BRITISH CHEMICAL ABSTRACTS

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

JUNE, 1937.

Electrical and optical measurements on the illumination of helium in the high-frequency discharge. J. Roig (Compt. rend., 1937, **204**, 961—964; cf. A., 1931, 1343).—The characteristics of a valve oscillator causing the discharge, and the intensity of the illumination, have been investigated.
A. J. E. W.

Ultra-violet wave-length standards of N, C, and O, λλ 2300—1080. R. L. Weber and W. W. Watson (J. Opt. Soc. Amer., 1936, **26**, 307—309).—λλ accurate to 0·01 A. for 48 lines are tabulated. Results are in close agreement with those of Boyce (cf. A., 1935, 799).
N. M. B.

Attempt to detect the presence of metastable atoms in active nitrogen by light absorption. W. S. Herbert, G. Herzberg, and G. A. Mills (Canad. J. Res., 1937, **15**, A, 35—38).—The N emission lines 1492 and 1742 A. were not absorbed by active N and hence the concn. of ^2D and ^2P atoms is $<1/6000\%$ of the active N. From the Cario–Kaplan theory the concn. of metastable $^3\Sigma$ mols. in active N is calc. to be $>0{\cdot}003\%$, with 1% of normal atoms.
R. S. B.

Effect of configuration interaction on the low terms of the spectra of oxygen. D. R. Hartree and B. Swirles (Proc. Camb. Phil. Soc., 1937, **33**, 240—249).—Theoretical. The magnitude of the effect of configuration interaction is sufficient to account for differences between observed intermultiplet separations and those calc. on the assumption that each state can be adequately described by a single configuration. Configuration interaction should be taken into account in obtaining the equations of the self-consistent field from which the radial wave functions are derived.
A. J. M.

Rotation structure of $^4\Sigma \rightarrow {}^4\Pi$-bands. A. Budó (Z. Physik, 1937, **105**, 73—80).—Rotation analysis of the quartet bands of diat. mols. is discussed mathematically with special reference to O_2. The 48 possible modes of transition for $^4\Sigma \rightarrow {}^4\Pi$ are tabulated and a formula for the intensity distribution in the limiting cases is given.
H. C. G.

Separation of close spectral lines by the method of anomalous dispersion. F. T. Holmes (J. Opt. Soc. Amer., 1936, **26**, 365—366).—A column of vapour which absorbs strongly in the region between the λλ of the lines to be separated is used as the dispersive element of a "spectroscope." With Na vapour, the Zeeman effect of the Na *D* lines is shown.
N. M. B.

Influence of an electric field on the absorption spectrum of sodium. N. T. Ze and W. W. Po (J. Phys. Radium, 1936, [vii], **7**, 193—197).—Data are recorded for fields up to 2800 volts per. cm.
H. J. E.

Hyperfine structure of the sodium *D* lines. K. W. Meissner and K. F. Luft (Ann. Physik, 1937, [v], **28**, 667—672).—Direct measurements of the structure of the D_1 line, using an electrically excited at. Na beam as light source, give for the $^2S_{1/2}$ and $^2P_{1/2}$ terms vals. of $\Delta\nu$ $0{\cdot}0594 \pm 0{\cdot}0003$ cm.$^{-1}$ and $0{\cdot}0058 \pm 0{\cdot}0003$ cm.$^{-1}$, respectively. The corresponding vals. for the no. of nuclear magnetons are 2·08 and 1·96.
O. D. S.

New absorption spectrum of diatomic sulphur. H. Cordes (Z. Physik, 1937, **105**, 251—264).—The banded absorption spectrum of the gas from an electric discharge in S–SO_2 mixture has been measured between λ 2488 and 3396 A. and is ascribed to metastable S_2 mols. (cf. A., 1933, 1021, 1130). Data are discussed in relation to transitions between energy levels of the S mol.
H. C. G.

Emission band spectrum of chlorine-I. A. Elliott and W. B. Cameron (Proc. Roy. Soc., 1937, A, **158**, 681—691).—The wave nos. of band heads and of maxima of the continuous spectrum are measured. The analysis proposed by Ota and Uchida (A., 1929, 118) is shown to be untenable; no alternative is suggested at present.
G. D. P.

New terms in the spark spectra of argon, A II and A III. T. L. de Bruin (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 340—348).—An extension of earlier work (cf. A., 1930, 650). New terms in the spectra of singly ionised A II and doubly ionised A III are recorded.
F. J. L.

Temperature shift of the potassium resonance lines. G. F. Hull, jun. (Physical Rev., 1937, [ii], **51**, 572—574; cf. this vol., 103).—Sets of data at 270° and 90° show that both shift and half-width of the K resonance lines in absorption perturbed by N_2 pressures 1—15 atm. vary with temp. in the same manner. As the "relative density" of N_2 increases the effect of temp. decreases, and becomes unobservable above relative density 7. Results agree with Margenau's theory (cf. A., 1936, 3).
N. M. B.

Magnetic moment of the scandium nucleus. H. Hopfermann and H. Wittke (Z. Physik, 1937, **105**, 16—20).—From analysis of the hyperfine structure of the $4s^2S_{1/2}$ terms of Sc III the magnetic moment of the Sc nucleus is 4·8 nuclear magnetons.
L. G. G.

Theory of the continuous absorption spectrum of bromine. N. S. Bayliss (Proc. Roy. Soc., 1937, A, **158**, 551—561).—Wave-mechanical treatment of

absorption by a diat. mol. leads to an expression involving only two arbitrary consts. When applied to Br, satisfactory agreement with experiment is obtained.
G. D. P.

Hyperfine structure and Zeeman effect of the resonance lines of silver. D. A. Jackson and H. Kuhn (Proc. Roy. Soc., 1937, **A**, **158**, 372—383).—The structure of the resonance lines of Ag is investigated by absorption in an at. beam, and resolution by a Fabry–Pérot etalon. Each line is found to have four components; the two inner are ascribed to ^{107}Ag, the two outer to ^{109}Ag. Nuclear magnetic moments are calc. A small isotope shift is observed. Observations of the Zeeman effect confirm the origin of the lines and the val. of the spin ($\frac{1}{2}$ for each isotope; cf. A., 1936, 916).
G. D. P.

Displacement of principal series lines of rubidium by the addition of rare gases. N. T. Ze and C. S. Yi (Physical Rev., 1937, [ii], **51**, 567—571; cf. A., 1936, 1167).
N. M. B.

Spectrum of ionised tellurium. S. G. Krishnamurti (Proc. Roy. Soc., 1937, **A**, **158**, 562—570).—A continuation of previous work (cf. A., 1935, 1183) on the classification of lines of Te III. Terms due to sp^3, $6d$, and $7s$ configurations are identified.
G. D. P.

Determination of the mechanical moment of the cæsium nucleus from the inverse Zeeman effect of the hyperfine structure. T. Fölsche (Z. Physik, 1937, **105**, 133—163).—From the inverse Zeeman effect on the hyperfine structure of the 8943 A. and the 8521 A. lines, $I = 7/2$. At the field strength used, about 5000 gauss, good agreement is obtained between theory and practice, in respect also of forbidden components at high field strengths.
L. G. G.

Zeeman effect of doubly ionised cerium, Ce III. T. L. de Bruin, J. N. Lier, and H. J. van de Vliet (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 334—339).—Arc and spark spectra of Ce III (λ 3500—2900 A.) are analysed. Terms are identified.
F. J. L.

Regularity in the structure of atomic nuclei, and determination of the quadrupole moments of ${}^{187}_{75}$Re and ${}^{185}_{75}$Re. H. Schüler and H. Korsching (Z. Physik, 1937, **105**, 168—174).—Hyperfine structure measurements on the 4946 A. line of the Tl II spectrum, the 4889 and 5275 A. lines of the Re I spectrum, and the 5782 A. line of the Cu I spectrum show that whilst the nuclei ^{203}Tl, ^{205}Tl, ^{185}Re, ^{187}Re, and ^{63}Cu, and ^{65}Cu possess, respectively, equal mechanical moments, their magnetic moments show a minimum variation given by $\mu_{u+2}/\mu_u = M_{u+2}/M_u$, where u is the mass no. of the lighter isotope and μ = magnetic moment. This is general for at. nuclei containing an even no. of neutrons and an odd no. of protons, and the corresponding isotopic nuclei formed by the introduction of 2 neutrons. The above Re lines have sufficient isotopic shift to allow separate determination of the magnetic moment. The quadrupole moment for ^{187}Re is $2{\cdot}6 \times 10^{-24}$ (elongated nucleus). Contrary to the behaviour of the magnetic moment, absorption of 2 neutrons in a nucleus reduces the quadrupole moment a few %.
L. G. G.

Fine structure in the arc spectrum of platinum. (A) Nuclear spin of ^{195}Pt. (B) Even isotope displacement. S. Tolansky and E. Lee (Proc. Roy. Soc., 1937, **A**, **158**, 110—127; cf. A., 1936, 772).—36 lines of the Pt spectrum, excited in a H_2O-cooled hollow cathode, have been examined for fine structure. The $5d^8$ and $5d^9$ electron groups have an appreciable coupling with the nucleus. All the terms observed exhibit even isotope displacement. In all the displacements ^{194}Pt lies deepest and the centre of gravity of the 195 pattern is not midway between the lines 194, 196, but nearer to 194. The val. of the even isotope displacement appears to be determined by the degree of penetration exhibited by any penetrating electrons in the term electron configuration. The displacements are not a function of J.
G. D. P.

Absolute concentration of excited atoms in a low-pressure mercury discharge. V. Fabrikant, F. Butajeva, and I. Cirg (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 423—426; cf. this vol., 158).—By measuring the absorption in the discharge of visible triplet lines ending at the levels $6^3P_{0,1,2}$, the concns. at these three levels were determined, and results are discussed in relation to available calc. data.
N. M. B.

Pressure broadening of spectral lines and van der Waals forces. I. Influence of argon on mercury resonance line. II. Continuous broadening and discrete bands in pure mercury vapour. H. Kuhn (Proc. Roy. Soc., 1937, **A**, **158**, 212—229, 230—241).—I. Measurement of the intensity distribution in the wings of the Hg line 2537 A. broadened by A at different pressures proves the validity of the C/r^6 potential law for internuclear distances between $3{\cdot}4$ and $4{\cdot}8 \times 10^{-8}$ cm.

II. The broadening of the absorption line 2536·5 A. of Hg vapour under the influence of its own pressure is measured, confirming the above results. The total absorption of the band system 2540 A. is measured and yields a val. for the concn. of Hg_2 mols. The heat of dissociation of Hg_2 is calc. as $\not> 2{\cdot}1$ g.-cal.
G. D. P.

Spectrum of rubidium in the mercury arc. I. A. Balinkin and D. A. Wells (J. Opt. Soc. Amer., 1936, **26**, 77—78).—Work previously reported (cf. A., 1933, 439) is extended to a Rb–Hg amalgam lamp. A spectrogram showing the emission lines of Rb and Hg at full glow was obtained.
N. M. B.

New terms in the second spark spectrum of Hg III. R. Ricard (J. Phys. Radium, 1936, [vii], **7**, 315—317).—Data for certain lines in the visible and near ultra-violet spectrum are classified.
H. J. E.

Spectrum of trebly-ionised lead, Pb IV. M. F. Crawford, A. B. McLay, and A. M. Crooker (Proc. Roy. Soc., 1937, **A**, **158**, 455—463).—The lines of the spectrum of Pb IV in the range 4000—9000 A. are classified.
G. D. P.

Wave-length identification lists for the extreme ultra-violet. J. C. Boyce and H. A. Robinson (J. Opt. Soc. Amer., 1936, **26**, 133—143).—A tabular compilation of available data. Lines likely to be present in gas discharges, lines arising from the common constituents of glass, and the principal line or groups of lines of each of the first five spectra of a no. of elements are included. N. M. B.

Sparking potential curves for ionisation by collision of the second kind. R. Zouckermann (Compt. rend., 1937, **204**, 964—966; cf. A., 1933, 656; 1935, 1438).—The variation of the sparking potentials with pressure for A and N_2, alone and in presence of Hg, has been investigated. The results are discussed in relation to the mechanism of the discharge. A. J. E. W.

Mechanism of the discharge in the Siemens ozone tube. A. Klemenc, H. Hintenberger, and H. Höfer (Naturwiss., 1937, **25**, 249).—No high-frequency oscillations were found in the discharge current of the tube. A. J. M.

Altitudes and spectra of red and sunlit auroras. C. Störmer (Nature, 1937, **139**, 584).—Principal results for the spectra of various auroras are given. L. S. T.

Electronic origin of nitrogen bands in the spectrum of the aurora borealis. Energy of the exciting electrons. R. Bernard (Compt. rend., 1937, **204**, 993—995).—Comparison of the spectrum with N spectra excited by electronic collisions (this vol., 207) shows that the radiation of N bands by the aurora is due to electrons of energy 27 e.v. A. J. E. W.

Absorption of oxygen at the limit of the solar spectrum. L. Herman (Compt. rend., 1937, **204**, 1035—1037).—Data are given for the optical density of a column of O_2 100 m. long, at 18°/27·7 kg. per sq. cm., for λλ between 2820 and 3050 A. The absorption of solar radiation in this λ range by atm. O_2 is negligible. A. J. E. W.

Spectrum of Nova Lacertæ 1936, shortly after maximum brilliancy. (Mlle.) M. Bloch (Compt. rend., 1937, **204**, 1055—1056).—Lines attributed to H, He, N, C, O, Na, Ca, Si, Sc, Ti, Fe, Sr, Y, and Ba were observed. A. J. E. W.

Structure of the *X*-ray *K* absorption limits of bromine, iodine, and some of their compounds. B. Cioffari (Physical Rev., 1937, [ii], **51**, 630—637).—Using the double-crystal spectrometer an investigation was made of the structure, width, and relative positions of the *K* absorption limits of Br (solid, liquid, and vapour), I (solid and vapour), and of HBr, MeBr, Br–H_2O, aq. and solid KBr, IBr (solid and vapour), HgI_2, CdI_2, SnI_4, KIO_3, and KI. Absorption curves are given, and widths and relative displacements of limits and positions of secondary structure are tabulated and discussed. N. M. B.

***X*-Ray fluorescence yields.** R. J. Stephenson (Physical Rev., 1937, [ii], **51**, 637—642).—The *X*-ray fluorescence yields for the *K* shell, measured by an ionisation-chamber method, for Ni, Cu, Zn, Se, Zr, Mo, Rh, Ag, Cd, and Sn show an increase with at. no., and results are compared with available data and with vals. calc. by relativistic and non-relativistic wave mechanics. The fluorescence yield for the L_{III} shell of Pb, Th, and U has been determined, and shows an increase with at. no. N. M. B.

Relative probability of excitation of the three *L* levels of tungsten as a function of the velocity of the cathode rays. W. J. Huizinga (Physica, 1937, **4**, 317—324).—For tensions $>$ twice the crit. tension the probability of excitation of the L_{I} level of W increases relative to that of the L_{II} and L_{III} levels when the velocity of the exciting cathode rays increases. H. J. E.

Simultaneity of the absorption of the primary quantum and of the emission of secondary rays in the Compton and photo-electric effects. A. Piccard and E. Stahel (J. Phys. Radium, 1936, [vii], **7**, 326—328).—Using the revolving-disc method it is shown that the absorption of a γ-ray in the Compton effect is accompanied by the emission of a recoil electron and a diffused quantum. Similar behaviour is found in the photo-electric effect. W. R. A.

Auger effect in xenon and krypton. L. H. Martin and F. H. Eggleston (Proc. Roy. Soc., 1937, **A**, **158**, 46—54).—A statistical determination by means of a Wilson expansion chamber gives the *K* yields of Xe (0·78) and Kr (0·53). In the case of Xe the ejection of *K* and *L* electrons from the same atom is accompanied by the ejection of two *M* electrons. G. D. P.

Modification of apparent thermionic constants for oxygenated tungsten by temperature variation of adsorptive equilibrium. M. C. Johnson and F. A. Vick (Proc. Roy. Soc., 1937, **A**, **158**, 55—68).—It is shown that the temp. coeffs. of chemical reaction at a composite surface will cause changes in the plot of thermionic emission; these changes lead to the measurement of slopes and intercepts which do not coincide with and are not even intermediate between the thermionic consts. of the bare or covered surface. The "anomalous" consts. of oxygenated W are examples. Further applications of the method of investigation are suggested. G. D. P.

Theory of the atomic photo-electric effect. F. Renner (Ann. Physik, 1937, [v], **29**, 11—24).—A mathematical discussion of photo-emission in relation to the work of Wentzel, Fischer, and Sauter. A. E. M.

Effect of oxygen on the photo-electric thresholds of metals. H. C. Rentschler and D. E. Henry (J. Opt. Soc. Amer., 1936, **26**, 30—34; cf. A., 1933, 202).—The following threshold vals. have been determined: Mo 2850 approx., Pt <2000, Fe 2680 approx., Ni 2550, Cr 2840, Bi 2870 A. A small amount of O_2 reacting with the active surface of Th, U, Ca, Ba, and Cs shifts the threshold to longer λ, and with Ti, Zr, Ag, Fe, and Ni, to shorter λ. For Au there is no change. The effect is attributed to the activity of the interaction product. N. M. B.

Energy distribution of photo-electrons emitted by calcium and calcium oxide. I. Liben (Physical Rev., 1937, [ii], **51**, 642—647).—With careful elimination of contact potentials, measurements were made, with the aid of a magnetic velocity analyser, of the

energy distribution of the photo-electrons from pure Ca using λ 2536 radiation. Energy distribution curves for Ca, CaO, and intermediate stages were obtained. Data for Ca agreed with theory on the high- but not on the low-energy side. The photo-electric work function for pure Ca was 3·21 e.v.
N. M. B.

Critical potentials of secondary emission. R. Warnecke (J. Phys. Radium, 1936, [vii], 7, 318—320).—There is a correspondence between crit. potentials observed in the secondary emission of Al, W, Ta, and Ni and vals. corresponding with the known energy levels.
H. J. E.

Secondary emission of pure metals. R. Warnecke (J. Phys. Radium, 1936, [vii], 7, 270—280).—Secondary emission curves (0—1500 volts) are recorded for W, Ta, Mo, Ni, Cu, Al, Ag, Au, and Nb.
H. J. E.

Secondary electron emission of solids. R. Kollath (Physikal. Z., 1937, 38, 202—223).—A review.
A. J. M.

Secondary electron emission of soot in valves with oxide cathode. H. Bruining, J. H. de Boer, and W. G. Burgers (Physica, 1937, 4, 267—275).—Ba atoms evaporated on to a soot surface were shown, from the secondary emission, to migrate into the interior of the soot layer. Migration was more rapid with soot deposited from a flame than with a deposit formed by spraying an EtOH suspension. The migration is caused by electron bombardment.
H. J. E.

Wave theory of positive and negative electrons. A. Proca (J. Phys. Radium, 1936, [vii], 7, 347—353).—Mathematical. A theory is developed which combines simultaneously the characteristics of those of Gordon and Dirac.
W. R. A.

New process of negative ion formation. II. III. Energy distribution of negative ions and accommodation coefficients of positive ions. F. L. Arnot (Proc. Roy. Soc., 1937, A, 158, 137—156, 157—166; cf. A., 1936, 1042).—II. An extension of the previous work on Hg vapour to H_2, N_2, O_2, and CO_2. Only monat. negative ions are found in H_2 and N_2. O_2 gives both diat. and monat. ions. For positive ions of 180 volts energy the probability of conversion into a negative ion lies between 10^{-5} and 10^{-3}, depending on the negative ion formed.

III. The energy distribution of positive ions rebounding as negative ions from a Ni surface has been measured, for ions formed in H_2, N_2, O_2, and CO_2. The negative ions leave the surface on which they are formed with a wide range of energy. Accommodation coeffs. for positive ions are calc. and are shown to have an extended range of vals. with one, or sometimes two, most probable vals.
G. D. P.

Ionic impact at strict resonance. F. Wolf (Ann. Physik, 1937, [v], 29, 33—47).—Measurements of the effective cross-section of the ions Ne^+, He^+, A^+, N_2^+, and H_2^- in the recharging reaction by which they are converted into uncharged mols. are reported and discussed.
H. C. G.

Photo-electric cross-section of the deuteron. (Miss) K. Way (Physical Rev., 1937, [ii], 51, 552—556).—Comparison of photo-electric cross-section curves for a Majorana–Heisenberg type potential and a velocity-dependent potential (cf. A., 1936, 1442) with the cross-section curve for a square hole Majorana force (cf. Breit, this vol., 105) shows that the cross-section vals. for the first two are consistent, but differ considerably from the third. A general formula, valid for exchange and for ordinary forces, for the area under the curve is derived.
N. M. B.

Chemical at. wts. and the relative abundance of the oxygen isotopes. G. M. Murphy and P. F. Brandt (J. Chem. Physics, 1937, 5, 274).—Comparisons, on the scale O = 16, between chemical and physical at. wts. are vitiated by the uncertainty regarding the relative abundance of the O isotopes, and it is suggested that a conversion factor derived from the chemical and physical at. wt. of He should be employed. This would mean that physical at. wts. = 1·00054 times chemical at. wts. of all light elements. The conversion factor on the O scale is 1·00025. The new conversion factor is used in converting physical at. wts. of He, F, Al, and P and gives vals. in good agreement with chemical at. wts. except for P, for which the old conversion factor gives a better val. The conversion factor is used to determine the relative abundance of the O isotopes, and it appears that ^{17}O and ^{18}O are more abundant than previous estimates. If, however, the generally accepted abundance ratio of the O isotopes is right, the chemical at. wts. of He, Al, and F are apparently wrong.
W. R. A.

At. wt. of erbium. II. O. Hönigschmid and F. Wittner (Z. anorg. Chem., 1937, 232, 113—118; cf. A., 1933, 1099).—By analysis of $ErCl_3$ and making allowance for the presence of small quantities of other rare earths, the at. wt. of Er is 167·2.
E. S. H.

At. wt. of radiogenic leads. G. P. Baxter, J. H. Faull, jun., and F. D. Tuemmler (J. Amer. Chem. Soc., 1937, 59, 702—705).—The at. wts. of specimens from different sources vary between 206·04 and 206·34. Several % of common Pb (207·21) are present.
E. S. H.

At. wt. of lead from galena, Great Bear Lake, N.W.T., Canada. J. P. Marble (J. Amer. Chem. Soc., 1937, 59, 653—655).—The at. wt. is 207·21. The constancy of at. wt. of common Pb is discussed in relation to geological age.
E. S. H.

