, and kaolinitic. Correlation of mineralogical characteristics with adsorptive capacity indicates that granular or inseparable impurities lower adsorptive capacity, but that there is no relation between microscopic texture and structure and adsorptive efficiency. Strongly adsorptive members of the (I) group have much loosely-bound H_2O, and clay minerals with the (I) lattice have a structure which permits high adsorption. The amount and degree of alteration of original material to clay appear to be related to adsorptive capacity, and completely-altered bentonite forms the best activable clay. Adsorptive clays originating by transportation of material tend to contain more granular impurities than those altering *in situ* and seem to be active, but poorly activable. Chemical analyses [E. EMENDORFER] recorded for raw and activated clays show a considerable increase in SiO_2 with a corresponding decrease, in most cases, of Al_2O_3, MgO, CaO, and Fe_2O_3, indicating that high % of removable bases accompanies high adsorptive capacity. (I) is the most highly adsorptive clay mineral studied.
L. S. T.

Earth structure and earth origin. K. F. MATHER (Science, 1939, **89**, 65—70).—An address.
L. S. T.

Calculation of geological age. N. B. KEEVIL (Amer. J. Sci., 1939, **237**, 195—214).—New equations for computing the age of rocks and minerals from radioactivity data are developed. Errors in former work are discussed. By a suitable choice of equations, any desired degree of accuracy in calculation of the age can be obtained for all methods involving the accumulation of Pb and He from the Th, U, and actino-U series. At low ages the simple equation incorporating recent vals. of the disintegration consts. is satisfactory, whilst for rocks of high age the new equation given can generally be applied.   L. S. T.

Oxygen method for geological age determination based on atomic disintegration ; application to Karelian, Wilberforce, and South Dakotan uraninites. V. G. CHLOPIN (Bull. Acad. Sci. U.R.S.S., 1938, Sér. Chim., 489—497).—The geological age is calc. from the $UO_2 : UO_3$ ratio on the assumption that the U was originally present solely as UO_2, and that the O content has remained const. The applicability and limitations of the method are discussed, particularly in relation to the Pb method.
L. J. J.

Geological age of uraninites and monazites from the pegmatite veins of north Karelia. V. G. CHLOPIN and M. E. VLADIMIROVA (Bull. Acad. Sci. U.R.S.S., 1938, Sér. Chim., 499—508).—The Pb method gives close agreement between secondarily unaltered samples from the same or different veins ; secondary alteration causes too high vals. No change of Pb : U ratio occurred during crystallisation. Results by the O method (cf. preceding abstract) are in agreement. North Karelian and Manitoban monazites give ages (by Pb method) > those of associated uraninites. The upper limit for North Karelian pegmatites is 1600×10^6 years.   L. J. J.

Nitrogen, argon, and neon in the earth's crust with applications to cosmology. (LORD) RAYLEIGH (Proc. Roy. Soc., 1939, A, **170**, 451—464).—The ratio of A to Ne was determined for a no. of plutonic rocks by extracting the gases by heat. The method of manipulation of the gases is described. The ratio Ne : A is of the same order as the ratio of the gases in the atm., a fact which is not in favour of the view that there has been a loss of Ne from the atm. Pumice stone contains an exceptionally high proportion of Ne. The rocks examined contained about 0·04 c.c. of N per g. ; the N is mainly in combination. It is concluded that the rocks contain in all ~50 times as much N as the atm. ; it is not necessary to regard the atm. as primitive and no difficulty arises as to why the earth did not lose its N when its temp. was high.   G. D. P.

Cause of the colour of the blue quartzes of the charnockites of South India and of the Champion gneiss and other related rocks of Mysore. N. JAYARAMAN (Proc. Indian Acad. Sci., 1939, A, **9**, 265—285).—The blue colour of charnockite quartz and opalescent blue quartz from the Champion gneiss is due to the presence of Ti, and the intensity of colour is ∝ [Ti]. The coloured quartzes show a brownish-

yellow turbidity in transmitted light, the intensity of which is ∝ the intensity of the blue colour in reflected light. The turbidity is also due to Ti. Heating destroys the blue colour and the turbidity. The various types of quartz have been examined microscopically and chemically.   W. R. A.

Siliceous sinter from Vis Island (Lissa), Dalmatia. S. MIHOLIĆ (Bull. Soc. scient. nat. Croat, 1937—1938, **49/50**, 49—56).—The sinter contains SiO_2 73·15, Al_2O_3 0·24, Fe_2O_3 0·15, MgO 0·02, CaO 15·98, Na_2O 0·14, K_2O 0·12, H_2O+ 0·07, H_2O- 0·03, CO_2 10·46, SnO_2 0·0027, PbO 0·0212, ZnO 0·0265, SrO 0·0280, BaO 0·0007, total 100·44%.
L. S. T.

Sedimentary siliceous rocks, hornstone, and the flint problem. J. KÜHNEL (Z. deut. Geol. Ges., 1939, **91**, 207—231).—The possible origin of hornstone and flint is discussed.   L. S. T.

Is a thermal hypothesis of flint formation possible? W. WETZEL [with D. WIRTZ] (Z. deut. Geol. Ges., 1939, **91**, 231—236).—Kühnel's views (preceding abstract) are criticised.   L. S. T.

Thermoluminescence in several marbles. M. DÉRIBÉRÉ (Bull. Soc. Franç. Min., 1938, **61**, 295—296).—The orange thermoluminescence which occurs in many marbles and breccias is not closely associated with their age. It appears most often as luminous points, and seems to be connected directly with crystallisation. Marbles showing thermoluminescence are enumerated.   L. S. T.

Attapulgite. J. DE LAPPARENT (Bull. Soc. Franç. Min., 1939, **61**, 253—283).—A reply to criticism (A., 1937, I, 484 ; A., 1938, I, 218) and a reiteration of the author's views (A., 1938, I, 52). The mineral constituent of Attapulgus clay is not montmorillonite.
L. S. T.

Mineralisation of the deposits of Bucium, Alba District. T. P. GHITULESCU and D. GIUSCĂ (Bull. Acad. Sci. Roumaine, 1938, **20**, 34—44).—The general geology and mineralisation of the district are described. The distribution of the sulphide minerals and sylvanite, hessite, altaite, and petzite in the Arama vein is described. Enargite (analysis given) is recorded from Rumania for the first time.   L. S. T.

Leverrierite from the lateritic formations of French West Africa. J. DE LAPPARENT and R. HOCART (Compt. rend., 1939, **208**, 1465—1467 ; cf. A., 1934, 387).—The detection (by the Debye–Scherrer method) and occurrence of the mineral are described and discussed.   A. J. E. W.

Tin deposits of the Black Hills, South Dakota. E. D. GARDNER (U.S. Bur. Mines, 1939, Inf. Circ. 7069, 78 pp.).

H. Ungemach, 1879—1936. R. HOGART (Bull. Soc. Franç. Min., 1938, **61**, 142—172).—A review of Ungemach's contributions to crystallography.
L. S. T.

Factors in oil accumulation. V. C. ILLING (J. Inst. Petroleum, 1939, **25**, 201—225).—An investigation of the influence of texture and buoyancy in the flow of oil and H_2O mixtures through sands and its bearing on oil accumulation.   T. C. G. T.