Search for element 87. F. R. Hirsh, jun. (Physical Rev., 1937, [ii], 51, 584—586).—Available data are surveyed critically. Oscillation of the crystal used by Papish (cf. A., 1931, 1348) proved that the lines originally reported were due to a crystal defect.
N. M. B.

Absorption method for determining the limit of the continuous β-spectrum of radium-*E*. (Mlle.) A. Baschwitz (J. Phys. Radium, 1936, [vii], 7, 37—39).—The upper limit of the energy of a bundle of β-rays from Ra-*E* is obtained by absorption, using bakelite and Al screens of various thicknesses. The results, which are approx., depend on distance of specimen from measuring instrument. Scattering in the absorber produces progressively inconsistent results as its at. no. increases. F. J. L.

Series of nuclear levels. W. M. Elsasser (J. Phys. Radium, 1936, [vii], **7**, 312—314).—An analysis of the energy groups in the α-ray spectrum of Ra-C''. H. J. E.

Precise measurement of three radium-B β-particle energies. F. T. Rogers, jun. (Physical Rev., 1937, [ii], **51**, 588; cf. A., 1936, 1313).—A correction. N. M. B.

Absolute intensities of the strong β-ray lines of Ra ($B + C$), Th ($B + C$), and Ac ($B + C$). K. T. Li (Proc. Roy. Soc., 1937, **A**, **158**, 571—580).—Measurements by a photographic method confirm the results of Ellis and Aston (A., 1930, 1339) for the three Ra-B lines, and also Gurney's result (A., 1926, 5) for the ratio of Ra-B, H to Th-B, F. A val. is obtained for the internal conversion coeff. for the strong γ-ray line of Ac-C. G. D. P.

β- and γ-Radiations of members of the actinium family. J. Surugue (J. Phys. Radium, 1936, [vii], **7**, 337—346).—The γ-radiation of Ra-Ac, Ac-X, actinon and its active deposit have been studied. The discontinuous β spectra of these substances have been investigated by a method of focalisation. For Ra-Ac and Ac-X $>$ 50 new β-rays are recorded. The 23 γ-rays of Ra-Ac enable the construction of a scheme of nuclear energy levels very close to that deduced from a study of the α-rays, whereas with the 14 γ-rays of Ac-X the scheme of energy levels is not completely confirmed by the observations on the α-rays. Actinon gives 8 γ-rays. W. R. A.

Anomalous phenomena in the scattering of fast β-particles. D. V. Skobelzyn (Bull. Acad. Sci. U.R.S.S., 1936, 651—661; cf. A., 1936, 540).—The coeffs. of scattering by N_2 of β-particles with velocities of the order of 1500—2000 kv. are $\gg$ vals. deduced from Mott's formula. The effective cross-section for scattering is 10^{-22} sq. cm. A similar but smaller anomaly was observed at velocities of 500 kv. O. D. S.

End-points of the β-ray spectra of radium-E and uranium-X_2. A. G. Ward and J. A. Gray (Canad. J. Res., 1937, **15**, **A**, 42—44).—The end-points of the β-ray spectra of Ra-E and U-X_2 are 5250 and 9300 gauss cm., respectively. R. S. B.

Absorption curves and ranges for homogeneous β-rays. J. S. Marshall and A. G. Ward (Canad. J. Res., 1937, **15**, **A**, 39—41).—The absorption of β-rays from Ra-E and U-X has been determined in Al. R. S. B.

Quantitative interpretation of the γ-radiation diffused by the radiator in lead. E. Stahel, H. Ketelaar, and P. Kipfer (J. Phys. Radium, 1936, [vii], **7**, 379—388).—The component hardness of the γ-radiation diffused by lead can be interpreted qualitatively and quantitatively by the γ-radiation of impulse caused by the same radiator as produces the rapid secondary electrons. The materialisation of positrons is also discussed. W. R. A.

Diffusion of γ-rays without change of wavelength. E. Stahel and H. Ketelaar (J. Phys. Radium, 1936, [vii], **7**, 389—390).—The radiation diffused by Pb at 120° when submitted to the radiation of Ra has been studied, especially a very hard fraction of unchanged λ which is exhibited only with filters of Pb $>$4 cm. thick. The experimental data are compared with the theoretical considerations of Franz (A., 1936, 264). W. R. A.

Scattered γ-radiation. H. Ketelaar (J. Phys. Radium, 1936, [vii], **7**, 243—247).—Data are recorded for the scattering of γ-radiation from a 7-g. Ra source by Pb. A hard component (absorption coeff. = 0·4 per cm. of Pb) was observed in the scattered radiation. The effect of filtering the primary radiation was studied. H. J. E.

Fourth radioactive family. I. Joliot-Curie (Bull. Acad. Sci. U.R.S.S., 1936, 645—649; cf. A., 1935, 1050).—A lecture discussing the formation of the $4n + 1$ family from Th bombarded by neutrons. O. D. S.

Regularities in the nuclear levels of radioactive atoms. S. Rosenblum and M. Guillot (Compt. rend., 1937, **204**, 975—977; cf. A., 1931, 280; 1936, 657; this vol., 160).—Cases of disintegration accompanied by the emission of β-rays are discussed in relation to the existence of nuclear energy levels. A. J. E. W.

Quantitative study of pleochroic haloes. III. Thorium. G. H. Henderson, C. M. Mushkat, and D. P. Crawford (Proc. Roy. Soc., 1937, **A**, **158**, 199—211; cf. A., 1934, 1087).—Haloes due to Th in biotite from Star Lake, Manitoba, and from Pierrepont, St. Lawrence Co., N.Y., are measured by means of the halo photometer. The ranges are in good agreement with accepted vals. and that found for Th, 2·53 cm. in air at 15°/760 mm., confirms the magnitude of this const. A ring of undetermined origin and short range (1·18 cm. in air) is observed. G. D. P.

Neutron absorption in aqueous solution. W. H. Furry (Physical Rev., 1937, [ii], **51**, 592; cf. A., 1936, 1172).—An application of the theory of the determination of an element's resonance absorption of slow neutrons by measurements of the activation of an aq. solution is developed. N. M. B.

Magnetic scattering of neutrons. J. S. Schwinger (Physical Rev., 1937, [ii], **51**, 544—552).—Mathematical. Assuming, in addition to the ordinary nuclear forces, a magnetic interaction between the neutron and the at. electrons, the neutrons scattered from an unpolarised beam will be partly polarised by virtue of this magnetic interaction, and the polarisation can manifest itself by a second scattering. Expressions are derived for neutron intensity after double scattering from magnetised Fe plates, and for the intensity and spin density of a neutron beam after traversing magnetised Fe. N. M. B.

Inelastic scattering of fast neutrons. D. C. Grahame, G. T. Seaborg, and G. E. Gibson (Physical Rev., 1937, [ii], **51**, 590—591; cf. this vol., 211).—Measurements by a method precluding scattering and changes in the energy spectrum of the neutrons show that, unlike slow neutrons, fast neutrons are not absorbed in the excitation of soft γ-rays with Fe, Cu, and Pb absorbers; they lose, however, much of their ability to excite γ-rays in Pb, and are slowed down. It is concluded that many of the collisions of fast neutrons with nuclei are inelastic, leaving the nucleus in an excited state; the energies of the γ-rays subsequently emitted correspond with the energies of these low lying nuclear states. N. M. B.

Absorption of slow neutrons at low temperatures. A. I. Leipunski (Bull. Acad. Sci. U.R.S.S., 1936, 687—691).—The mean free path of neutrons in paraffin has been found to be 1·3±0·2 cm. for energy 150 kv. and 1±0·5 for energy 30 kv. Vals. are in agreement with theory. The absorption of group *C* neutrons in Ag and B has been measured at 290°, 77°, and 20·4° abs. The ratio of the thicknesses of equal absorbing layers at different temp. is const., but is $<$ the theoretical val. O. D. S.

Transformation of boron by slow neutrons. E. Fünfer (Ann. Physik, 1937, [v], 29, 1—10).—A counter, checked by the known Sm α-radiation, is used for studying the transformation of B and for ionisation measurements on the short-range residue from B after absorption of slow neutrons. L. G. G.

Slow neutrons. H. von Halban, jun., and P. Preiswerk (J. Phys. Radium, 1937, [vii], 8, 29—40).—Experiments with neutrons retarded by passage through paraffin are described and discussed, with a view of elucidating the mechanism of the retardation and the capture of neutrons. Neutrons passing through paraffin come into thermal equilibrium with the protons of the paraffin, and emerge as neutrons with thermal energy, the amount of which can be varied by altering the temp. of the paraffin. Cd acts as a filter for such neutrons, strongly absorbing neutrons with thermal energy, but being transparent to neutrons of greater energy. The effective section of Rh, Ag, and I for thermal neutrons is inversely ∝ speed of neutrons, but these elements also absorb considerably the more rapid neutrons. Neutrons of different speeds are selectively absorbed by different elements, and are known as "resonance" neutrons. Those from I contain more energy than those from Ag, and it is possible to arrange the elements in the order of such energies, *e.g.*, Br (18 min.) $>$ I $>$ Ag (22 sec.) $>$ Rh (45 sec.) $>$ In $>$ Ir. The effective cross-section of B for resonance neutrons is inversely ∝ speed of neutrons over a wide range. The energies of resonance neutrons of various nuclei are 1—200 volts. The form of the resonance levels is discussed. The levels are similar to those responsible for the lines of the at. spectra, and the reversal of lines can be observed when the same element is used as absorber and detector. If neutrons are associated with a wave-motion, the slower neutrons would have λ $1-3\times 10^{-8}$ cm., and it should be possible to observe diffraction phenomena. Qual. experiments are described which demonstrate this diffraction. A. J. M.

Detection of slow neutrons in the atmosphere. E. Fünfer (Naturwiss., 1937, 25, 235).—Apparatus is described by means of which it is shown that slow neutrons occur in the atm. at the rate of about 2 per hr. per sq. cm. It is improbable that these neutrons are due to radioactive radiation. They are probably slowed-down neutrons from the stratosphere. A. J. M.

D–D nuclear reaction. H. Kallmann and E. Kuhn (Naturwiss., 1937, 25, 231—232).—The nuclear reaction ${}^2_1D + {}^2_1D = {}^3_2He + {}^1_0n$ was investigated by causing accelerated ions in a positive-ray tube filled with D_2 to impinge on a film containing D_2O. The no. of slow and rapid neutrons evolved was measured and compared with those from a standard Ra–Be source. A. J. M.

Study of transmutation in the chemical laboratory. F. A. Paneth (J.C.S., 1937, 642—654).—A lecture. A. J. M.

Disintegration energy of artificial radioactive nulcei. G. J. Sizoo (Physica, 1937, 4, 316).—Theoretical. H. J. E.

Range of groups of natural *H*-radiation. W. Volland (Z. Physik, 1937, 105, 104—113).—Particle counts on *H*-radiation resulting from Po α-ray bombardment of $C_{29}H_{60}$ in layers 10 μ thick show that minima occur at two vals. of the α-particle velocity, viz., 1·09 and 1·33 × 10⁹ cm. per sec. Deviations from classical scattering are discussed wave-mechanically. L. G. G.

Theory of β-disintegration and nuclear forces. E. Tamm (Bull. Acad. Sci. U.R.S.S., 1936, 681—685).—Mathematical. O. D. S.

Influence of the charge of a nucleus on the form of its β-spectrum. B. S. Dzelopov (Bull. Acad. Sci. U.R.S.S., 1936, 673—679).—The energy distribution in the β-spectrum has been investigated down to 100 e.kv. for ${}^{28}_{13}Al$, ${}^{30}_{15}P$, and ${}^{152}_{63}Eu$, and down to 22 e.kv. for Ra-*E* (${}^{214}_{83}Bi$). The curves for P, positron disintegration, and for Al, electron disintegration, are similar in configuration. A relatively greater no. of slow electrons was observed in the spectrum of Ra-*E*. Results agree with theory. O. D. S.

Production of pairs by γ-rays and the internal conversion of γ-rays. A. Alichanian (Bull. Acad. Sci. U.R.S.S., 1936, 663—672; cf. A., 1934, 1150).—Investigation of the spectrum of positrons emitted by Ra-*C* shows the presence of a new line in the γ-ray spectrum of Ra-*C* with energy 2470 e.kv. and intensity 2% of the no. of disintegrating nuclei. Evidence was also obtained of an internal conversion with formation of positrons for the γ-ray line 1380 e.kv. The spectra of positrons produced by illuminating thin films of Pb, Sn, and Cu are asymmetrical, the asymmetry increasing with increasing at. no. O. D. S.

Formation of helium from α-radiators. I. Formation of helium on bombardment of substances with the unfiltered radiation from thorium-*B* + *C*. P. L. Günther (Z. physikal. Chem., 1937, B, 35, 331—342).—With Hg, Sn, and I the amount of He formed corresponds with the no. of α-particles received, but with C, S, Na, H_2O, and hydrocarbons a 20—46% excess of He appears. R. C.

Disintegration of ⁸Li. G. Breit and E. Wigner (Physical Rev., 1937, [ii], 51, 593; cf. this vol., 108).—Evidence supporting the disintegration into two α-particles of the residual ^{8}Be nucleus from the β-ray disintegration of ^{8}Li is discussed. N. M. B.

Induced radioactivity in light atomic nuclei by bombardment with α-rays. A. Meye (Z. Physik, 1937, **105**, 232—250).—Induced radioactivity in Al, Mg, and N excited by bombardment with α-rays from Ra-*C* was examined with an ionisation chamber containing CO_2. Radioactive isotopes ^{30}P, ^{28}Al, ^{27}Si, and ^{17}F arise from Al, ^{25}Mg, ^{24}Mg, and N, respectively. Vals. obtained for half-life periods, resonance levels, and radiation energies were in good agreement with those obtained by other workers using the counter tube method. The relative nos. of activated particles were also determined in each case. H. C. G.

Activation of rhodium, silver, and copper with neutrons. H. K. Müller (Naturwiss., 1937, **25**, 251—252).—In contrast to the usually accepted vals. and in agreement with Döpel (A., 1936, 264) the half-life periods of Rh activated by neutrons are 35±1 sec. and 3·8±0·1 min. A weak product of half-life period of several hr. was also found. The processes are $^{103}_{45}Rh + ^{1}_{0}n \rightarrow ^{103}_{44}Ru + ^{1}_{1}H\uparrow \rightarrow ^{103}_{45}Rh + e\ (+ \gamma)$ for the 35 sec. nucleus, and $^{103}_{45}Rh + ^{1}_{0}n \rightarrow ^{104}_{45}Rh \rightarrow ^{105}_{46}Pd + e$ for the 3·8 min. nucleus. The effect of filtering the neutrons through H_2O on the activation was examined. Half-life vals. for the radioactive products from Ag have been confirmed. With Cu, the only product had half-life 6·1±0·2 min. A. J. M.

Radioactivity induced in silicon and phosphorus by deuteron bombardment. H. W. Newson (Physical Rev., 1937, [ii], **51**, 624—627).—Bombardment with 3 m.e.v. deuterons caused the reactions $^{30}Si + ^{2}D = ^{1}H + ^{31}Si$ (170±10 min.) and $^{31}P + ^{2}D = ^{1}H + ^{32}P$ (14·5±0·3 days). The absorption curves of the β-rays, absorbed in Al, showed sharp end-points from which the calc. max. energies of the β-ray spectra were 1·50±0·01 for ^{31}Si and 1·59±0·03 m.e.v. for ^{32}P, in satisfactory agreement with experiment (cf. Lyman, this vol., 107; Paxton, *ibid.*, 162). N. M. B.

Disintegration of cadmium with deuterons. J. M. Cork and R. L. Thornton (Physical Rev., 1937, [ii], **51**, 608—611).—The following reactions are postulated to explain the observations when a Cd target is bombarded with 6·3 m.e.v. deuterons: $^{114}_{48}Cd + ^{2}_{1}H \rightarrow ^{1}_{1}H + ^{115}_{48}Cd$ (4·3 hr.) $\rightarrow ^{115}_{49}In + _{-1}e$; $^{116}_{48}Cd + ^{2}_{1}H \rightarrow ^{1}_{1}H + ^{117}_{48}Cd$ (58 hr.) $\rightarrow _{-1}e + ^{117}_{49}In$ (2·3 hr.) $\rightarrow _{-1}e + ^{117}_{50}Sn$ (stable). Identifications were by chemical analysis, and successive separations over 60 hr. showed $^{117}_{49}In$ to be in equilibrium with $^{117}_{48}Cd$. N. M. B.

Transmutation functions at high bombarding energies. H. W. Newson (Physical Rev., 1937, [ii], **51**, 620—623; cf. A., 1936, 132).—The differential transmutation functions of the reactions $^{12}C + ^{2}D = ^{13}N + ^{1}n$; $^{14}N + ^{2}D = ^{15}O + ^{1}n$; $^{16}O + ^{2}D = ^{17}F + ^{1}n$ have been measured for bombarding energies 2—5 m.e.v. All three curves showed a marked change of slope at the top of the potential barriers, corresponding with potential barrier heights 2·8, 3·2, and 3·1 m.e.v., respectively. The abs. cross-sections for disintegrations at the top of the potential barrier are 4·0, 2·8, and 6·0 × 10^{-26} sq. cm., respectively. N. M. B.

Disintegrations produced by cosmic rays. J. Solomon (J. Phys. Radium, 1936, [vii], 7, 71—76).—Mathematical. The probability that electrons of high energy will produce nuclear disintegration accompanied by the emission of a heavy particle is shown to be very small. It is therefore improbable that fast protons observed at the earth's surface are due to such disintegrations. O. D. S.

Secondary particles from the penetrating component of the cosmic radiation. W. H. Pickering (Physical Rev., 1937, [ii], **51**, 628—629).—Some of the coincidences between three Geiger counters in line separated by thick Pb are not due to the passage of a single ionising particle, but to secondary particles released in the Pb near the counters. N. M. B.

Diurnal variation of cosmic-ray showers. M. Forró (Nature, 1937, **139**, 633—634).—The variation in intensity of cosmic ray showers, unlike the vertical rays themselves, is not related to the diurnal periodicity of the horizontal intensity of the earth's magnetic field. This indicates that the shower-producing primary radiation is not composed of electrically charged particles. L. S. T.

Studies of cosmic-ray showers by quintuple coincidences. H. C. Shan (Proc. Roy. Soc., 1937, A, **158**, 581—590).—Five Geiger–Müller tube-counters arranged in a regular pentagon are used to study cosmic-ray showers produced in Pb. The effect of the angle of divergence of the showers on the transition curve is investigated. The initial parts of the transition curves for Pb, Sn, Zn, and Al have been studied. When the rate of coincidences is plotted against nZ^2, where n = no. of atoms per sq. cm. of the shower-producing material, and Z = at. no., the transition curves for different elements are the same. G. D. P.

Method of analysis of absorption curves of ultra-radiation. B. Gross (Physikal. Z., 1937, **38**, 201—202).—The principle of a method of obtaining the primary radiation curve from the general absorption curve of ultra-radiation is given. A. J. M.

Terrestrial origin of cosmic rays. M. C. Holmes (J. Franklin Inst., 1937, **223**, 495—500).—A proposed mechanism for cosmic ray origin is based on the orientation of the Debye H_2O mol. resulting in a negative terrestrial surface charge, which, with ionisation of the upper atm. by ultra-violet radiation from the sun, maintains the earth's electric gradient. This effects a vertical separation of positive and negative ions, and there is an additional horizontal separation by the poleward air currents. Approx. estimations are outlined. N. M. B.

Ionisation of dielectric liquids. Application to cosmic rays. M. C. Bialobrzeski (J. Phys. Radium, 1936, [vii], 7, 329—336).—The ions produced in the five hydrocarbons from C_5H_{12} to C_9H_{20} by *X*-rays are of three kinds, two positive and one negative; their mobilities (u) and coeffs. of recombination have been determined; the negative ion has a *u* intermediate in val. between the vals. of the two positive ions. An equation connecting *u* and η is given. The dielectric liquids have been applied also to a study of the ionisation "kicks" produced by cosmic rays. W. R. A.

Theory of internal pair production. H. Yukawa and S. Sakata (Proc. Phys.-Math. Soc. Japan, 1935, **17**, 397—407).—Internal pair production by radiationless *S–S* transitions of a radioactive nucleus will account for only a small part of the observed effect. Ch. Abs. (*e*)

Hartree and Hartree–Fock methods. N. H. Frank (Physical Rev., 1937, [ii], **51**, 577—583).—Mathematical. Limitations of the methods for many-body problems and the importance of these limitations in nuclear structure theory are discussed. N. M. B.

Correction due to motion of centre of gravity in the Hartree approximation in nuclei. A. F. Stephenson (Physical Rev., 1937, [ii], **51**, 590; cf. Feenberg, this vol., 109; Bethe, *ibid.*, 215).—Considerations applicable to any type of one-particle wave function are discussed. N. M. B.

Structure of light nuclei. E. Feenberg and M. Phillips (Physical Rev., 1937, [ii], **51**, 597—608; cf. this vol., 109).—Mathematical. Additional calculations for the nuclei between ^{6}He and ^{16}O, based on the Hartree method, are given. N. M. B.

Perturbation theory of light nuclei: ^{4}He and ^{6}Li. D. R. Inglis (Physical Rev., 1937, [ii], **51**, 531—544).—Mathematical. N. M. B.

Theory of charged elementary particles. H. Hönl (Ann. Physik, 1937, [v], 28, 721—760).—Basic wave equations are developed for the extension of Dirac's theory to include the proton and antiproton (proton with negative charge). O. D. S.

Nuclear transformation with absorption of the orbital electron. H. Yukawa and S. Sakata (Physical Rev., 1937, [ii], **51**, 677—678).—Mathematical. N. M. B.

Coulomb force between two neutral atoms. L. Goldstein (J. Phys. Radium, 1936, [vii], 7, 466—468).—Mathematical. Using analytical forms similar to the functions for the statistical distribution of at. charge and potential (Thomas–Fermi atom), the Coulomb force between two identical neutral atoms (neglecting mutual polarisation) is evaluated in terms of the at. no. and the distance between the at. nuclei. F. J. L.

Comparison of wave functions for the normal helium atom. T. D. H. Baber and H. R. Hassé (Proc. Camb. Phil. Soc., 1937, **33**, 253—259).—Some suggested wave functions of the normal He atom are compared as regards energy, magnetic susceptibility, and electrical polarisability. A. J. M.

Helium wave equation. T. H. Gronwall (Physical Rev., 1937, [ii], **51**, 655—669).—Mathematical. An attempt to solve the wave equation for He *S*-states. N. M. B.

Connexion formulæ and solutions of the wave equation. R. E. Langer (Physical Rev., 1937, [ii], **51**, 669—676).—Mathematical. N. M. B.

Density of eigenfunctions for an electron obeying Dirac's equation. E. K. Broch (Physical Rev., 1937, [ii], **51**, 586—588).—Mathematical. N. M. B.

Generalised Fermi interaction. F. Hoyle (Proc. Camb. Phil. Soc., 1937, **33**, 277—292).—Mathematical. A. J. M.

Non-adiabatic processes in inhomogeneous fields. J. Schwinger (Physical Rev., 1937, [ii], **51**, 648—651).—Mathematical. The Güttinger equations are incorrect. The corr. equations are applied to calc. transition probabilities between the various magnetic states of a field precessing with const. angular velocity. N. M. B.

Energy differences in the addition of neutrons. S. Kikuchi, K. Husimi, and H. Aoki (Z. Physik, 1937, **105**, 265—266).—A reply to Fleischmann (A., 1936, 1440). L. G. G.

Theory of atomic diffusion phenomena. L. Goldstein (J. Phys. Radium, 1936, [vii], 7, 255—262). H. J. E.

Constitution of the ionosphere. R. Jouaust (J. Phys. Radium, 1936, [vii], 7, 289—296). H. J. E.

Neutrino theory of light. II, III. P. Jordan (Z. Physik, 1937, **105**, 114—121, 229—231; cf. A., 1936, 1176).—The relation between the wave amplitudes of light and neutrino fields is considered mathematically. H. C. G.

Neutrino theory of light. M. H. L. Pryce (Z. Physik, 1937, **105**, 127—132).—The energy of interaction between neutrino and matter is deduced from that between light and matter on the basis of Jordan's theory. H. C. G.

Equation of the photon. J. J. Placinteanu (J. Phys. Radium, 1936, [vii], 7, 127—132; cf. A., 1933, 995).—The photon is considered as composed of a Dirac electron and a positron. The properties of the equation deduced are considered. O. D. S.

Relations between the second- and higher-order processes in the neutrino–electron field theory. M. H. Johnson, jun., and H. Primakoff (Physical Rev., 1937, [ii], **51**, 612—619).—Mathematical. The magnitude and range of the proton–neutron and proton–proton forces are deduced. The range of the latter force is $<$ that of the former, and there is a simple relationship between the magnitude of the *P–P* force and the range and magnitude of the *P–N* force. The calc. *P–N* force cannot exceed $0{\cdot}4 \times 10^{-13}$ cm. A treatment of an *n*-fold process in which a fast proton or neutron produces cosmic ray showers is given. N. M. B.

Temperature measurement on freely burning carbon arcs by means of the CN band. W. Lochte-Holtgreven and H. Maecker (Z. Physik, 1937, **105**, 1—15).—The CN band (3883 A.) is photographed through a bored anode. Calculations from intensities of the line give for a normally burning arc a temp. of 7600° abs., a slightly overloaded arc a temp. of 6700° abs., and for the strongly overloaded arc, temp. of 8700° abs. and over. L. G. G.

Luminous flames. I. Absorption spectra of soot layers. II. Absorption spectra of luminous flames. S. Yagi (J. Soc. Chem. Ind. Japan, 1937, **40**, 50—55B).—I. The visible and infra-red absorption spectra of layers of various soots, caught in flames on thin mica plates, can be expressed by $k = 39{\cdot}5r^3\nu Nl(1-15[r\nu]^2)$.

II. Flames made luminous by addition of C_6H_6 or C_2H_2 give infra-red absorption which can be expressed by $k = Cw(1-0{\cdot}15\nu^2) \times 10^4$, where k = absorption coeff. of soot in cm.$^{-1}$, r = radius of a soot particle in μ, N = no. of particles per c.c., ν = wave no. cm.$^{-1}$, w = g. of C per c.c. of gas, and C is a const. C. R. H.

Energy of dissociation of the molecule of carbon monoxide. M. de Hemptinne, J. Savard, and P. Capron (Compt. rend., 1937, **204**, 1039—1041).—Observed crit. potentials for CO (cf. this vol., 170) are discussed. The energy of dissociation into $C^+ + O$ is 20 e.v. A. J. E. W.

Completion of the term system for carbon monoxide. I. Vibration terms and rotation constants of the $a'.{}^3\Sigma^+$-state. R. Schmid and L. Gerö (Z. Physik, 1937, **105**, 36—44).—Vibration terms and rotation consts. of the $a'.{}^3\Sigma^+$-state are calc. from collected data and discussed. The limiting curve of dissociation for the $a'.{}^3\Sigma^+$-state is identical with the limiting curve of predissociation of the $b.{}^3\Sigma$-state. H. C. G.

Band spectrum of manganese hydride, MnH. R. W. B. Pearse and A. G. Gaydon (Nature, 1937, **139**, 590; cf. A., 1936, 1177).—Bands in the red, yellow-green, green, and blue obtained in the spectrum of an electric discharge between Mn poles in a H_2 flame are attributed to MnH. The nature of the electronic transitions is discussed in relation to the levels of Mn. L. S. T.

Red band spectrum of nickel hydride. A. Heimer (Z. Physik, 1937, **105**, 56—72).—Analysis of new bands has increased the no. of known vibrational levels to 4 in the initial state and 2 in the final state. Term differences and doublet splitting are discussed. The isotope effect was investigated for all bands. H. C. G.

Gold deuteride bands. S. Imanishi (Nature, 1937, **139**, 591).—Preliminary vals. of the mol. consts. of AuD have been calc. from the arc spectrum obtained between Au electrodes in D_2 of high concn. at approx. 12 cm. pressure. 723 AuD lines between 3370 and 4440 A. have been analysed into eleven bands of a ${}^1\Sigma \rightarrow {}^1\Sigma$ system. The electronic isotope shift from the corresponding AuH system ($0 \rightarrow 0$, 3650 A.) is +14 cm.$^{-1}$ L. S. T.

Nature of the colour centres in alkali halide crystals. J. H. de Boer (Rec. trav. chim., 1937, **56**, 301—309).—Schottky's conception of "ionic voids" is adopted to explain ionic conduction and diffusion in alkali halide crystals. It is shown that the colour centres are neutral alkali atoms in close proximity to "halogen ionic voids." The no. of such voids which are in thermodynamical equilibrium with the lattice is dependent on temp. F. J. L.

Spectrum of mercury chloride (HgCl) and Samuel's theory of linkage. K. Wieland (Nature, 1937, **139**, 590—591).—Analysis of a spectrum of HgCl vapour between 5600 and 3200 A. supports the view that the ground state of the HgCl mol. is built up from a Cl atom in its normal term and a Hg atom in its lowest term, 1^1S, and not from an excited atom. This does not agree with the views of Samuel *et al.* (cf. A., 1936, 272). L. S. T.

Absorption spectra of tri-iodides. C. B. Allsopp (Proc. Roy. Soc., 1937, **A**, **158**, 167—181).—The absorption spectra of EtOH solutions of AsI_3, SbI_3, BiI_3, and $SnMeI_3$ show maxima similar to those found in the spectra of solutions of CHI_3. The influence of solvents on the absorption spectra of tri-iodides is investigated. The absorption maxima are ascribed to the same origin as those found in the spectra of the I′ ion, of adsorbed I mols., of the polyhalides of the alkalis, and of certain I derivatives of Te. G. D. P.

Absorption spectrum of copper sulphate in heavy water. A. I. Brodski and A. A. Zanko (J. Phys. Chem. Russ., 1936, **8**, 953—954).—The absorption by aq. solutions is stronger than that by solutions in 44% and 93% D_2O. J. J. B.

Absorption spectrum of potassium cobaltous thiocyanate. O. R. Howell and A. Jackson (J.C.S., 1937, 621—626).—The absorption of aq. solutions of $CoCl_2$ with increasing [KCNS] have been measured at 20°. The two principal bands are at 6200 and 5850 A., and the variation of the extinction coeff. of these two bands with [KCNS] has been plotted. The curves are similar to those obtained for the addition of HCl (A., 1936, 1047) and of $MgCl_2$ (*ibid.*, 1443) to $CoCl_2$, except that the concn. of the blue constituent increases right from the beginning. There is a rapid rise of the extinction coeff. as [KCNS] increases, which later becomes a linear relationship, and ends abruptly at a concn. above which further addition of KCNS causes no change in the coeff. At these crit. concns. the ratio of (CNS) to (H_2O) is 1 : 4. At the beginning of the linear portion the complex present is $[Co(H_2O)_3CNS]^{\cdot}$; at the end the substitution of H_2O by (CNS) is complete, and the complex is $[Co(CNS)_4]''$. The complete change is $[Co(H_2O)_6]^{\cdot\cdot}$ (red) $\rightarrow$ $[Co(H_2O)_5CNS]^{\cdot}$ (red) $\rightarrow$ $[Co(H_2O)_3CNS]^{\cdot}$ (blue) $\rightarrow$ $[Co(CNS)_4]''$ (blue). Examination of the subsidiary band at 5250 A. indicates that $K_2[Co(CNS)_4]$ is very little ionised when its formation is first complete. The absorption of $[Co(CNS)_4]''$ is $\ll$ that of $[CoCl_4]''$. There is also a marked difference between the two principal valencies in $[Co(CNS)_4]''$ and great similarity between those in $[CoCl_4]''$. A. J. M.

Influence of solvents and of other factors on the rotation of optically active compounds. XXXIV. Influence of water and of deuterium oxide. C. Buchanan (J.C.S., 1937, 581—584).—The optical rotation of Me *d*-tartrate in D_2O (99%) is < that in H_2O, that of Me *d*-dimethoxysuccinate is the same in both solvents, whilst that of *l*-nicotine in D_2O is > that in H_2O. Nicotine is less sol. in D_2O than in H_2O at 60·5°. A. J. M.

Absorption spectra of praseodymium salts and their Zeeman effect. A. Merz (Ann. Physik, 1937, [v], **28**, 569—602).—The spectra of $Pr_2Mg_3(NO_3)_{12},24H_2O$ (I), $Pr(EtSO_4)_3,9H_2O$ (II), $Pr(BrO_3)_3,9H_2O$, $Pr_2(MoO_4)_3$, $Pr(C_6H_3Br_2{\cdot}SO_3)_3,9H_2O$, and $Pr_2(SO_4)_3,8H_2O$ (III) have been investigated at liquid H_2 temp. and in magnetic field. The Zeeman effect and the variation of the no. of lines in the spectrum with the crystal symmetry of the compounds were found to agree qualitatively with the theory of Kramers and Bethe. The term classification of Gobrecht (this vol., 60) is confirmed and extended. The substitution of D_2O for H_2O in (III) causes slight displacements in the lines. Transition probabilities for the observed line groups in the spectra of (I), (II), and (III) were determined from measurements of the intensity of absorption, the vals. lying between $1{\cdot}9 \times 10^{-5}$ and $5{\cdot}7 \times 10^{-5}$. O. D. S.

Absorption spectrum of the carboxyl group in the vacuum ultra-violet. W. M. Evans and W. C. Price (Nature, 1937, **139**, 630—631).—Discrete absorption bands of HCO_2H in the region 2000—1000 A. are described and discussed. L. S. T.

Absorption spectra. I. Crotonaldehyde and acraldehyde. F. E. Blacet, W. G. Young, and J. G. Roof (J. Amer. Chem. Soc., 1937, **59**, 608—614).—Modified procedure for obtaining mol. extinction coeffs. is described. The ultra-violet absorption spectra of crotonaldehyde and acraldehyde in the vapour phase have been determined. *cis*-Crotonaldehyde does not appear to be present in the commercial product. E. S. H.

Differences in absorption curves of groups of unsaturated hydantoins.—See A., II, 211.

Ultra-violet absorption spectra of some complex aromatic hydrocarbons. II. W. V. Mayneord and E. M. F. Roe (Proc. Roy. Soc., 1937, **A, 158**, 634—650; cf. A., 1936, 267).—The spectra of a no. of polycyclic aromatic compounds in solution in EtOH, some of biological importance, have been studied. Technique of low-temp. measurements and results with C_6H_6 solutions are described. Preliminary experiments on $C_{10}H_8$, anthracene, and phenanthrene are reported. G. D. P.

Influence of substituents on the ultra-violet absorption of doubly conjugated benzene chromophores. M. Pestemer and E. Mayer-Pitsch (Monatsh., 1937, **70**, 104—112; cf. A., 1936, 1318).—The absorption spectra of *o*-, *m*-, and *p*-amino-, *o*-, *m*-, and *p*-nitro-, and *o*- and *p*-cyanodiphenyl in various solvents have been measured in the region 20,000—45,000 cm.$^{-1}$ The shift of the *A* band towards longer λ produced by substitution follows the order $o > m > p$ for the NH_2-substituted Ph_2, but the reverse order for NO_2-substitution. The NH_2-group loses its effect on addition of HCl. The *p*-substituted compounds show such a large shift of the *B* band towards longer λ that it merges with the *A* band. It is concluded that the *B* band is due to the action of the conjugation of the C_6H_6 chromophores. J. W. S.

Substitution and absorption band displacement. IX. Halogeno-anilines and -nitrobenzenes. G. Förster and J. Wagner (Z. physikal. Chem., 1937, **B, 35**, 343—353; cf. A., 1936, 1178).—The band displacements of Cl- and Br-substituted anilines agree with the rule previously formulated (A., 1933, 445), but those of p-$C_6H_4F{\cdot}NH_2$ do not. The first principal band of the *o*- and *m*-halogenonitrobenzenes with a max. at 34,700 cm.$^{-1}$ is ascribed to the NO_2 chromophore. R. C.

Ultra-violet and infra-red spectra of thiophen, thiophthen, and thionaphthen. J. Godart (J. Chim. phys., 1937, **34**, 70—93).—Infra-red absorption has been measured between 0·80 and 2·70 μ. The spectra of thionaphthen (I) and thiophthen (II) resemble those of C_6H_6 and $C_{10}H_8$, respectively. The frequencies of (I) and thiophen (III) have been classified as harmonics of the Raman frequencies. In their ultra-violet absorption curves (III) and (II) resemble C_6H_6 and $C_{10}H_8$, respectively. The ultra-violet frequencies of (III) vapour have been classified. R. C.

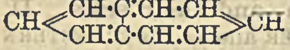
Optical absorption of imidoporphyrins. A. Stern and F. Pruckner (Z. physikal. Chem., 1937, **178**, 420—436).—The absorption spectra of the mono- and di-imidoætioporphyrins have the same no. of bands in the visible as those of the porphyrins, and are only slightly influenced by β-substitution and the solvent. In these and the tetra-imidoporphyrins the red band I is intensified by an amount which approx. ∝ the no. of C:N groups. Band III is also intensified. It is probable that in the imidoporphin system nuclei I and III have the pyrrolenine structure. There is some similarity in type between the absorption curve in the visible of tetraimidoætioporphyrin and that of phthalocyanine. The latter has two very strong bands at 698 and 664 mμ, which are attributed to the chromophoric influence of the C:N groups in the ring system. R. C.

Behaviour of the 4930 A. absorption band of uranine solutions under high pressure. W. J. Lyons (J. Opt. Soc. Amer., 1936, **26**, 144—145).—*n* for the three principal lines of the Hg arc, and for λ corresponding with the absorption band max. (4930 A.), were determined for two dil. aq. solutions of uranine of slightly different concns. for pressures $\not>$915 and $\not>$8123 kg. per sq. cm., respectively. The absorption band retained its position relative to the rest of the spectrum formed by the liquid prism under various pressures. Results indicate that the natural vibration frequency of resonators is not appreciably affected by the pressure or density of a medium, in agreement with electromagnetic dispersion theory. N. M. B.

Absorption spectra of datiscetin, morin, and quercetin. R. Grinbaumówna and L. Marchlewski (Biochem. Z., 1937, **290**, 261—268).—Absorption curves have been plotted for datiscetin (I), its Ac_4, Bz_4, and $(PhSO_3)_4$ derivatives, morin (II), and quercetin (III). (I), (II), and (III) exhibit two max. at 264 and 375, 263 and 371·5, and 255·5 and 375·5 mμ, respectively. W. McC.

Volatile vegetable materials. VI. Absorption spectra of azulene, guaiazulene, and vetiv-

azulene. B. Susz, A. S. Pfau, and P. A. Plattner (Helv. Chim. Acta, 1937, **20**, 469—477).—The absorption spectra of these compounds have been measured over the range 2300—7500 A. Azulene and *S*-guaiazulene show const. frequency differences between their absorption max. in the visible region. The absorption spectra confirm the presence in the three compounds of the same group, viz.,



$CH{<}\begin{matrix}CH\cdot C{:}CH\cdot CH\\ CH{:}C\cdot CH{:}CH\end{matrix}{>}CH$

J. W. S.

Model of a vibrating molecule. W. H. J. Childs and H. A. Jahn (J. Sci. Instr., 1937, **14**, 141—142).—A simple demonstration model of the C_2H_2 mol. is described. The three axial modes of vibration are excited by a series of air impulses timed by a simple pendulum of continuously adjustable period. At resonance with a normal frequency the latter vibration continues automatically.

N. M. B.

Investigations in the infra-red. II. Absorption spectrum of boric acid. M. K. Sen (Indian J. Physics, 1937, **11**, 9—11).—The absorption spectrum of boric acid between 5 and 15 μ shows 8 bands, three of which are attributed to the BO_3 radical and have been reported previously for inorg. borates. The other bands are due to the mol., $B(OH)_3$, and from its identity with the only recorded Raman frequency the band at 875 cm.$^{-1}$ is attributed to the totally symmetrical vibration of the mol. W. R. A.

Transmissions of powder films to the infra-red spectrum. J. H. Plummer (J. Opt. Soc. Amer., 1936, **26**, 434—438).—A wire-grating spectrometer was used to investigate the transmission of powder films of uniform particle size obtained by dispersion in a liquid, or, for particles >67 μ, by sieves. Quartz powders eliminate the 40—80 μ band and form efficient filters over 6·5—7·9 μ. Filters obtained by fuming MgO or distilling Se are satisfactory over 0·5—10 μ, and NaCl and KBr powders for 10—40 μ.

N. M. B.

Infra-red absorption spectra of some polyatomic fluorides. C. R. Bailey, J. B. Hale, and J. W. Thompson (J. Chem. Physics, 1937, **5**, 274—275).—By combining infra-red results with Raman data it is concluded that BF_3 is planar, NF_3 is a very flat pyramid with a bond angle of $\nless 110°$, CF_4 and SiF_4 are tetrahedral. Fundamental frequencies and their activities are discussed and force consts. are evaluated. W. R. A.

Absorption and fluorescence spectra of ions of the rare earths in solid bodies especially in the infra-red. H. Gobrecht (Ann. Physik, 1937, [v], **28**, 673—700; cf. this vol., 60).—Spectra were measured of cryst. $M_2(SO_4)_3,8H_2O$ (I) (M = rare earth atom), down to $-180°$ in the visible and of solutions of (I) in borax beads down to 2·5 μ. Deviations from selection rules were observed in the fluorescence spectra. Screening consts. were determined for Sm, Eu, Tb, and Dy. The Stark effect of the electric field of the crystals was investigated theoretically and the symmetry of the field determined.

O. D. S.

OH vibration spectrum in the photographic infra-red. S. Mizushima, Y. Uehara, and Y. Morino (Bull. Chem. Soc. Japan, 1937, **12**, 132—135).—MeOH, EtOH, $Pr^{\alpha}OH$, $Bu^{\alpha}OH$, PhOH, *o*- and *p*-$C_6H_4Cl\cdot OH$, *o*-$C_6H_4Br\cdot OH$, and *o*-cresol in CCl_4 solution all show two maxima in the region 10,000—13,600 cm.$^{-1}$, which are regarded as the second and third overtones of the OH vibration. The frequencies of the first overtones are thence calc., and agree with the experimental vals. of Wulf and Liddel (A., 1935, 1189). All the overtones are duplicated for the *o*-$C_6H_4Hal\cdot OH$ as required by Pauling (A., 1936, 718). The dissociation energies calc. from these results agree with thermochemical vals. F. R. G.

Near infra-red spectra of organic substances in the liquid and vapour states. A. Naherniac (Ann. Physique, 1937, [xi], **7**, 528—597).—Using a spectrometer of high dispersion and automatic recording, the characteristic OH band was investigated for a no. of alcohols, acids, and phenols in the liquid and vapour state and for the liquid–vapour transition. For vapours, on ascending the primary alcohol series, the band is displaced to longer λλ to a finally const. position; the displacement is progressively greater for *sec.* and *tert.* alcohols; in the case of acids it is more marked, but proceeds to shorter λλ on ascending the series. For liquids, the alcoholic OH bands are not displaced, except in the case of *tert.* alcohols and those containing a double linking. The acids, on heating, show a strongly displaced band. Data for PhOH in CCl_4 and C_6H_6 were obtained. Infra-red absorption was measured as a function of temp. to beyond the crit. point for liquid–vapour transition. For all infra-red bands and Raman lines which undergo sharp displacement the displacement curve is similar to the Mathias rectilineal diameter curve, indicating that the OH oscillation frequency depends on van der Waals forces between the mols., and that there is a direct relation between density and OH group frequency. The OH band intensity increases to the crit. point, an effect due to the dissolution of mol. associations. Results are discussed and interpreted on the basis of inter- and intra-mol. van der Waals forces. N. M. B.

Infra-red absorption spectra of mixtures of alcohol and water. D. Williams, R. D. Weatherford, and E. K. Plyler (J. Opt. Soc. Amer., 1936, **26**, 149—152).—The absorption spectra of EtOH–H_2O mixtures, studied in the region 1·5—5 μ, showed a band at 2·8 μ not characteristic of EtOH or H_2O. For small concns. of H_2O the intensity of this band increased with increasing H_2O content. The band is interpreted as indicating association of H_2O and EtOH mols., in agreement with anomalous vol. and sp. heat changes in the mixtures. N. M. B.

Effects of certain liquids on the OH vibrational band of alcohol. W. Gordy (Physical Rev., 1937, [ii], **51**, 564—566; cf. this vol., 112).—Transmission curves for several different concns. of MeOH in dioxan, MeCN, Pr^{β}_2O, C_6H_6, and CCl_4, and of EtOH in dioxan, for the region 2·55—3·15 μ are given. In the first three cases the OH band is shifted to shorter λλ with increase in intensity. No correlation with the electric moment of the solvent mol. was found, but a type of interaction with OH is suggested and discussed.

N. M. B.

The two infra-red OH bands of alcohols and polyalcohols ; molecular association. R. Freymann (Compt. rend., 1937, **204**, 1063—1065; cf. this vol., 131).—One band, at about 2·75 μ, is strong in the vapour phase, but weak in the liquid phase at room temp.; it is intensified by raising the temp., or dilution in CCl_4. The second band, at about 2·98 μ, is given by the solid and by the liquid at low temp. The two bands are compared with those given by the supposed *cis* and *trans* forms of o-$C_6H_4Cl\cdot OH$. Similar bands occur with Et lactate and tartrate.

A. J. E. W.

Infra-red absorption spectra and ethylenic compounds. I. General. Ethylenic alcohols. II. β-Allyl bromide homologues and ethylenic nitriles. R. Delaby and J. Lecomte (Bull. Soc. chim., 1937, [v], **4**, 738—749, 749—759).—I. Infra-red absorption spectra (7—20 μ) are recorded for 3 primary aliphatic alcohols (type, $OH\cdot CH_2\cdot CH{:}CHR$), 12 *sec.* aliphatic alcohols (type, $CH_2{:}CH\cdot CHR\cdot OH$), 5 *sec.* aromatic alcohols, and for *cyclo*hexylvinylcarbinol.

II. Data are recorded for 12 aliphatic bromides (type, $CHR{:}CH\cdot CH_2Br$) and for 11 aliphatic nitriles (type, $CHR{:}CH\cdot CH_2\cdot CN$). H. J. E.

Near infra-red absorption spectra and Raman spectra of derivatives of nitrogen. II. Amines. (Mme.) M. Freymann and R. Freymann (J. Phys. Radium, 1936, [vii], **7**, 476—480; cf. A., 1936, 921).—Raman spectra and near infra-red absorption spectra (0·8—1·2 μ) for aliphatic, aromatic, and heterocyclic amines have been compared. The bands are const. for an homologous series, but the primary and *sec.* aromatic amines show, with respect to the aliphatic amines, a displacement (100—200 A.) of the first order of the NH band towards the visible, attributed to double linkings in neighbourhood of N, and <50 A. for the second order depending on the position and electric moment of the substituents ($o > m > p$). The examination of pyrrole and piperidine shows that equilibrium exists between coplanar and non-coplanar forms of the mol. F. J. L.

Absorption measurements of organic dyes in the near infra-red. A. Schiller (Z. Physik, 1937, **105**, 175—192).—The absorption spectrum in the red and near infra-red has been determined for 18 dyes related in structure to the type $R\cdot CH{:}CR'R''$ (R = variously substituted aromatic nuclei) and also for the two infra-red photographic sensitisers, cryptocyanine and neocyanine. Results are discussed in general terms. H. C. G.

Raman spectra of crystalline powders. IV. Some organic and inorganic compounds. R. Ananthakrishnan (Proc. Indian Acad. Sci., 1937, **5**, **A**, 200—221; cf. this vol., 10, 167).—A discussion of the spectra and structure of cryst. $C_{10}H_8$, $H_2C_2O_4$, $CO(NH_2)_2$, guanidine hydrochloride, NH_4Ac, $EtCO\cdot NH_2$, glycine, $CH_2Ph\cdot CO_2H$, H_3PO_3, Na_2HPO_3, H_3PO_4, H_3BO_3, obtained from powders, using the author's method of complementary filters.

R. C. M.

Raman effect at low temperature : phosphorus trichloride, *cyclo*hexane, and chlorobenzene. S. C. Sirkar (Indian J. Physics, 1937, **11**, 55—64).—The Raman spectra of PCl_3, C_6H_{12}, and PhCl at the temp. of liquid O_2 have been investigated. Only PhCl shows new lines in the neighbourhood of the Rayleigh line and their significance and origin are discussed. The influence of temp. on the location of the lines of the other compounds is also discussed.

W. R. A.

Constitution of acids of the elements of group V of the periodic system, and their salts. II. Acids of arsenic. F. Fehér and G. Morgenstern (Z. anorg. Chem., 1937, **232**, 169—178; cf. this vol., 167).—The Raman spectra of H_3AsO_4 and its K and Na salts afford evidence of the existence of H_3AsO_4, H_2AsO_4', $HAsO_4''$, and AsO_4''' in solution. The anhyd. acid has the structure $O{:}As(OH)_3$. Observations with H_3AsO_3 in presence of NaOH or KOH show that H_3AsO_3 is monobasic. E. S. H.

Effect of temperature on the Raman frequencies of topaz, beryl, and calcite crystals. T. Kopcewicz (J. Phys. Radium, 1937, [vii], **8**, 6—10).—The variation of the frequencies (ν) of the Raman lines of topaz, beryl, and calcite crystals with temp. (20° and 500°) has been investigated. In each case ν decreases with rise of temp. The natural vibrations of calcite are discussed, and their variation with temp. is considered on the basis of Kornfeld's theory. Experimental results agree satisfactorily with theory. A. J. M.

Raman spectra of amino-acids and related substances. III. Ionisation and methylation of the amino-group. J. T. Edsall (J. Chem. Physics, 1937, **5**, 225—237).—Raman spectra of methylated amines and the corresponding hydrochlorides in aq. solution, of NEt_3 and its hydrochloride, and of the hydrochlorides of N_2H_4, NH_2OH, and NMe_3O are recorded. Polarisation measurements have been made on some. Since the spectra of the hydrochlorides arise from the NH_4 ion only, spectra of these ions resemble those of analogous hydrocarbons, in which a C replaces N^+. By treating groups, *e.g.*, Me and NH_3^+, as single atoms of the same mass all the compounds are represented as simple models. From the similarity to hydrocarbon spectra, and by means of the simple models and qual. polarisation data, assignment of observed frequencies to modes of mol. vibration have been made. Bond force consts. and valency angles have been evaluated for some of the compounds. For $N_2H_4,2HCl$ lines attributable to $^+H_3N\cdot NH_3^+$ and $^+H_3N\cdot NH_2$ are found. The frequencies for aq. solutions of amines are approx. the same as those for the pure anhyd. liquids. The characteristic valency vibrations of the uncharged NH_2-group, between 3300 and 3400 cm^{-1}., are not found in the $^-NH_3^+$ or NH_2^+ groups. Comparison of ionised and non-ionised amines with glycine and alanine and their Na salts yields evidence that NH_2-acids exist as dipolar ions $^+H_3N\cdot R\cdot COO^-$.

W. R. A.

Raman effect as a method of analysis of amino-acid solutions. N. Wright and W. C. Lee (Nature, 1937, **139**, 551—552).—Additional (cf. A., 1935, 1190) Raman frequencies for solutions of *dl*-valine (I), *l*-leucine, and *dl*-phenylalanine are recorded. Comparison of the Raman spectra of 5% aq. solutions of glycine, *dl*-alanine, (I), and a mixture of the three, with the spectrum of a zein hydrolysate from which the less sol. NH_2-acids had been partly removed shows that the Raman effect can be used for the analysis of solutions containing only a limited no. of NH_2-acids. L. S. T.

Raman spectra of some simple molecules. R. Ananthakrishnan (Proc. Indian Acad. Sci., 1937, **5**, **A**, 285—300).—The spectra of Me_2O, $COCl_2$ (I), *n*-C_4H_{10} (II), $(CH_2{\cdot}NH_2)_2$, $(CH_2{\cdot}OH)_2$ (III), $C_2H_4Br_2$ (IV), $C_2H_4Cl_2$ (V), $C_2H_2Cl_4$, $C_2H_2Br_4$ (VI), and C_2Cl_6 have been re-studied, and the results classified by means of polarisation data in the case of (I)—(VI). The coexistence of *cis* and *trans* compounds of the C_2H_6 derivatives is supported. R. C. M.

Raman effect. LXIII. Five-membered ring. II. Experiments with models. A. W. Reitz (Z. physikal. Chem., 1937, **B**, **35**, 363—381; cf. A., 1936, 1180).—By means of mechanical models vibration frequencies have been calc. for *cyclo*-pentane, -pentene, -pentadiene, and their derivatives. The model method is of only limited val. in interpreting frequency abnormalities of five-membered rings.

R. C.

Molecular symmetry of thiophen. II. G. B. Bonino (Atti R. Accad. Lincei, 1936, [vi], **24**, 374—380; cf. this vol., 10).—Theoretical. Further possible structures for C_4H_4S are discussed. Most of the Raman and infra-red data favour a C_{2v} symmetry.

O. J. W.

Raman spectrum of aromatic hydrocarbons with condensed nuclei. I. Anthracene and phenanthrene and their molecular symmetry. R. Manzoni-Ansidei (Atti R. Accad. Lincei, 1936, [vi], **24**, 368—373).—A more detailed account of work already noted (cf. this vol., 10). O. J. W.

Polymerisation of styrene as revealed by the Raman effect. S. Mizushima, Y. Morino, and Y. Inoue (Bull. Chem. Soc. Japan, 1937, **12**, 136—137).—Contrary to Signer and Weiler (A., 1932, 559) in polystyrene (mol. wt. 1150 in C_6H_6) the line due to the ethylenic linking does not disappear, but is reduced in intensity inversely as the mol. wt., in accordance with the structure of Staudinger and Steinhofer (A., 1935, 740). The η of $CHPh{:}CH_2$ changes before the reduction in intensity is appreciable. The early stages of polymerisation are attributed to micelle formation arising from van der Waals forces. F. R. G.

New type of diffusion spectrum of crystals and structure of liquids. E. Gross and M. Vuks (J. Phys. Radium, 1936, [vii], **7**, 113—117; cf. A., 1935, 281).—Lines with $\Delta\nu$ between 20 cm.$^{-1}$ and 130 cm.$^{-1}$ are observed in the Raman spectra of single crystals of C_6H_6, Ph_2O, $C_{10}H_8$, and *p*-$C_6H_4Br_2$. They coincide with the continuous diffused region in the spectra of the liquids, in agreement with the authors' theory of the origin of this diffusion.

O. D. S.

Fluorescence of rhodamine. G. R. Fonda (J. Opt. Soc. Amer., 1936, **26**, 316—322).—The efficiency of light conversion and resistance to fading of fluorescence under visible light was investigated for solid films. The solvent and concn. for max. efficiency are cellulose acetate, 30% solution in $COMe_2$ containing 0·2 g. of rhodamine per litre. The optimum film thickness is 0·014 cm. Resonance losses account for the abrupt efficiency decrease at higher concns. Fading of fluorescence under exposure to visible Hg light is due to a destruction of rhodamine by bleaching, and its speed varies with thickness as does the efficiency. Resistance to fading is increased by substituting an org. radical or a metal for the H in the CO_2H group.

N. M. B.

Brownian movement of an ellipsoid. Free rotation and depolarisation of fluorescence. Translation and diffusion of ellipsoidal molecules. F. Perrin (J. Phys. Radium, 1936, [vii], **7**, 1—11).—Mathematical (see A., 1935, 15).

F. J. L.

Effects of electric field on phosphorescent sulphides. G. Destriau (J. Chim. phys., 1937, **34**, 117—124; cf. A., 1936, 1320).—The luminescence of phosphorescent ZnS can be excited by application of a varying electric field, the phosphorescence bands being deformed and shifted towards shorter $\lambda\lambda$ compared with those of the normal phosphorescence. Alternating fields may either intensify the transient luminescence of a sulphide previously excited by light or weaken it. R. C.

Quantum interpretation of the mirror symmetry of absorption and luminescence spectra. V. L. Levschin (Acta Physicochim. U.R.S.S., 1937, **6**, 213—228).—Theoretical. J. W. S.

Potential and luminescence of insulated willemite cathode-ray screens. W. B. Nottingham (Physical Rev., 1937, [ii], **51**, 591).—Results of experiments on two phosphors are reported.

N. M. B.

Electric breakdown field intensity of water and aqueous solutions. Y. Toriyama and U. Shinohara (Physical Rev., 1937, [ii], **51**, 680).—Breakdown voltage curves are given for distilled H_2O, and for aq. solutions of $BaCl_2$, NaCl, NaOH, HCl, and NH_3. Results indicate that there is no direct relation between the current–voltage characteristic and the breakdown field intensity of liquid dielectrics, and that breakdown is an electronic, and conduction through liquid dielectrics an ionic, phenomenon.

N. M. B.

Volume rectification effect in illuminated crystals of cuprous oxide. G. Groetzinger and J. Lichtschein (Physical. Z., 1937, **38**, 292—298).—Natural Cu_2O crystals which show the crystal photo-effect (Dember effect) show also, on illumination, a rectifying effect. The two effects are intimately connected. The effect of variation of intensity, direction, and spectral range of the incident light was studied. In blue light, for which the crystal photo-effect has an opposite sign from that in white light, the rectifying effect is also reversed in direction. Artificial Cu_2O crystals, which do not show the crystal photo-effect, do not give the rectifying effect.

A. J. M.

Investigation of barrier-type photo-cells with soft *X*-rays. H. Felsinger (Ann. Physik, 1937,

[v], 29, 81—96).—The response of barrier type photo-cells of Cu_2O and of Se to soft *X*-rays (5 to 25 kv.) was investigated. Dependence of photo-current and voltage of each cell on the anti-cathode current and tube voltage was measured. The current output of the front wall cell was about the same order as for visible light. A. E. M.

Amorphous state. IX. Electrical conductivity and viscosity of alcohols. P. P. Kobeko, E. V. Kuvshinski, F. A. Gorodezkaja, I. P. Bachaev, and S. G. Shitnikov. **X. Conductivity of strong electrolytes in the amorphous state.** P. P. Kobeko, E. V. Kuvshinski, and N. J. Schischkin (Acta Physicochim. U.R.S.S., 1937, 6, 239—254, 255—262).—IX. For simple alcohols, glycerol, and solutions of HCl in $C_5H_{11}\cdot OH$, log ρ and log η (ρ = sp. resistance, η = viscosity) are not linear functions of $1/T$ over the amorphous and softening regions; but log ρ is a linear function of log η and Walden's law holds over wide temp. intervals. The variation of $1/\rho$ with temp. is probably due to change of mobility and not to dissociation. Over the same temp. interval the dielectric const. (ε) rises slowly and then, beyond a certain temp., rapidly with rise of temp., finally falling with rise of temp. in the liquid state.

X. ρ and ε have been determined for H_2SO_4, $H_2SO_4,2H_2O$, H_3PO_4, and 25% aq. KOH, and η for H_2SO_4 over the amorphous and softening regions. Log ρ is not a linear function of $1/T$, but is a linear function of log η. Discontinuities occur in the log $\rho = f(1/T)$ curve, the portion below the discontinuity (*i.e.*, for the amorphous state) being coincident with and an extension of the curve for the cryst. state. This can be explained on modern theory of the state of glasses (A., 1933, 12). J. W. S.

Unipolar electrical conductivity of carborundum. M. K. Chakravarty and S. R. Khastgir (Z. Physik, 1937, **105**, 88—91).—Steady potentials are applied to crystals of carborundum, Fe pyrites, galena, and magnetite soldered into brass cups, by means of a Ag needle. Potentials measured between this needle and a movable needle are plotted against distance between them, and by reversal of the steady potential it is shown that carborundum possesses unidirectional conductivity; pyrites, galena, and magnetite do not. L. G. G.

Dielectric constant of an electronic atmosphere for ultra-short waves. A. Iman and S. R. Khastgir (Indian J. Physics, 1937, **11**, 37—48).—The dielectric consts. of an electronic medium measured between the plate and the filament of a dull-emitting screen-grid valve first decrease and subsequently increase with increasing vals. of the thermionic current, and decrease with λ for the shorter $\lambda\lambda$. W. R. A.

High dielectric constants. F. C. Frank (Trans. Faraday Soc., 1937, **33**, 513—523).—The influence of chemical constitution on dielectric properties is discussed, particularly with reference to the part contributed by electronic polarisation. The chief criterion of high dielectric const. (*D*) in substances of ionic character is a high val. of the ratio (ionic refraction)/(ionic vol.). The influence of cryst. structure in promoting a high *D* is dependent on (1) close packing and (2) directional effects due to lattice vibrations. The temp. coeff. of *D*, and the correlation between high *D* and electronic semi-conduction, are also discussed. F. L. U.

Dipole moments of phosphorus pentafluoride and boron trifluoride, and vapour pressure curve of phosphorus pentafluoride. R. Linke and W. Rohrmann (Z. physikal. Chem., 1937, **B**, **35**, 256—260).—Dielectric const. measurements over a wide temp. range show the dipole moments to be zero. The sublimation pressure and v.p. of PF_5 at 147·5—188·6° abs. rises from 6·4 to 755·0 mm. R. C.

Dielectric polarisation of *n*-long-chain ketones near their m.p. A. Müller (Proc. Roy. Soc., 1937, **A**, **158**, 403—414).—The dielectric const. of a paraffin, $C_{22}H_{46}$, and two ketones, $C_{17}H_{34}O$ and $C_{23}H_{46}O$, are measured near their m.p. The paraffin shows a small decrease (2%) in dielectric const. on melting; the ketones show a large increase which starts some 15° < m.p. The results are interpreted as being due to an increase in the rotational mobility of the mols. around the chain axes in the solid state. Dipole moments calc. for the pure molten substance and from their dil. solutions indicate interaction between dipoles. G. D. P.

Dielectric constants of solids at high frequencies and the influence of water of crystallisation on dielectric constant. E. F. Burton and L. G. Turnbull (Proc. Roy. Soc., 1937, **A**, **158**, 182—198).—The dielectric consts. of $MgSO_4$, $CuSO_4$, borax (cryst. and dehydrated), and of NaCl, K alum, and KI, are measured at room temp. and a frequency of 2×10^6 cycles per sec. The dehydration of a salt increases its dielectric const. The change in mol. refractivity per mol. of H_2O of crystallisation is approx. const. G. D. P.

Dipole moment of chlorobenzene and the effect of solvents on it, using thirty-four different liquids. F. H. Müller (Physikal. Z., 1937, **38**, 283—292).—The dipole moment (*P*) of PhCl in 34 liquids of which the dielectric consts. (ε) varied between 1 and 4·25 was determined, in order to discover whether the variation of *P* with the solvent was influenced only by the ε of the latter. It was found that ε was the most important parameter, although the structure of the solvent mols. exerts a smaller effect. *P* of PhCl in a series of aliphatic hydrocarbons decreases more rapidly than is accounted for by the change in ε as the chain is increased in length. This is due to the fact that the longer is the chain the more incompletely is the PhCl mol. surrounded by the solvent mol. Comparison with the Debye theory of rotation coupling shows that $\varepsilon - 1 \propto E$ (E = rotation coupling energy). Deviations in mixed solvents are discussed. A. J. M.

Dipole moments of the chalkones and β-ethoxychalkones. F. Eisenlohr and A. Metzner (Z. physikal. Chem., 1937, **178**, 350—354).—In C_6H_6 the forms of chalkone of m.p. 49°, 57°, and 59° have the same dipole moment, and the same is true of the four forms of β-ethoxychalkone. R. C.

Molecular interactions and the structure of liquids. P. Girard and P. Abadie (J. Phys. Radium, 1936, [vii], 7, 211—214; cf. A., 1936, 666).—A discussion of the interpretation of the max. in the curves obtained by plotting time of relaxation of dipoles against concn. of a polar solute in a non-polar solvent. For concns. near the max. a quasi-cryst. state exists. H. J. E.

Structure of dipole liquids. J. Malsch (Ann. Physik, 1937, [v], **29**, 48—60).—A theoretical survey of mol. polarisation, dielectric saturation, anomalous dispersion and absorption in relation to pure polar liquids. L. G. G.

Dielectric constant and dipole loss of glasses at high frequencies. W. Hackel (Ann. Physik, 1937, [v], **29**, 63—80).—A resonance method is described for the simultaneous measurement of ϵ and κ of plates of glass over a λ range 12,000—10 m., by immersion in H_2O-dioxan mixtures adjusted to have ϵ and κ equiv. to the glass under examination. The method is independent of the shape of the solid dielectric. L. G. G.

Anomalous dispersion of excited argon. K. Schön (Ann. Physik, 1937, [v], **28**, 649—666).—The anomalous dispersion of electrically excited A in the neighbourhood of the $1s_i$—$2p_k$ lines has been measured. Results are analogous to those obtained by Ladenburg for Ne (A., 1934, 575). O. D. S.

Optical constants of potassium. H. E. Ives and H. B. Briggs (J. Opt. Soc. Amer., 1936, **26**, 238—246).—Using the Babinet compensator with the addition of right and left rotary quartz wedges forming a plane parallel plate between the compensator and analyser, vals. of n and extinction coeffs. were obtained for the range 5780—2536 A. N. M. B.

Photo-electric emission from thin films of potassium. H. E. Ives and H. B. Briggs (J. Opt. Soc. Amer., 1936, **26**, 247—250).—Results previously obtained (cf. preceding abstract) are applied to the photo-electric theory and results are compared with experiment. Satisfactory agreement on the short-λ side of the curves, but not on the long-λ side, is found. The behaviour of bulk K is discussed. N. M. B.

Refraction and dispersion of heavy methane (CD_4). T. Larsén (Z. Physik, 1937, **105**, 164—167).—Measurements were made with a Jamin refractometer between λ 5680 and 2300 A. Compared with CH_4, CD_4 shows a decrease in the refractivity and a general flattening of the dispersion curve analogous to that found in the cases of D_2 and D_2O vapour. H. C. G.

Optical properties and polymorphism of paraffins. C. D. West (J. Amer. Chem. Soc., 1937, **59**, 742—743).—Procedure for determining n of substances that solidify to form transparent uniaxial films is described. The dimorphism of solid Ac_2 is demonstrated and approx. vals. of its optical consts. have been determined for the solid and liquid phases between 20° and 80°. E. S. H.

Spectrochemistry of unsaturated compounds. K. von Auwers and R. Hügel (Z. physikal. Chem., 1937, **178**, 315—321).—Measurements of n with glycol and glycerol esters of saturated and unsaturated acids have shown that in general the optical exaltation of a compound with several isolated conjugated groups of linkings $\propto$ the no. of such groups. R. C.

Spectrochemistry of pyridine and pyridone derivatives. K. von Auwers (Z. physikal. Chem., 1937, **178**, 322).—Corrections and additions to a previous paper (A., 1933, 556). R. C.

Optical properties of some halogenated derivatives of camphor. J. P. Mathieu and J. Perrichet (J. Phys. Radium, 1936, [vii], 7, 138—140).—The absorption, rotation, and circular dichroism between 650 and 250 mμ of α-chloro-, α-bromo-, $\alpha\alpha$-dichloro-, and $\alpha\alpha$-dibromo-camphor have been measured. An absorption band about 300 mμ shows a strong Cotton effect, but the max. of dichroism is displaced towards longer $\lambda\lambda$ relative to the absorption max. O. D. S.

Optical rotation and atomic dimensions for the four optically active α-halogeno-β-methylbutanes. D. H. Brauns (J. Res. Nat. Bur. Stand., 1937, **18**, 315—331).—The prep. and vals. of $[\alpha]$, d, b.p., and n are given for the optically active α-fluoro-, -chloro-, -bromo-, and -iodo-derivatives of β-methylbutane and for β-methylbutanol. The differences in the mol. rotations of the halogen derivatives, Cl — F, Br — Cl, and I — Br, are in the ratio 41 : 18·1 : 21·6 for λ 5892·5 A. and 41 : 18·5 : 21·6 for 5461 A., which are close to the ratio of the differences in at. radii of the halogens, viz., 41 : 16 : 21, as in the case in which the halogen is directly attached to the asymmetric C (cf. A., 1931, 1355). R. S. B.

Constitution, optical activity, and photochemical behaviour of platino-complexes. II. I. Lifschitz and W. Froentjes (Z. anorg. Chem., 1937, **232**, 161—168; cf. A., 1935, 1335).—A consideration of Jensen's results (A., 1936, 12), and a reply. E. S. H.

Structure of N_2^+ and its bearing on the theory of valency. R. K. Asundi and R. Samuel (Proc. Indian Acad. Sci., 1937, **5**, **A**, 244—248; cf. A., 1936, 477).—Theoretical. From its excitation energy, N_2^+ must possess a double linking, disturbed by the odd electron, giving another example in favour of the pair-bond theory of valency. The spectroscopic CN mol., having the same no. of electrons, must also have a double linking. Other cases of disturbance caused by odd electrons are discussed. R. C. M.

Synchronised oscillations in hydrogen bridges. M. L. Huggins (Nature, 1937, **139**, 550).—The tendency of the electron distribution around the ring containing the H bridge to shift in synchronism with the oscillation of the bridge H is as important as resonance as a stabilising factor. In rings containing two H bridges the two bridging H tend to oscillate synchronously, the oscillation of each helping that of the other. Synchronous oscillation of the H of H bridges suitably linked together in long strings increases stability. In proteins, some of the chief forces connecting the primary chains are considered due to H bridges. L. S. T.

Potential constants of tetrachloroethylene. J. Duchesne (Nature, 1937, **139**, 634).—A correction (cf. this vol., 224). L. S. T.

Electronic structure of some polyenes and aromatic molecules. I. Nature of links by the method of molecular orbitals. J. E. Lennard-Jones. **II. Nature of the links of some aromatic molecules.** J. E. Lennard-Jones and J. Turkevich. **III. Bonds of fractional order by the pair method.** W. G. Penney (Proc. Roy. Soc., 1937, **A**, **158**, 280—296, 297—305, 306—324).—I. Formulæ are given for the lengths of links in conjugated hydrocarbon chains. In short chains there are two kinds of link. In long chains both links tend to equal 1·38 A.

II. Formulæ are derived for the lengths of links of cyclic aromatic mols. C_6H_6 is shown to be a regular hexagon of side 1·37 A. Other cyclic mols. are irregular and consist of alternate long and short links. The method is also applied to Ph_2 and $C_{10}H_8$.

III. The electron pair theory of "resonance" is interpreted by ascribing fractional orders to linkings. A method of evaluating the bond order is suggested, and hence bond energies are found. Heats of formation may then be calc. The ionic diameter of C atoms is correlated with bond order in cases where internuclear distance is known. Hence by calculating the bond order the internuclear distances of butadiene, hexatriene, octatetraene, $C_{10}H_8$, and the infinite chain are predicted. G. D. P.

"Free" and "non-free," "loose" and "bound" valency electrons of carbon in organic substances. O. Schmidt (Z. Elektrochem., 1937, **43**, 238—246).—Theoretical. The significance of free and bound electrons is discussed, with special reference to org. decomp. reactions. E. S. H.

Molecular orbitals. A. F. Devonshire (Proc. Camb. Phil. Soc., 1937, **33**, 250—252).—Mathematical. A method of obtaining an approx. solution of Schrödinger's equation with a non-central field of force is given, when a solution of a similar equation involving angular co-ordinates only is known. A. J. M.

Symmetry properties of the forces in atomic nuclei and results for the states, particularly for nuclei up to sixteen particles. F. Hund (Z. Physik, 1937, **105**, 202—228).—Theoretical. L. G. G.

Exchange energy in many-electron problems. L. Goldstein (J. Phys. Radium, 1936, [vii], **7**, 141—145).—Mathematical. O. D. S.

Interaction of atoms and molecules with solid surfaces. VI. Behaviour of adsorbed helium at low temperatures. VII. Diffraction of atoms by a surface. J. E. Lennard-Jones and A. F. Devonshire. **VIII. Exchange of energy between a gas and a solid.** A. F. Devonshire (Proc. Roy. Soc., 1937, **A**, **158**, 242—252, 253—268, 269—279).—VI. The lateral velocity of migration of He atoms on the surface of a LiF crystal is calc. Even at the lowest temp. the periodic field of the surface does not prevent migration.

VII. The theory of diffraction of atoms at a surface is given.

VIII. An expression for the accommodation coeff. of a monat. gas on a solid is obtained. Applied to the cases of He and Ne on W, satisfactory agreement with experiment is shown. G. D. P.

Ionisation, excitation, and chemical reaction in uniform electric fields. III. Excitation of the continuous spectrum of hydrogen. R. W. Lunt, C. A. Meek, and E. C. W. Smith (Proc. Roy. Soc., 1937, **A**, **158**, 729—738).—Experiments were made to determine the energy efficiency of excitation of the continuous spectrum of H as a function of Xp^{-1}, the ratio of electric field to pressure. In the range of Xp^{-1} between 25 and 140 satisfactory agreement with theory is obtained. For higher vals. of Xp^{-1} the theory gives too small a val. for the energy. G. D. P.

Exact and approximate expressions for the permeability of potential barriers to light particles. R. P. Bell (Proc. Roy. Soc., 1937, **A**, **158**, 128—136).—The validity of approx. expressions for the permeability of potential barriers is discussed. A solution of the wave equation is obtained for a parabolic barrier; when the energy of the particles is equal the max. potential energy of the barrier a solution can be obtained for a more general type of barrier. This solution is used to estimate the error involved in the approx. treatment. For barriers appropriate to chemical reactions the approx. expressions may be used for calculations of rates and will give accurate results for the relative rates of similar reactions. G. D. P.

Quantum-mechanical discussion of cohesive forces and thermal expansion coefficients of the alkali metals. H. Fröhlich (Proc. Roy. Soc., 1937, **A**, **158**, 97—110).—A theoretical treatment which enables the lattice const., heat of sublimation, compressibility, and thermal expansion coeff. to be calc. in terms of the ionisation potential. Satisfactory agreement with experimental vals. is obtained. G. D. P.

Modern theory of solids. II. F. Seitz and R. P. Johnson (J. Appl. Physics, 1937, **8**, 186—199).—The application of wave mechanics to differentiating between five solid types, viz., pure metals, semi-conductors, and mol., ionic, and valency crystals, and to interpreting their physical properties, is discussed. C. R. H.

Mean electrical density of a complex atom. G. Allard (Compt. rend., 1937, **204**, 1057—1058).—Mathematical. A development of Slater and Pauling's theory of directed valencies. A. J. E. W.

***U*-effect of Amagat and Weiss.** V. Jacyna (Z. Physik, 1937, **105**, 267—268).—Completion of work already noted (A., 1936, 1454). L. G. G.

Penetration of nickel ions into rock-salt. I. A. Parfianovitsch and S. A. Schipizin (Acta Physicochim. U.R.S.S., 1937, **6**, 263—274).—Ni can penetrate rock-salt both by electrolysis and by diffusion, the extent of penetration being shown by introducing Na into a small cavity in the face of the crystal which has been in contact with the Ni, covering with a rock-salt plate, and heating between two electrodes, when the electron cloud produces a brownish-yellow colour in the region penetrated by the Ni. The mobility of Ni$^{\cdot\cdot}$ ions in NaCl at various temp. was measured. It is concluded that the *U*-electrons in rock-salt can combine with the Ni$^{\cdot\cdot}$ ions which have entered the lattice. J. W. S.

Surface tension of intensively dried α-sulphur trioxide. A. N. Campbell and N. O. Smith (Trans. Faraday Soc., 1937, **33**, 545—551).—The *d* and surface tension of successive fractions obtained from SO_3 intensively dried by passage of the vapour through P_2O_5 have been determined at 20° and 50°. The vals. at 20° vary irregularly but are nearly const. at 50°. It is assumed that the drying retards the attainment of equilibrium between the constituents at 20° but not at 50°. The m.p. range of the solid is large and indicates great heterogeneity. F. L. U.

Application of convergent beam and oscillation photographs to layer lattice diagrams. O. Kratky and G. Krebs (Z. Krist., 1937, **95**, 253—265).—The use of such methods is discussed in relation to exposure time, effects of maladjustment of the crystal, and interpretation of the photographs. B. W. R.

Influence of perpendicular and horizontal strains on the magnitude of *X*-ray deformations. M. P. Sheldak and G. V. Kurdjumov (Zavod. Lab., 1936, **5**, 752—754).—Perpendicular as well as horizontal residual strains influence the *X*-ray deformation diagrams. R. T.

Scattering of *X*-rays at very small angles. H. H. Penley and J. A. Gray (Canad. J. Res., 1937, **15**, **A**, 45—47).—The scattering of *X*-rays at very small angles has been studied with charcoal, anthracene pptd. by H_2O from solution in EtOH, and graphite. The scattering curves fall into distinct types characteristic of the charcoals on the one hand and of graphite and anthracene on the other. The Debye theory gives 20 A. as the diameter of the smallest particle in blood charcoal. With Shawinigan charcoal the scattering at small angles is greatly reduced by pressures of 1 ton per sq. in., but for angles $>4'$ there is no change. R. S. B.

***X*-Ray investigation of the glassy state.** N. Valenkov and E. Porai-Koschitz (Z. Krist., 1936, **95**, 195—229; cf. A., 1936, 413).—The two theories of the glassy state are discussed in detail—that of a continuous non-cryst. at. or ionic network (i), and that of the existence of pseudo-regular crystallites (ii). Devitrification, by (i), will be essentially a discontinuous process; by (ii) it will be the steady growth of crystallites. Also (i) gives no higher-order diffraction maxima (since there is only radial, not azimuthal, regularity) whilst (ii) gives such maxima. *X*-Ray photographs of various glasses and SiO_2 are discussed and agree with (ii), not (i). Ostwald's rule, solubility, and electrical conductivity are discussed. B. W. R.

Recent crystallography. (Sir) W. Bragg (Proc. Roy. Inst., 1937, **29**, 484—495).—A lecture.

Making crystal lattice and unit cell models. A. Scattergood (J. Chem. Educ., 1937, **14**, 140). L. S. T.

Distribution and geometry of twinning phenomena. H. Tertsch (Z. Krist., 1937, **94**, 461—490).—Classification of, and comments on, the occurrence of twinning, from the mineralogical point of view. B. W. R.

Growth of crystals at the expense of the grains close to them. J. M. Anscheles (Z. Krist., 1936, **95**, 150—156).—The Federov hypothesis of crystal growth is discussed. Surface tension is probably of importance. B. W. R.

Common orientation and a classification for crystals based on a marcasite-like packing. M. J. Buerger (Amer. Min., 1937, **22**, 48—56).—A discussion and a co-ordination of data. L. S. T.

Nature of snow. G. Seligman (Proc. Roy. Inst., 1937, **29**, 463—483).—A lecture.

Structure and morphological characteristics of ice crystals. M. P. Golovkov (J. Gen. Chem. Russ., 1937, **7**, 335—340).—Ice crystals are probably of the trigonal-pyramidal type of symmetry, and of hexagonal syngony. R. T.

Determination of lattice constants of diamond and graphite. W. Trzebiatowski (Rocz. Chem., 1937, **17**, 73—82).—For diamond at 20° *a* is $3{\cdot}5595_7 \pm 0{\cdot}0000_9$ A.; at 150—460° $a = 3{\cdot}5593_9(1 + 1{\cdot}7 \times 10^{-6}t + 1{\cdot}9 \times 10^{-9}t^2)$. For graphite $a = 2{\cdot}456_3$, $c = 6{\cdot}695_6$ A., at 20°. R. T.

Determination of orientation of crystals of metals. J. Czochralski and J. Skowrońska (Przemysł Chem., 1937, **21**, 65—71).—Methods of determining crystal structure, depending on determination of planes of cleavage, and on examining the figures produced by etching spheres cut out of single crystals, are described. R. T.

***X*-Ray study of the structure of copper, lead, cadmium, and antimony at high temperatures.** J. E. Dorn and G. Glockler (J. Physical Chem., 1937, **41**, 499—506).—No evidence was obtained of the existence of transitions or of metastable forms in the temp. range studied. The metals have the following lattice structures: Cu, 20—420°, and Pb, 20—185°, face-centred cubic; Cd, 20—120°, hexagonal; Sb, 20—170°, rhombohedral. C. R. H.

Structure of electrodeposited nickel. G. I. Finch and A. L. Williams (Trans. Faraday Soc., 1937, **33**, 564—569; cf. A., 1936, 784).—Photomicrographs of Ni electrodeposited on a macrocryst. substrate of Cu or Cu_2O preserve throughout the essential features of the substrate, irrespective of the deposit depth, whereas the corresponding electron diffraction patterns undergo a radical change with increasing thickness of the Ni deposit. Conclusions based on microscopic methods should therefore be treated with reserve unless confirmed by electron diffraction. The influence of the substrate on the crystal size and orientation of the deposit becomes progressively weaker as the thickness of the latter increases, and is generally extinguished at depths $\leqslant 3 \times 10^{-4}$ cm., the size being then determined by the deposition conditions. Interrupting the deposition process sometimes leads to an abrupt suppression of the substrate influence in subsequently deposited layers, and to weakened adhesion of the latter. F. L. U.

Primary oxide film on iron. H. R. Nelson (J. Chem. Physics, 1937, **5**, 252—259).—Electron diffraction patterns of air-formed oxide films below 200° on Fe show this film to be Fe_3O_4 and to be oriented in a definite manner to the underlying Fe (cf. this vol., 130). The high-temp. form is Fe_2O_3. W. R. A.

Oxide films on iron. R. F. Mehl and E. L. McCandless (Amer. Inst. Min. Met. Eng. Tech. Publ. No. 780, 1937, 23 pp.; cf. A., 1936, 786).—The orientation relationships obtaining between α-iron and the phase FeO, and between Fe_3O_4 and FeO formed on it by direct reduction, provide a simple at.-crystallographic picture of the mechanism of oxidation. The orientation relationships obtaining between FeO and Fe_3O_4 formed on it by eutectoid decomp. are identical with those obtaining in oxidation layers; this may prove to be a general rule. No valid method exists for the determination of the true thickness of films on Fe in the temper-colour range. The rates of temper-film formation were determined at several temp. on a large no. of single crystals of H_2-purified Fe. A prep. of surfaces is described which gives reproducible temper colours on oxidation. R. B. C.

Crystal structure of the low-temperature modification of thallous iodide. L. Helmholz (Z. Krist., 1936, **95**, 129—137).—The yellow modification (below 175°) has an orthorhombic cell, space-group D_{2h} (17), with a_0 5·24, b_0 4·57, c_0 12·92 A. At. parameters are determined and interat. distances given. The structure is in a sense a layer type. B. W. R.

Crystal structure of Mg_2Zn_{11} and its isomorphy with $Mg_3Cu_7Al_{10}$. F. Laves and S. Werner (Z. Krist., 1936, **95**, 114—128).—Mg_2Zn_{11} (to which hitherto the formula $MgZn_5$ has been ascribed) is cubic with Laue symmetry O_h and a_0 8·53 A., 6 Mg and 33 (perhaps 32) Zn in the cell. $Mg_3Cu_7Al_{10}$ has the same structure with a_0 8·29 A., being an example of a ternary compound in a binary structure type. B. W. R.

Crystal structure of gallium nitride. J. V. Lirmann and H. S. Schdanov (Acta Physicochim. U.R.S.S., 1937, **5**, 306).—GaN (prepared as a friable grey powder by heating Ga in NH_3 at 1200°) has hexagonal structure of the wurtzite type, with a 3·160±0·008, c 5·125±0·010 A.; c/a = 1·622. J. W. S.

Crystal structure of $(NH_4)_2SbBr_6$, Rb_2SbBr_6, and Rb_2SbCl_6. K. A. Jensen (Z. anorg. Chem., 1937, **232**, 193—201).—Lattice consts. and crystallographic data have been determined by X-ray analysis. The valency no. of Sb in these compounds is even, but does not appear to be 4, since $(NH_4)_2SbBr_6$ and Rb_2SbBr_6 are diamagnetic. E. S. H.

Structure of polysulphides. I. Barium trisulphide. W. S. Miller and A. J. King (Z. Krist., 1937, **94**, 439—446).—The cell is orthorhombic, space-group $P2_1\,2_1\,2_1$, a_0 8·32, b_0 9·64, c_0 4·82 A. The S_3 ion has the three atoms distributed approx. at an angle of 103° to each other, the S—S distance being 2·15 A. B. W. R.

Crystal structure of sodium carbonate monohydrate, Na_2CO_3,H_2O. J. P. Harper (Z. Krist., 1937, **95**, 266—273).—The cell is orthorhombic, 4 mols. to cell, space-group $2e$–5, a_0 10·721, b_0 6·440, c_0 5·243 A. Probable at. parameters are determined. B. W. R.

Crystal structure of potassium nitrite, KNO_2. G. E. Ziegler (Z. Krist., 1937, **94**, 491—499).—The cell is monoclinic, a_0 4·45, b_0 4·99, c_0 7·31 A., β 114° 50′, space-group C_s^3. The parameter vals. are determined, the structure being a distorted $NaNO_2$ type. A high birefringence of the crystal is deduced. B. W. R.

Symmetry and crystal structure of manganite, Mn(OH)O. M. J. Buerger (Z. Krist., 1936, **95**, 163—174).—An arsenopyrite-like structure is confirmed. The cell is monoclinic, space-group $B2_1'/d$, a_0 8·86, b_0 5·24, c_0 5·70 A., β 90°. Mn(OH)O corresponds with FeAsS, the (OH) being slightly larger than the O atom. The structure is in detail a layer structure, and accounts for the (010) cleavage. B. W. R.

Structure of pentacalcium trialuminate. W. Büssem and A. Eitel (Z. Krist., 1936, **95**, 175—188).—By fusing together pure CaO and Al_2O_3 in proportions 5 : 3 a pure cryst. *compound* is obtained, d 2·69, space-group probably T_d^6, a_0 11·95 A., which is probably $12CaO,7Al_2O_3$ with 2 mols. in the cell. Two extra O are distributed statistically. B. W. R.

Lead titanate: crystal structure, temperature of formation, and specific gravity data. S. S. Cole and H. Espenschied (J. Physical Chem., 1937, **41**, 445—451).—X-Ray data reveal the formation of only one compound in the solid state, $PbTiO_3$, d 7·52, on calcining PbO–TiO_2 mixtures containing 25—89% PbO. Compound formation begins at 360° and is complete at 375°. $PbTiO_3$ crystallises as orthorhombic holohedral pyramids with a 4·000, b 4·211, c 3·875 A., axial ratios 0·95 : 1 : 0·92. The space-group D_{2h}^1 is assigned and the most probable at. arrangement is Pb : 000; Ti : $\frac{1}{2}\frac{1}{2}\frac{1}{2}$; O : $\frac{1}{2}\frac{1}{2}0$; $\frac{1}{2}0\frac{1}{2}$; $0\frac{1}{2}\frac{1}{2}$. C. R. H.

Formula of ammonium paramolybdate. J. H. Sturdivant (J. Amer. Chem. Soc., 1937, **59**, 630—631).—The formula $(NH_4)_6Mo_7O_{24},4H_2O$ is confirmed by determination of lattice consts., space-groups, and d. E. S. H.

Crystallography and chemistry of the lower hydrates of heteropoly-acids. O. Kraus (Naturwiss., 1937, **25**, 250—251).—Hydrates of $H_3SiW_{12}O_{40}$, $H_3PW_{12}O_{40}$, $H_5BW_{12}O_{40}$, $H_3PMo_{12}O_{40}$, and $H_4SiMo_{12}O_{40}$ containing $14H_2O$ are triclinic and isomorphous. The lattice is face-centred, and the space-group is C_i, with 8 mols. in the unit cell. The complex anions of the type $[SiW_{12}O_{40}]''''$ are arranged like the C atoms in a slightly distorted diamond lattice. The previously described (Rosenheim *et al.*, A., 1918, ii, 77) $B_2O_3,24WO_3,29H_2O$ has been shown to be a mixture of $H_5BW_{12}O_{40},14H_2O$ and $H_5BW_{12}O_{40},5H_2O$. The latter is obtained from solution as strongly refracting rhombododecahedral crystals. The previously described $P_2O_5,12WO_3,42H_2O$ is identical with $H_3PW_{12}O_{40},14H_2O$ (cf. Jander *et al.*, A., 1936, 1477). The crystal form of hydrates of the above acids containing 21, 24, 29 and $30H_2O$ is also given. A. J. M.

Complex salts of the racemic and optically active *cyclo*hexanediamines with tervalent cobalt and rhodium. IV. Crystallographic properties of optically active tri*cyclo*hexanediamine cobaltic salts and ethylenediamine *cyclo*hexanediamine cobaltic salts of the series. F. M. Jaeger and L. Bijkerk (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 316—325; cf. this vol., 259).—Crystallographic data are recorded for

D-$\{Co(l\text{-chxn})_3\}Cl_3,4H_2O$;
D-$\{Co(l\text{-chxn})_3\}(NO_3)_3,3H_2O$;
$\{Co(en_2,d\text{-chxn})\}Cl_3,H_2O$;
$\{Co[en(d\text{-chxn})_2]\}Cl_3,3{\cdot}5H_2O$;

$\{Co(r\text{-chxn en}_2)\}I_3,H_2O$ (chxn = *cyclo*hexanediamine). Salts of the type $\{Co(X_2Y)\}Cl_3$ are shown to be unstable in general, decomp. into $\{CoX_3\}Cl_3$ and $\{CoY_3\}Cl_3$. F. J. L.

Systematic method of investigating superstructures, applied to the arsenopyrite crystal structure type. M. J. Buerger (Z. Krist., 1936, **94**, 425—438).—Where formal theory gives no structure solution, it may be possible to obtain a structure using the plane group theory and simple *X*-ray deductions. The method is developed for the arsenopyrite structure type. B. W. R.

Fibrous brucite. J. Garrido (Z. Krist., 1937, **95**, 189—194).—The cell structure is the same as that of the normal mineral. The orientation of the small crystals in the fibre is studied from Weissenberg photographs. On dehydration at 500° the resultant cubic MgO crystals preserve a certain orientation in relation to the original texture. B. W. R.

Crystal structures of alkyl–metal complexes. A. F. Wells (Z. Krist., 1937, **94**, 447—460).—Using intensity measurements and a simple Fourier analysis, the structure of solid $AsEt_3,CuI$ is found in detail, and compared with that of the analogous compounds PBu_3,CuI and $AsEt_3,AgI$. Fourfold mols. [*e.g.*, $Cu_4I_4(AsEt_3)_4$] are necessary to describe the structure; details are: space-groups $I\bar{4}3m$, $C3c$, and $I\,4m2$ or $142m$; cells cubic, a_0 13·08, trigonal, c_0 23·7, a_0 22·4, and tetragonal, c_0 19·7, a_0 10·7 A., respectively, for the three compounds. B. W. R.

Structure of aromatic compounds. I. Acenaphthene. K. Banerjee and K. L. Sinha (Indian J. Physics, 1937, **11**, 21—35).—Acenaphthene crystals are orthorhombic bipyramidal; four mols. in the unit cell. The mol. has a plane structure. Analysis of the estimated intensities of *X*-ray reflexions from a no. of planes, in conjunction with magnetic data, proves that the two-fold axis of the mol. lies parallel to the *b* axis and that the mol. plane is inclined at 26° to the *c* face. The distance between an aliphatic C and its neighbouring aromatic C is 1·47 A., whilst that between two aliphatic C is 2·01 A. The angle between an aliphatic linking and an aliphatic–aromatic linking is 97°, and those between aliphatic–aromatic linkings and adjacent linkings in the $C_{10}H_8$ nucleus are 114° and 126°. W. R. A.

Crystallographic constants of benzylideneketopinene. T. Bialas (Arch. min. soc. sci. Varsovie, 1934, **10**, 90—97).—$C_{17}H_{20}O_2$ forms orthorhombic pseudotetragonal crystals ($a:b:c$ = 0·994 : 1 : 1·573). Ch. Abs. (*e*)

The *n*-fatty acids and certain of their derivatives. F. Francis, F. J. E. Collins, and S. H. Piper (Proc. Roy. Soc., 1937, **A**, **158**, 691—718).—Crystal spacings, m.p., and setting points of *n*-fatty acids and their derivatives having even C content between 28 and 38, and the single acid with 46 C, are given. A linear relationship between crystal spacing and C content of the acids and their derivatives is observed. G. D. P.

Modifications and transformations of metals on heating in a vacuum or in different gases. I, II. J. J. Trillat and S. Oketani (J. Phys. Radium, 1937, [vii], **8**, 59—66, 93—98).—I. The surface changes occurring in pure metals on heating in vac. or in various gases have been examined by electron diffraction. At <550° no change is found in the surface of Au. When warmed above this temp. for 2 hr. there is a change in the colour of the light transmitted by the foil, and a supplementary annular diffraction pattern is obtained at certain points on the surface. This supplementary pattern becomes more marked as the temp. is raised, and numerous spots appear with hexagonal symmetry (modification *B*). These always occur in the thinnest parts of the film, and indicate that there is a superficial mobility of atoms at temp. ≪ m.p. (cf. Andrade, A., 1935, 1307, 1449). If the temp. is raised to 700°, or if heating at 600° in vac. is prolonged, recrystallisation of the Au occurs, with the formation of large Au crystals oriented in certain directions. This occurs more easily in the thicker parts of the film. All the above effects are the same whether the heating is carried out in vac., air, N_2, O_2, or A. The origin of modification *B* is discussed.

II. Au containing very small amounts of Ag and Cu gives the same diffraction pattern as pure Au, and modification *B* is formed when heated in vac., N_2, or A. When heated in air or O_2 a supplementary diagram (diagram *O*) appears, and is given by the whole surface of the foil. It is the more marked the higher is the temp., and disappears slowly when the film is maintained at room temp. The removal is accelerated by heating in vac. to 450°. Diagram *O* is due to a Au oxide, the formation of which is catalysed by the more easily oxidisable Cu. The structure of thin films of Ag was examined. At room temp. a fibrous structure was found, which became microcryst. after heating for 2 hr. at 500°. At the same time new rings appeared in the diagram, ultimately breaking into spots. This new structure is identical with structure *B* of Au. Pt, Cu, and Al do not give any new modification when heated in vac. or in inert gases. The effect of passing electron beams through thin metallic foils for prolonged periods was examined. With Au the primary intense diffraction pattern gradually became weaker, and on keeping for 24 hr. after exposure to the beam, the original intensity was not regained. Intense diagrams were, however, obtained from neighbouring spots of the film. The phenomenon is due to a local thickening of the film owing to the mobility of superficial layers at the temp. to which they are raised by the electron beam. A. J. M.

Structure of thin metallic films deposited at low temperatures. G. Hass (Naturwiss., 1937, **25**, 232—233).—Electron diffraction experiments have been carried out with thin films of Ag and Sb deposited at −175° in the diffraction tube itself. For Ag a no. of strong interference rings were obtained; they became sharper as the temp. was raised, indicating crystal growth. This crystallisation with rising temp. was more noticeable with thin than with thicker films. With Sb only two diffuse, weak rings were obtained at low temp., corresponding with a colloidal structure. At room temp. large crystals with a thread structure were present, the diffraction rings becoming sharper and more numerous. The results do not agree with the theory that the films are amorphous at low temp. (Zahn *et al.*, A., 1934, 16) or that there is a transition temp. from one form to another (Kramer, *ibid.*, 244). A. J. M.

Electron diffraction examination of precipitated metals and their alloys. G. Natta (Gazzetta, 1937, **67**, 10—22).—The electron diffraction method is more suitable than the *X*-ray method for investigating the structure of colloidal and pptd. metals and of thin metallic films. Colloidal Au has the usual face-centred cubic lattice. Purple of Cassius also shows lines due to SnO_2. When pptd. by CH_2O or N_2H_4, Au, Pt, and Pd have lattice consts. which are equal to or about 0·01 A. > the vals. given in the literature. Thin films (about 10^{-5}—10^{-6} cm.) of Pd, Ag, and Au deposited on Cu from solutions of their ions have lattice consts. of 3·67—3·71, 4·02, and 4·01—4·07 A., respectively, and consist of solid solutions of Pd in Cu, Cu in Ag, and Cu in Au. The film of metal obtained by depositing one metal on a more electro-positive one is compact and adherent only when a solid solution is formed. O. J. W.

Molecular structure of inorganic fluorides from electron diffraction measurements. H. Braune and P. Pinnow (Z. physikal. Chem., 1937, **B**, **35**, 239—255).—The structure and the internuclear distances have been determined. UF_6, WF_6, and probably also MoF_6 mols. have rhombic symmetry. SiF_4 is tetrahedral. The PF_5 mol. is a symmetrical double pyramid. In IF_5 all the distances I—F are equal, and the radius of the I^{5+} ion is 1·46 A. BF_3 is planar. R. C.

Electron diffraction investigation of some vinyl polymerides. G. Natta and R. Rigamonti (Atti R. Accad. Lincei, 1936, [vi], **24**, 381—388; cf. A., 1934, 993).—Electron diffraction by the following substances has been investigated: polyvinyl chloride, bromide, acetate, and alcohol, polystyrene, and polydichloroethylene. The last two have a definitely cryst. structure. All the substances show characteristic distances of 2·13—2·27 and 1·20—1·26 A. O. J. W.

Investigation of unimolecular films by electron diffraction. E. Havinga and J. de Wael (Rec. trav. chim., 1937, **56**, 375—381).—Unimol. films of Ba salts of fatty acids are examined, after transference from a H_2O surface to a film of cellulose nitrate or Au leaf. They show hexagonal symmetry, and may be regarded as "two-dimensional single crystals." The C chains are perpendicular to the surface, with the polar groups towards the supporting film. The separation of the chains is 4·78—4·80 A., from which the surface area per mol. is 19·9 A.^{2}, compared with Langmuir and Adam's val. 20·0 A.^{2}; thus in transferring the film no change has taken place. F. J. L.

Piezo-electric constant of quartz. J. Clay and J. G. Karper (Physica, 1937, **4**, 311—315).—The piezo-electric charge ∝ pressure up to 10 kg. per sq. cm., and ∝ temp. (17—90°). H. J. E.

Variation of the piezo-electric modulus of quartz as a function of temperature. A. Langevin (J. Phys. Radium, 1936, [vii], **7**, 95—100).—The piezo-electric modulus of quartz decreases linearly with temp. between 20° and 300°, decreasing by 10% between those temp. Conflicting results of earlier workers are due to irregularities in the transmission of the compressing force to the crystal. O. D. S.

Magneto-striction of iron crystals at high temperatures. H. Takaki (Z. Physik, 1937, **105**, 92—103).—The first const. *C* of elongation of Fe crystals in the direction of the tetragonal axis at saturation increases with temp. up to 500° and then falls sharply, disappearing completely at the Curie point. The second const. χ of elongation decreases along the trigonal axis up to 500° and then disappears rapidly. These results agree with theory and can be related to the variation of the anisotropic const. with temp. H. C. G.

Magnetic powder experiments on rolled nickel iron. II. J. L. Snoek and M. W. Louwerse (Physica, 1937, **4**, 257—266; cf. A., 1936, 413).—Observations on polished surfaces in the *xz*- and *yz*-planes, and additional observations on the rolling plane, are recorded. H. J. E.

Torsion in an iron or nickel wire facilitates discontinuities of magnetisation with an axial alternating current. S. Procopiu and G. Vasiliu (Compt. rend., 1937, **204**, 971—973).—The effect (this vol., 227) occurs at lower *I* with increasing torsion. A. J. E. W.

Charge separation in a mass as a result of the pressure gradient due to the application of very high pressures. (The origin of the earth's magnetic and electric fields.) H. Haalck (Z. Physik, 1937, **105**, 81—87).—A quasi-theoretical discussion on the origin of the earth's magnetic and electric fields based on separation of charges as a result of pressure gradients along the earth's radius. L. G. G.

Optical constants of several metals in vacuum. H. M. O'Bryan (J. Opt. Soc. Amer., 1936, **26**, 122—127).—Data for *n*, reflecting power at normal incidence, extinction coeffs., dielectric consts., and at. rates of absorption for Be, Mg, Ca, Sr, Ba, Al, Ge, La, Ce, and Mn, evaporated in vac. on to thin glass plates, and with a special Hg arc light source, are tabulated and discussed. N. M. B.

Molecular, nematic, and crystal states of 1 : 1′-diethyl-ψ-cyanine chloride. E. E. Jelley (Nature, 1937, **139**, 631—632; cf. this vol., 63).—The application of spectrographic, ultramicroscopic, and streaming birefringence methods to the ageing of aq. solutions of this dye in presence of NaCl shows that the dye passes from the dissociated state through a mol. phase of brief duration to form thin threads. The optical properties of these threads and of thin needle crystals of the dye indicate that the threads are cryst. only in one direction, and correspond with the nematic type of liquid crystal. The η abnormalities described by Scheibe *et al.* (*ibid.*, 165) are explained not by polymerisation of ions of the dye but by the existence of nematic aggregates of dye mols. L. S. T.

Elastic properties of sulphur trioxide. H. Gerding (Naturwiss., 1937, **25**, 251).—SO_3 possesses elastic properties at low temp. owing to polymerisation and the consequent formation of long chain-like mols. A. J. M.

Absorption of strain energy in metals. N. A. De Bruyne (Nature, 1937, **139**, 633).—There is a linear relation between the Debye temp. θ of a metal and the logarithm of the ratio of the energy absorbed to that stored. L. S. T.

Transformations of higher orders. N. F. Moerman and G. J. Muller (Physikal. Z., 1937, **38**, 298—302).—In disagreement with Justi *et al.* (A., 1936, 926) the transformations of the three solid modifications of H_2S (α, β, γ) may be treated as transformations of the first kind. Conditions governing transformations of higher orders are discussed. A. J. M.

Transformations of higher orders. E. Justi and H. Nitka (Physikal. Z., 1937, **38**, 302—303).—A reply to criticism (cf. preceding abstract). A. J. M.

Velocity of polymorphic transformation of α- and β-ammonium nitrate. V. K. Perschke and A. N. Popov (J. Gen. Chem. Russ., 1937, **7**, 363—368).—The velocity of mutual transformation is a function of the no. of active centres, and varies with the rate of heating and the H_2O content of the NH_4NO_3. R. T.

Supposed allotropy of liquid benzene. E. Cohen and J. S. Buij (Z. physikal. Chem., 1937, **B**, **35**, 270—284; cf. A., 1934, 480, 722).—Determinations of *d* at 20—60° and the sp. heats at 8—24° give no evidence of allotropy. R. C.

***cis*-Cinnamic acids. II.** F. Eisenlohr and A. Metzner (Z. physikal. Chem., 1937, **178**, 339—349; cf. A., 1935, 916).—The various forms retain their individuality in the dissolved state. The heats of combustion are: form of m.p. 42°, 7046; form of m.p. 58°, 7055; form of m.p. 68°, 7071 g.-cal. per g. Pressure converts the acid m.p. 68° into the form m.p. 58° or, after a long time, into the acid m.p. 42°. The m.-p. diagrams of the *trans*-acid with the three forms of the *cis*-acid are all different. In the molten state the stable form is that of m.p. 42°. R. C.

Expansion of *p*-azoxyphenetole and nature of the phase change, mesomorphic to isotropic liquid state. E. Bauer and J. Bernamont (J. Phys. Radium, 1936, [vii], **7**, 19—22).—Vol.–temp. and coeff. of expansion–temp. curves show discontinuity at 165·5—167·7°, the transition point, mesomorphic → isotropic liquid state, indicating a true change of phase. F. J. L.

Transformation of solid metal phases. VI. Allotropic transformation. U. Dehlinger (Z. Physik, 1937, **105**, 21—35; cf. A., 1933, 896).—The energy changes of individual atoms are considered thermodynamically and the proportions of both phases present in equilibrium expressed as a function of temp. Introduction into the equation of a parameter (*W*), representing the free energy of strain in the crystal lattice when partial change has occurred, leads to a sharp transition point. The proportion of either phase present above or below this point depends on the magnitude of (*W*). A relation between temp. and velocity of transformation is deduced and the general mechanism of transformation both on the surface and inside the crystal considered. H. C. G.

Allotropy of iron. H. Esser (Iron & Steel Inst. Carnegie Schol. Mem., 1936, **25**, 213—234).—The A3 transformation temp. rises as the purity of the Fe increases, and the intensity simultaneously decreases. Experiments carried out to ascertain the dependence of the transformations on the degree of purity, particularly those concerned with the effect of H_2 (doubling of the A3 point), suggest that the allotropy of Fe is not an inherent, but an imposed, characteristic. A. J. K.

Mechanico-chemical determination of mol. wt. of liquids boiling at constant pressure. G. Duch (Ann. Guébhard-Séverine, 1936, **12**, 102—119).—Determinations of the *d* and surface tension, γ, of liquids at the b.p. are described. A relation between the mol. wt., *d*, and γ of members of homologous series is verified. J. G. A. G.

Resistance of boron. E. Podszus (Ann. Physik, 1937, [v], **29**, 61—62).—Measurements of the resistance of B at temp. up to 2000° by various workers are considered and it is concluded that the previously suggested existence of B in two different modifications is not established. A. E. M.

Contribution to the electrical resistance of metals from collisions between electrons. W. G. Baber (Proc. Roy. Soc., 1937, **A**, **158**, 383—396).—The theory of electrical conductivity due to Bloch and others neglects the interaction between the conduction electrons. The contribution to resistivity arising from collisions is shown to vary as T^2. This term is negligible down to 1° abs. for normal metals but is appreciable for transition metals Pd and Pt, in agreement with experiment. G. D. P.

Electrical conductivity of thin metallic films. II. Cæsium and potassium on Pyrex glass surfaces. E. T. S. Appleyard and A. C. B. Lovell (Proc. Roy. Soc., 1937, **A**, **158**, 718—728; cf. this vol., 121).—The resistivity of films from 0·3 to 50 A. thickness is measured. The decay of conductivity shown by films is investigated. At 64° abs. Cs films of only a few A. thickness are stable. The resistivity–thickness and resistivity–temp. curves are in good agreement with theory. G. D. P.

Experimental determination of the free path of electrons in lead and cadmium. L. Riedel (Ann. Physik, 1937, [v], 28, 603—631).—Measurements have been made of the resistance at 20·33° abs. of Pb and Cd wires of diameter from 1 to 25 μ. It is calc. that the mean free paths of electrons in Pb and Cd are respectively 63 and 292 A., and that the corresponding nos. of free electrons per atom are 1·0 and 0·34. O. D. S.

Superconducting state. F. London (Physical Rev., 1937, [ii], **51**, 678—679; cf. Slater, this vol., 174).—A theory based on stationary waves by which a transport of electricity can be effected only in the presence of a magnetic field is discussed for the interpretation of supercurrents. N. M. B.

Disturbance of the superconductive state by a magnetic field; supplementary measurements. W. J. de Haas and (Miss) A. D. Engelkes (Physica, 1937, **4**, 325—328; cf. A., 1936, 929).—Measurements with a Sn sphere with Bi wires on the equator and in the canal, and on a monocryst. Sn wire are given. H. J. E.

Types of carrier electrons in superconduction. R. Forrer (J. Phys. Radium, 1937, [vii], **8**, 67—80; cf. A., 1936, 1056).—Electrons responsible for superconduction are the *s* electrons of the outermost incompleted shells. The electronic lattices of superconducting alloys (Hg_5Tl_2, Tl_2Pb, Bi_2Tl, Sb_2Tl_7, Au_2Bi) are considered and shown to conform to this rule. Absence of *s* electrons in the outermost shell makes superconduction impossible, so that those elements or alloys in which all the valency electrons are used in the electronic lattice (*e.g.*, Hume-Rothery alloys) are not superconductors. The electronic lattices of the non-superconducting $CuZn_3$, $AgZn_3$, Cu_3Sn, AuSn, PbSe, and PbS confirm this rule. It is predicted that SnTe will be superconducting, and Cu_2Sb not. A hypothesis of the mechanism of superconduction supposes that the *s* electrons below the transition temp. (*T*) are linked together in a lattice superimposed upon the principal electronic lattice. Comparison with ferromagnetism indicates that *T* is analogous to the Curie point. A. J. M.

Structure of the electron and superconductivity. J. Stark (Physikal. Z., 1937, **38**, 269—277).—The conclusions respecting the structure of the electron which may be drawn from a study of magnetic induction in superconductors are discussed. If the electron has an annular structure, the electron moving within the ring without resistance, a superconductor should be paramagnetic, although there is a diamagnetic induction which may mask the paramagnetic effect. The theory of an experiment to determine the magnetic induction in superconductors is given. A. J. M.

Magnetic induction in superconductors. J. Stark and K. Steiner (Physikal. Z., 1937, **38**, 277—283; cf. preceding abstract).—The magnetic induction in superconductors was determined with tubes of Sn, Sn + 1% Cd, and a single crystal of Sn. The dependence on field strength of the induction changes when superconductivity commences was found, the results agreeing with the existence of a paramagnetic and a diamagnetic induction, as required by the theory that the electron has an annular structure. The paramagnetic magnetisation for polycryst. superconductors is > for single crystals, and also varies with the previous heat-treatment of the metal. A. J. M.

New phenomenon in the superconducting transition of tantalum and tin. F. B. Silsbee, R. B. Scott, and F. G. Brickwedde (J. Res. Nat. Bur. Stand., 1937, **18**, 295—314).—A sudden increase in resistance (*R*), up to 75% of the normal, has been observed with Sn and Ta on passing from the superconducting to the normal state by changing the temp., current, or magnetic field, relatively large currents being necessary. The sudden increase in *R* is followed by a slow decrease. The cause of the "overshoot" is discussed. R. S. B.

Electrical conductivity of a superconducting sphere in the intermediate state. L. Schubnikov and I. Nakhutin (Nature, 1937, **139**, 589—590).—A spherical single crystal of Sn in the intermediate superconducting state, *i.e.*, when the magnetic permeability no longer equals 0, possesses anisotropic superconductivity. With a current direction parallel to the external field the sphere remains superconducting even when the magnetic permeability is near unity, and with a direction perpendicular to the field superconductivity disappears at a field strength of approx. $2/3H_k$. L. S. T.

Thermo-electric force of a superconductor against the same metal in the non-superconductive state. J. A. Kok (Physica, 1937, **4**, 276—278).—Theoretical. H. J. E.

Bismuth crystals. IV. Alteration of the thermo-electric power on transition from transverse to longitudinal magnetic field. E. Grüneisen and J. Gielessen (Ann. Physik., 1937, [v], **29**, 25—32; cf. this vol., 121).—The variation produced by a magnetic field in the thermo-electric e.m.f. for Bi crystals in contact with manganin and constantan at −182° has been measured. The effect varies with the orientation of the Bi crystal in the field and reaches a max. when the field is perpendicular to, and a min. when the field is parallel to, the trigonal axis. The relation between this effect and the variation in heat-conductivity of Bi crystals in a magnetic field is illustrated graphically. H. C. G.

Influence of mechanical strains on the ferromagnetic properties of cubic single crystals. K. Schlechtweg (Ann. Physik, 1937, [v], 28, 701—720).—Theoretical. O. D. S.

Anomalous diamagnetism of selenium. M. Prasad and S. S. Dharmatti (Indian J. Physics, 1937, **11**, 1—8).—The effect of powdering and colloidisation on the diamagnetic susceptibility of Se has been determined by a Curie balance method. Increased time of powdering in air leads to a decrease in diamagnetism followed by the appearance of paramagnetism, and the colour of Se changes from grey to pink and finally to red. Sols prepared under varying conditions have also been examined. The anomalies are due principally to impurities formed by contact with the air but conversion into the allotropic red forms also contributes. W. R. A.

Magnetochemistry of silver and copper ; bivalent ions and mixed crystals. N. Perrakis and L. Capatos (J. Phys. Radium, 1936, [vii], 7, 391—400).—Bivalent ions of Ag and Cu exhibit a negative Curie point and have magnetic moments of 9·78 and 9·11 Weiss magnetons, respectively. Mixed crystals of the two ions have been investigated throughout the temp. interval from room temp. to approx. $-80°$ and they obey the Weiss law. Introduction of a small quantity of either metal lowers the Curie point of the constituent present in excess by an amount $\propto$ the concn. W. R. A.

Paramagnetism of anhydrous cobalt chloride in the pure state, and in solution in cadmium chloride or manganous chloride. C. Fehrenbach (J. Phys. Radium, 1937, [vii], 8, 11—22).—$CoCl_2$ exists in two magnetic states, in both of which it obeys the Weiss law. Below 409° abs. the at. Curie const., C_1, is 3·342, and the Curie point, θ, is 30°. Above 409° abs. C_1 is 3·101, and θ is 60°. The difference in moments of the two forms is approx. 1 Weiss magneton. Another form, for which $1/\chi$ was not $\propto T$, obeyed the law of Cabrera, $(\chi + a)(T - \theta) = C$, where a represents a const. superimposed diamagnetism. Mixed crystals of $CoCl_2$ and $CdCl_2$ in various proportions obeyed Weiss' law like $CoCl_2$, over two temp. ranges. The Curie consts. increase linearly with $[CdCl_2]$. θ decreases and ultimately becomes negative as $[CdCl_2]$ increases. Mixed crystals of $CoCl_2$ and the paramagnetic $MnCl_2$ gave similar results. The Curie points are given by $\theta = m_1\theta_1 + m_2\theta_2$, where θ_1, θ_2 are the Curie points of $MnCl_2$ and $CoCl_2$, respectively, and m_1, m_2 are the concns. A. J. M.

Variation of the magnetic susceptibility of hæmatite powder as a function of the size of the grains. R. Chevalier and (Mlle.) S. Mathieu (Compt. rend., 1937, 204, 854—856).—χ for three specimens of hæmatite decreased rapidly with decreasing particle size, the change being most marked for diameters $<50\ \mu$. For fine powders, χ approached the val. for artificial rhombohedral Fe_2O_3. A. J. E. W.

Magnetic properties and structure of ferrihæmoglobin (methæmoglobin) and its compounds. C. D. Coryell, F. Stitt, and L. Pauling (J. Amer. Chem. Soc., 1937, 59, 633—642).—Measurements at 24° lead to vals. of the paramagnetic part of the mol. susceptibility which correspond with the following vals. of the effective magnetic moment per heme, in Bohr magnetons: ferrihæmoglobin (I) 5·80, and its hydroxide (II) 4·47, fluoride (III) 5·92, cyanide (IV) 2·50, and hydrosulphide (V) 2·26. For (I) and (III) these correspond with 5 unpaired electrons per heme, indicating essentially ionic linkings; for (IV) and (V) to 1 electron, indicating covalent linkings; and for (II) to 3 electrons, indicating linkings of an intermediate type. The dissociation consts. of (II), (III), and (IV) have been determined by magnetic titrations. E. S. H.

Theory of the absorption of sound in polyatomic gases. M. A. Leontovitsch (Bull. Acad. Sci. U.R.S.S., 1936, 633—642).—Mathematical. The application to liquids is discussed. O. D. S.

Acoustic spectrum of liquids. (Sir) C. V. Raman and B. V. R. Rao (Nature, 1937, 139, 584—585).—Fabry–Perot patterns with 4358 Å. radiation scattered by PhOH, $COMe_2$, and BuOH are discussed. L. S. T.

Absorption and diffusion of supersonic waves and the structure of liquids. R. Lucas (J. Phys. Radium, 1937, [vii], 8, 41—48).—The absorption of supersonic waves in liquids is $>$ that demanded by the theory of Stokes and Kirchhoff, the elastic heterogeneity of the liquid playing an important part, independent of viscosity. The diffusion of elastic waves in liquids is discussed. The comparatively large vals. of the absorption and diffusion could be explained by supposing liquids to have a subcryst. structure. A. J. M.

Thermal properties of heavy and light hydrogen at low temperatures. A. Eucken (J. Phys. Radium, 1936, [vii], 7, 281—288).—A résumé. H. J. E.

Specific heat of liquids and their constitution. L. Brillouin (J. Phys. Radium, 1936, [vii], 7, 153—157).—Theoretical. Monat. liquids have a sp. heat of about $3R$ near the m.p., which decreases to $2R$ at the crit. point. Such liquids have a cryst. microstructure at low temp., and approach the ideal at the crit. point. H. J. E.

Heat capacity, entropy, and free energy of the vapour of phosphorus P_2. I. Godnev and A. Sverdlin (J. Phys. Chem. Russ., 1936, 8, 904—908).—Spectroscopic data are used for calculating thermodynamic properties of P_2. J. J. B.

Calorimetric determinations of the transition of the anisotropic liquid phase to the isotropic. K. Kreutzer and W. Kast (Naturwiss., 1937, 25, 233—234).—The heat of transition from the anisotropic to the isotropic liquid state of *p*-azoxyanisole is 1·6 g.-cal. per g. (410 g.-cal. per g.-mol.), and c_p for the anisotropic liquid is $>$ that for the isotropic by 0·037 g.-cal. per g. The corresponding difference in c_v is 0·016 g.-cal. per g. For *p*-azoxyphenetole the heat of transition is 2·9 g.-cal. per g. (830 g.-cal. per g.-mol.), and the difference in c_p for the two states is 0·11 g.-cal. per g. A. J. M.

Conditions for the occurrence of an anisotropic liquid phase. W. Kast (Naturwiss., 1937, 25, 234—235).—The small difference in sp. heat of a substance in the anisotropic and isotropic liquid states (see preceding abstract) does not agree with the assumption that in the isotropic state the mols. become capable of completely free rotation, but would allow the free rotation of the terminal groups of the mol. about the axis of the mol. The hindrance to free rotation of the terminal groups in the anisotropic state is determined by the interaction between the dipole moments of these groups and that of the middle of the mol. By increasing the mass of the terminal group the temp. necessary for it to reach a sufficiently large amplitude is increased, agreeing with the experimental fact that such mols. have a wider temp. range for the anisotropic state. A. J. M.

B.p. of organic compounds. I. Formula of Boggio-Lera. II. Properties of paraffins. A. H. W. Aten (J. Chem. Physics, 1937, **5**, 260—263, 264—267).—I. The formula $T = (nD + B)^{\frac{1}{2}}$ for the b.p. (T) abs. of the mono-derivatives of the paraffin series, where n is the no. of CH_2 groups in the mol. and D and B are consts. for a given series (Boggio-Lera, A., 1899, i, 843), is tested for the paraffin series and 11 series of mono-derivatives. For all these D has a const. val. of 20,500 and B has different vals. dependent on the nature of the terminal groups. The formula holds also, $D = 20{,}500$, for five series $R\cdot[CH_2]_n\cdot R$ and for methylparaffins and dialkylparaffins. For *cyclo*paraffins the same formula holds if $D = 24{,}300$ and $B = 18{,}000$. In all cases there must be $\not< 3$ C in the chain.

II. Utilising Langmuir's ideas concerning the evaporation of liquids at their b.p. and the rules on the cohesion of liquids, the formula of Boggio-Lera is derived for paraffins, and this formula is applicable to all paraffins containing >3 and <20 C in the chain.
W. R. A.

Exchange of energy between organic molecules and solid surfaces. II. Accommodation coefficients and specific heats of paraffin hydrocarbons and the influence of temperature on the accommodation coefficients (including argon) at some 10^{-6} mm. (Hg) pressure. O. Beeck (J. Chem. Physics, 1937, **5**, 268—273).—The investigation of the accommodation coeffs. (α) of various paraffins and their relation to sp. heats has been extended to various temp. of the bright Ni surface and to various gas temp. The results agree with the general formulæ (this vol., 21) relating α to the mol. wts. and sp. heats. Kassel's calc. vals. of C_{r_0} of C_3H_8 and C_4H_{10} give satisfactory agreement if the contributions of the deformation frequencies of the C chain are omitted.
W. R. A.

Mathematical foundation of the thermodynamical equation of state. W. Jacyna (Physical Rev., 1937, [ii], **51**, 677).—Mathematical. N. M. B.

Properties of the condensed phases of helium and hydrogen. A. Bijl (Physica, 1937, **4**, 329—344).—Theoretical. The influence of the zero point motion on crystal d is discussed. H. J. E.

Vapour pressure of certain terpenes. G. A. Rudakov and S. J. Korotov (J. Appl. Chem. Russ., 1937, **10**, 312—318).—The v.p. of α-pinene, Δ^3-carene, camphene, limonene, and dipentene at 25—760 mm. and of *iso*bornyl acetate and formate at 25—200 mm. are given by $\log P = A/T + B$, where T is abs. temp., and A and B are consts. R. T.

Critical product of pure normal liquids. R. Lautié and S. Artières (Bull. Soc. chim., 1937, [v], **4**, 664—667; cf. A., 1936, 1330).—It is shown that, for a series of halogen derivatives, the mol. surface energy at the b.p. (E) and also the crit. product (P) (= crit. pressure × crit. mol. vol.) are approx. linear functions of E and P, respectively, for the corresponding rare gases. Data for the halogens and for mono-halogenated benzenes are recorded. H. J. E.

Rate of evaporation of barium oxide. G. Herrmann (Z. physikal. Chem., 1937, **B**, **35**, 298—308).—The rate of evaporation of a coating of BaO on Pt, Ni, Au, or Cu is not affected by the metal. The v.p., in mm. is given by $\log p = -2{\cdot}60 \times 10^4/T + 13{\cdot}44$, and the mol. heat of vaporisation is 119,000 g.-cal. For $\lambda = 0{\cdot}65\ \mu$ the radiation coeff. is 18—30% that of a black body. At high temp. BaO seems to be partly reduced to Ba by Ni on which it is coated, reduction apparently occurring either in the vapour phase or at the moment of release from the crystal lattice. This reaction seems to be responsible for certain differences in behaviour between Ni and Pt as bases for a BaO layer. R. C.

Thermal conductivity in relation to crystal structure. W. A. Wooster (Z. Krist., 1936, **95**, 138—149).—The conductivity in a given direction of several crystals, not of the layer or chain types, is roughly given by $\Sigma S \cos^2 \theta$, where there are S similar linkings making an angle θ with the direction considered. For the layer crystals examined, the conductivity is greater along than perpendicular to the layer; for chain lattice crystals it is greater along the chains. B. W. R.

Exchanges of energy between a platinum surface and hydrogen and deuterium molecules. W. B. Mann and W. C. Newell (Proc. Roy. Soc., 1937, **A**, **158**, 397—403).—The accommodation coeffs. relative to a cleaned Pt wire at 100° are 0·11 for H_2, 0·16 for D_2, and about 0·05 for He. Figures are also given for the coeffs. relative to a saturated wire. The Na method of prep. of D_2 is described. G. D. P.

Viscous properties of poly*iso*butylene. J. D. Ferry and G. S. Parks (Physics, 1935, **6**, 356—362).—The η was determined from 70° to 175° and from $-53°$ to 24° by the falling-sphere and concentric-cylinder methods, respectively. η was 19 poises at 175°, 10^{10} at $-53°$, and 10^{13} at $-76°$.
Ch. Abs. (*e*)

Streaming of liquids through small capillaries. H. B. Bull and J. P. Wronski (J. Physical Chem., 1937, **41**, 463—468).—The rate of flow of H_2O, *n*-aliphatic (C_1—C_7) alcohols, and CCl_4 through diaphragms of sintered glass, cellulose, and graphite is a linear function of pressure, and for a given pressure is a function of η and the degree of attraction between liquid and diaphragm. The crit. pore radius below which flow becomes anomalous is between 8·85 and $3{\cdot}12 \times 10^{-4}$ cm. C. R. H.

Oiliness of liquids. IV. Measurements of the static friction coefficients by the method of inclination. J. Sameshima and Y. Tsubuku (Bull. Chem. Soc. Japan, 1937, **12**, 127—132).—Coeffs. have been determined for H_2O, the straight-chain alcohols and the acids previously measured (this vol., 72). Vals. of both coeffs. decrease with lengthening C chain for the alcohols but remain const. for the acids. Results are interpreted in terms of affinities between the polar groups and glass. F. R. G.

Comparison of the rates of diffusion of hydrogen and deuterium through heated platinum. R. Jouan (J. Phys. Radium, 1936, [vii], **7**, 101—106).—The ratio of the rates of diffusion of D_2 and H_2 through Pt is 0·75 from 550° to 950°. O. D. S.

Thermal expansion of binary systems in the molten state. A. A. Leonteeva (Acta Physicochim. U.R.S.S., 1937, 6, 229—238; cf. this vol., 177).—The sp. vols. of various molten mixtures in the systems $K_2B_4O_7$–B_2O_3, KPO_3–$Na_2B_4O_7$, $NaPO_3$–$NaBO_2$, and $NaPO_2$–$Na_2B_4O_7$ have been determined. The mixtures show contraction in vol. and the formation of dipole complexes, often with dipolar linkings within the complex. The degree of association of the mols. and the possibility of complex formation are almost independent of temp., being determined mainly by the proportions of the components present. J. W. S.

Viscosity of ideal mixtures. G. P. Lutschinski (J. Phys. Chem. Russ., 1936, 8, 830—834).—The equation of Batschinski (A., 1913, ii, 928) is transformed so as to be applicable to mixtures formed without vol. contraction. J. J. B.

Diffusion, viscosity, and intermolecular action in binary mixtures of liquids. H. Lemonde (J. Phys. Radium, 1936, [vii], 7, 371—378).—Measurements of the diffusion and η have been made for the binary mixtures, H_2O–MeOH, H_2O–EtOH, H_2O–$Pr^{\alpha}OH$, $CHCl_3$–Et_2O, $CHCl_3$–$COMe_2$, and C_6H_6–EtOH. In dil. solutions the coeff. of diffusion is a function of the structure of the mols., the η of the solvent, and the no. of mols. per unit vol. The product $D\eta$ varies with the composition of the mixture and these variations can be interpreted in terms of intermol. association. $D\eta$ is also the motive force of diffusion which depends on the intermol. forces of attraction or repulsion. Comparison of the isotherms of diffusion and v.p. verifies the inverse variation of these two quantities in the mixture and indicates the direction of the variation of D with concn. W. R. A.

Diffusion in liquids. XI. Inter-diffusion of electrolyte solutions. T. Linhart (Z. Physik, 1937, **105**, 45—55).—Sitte's method for measuring diffusion in coloured liquids has been improved and applied to the inter-diffusion of aq. electrolytes. Rates of diffusion of $KMnO_4$ and $CoCl_2$ in H_2O and other aq. electrolytes have been compared. Differences as much as 4—5% were observed only when mobilities of corresponding ions of the inter-diffusing electrolytes differed widely. Results agree with theory. H. C. G.

Viscosities of liquid mixtures with pyrrole as a component. M. Dezelic (Trans. Faraday Soc., 1937, **33**, 713—719).—η–composition curves have been obtained for mixtures of pyrrole (I) with C_5H_5N, piperidine, nicotine, quinoline, $NHEt_2$, $CHCl_3$, AcOH, $Pr^{\alpha}CO_2H$, allylthiocarbimide, and $PhNO_2$. The first five, which form complexes with (I) and produce a rise of temp. on mixing, give curves which have a max. or are concave to the composition axis. The last five do not evolve heat on mixing, and give curves convex to the composition axis. The results indicate that the acid character of unsubstituted (I) predominates over the basic. F. L. U.

Viscosity in the systems phenol–aniline and –pyridine. A. D. Vinogradova, A. M. Tichomirova, and N. N. Efremov (Bull. Acad. Sci. U.R.S.S., 1936, 1027—1043).—The composition–d, –η, –temp. coeff. of η, and –surface tension curves of the systems afford no evidence of the compound formation which is suggested by the fusion diagrams. R. T.

Physico-chemical analysis of systems containing diamines. Viscosity and m.p. of the system ethylenediamine–methyl alcohol. M. S. Elgort (Bull. Acad. Sci. U.R.S.S., 1936, 495—505).—The m.p. curves indicate the formation of the compound $(CH_2{\cdot}NH_2)_2,2MeOH$, which decomposes near its m.p. (−48°). The viscosity and the temp. coeff. of viscosity curves show marked max. at this composition. D. C. J.

Determination of the composition of binary liquid systems examined by physico-chemical analysis. Stannic bromide–esters. N. S. Kurnakov and E. B. Schternin (Bull. Acad. Sci. U.R.S.S., 1936, 467—493).—The viscosity of mixtures of $SnBr_4$ with the Me and Et esters of HCO_2H, AcOH, oxalic and malonic acids, with Et ethylmalonate, and also with Et_2O has been determined. The sp. conductivity and the m.p. curves of mixtures of $SnBr_4$ and EtOAc are recorded. Most of the compounds formed are shown in the m.p. curves. The max. of viscosity and the min. of sp. conductivity occur approx. at the composition of the least dissociated compound. Other deductions are made from the experimental results. D. C. J.

Refraction in solutions. V. Complete refraction curve of carbamide. S. M. Scherschever and A. I. Brodski (J. Phys. Chem. Russ., 1936, 8, 890—895).—d and n have been measured for concns. up to $4N$. The n–concn. curve is similar to that for electrolytes. J. J. B.

Dielectric constants of ether–chloroform and ether–chlorobenzene mixtures. I. E. Coop (Trans. Faraday Soc., 1937, **33**, 583—590).—Dielectric const.–composition curves have been determined for Et_2O–$CHCl_3$ and Et_2O–PhCl mixtures between 20° and −85°. The curves for the PhCl mixtures are normal and indicate the absence of compound formation. In the Et_2O–$CHCl_3$ mixtures a well-marked max. at 50 mol.-% is observed, which becomes more pronounced as the temp. is lowered. Below −60° a secondary max. at $CHCl_3$ 67 mol.-% is developed. Of the two compounds, $Et_2O,CHCl_3$ and $Et_2O,2CHCl_3$, thus indicated, the first is considered to be formed by co-ordination of O with the H rather than with the Cl atoms of the $CHCl_3$. The nature of this link is discussed. F. L. U.

Ultra-violet absorption of binary liquid mixtures. XI. Ultra-violet absorption and orientation polarisation of the binary systems acetone–benzene and nitromethane–carbon tetrachloride. M. Pestemer and O. Fruhwirth (Monatsh., 1937, **70**, 146—156).—For both systems the change in the orientation polarisation with concn. indicates considerable quadripole association of the polar components, which decreases with increasing dilution. As a consequence of this association both systems show deviations from Beer's law. J. W. S.

Vapour pressure of binary solutions of *iso*propyl alcohol and benzene at 25°. A. L. Olsen and E. R. Washburn (J. Physical Chem., 1937, **41**, 457—462).—Partial and total pressure data are recorded. The system deviates in a positive manner from Raoult's law on account of the difference in polarity of the two components. C. R. H.

Vapour tension of mixtures of phosphoric and nitric acids. E. E. Babkin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 193—196).—B.p. curves for mixtures of H_3PO_4–HNO_3–H_2O are given for $p = 730$ mm. The partial pressures of HNO_3 are tabulated for mixtures containing 6—74% HNO_3. O. D. S.

Vapour–liquid equilibria of certain binary mixtures of terpenes. G. A. Rudakov and S. J. Korotov (J. Appl. Chem. Russ., 1937, **10**, 319—326).—B.p. and vapour composition are given for the systems camphene–*iso*bornyl acetate, –*iso*bornyl formate, –Δ³-carene, *iso*borneol–*iso*bornyl acetate and formate, α-pinene–Δ³-carene and –dipentene at 100 mm. R. T.

Equilibria in solutions. II. B.p. under atmospheric pressure and vapour composition of binary mixtures of dichloroethane with ethylene chlorohydrin or ethylene oxide. S. I. Kaplan, N. A. Grischin, and A. A. Skvortzova. **III. Solubility and vapour pressure of solutions of ethylene oxide in water or dichloroethane.** S. I. Kaplan and A. S. Reformatskaja (J. Gen. Chem. Russ., 1937, **7**, 538—544, 545—549).—II. The systems do not yield azeotropic mixtures.

III. Solubility and v.p. data are given for the range 0—20°. R. T.

System $POCl_3$–SO_2Cl_2. II. Vapour composition and pressure G. P. Lutschinski and A. I. Lichatscheva (J. Phys. Chem. Russ., 1937, **9**, 65—68; cf. A., 1936, 30).—V.p. at 0—60° are $>$ the vals corresponding with the linear law. The concn. of $POCl_3$ in the gas is always $<$ that in the liquid. E. R.

B.p.–composition diagram of the system dioxan–water. E. R. Smith and M. Wojciechowski (J. Res. Nat. Bur. Stand., 1937, **18**, 461—465).—There is a pronounced min. at 47—48 mol.-% dioxan, b.p. 87·82°. The normal b.p. of dioxan is 101·32°. F. J. G.

Calorimetry in binary liquid systems. (N. S. Kurnakov and N. K. Voskresenskaja (Bull. Acad. Sci. U.R.S.S., 1936, 439—466).—The heat of mixing when plotted against mol. composition gives sharp max. at 50% for the systems C_3H_5·CNS with piperidine and NHPhMe. $SnCl_4$ behaves similarly with HCO_2Et and with $PrCO_2Et$ although the max. at 33% $SnCl_4$ are less sharp. $SnCl_4$–EtOBz has a very flat max. $SnBr_4$ gives a sharp max., at 33% $SnBr_4$, with HCO_2Et and also with EtOAc at 50%. With $PrCO_2Et$ a very flat max. is found and a small heat effect observed with EtOBz. Et_2O–H_2SO_4 mixtures give a rounded max. at 50%. The results are compared with mol. vol. and viscosity changes in these systems. D. C. J.

Heat of mixing of di*iso*butylene and *iso*octane. W. D. Kennedy and G. S. Parks (J. Amer. Chem. Soc., 1937, **59**, 761—762).—Very small heat absorption occurs on mixing at 23°. The val. is a max. (12·1±1·0 g.-cal.) when the mixture contains 0·49 mol. of *iso*octane. E. S. H.

System water–sulphur trioxide. H. C. S. Snethlage (Chem. Weekblad, 1937, **34**, 320—321).—From a study of the rates of oxidation of $(CH_2·CO_2H)_2$ and $CH_2(CH_2·CO_2H)_2$ by CrO_3 in various concns. of H_2SO_4 at −40°, it follows that the hydrate $SO_3,3H_2O$ is the determining factor. S. C.

Metals and alloys. XXII. Alloy phases with the fluorite structure. E. Zintl, A. Harder, and W. Haucke (Z. physikal. Chem., 1937, **B**, **35**, 354—362; cf. this vol., 73).—The following alloy phases of the fluorite type have been examined: $AuAl_2$, $AuGa_2$ (*a* 6·063), $AuIn_2$ (*a* 6·502), $PtAl_2$ (*a* 5·910), $PtGa_2$ (*a* 5·911), and $PtIn_2$ (*a* 6·353 A.). $PtGa_2$ and $PtIn_2$ are stable only at higher temp. R. C.

Theory of the diffusion of solids. J. Cichocki (J. Phys. Radium, 1936, [vii], **7**, 420—426).—The speeds of inter-diffusion of two metals in contact have been calc. An exponential equation, similar in form to the empirical relation $D = Ae^{-b/T}$, has been derived and gives vals. in good agreement with experimental data. W. R. A.

Rates of diffusion in solid alloys. R. F. Mehl (J. Appl. Physics, 1937, **8**, 174—185).—A commentary on published data for diffusion in binary systems within single solid solution ranges, with special reference to alloys of Pb, Cu, Ag, and Au. C. R. H.

Occlusion and diffusion of hydrogen in metals. A metallographic study of nickel–hydrogen. G. A. Moore and D. P. Smith (Trans. Electrochem. Soc., 1937, **71**, Preprint 23, 249—267).—During electrolysis H_2 enters rolled Ni along fissured slip planes. H_2 in excess of that dissolved in the crystal lattice is retained in other fissures along planes parallel to the plane of rolling, *i.e.*, dodecahedral planes, increasing gas pressure subsequently enlarging the fissures. It is suggested that the presence of the Beilby surface layer, by acting as a non-return valve, facilitates the penetration of H_2 into the underlying metal. The nature of the metallographic changes produced by H_2 are discussed and the systems Pd–H_2 and Ni–H_2 compared. J. W. C.

Density and atomic volume of aluminium–zinc alloys. A. S. Fedorov (Ukrain. Chem. J., 1937, **12**, 61—63).—The curves exhibit a break at 40 at.-% Al. R. T.

Electron diffraction examination of Cu–Pt solid solutions obtained by precipitation. G. Natta and A. Giuriani (Gazzetta, 1937, **67**, 23—32; cf. this vol., 290).—Thin films of Pt deposited on Cu from H_2PtCl_6 solutions consist of solid solutions of Pt in Cu. The effect of varying the conditions of deposition on the composition of the solid solutions has been studied. O. J. W.

New type of solid solutions between metals. G. Natta (Gazzetta, 1937, **67**, 32—38).—Films of Pt deposited from H_2PtCl_6 solutions on Ag foil consist at first of solid solutions in which the lattice const. is the same as for Ag, viz., 4·08 A. This holds until the solutions contain $>$50 at.-% Pt. The lattice then contracts and the const. reaches a val. which is characteristic of the stable solid solutions. The change takes place in a few days at room temp., in a few hr. at 90°, and in a few sec. at ≮500°.

O. J. W.

Range of validity of the Hume-Rothery rule. H. Witte (Metallwirts., 1937, **16**, 237—245).—The range of existence of a no. of intermetallic compounds is plotted as a function of the valency electron concn. Phases of the γ-brass type agree better with the Hume-Rothery rule than those of the β-brass type. Compounds with a hexagonal dense-packed structure show considerable deviations. C. E. H.

Quantum theory of the electrical conductivity of alloys in the superlattice state. II. T. Muto (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 153—160; cf. A., 1936, 1332).—Theoretical.

H. J. E.

Iron–carbon constitutional diagram. I. Preliminary survey of the δ-region. F. Adcock (Iron and Steel Inst., April, 1937, Advance copy, 7 pp.).—A valve-energised high-frequency furnace has been used for the thermal analysis in vac. of the system Fe–0·003—1·01% C at 1550—1300°. The δ-phase is not formed in alloys containing >0·51% C. The data are compared with published results.

J. G. A. G.

Formation of the graphite eutectic in the iron–carbon alloy. T. Sato and S. Nishigori (Tetsu-to-Hagane, 1935, **21**, 887—895).—The eutectic reaction in the pure Fe–C system (C 3·54—4·85%) takes place in two steps, differing by 7—10°. The change at the higher temp. is due to formation of the austenite–graphite eutectic and that at the lower to the austenite–Fe_3C eutectic. Ch. Abs. (*e*)

Alloys of iron. XII. The β_M transformation in manganese-rich iron–manganese alloys. M. L. V. Gayler and C. Wainwright (Iron and Steel Inst., April, 1937, Advance copy, 5 pp.).—Experiments with 71% and 74% Mn–Fe alloys show that the β-Mn phase can exist in a metastable state at temp. < that at which the $\alpha \rightarrow \beta$ transformation occurs on heating. Discrepancies between published results (A., 1933, 1008; 1936, 1061) are thereby explained.

J. G. A. G.

Etching and microscopical investigation of phases in the copper–zinc system. J. L. Rodda (Amer. Inst. Min. Met. Eng. Tech. Publ. No. 746, 1936, 5 pp.).—The γ and ε phases are identified by anodic etching in 17% chromic acid. At c.d. >1·5 amp. per sq. cm. γ is attacked and ε unattacked. The reverse occurs at low c.d., and η is attacked under both conditions. The α and β phases are identified by their natural colours. R. B. C.

Transformations in copper–aluminium eutectoid alloys. I. Intermediate stages in the hypereutectoid alloys. G. Kurdjumov and T. Stelletki (Tech. Phys. U.S.S.R., 1935, **2**, 3—16).—Alloys with 10—15% Al were quenched from 600—950° and examined by the Debye–Scherrer method. With <13% Al the β phase changes to β'; with >13% Al it changes to a γ' phase, which decomposes in two steps. Decomp. starts at 300° and proceeds to a limit with formation of γ. The remaining γ' decomposes only on heating to 425—450°, forming $\alpha + \gamma$. On quenching hypereutectoid alloys (I) in a salt bath above 300°, some γ is pptd. from the β phase, the remainder of which is stable below 425°. On cooling (I) quickly below 300° the γ phase is not pptd., and the β phase changes to γ' at 170—200°. The $\beta \rightarrow \gamma'$ transformation is irreversible and comparable with the austenite–martensite transformation in steels. Ch. Abs. (*e*)

Abnormal phenomena of cast copper-rich antimony–copper alloys during heating. Y. Tanaka and M. Iio (J. Chem. Soc. Japan, 1935, **56**, 1293—1300).—With decrease of Sb the abnormal thermal expansion near 460° and 490° decreases. The limit of the solid solubility of Sb at 470° is 9·5—9·75%.

Ch. Abs. (*e*)

Abnormal phenomena of cast copper-rich magnesium–copper alloys during heating. E. Koizumi and T. Kawaguchi (J. Chem. Soc. Japan, 1935, **56**, 1300—1304).—The alloy with 0·8% Mg shows abnormal expansion near 550°.

Ch. Abs. (*e*)

Ferromagnetic Curie points and the saturation of some nickel alloys. V. Marian (Ann. Physique, 1937, [xi], **7**, 459—527).—A new apparatus for measuring Curie points at low temp. is described. For binary alloys of Ni with Cu, Zn, Al, Ti, Sn, V, Sb, Cr, Mo, Mn, Pd, Pt, and Au the Curie point is lowered as solute increases. The variation with composition, apart from the parabolic curve for Ni–Pd, is linear and this is also true for the variation with at. moment, except for Ni–Mn and Ni–Pd. The curves run approx. parallel. The alloys which correspond with a Curie point at 0° abs. and those which correspond with zero at. moment are in most cases identical; the slope of the at. moment curve $\propto$ the no. of outer electrons in the added metal. N. M. B.

Thermochemical effects in the formation of eutectoids of binary alloys. R. Chatelet (Compt. rend., 1937, **204**, 1246—1248).—Thermochemical effects relating to the system Fe–C have been examined. R. S. B.

Ternary system aluminium–magnesium–zinc. III. Section $Mg–Al_3Mg_4–Al_2Mg_3Zn_3–MgZn_2–Mg$. W. Köster and W. Dullenkopf (Z. Metallk., 1936, **28**, 363—367; cf. this vol., 73).—This section contains five primary crystallites, *viz.*, ε, δ, ζ, η, and a ternary compound (T), and shows three four-phase reactions: (*a*) liquid (Al 13, Mg 49%) + δ (Al 39, Mg 49%) $\rightleftharpoons$ ε (Al 3·5, Mg 91%) + T (Al 20, Mg 27%) at 363°, (*b*) liquid + T (Al 18·5, Mg 26·5%) $\rightleftharpoons$ $\varepsilon + \zeta$ at 342°, (*c*) liquid + $\eta \rightleftharpoons \zeta + T$ at 354°. The equilibria in the Mg–Al–Zn system are shown in a ternary diagram, a space model, and various sections through the latter. A. R. P.

Chemical properties of metallic compounds. III. Aluminium–silicon solutions. J. A. Kljatschko (J. Gen. Chem. Russ., 1937, **7**, 492—498).—Silumins are shown to be equilibrium mixtures originating from the reversible reaction Al + Si $\rightleftharpoons$ Al silicides. R. T.

Relations between solid solutions formed by ferrous sulphide. A. Michel (Compt. rend., 1937, 204, 1066—1068; cf. this vol., 23).—Solid solutions of FeS with $>1\%$ of Te, Ti, or W are of the pyrrhotine type. Solutions of the FeS type, possessing higher ferromagnetism and a lower Curie point than FeS, are formed with Mn, Fe, Co, Ni, Cu, Zn, Ag, Cd, Sb, Pb, and Bi. The limiting solid solutions contain 3, 6, or 18 mols. of FeS per mol. of added element, according as the latter is uni-, bi-, or ter-valent, respectively. The two types of solid solution probably correspond with different arrangements of the S lattice. A. J. E. W.

Experiment on a ternary system of liquids. A. A. Vernon and B. Brown (J. Chem. Educ., 1937, **14**, 143—144).—Equilibrium in the system $PhNO_2$–AcOH–H_2O is described. L. S. T.

Solubility of indium in mercury from 0° to 50°. W. G. Parks and W. G. Moran (J. Physical Chem., 1937, **41**, 343—349).—The solubility can be represented by $-\log N = 53{\cdot}57/T + 1{\cdot}714$, where N is the wt. fraction of In in the saturated amalgam. The solubility suggests that In has an internal pressure approx. equiv. to that of Pb. C. R. H.

Solid solubility of elements of sub-group Vb in copper. J. C. Mertz and C. H. Mathewson (Amer. Inst. Min. Met. Eng. Tech. Publ. No. 747, 1936, 20 pp.).—Previous work on the solubilities of P, As, Sb, and Bi in Au is reviewed. New data derived from *X*-ray measurements are given for P, As, and Sb. R. B. C.

Solubility of magnesium in the chlorides of magnesium, potassium, and sodium. A. I. Shurin (Metallurg, 1935, **10**, No. 4, 87—99).—Mg was heated in a steel bomb with $MgCl_2$, $MgCl_2$ + NaCl, and $MgCl_2$ + KCl at 800—1300° for 2·5 hr. and quenched, and the products were analysed. The solubility of Mg in $MgCl_2$ at 900° is 0·3%. It is much less in $MgCl_2$ + NaCl, and less still in $MgCl_2$ + KCl. Ch. Abs. (*e*)

Solubility of silver chloride in aqueous solutions of hydrochloric acid and alkaline chlorides. A. Pinkus and (Mlle.) A. M. Timmermans (Bull. Soc. chim. Belg., 1937, **46**, 46—73).—The form of the solubility curves for AgCl in LiCl and in HCl is similar to that previously found for NaCl and KCl (cf. this vol., 128). The min. solubilities, determined Tyndallometrically, occur in 0·003 mol. solutions; the val. for NaCl and KCl is $3{\cdot}63 \times 10^{-7}$, for LiCl $4{\cdot}17 \times 10^{-7}$, and for HCl $4{\cdot}47 \times 10^{-7}$ mol. of AgCl per litre. The higher val. for the min. solubility in NaCl and KCl now obtained is attributed to part of the AgCl being in colloidal solution. In more conc. chloride solutions, where solubility is principally due to complex formation, the differences between the two sets of data diminish. C. R. H.

Solubility of silver acetate in mixed solvents and the incomplete dissociation of ternary electrolytes. F. H. MacDougall and W. D. Larson (J. Physical Chem., 1937, **41**, 417—429).—The solubility of AcOAg in aq. $COMe_2$ at 25° decreases with increase in [$COMe_2$] between 10% and 20% $COMe_2$. Nitrates increase the solubility, the effect being in the order $KNO_3 < NaNO_3 < Sr(NO_3)_2 < Ca(NO_3)_2$. The Debye–Hückel equation is valid up to high ionic strengths of KNO_3 and $NaNO_3$, but the increased solubility in presence of $Sr(NO_3)_2$ and $Ca(NO_3)_2$ is attributed to the incomplete ionisation of $Sr(OAc)_2$ and $Ca(OAc)_2$ with formation of $AcOSr^{\cdot}$ and $AcOCa^{\cdot}$. The ionisation consts. for $AcOSr^{\cdot}$ and $AcOAc^{\cdot}$ calc. from the solubility data are respectively 0·34 and 0·15 in H_2O; 0·12 and 0·094 in 10%, 0·087 and 0·058 in 20%, 0·037 and 0·019 in 30%, $COMe_2$. Equations are derived, based on Born's theory, which relate satisfactorily the equilibrium consts. to the dielectric consts. of the solvents. C. R. H.

Solubilities of barium and strontium carbonates in aqueous solutions of alkali chlorides. R. W. Townley and W. B. Whitney [with W. A. Felsing] (J. Amer. Chem. Soc., 1937, **59**, 631—633).—Solubility data at 25° and 40° for $BaCO_3$ and $SrCO_3$ in H_2O and aq. LiCl, NaCl, and KCl are recorded. The activity coeffs. of $BaCO_3$ and $SrCO_3$ in the chloride solutions and their average heats of dissolution in the saturated solutions have been calc. E. S. H.

Acid salts of monobasic organic acids. III. J. D. M. Ross, T. J. Morrison, and C. Johnstone (J.C.S., 1937, 608—614; cf. A., 1933, 1013; 1936, 937).—Solubility data relating to the mandelates at 25° are given for Li, Na, K, NH_4, Rb, Cs, Tl, Mg, Ca, Sr, and Ba salts. A. J. M.

Solubility of semicarbazones in dilute hydrochloric acid. F. B. La Forge and H. L. Haller (J. Amer. Chem. Soc., 1937, **59**, 760—761).—Semicarbazones can be divided into two groups, according to their solubility in dil. HCl. The sol. members include the semicarbazones of pyrethrone, di- and tetra-hydropyrethrone, and tetrahydropyrethrolone; the insol. semicarbazones include those of pyrethrolone, pyrethrin, and hexahydropyrethrone. Their separation by solubility methods is discussed. E. S. H.

Equation of solubility of hydrates. J. Perreu (Compt. rend., 1937, **204**, 1037—1039).—The Le Chatelier equation is applicable to aq. solutions of NaCl and Na_2CO_3. Thermal and v.p. data for solutions of $H_2C_2O_4,2H_2O$ confirm the authors' equation for the solubility of hydrates (A., 1934, 249). A. J. E. W.

Dissociating power of chlorinated hydrocarbons. J. P. W. A. van Braam Houckgeest (Chem. Weekblad, 1937, **34**, 318—320).—The solubilities of NEt_4I, NPr_4Br, and NPr_4I have been determined at 25° in $(CH_2Cl)_2$, $CHMeCl_2$, $CH_2Cl{\cdot}CHCl_2$, $CMeCl_3$, $(CHCl_2)_2$, $CH_2Cl{\cdot}CCl_3$, $CHCl_2{\cdot}CCl_3$, $Pr^{\beta}Cl$, $Bu^{\gamma}Cl$, and PhCl, and the significance of the results is discussed in relation to Walden's views on the influence of dipole moments, dielectric const., etc. on solubility. S. C.

Partition of deuterium between methyl alcohol and water. G. Okamoto (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 211—216).—Only the H in the OH group of MeOH enters into an exchange reaction on shaking at 0° with a H_2–D_2 mixture in presence of Pt-black. When the Me is combined with I the resulting MeI yields H_2O of normal *d* on combustion. Data for the above equilibrium, and for that between H_2O and D_2 at 20°, are recorded. H. J. E.

Theory of the Freundlich adsorption isotherm. J. Zeldovitsch (Acta Physicochim. U.R.S.S., 1935, **1**, 961—974).—A mathematical interpretation of deviations from the adsorption isotherm $q = Cp^{1/n}$ is discussed, and relations between temp. and the consts. C and n are derived. C. R. H.

Adsorption of gases by lead chloride spheres. F. Durau and R. Müller (Z. anorg. Chem., 1937, **232**, 133—154).—Adsorption isotherms have been obtained for N_2, C_2H_6, CH_4, C_2H_2, N_2O, H_2, and CO at 20° and for C_3H_8 at 20°, −15°, and −45°. Adsorption is small in all cases; for H_2, N_2, CO, and CH_4 it is hardly measurable. It is greatest with C_3H_8, where 5·2% of the $PbCl_2$ surface (as determined by the radioactive method) is covered with a unimol. layer. E. S. H.

Heat of adsorption of gas by carbon at low temperature (−183°). R. Lepointe (J. Phys. Radium, 1936, [vii], **7**, 469—472).—The large initial evolution of heat which accompanies the adsorption of H_2 by charcoal is due to the formation of an exothermic, stable surface-compound which is unaffected by heat but may be destroyed by saturation of the charcoal with O_2 (after a few experiments HNO_3 is required); other gases give a smaller evolution of heat which is approx. ∝ the vol. of gas adsorbed. The modification of the surface in the formation of the compound does not affect the adsorbing power of the charcoal. F. J. L.

Kinetics of activated sorption of hydrogen on chromic oxide gel. L. Clarke, L. S. Kassel, and H. H. Storch (J. Amer. Chem. Soc., 1937, **59**, 736—740).—Theoretical. The data of Burwell and Taylor (A., 1936, 791) are analysed on the basis of a process involving primary adsorption followed by diffusion to secondary centres. A rate equation which fits the data for moderate amounts of sorption has been derived. E. S. H.

Rate of sorption of water vapour on silica gel and iron–silica gel. W. A. Patrick and L. H. Cohan (J. Physical Chem., 1937, **41**, 437—443).—Measurements have been made at 25° in absence and in presence of permanent gases. The rate of absorption on SiO_2 is independent of the permanent gas when the partial pressure of the latter is $<0{\cdot}5$ mm. Hg. At higher partial pressures the rate of absorption is inversely ∝ the pressure and to the mol. wt. of the permanent gas. Desorption data support the view that the inert gas resists the diffusion of H_2O vapour in the vapour phase around the gel, since the rate of desorption is independent of the gas present except when only the last traces of H_2O are present, in which case the rate is inversely ∝ the pressure and to the mol. wt. of the gas. This latter effect is possibly due to gas trapped in the capillaries of the gel thereby hindering H_2O desorption. It is more noticeable with Fe–SiO_2 gel than with SiO_2 gel. C. R. H.

Adsorption of arsenic trioxide by various silica gels. M. S. Charmandarian and E. L. Kapelevitsch (J. Phys. Chem. Russ., 1936, **8**, 929—932).—Adsorption by various samples of SiO_2 has been measured between 350° and 450°. J. J. B.

Kinetic–radioactive investigations on the active surface of crystalline powders. L. Imre (Trans. Faraday Soc., 1937, **33**, 571—583; cf. this vol., 25).—The area of the active part of the surface of pptd. PbI_2, $PbSO_4$, and $PbCrO_4$ has been calc. from determinations of the adsorption of $Pb(NO_3)_2$, and by measuring the rate of incorporation of Th-B. In those cases ($PbSO_4$ and $PbCrO_4$) where the adsorption was great enough to be directly measured the results obtained by the two methods agree. The radioactive method is specially adapted to fixing the limits of "real" (as distinct from exchange) adsorption. F. L. U.

Adsorptive properties of colloidal ferric oxide. E. I. Rudenko and V. I. Nikolaev (Bull. Acad. Sci. U.R.S.S., 1936, 1045—1052).—Colloidal $Fe(OH)_3$ adsorbs all the solutes of natural salines, except $Ca^{\cdot\cdot}$ and $Mg^{\cdot\cdot}$. The adsorbent–adsorbate complex does not yield FeS with H_2S. R. T.

Sorption of lime from solution by quartzites. S. L. German (J. Appl. Chem. Russ., 1936, **9**, 2127—2133).—The sorption of $Ca(OH)_2$ by SiO_2 agrees with Freundlich's equation; the process is, however, supposed to involve chemical combination, since elution cannot be effected. R. T.

Sorption of lime from solution by quartzites. S. L. German (Ukrain. Chem. J., 1937, **12**, 77—86).—The rate of adsorption of $Ca(OH)_2$ by SiO_2 varies with the structure and grain size of a given quartzite. R. T.

Asymmetric adsorption of complex salts on quartz. R. Tsuchida, M. Kobayashi, and A. Nakamura (J. Chem. Soc. Japan, 1935, **56**, 1339—1345).—Asymmetric adsorption has been studied by immersion of finely powdered *d*- and *l*-quartz into racemic complex salt solutions. The *d*-quartz powder adsorbs *l*-[Co en$_3$]Br, *d*-[Co en$_2$(NH$_3$)Cl]Br$_2$, *d*-[Co en$_2$Cl$_2$]Cl, *d*-[Co(C$_2$O$_4$)$_3$]K$_3$, *d*-[Co dg(NH$_3$)Cl], and *d*-[Co{Co(NH$_3$)$_4$(OH)$_2$}$_3$]Cl (dg = dimethylglyoxime). Ch. Abs. (*e*)

Adsorption of strong electrolytes by coppered charcoal. K. Volkov and D. Strashesko (Bull. Sci. Univ. Kiev, 1936, **2**, 129—141).—The adsorptive capacity for $H^{\cdot}$ rises with the Cu content (0—35%); adsorption of Cl' from aq. NaCl is at a max. for 5% Cu. The adsorptive capacity for OH' is very low. R. T.

Sorption of deuterium oxide by cellulose. T. King and C. Ouellet (Canad. J. Res., 1936, **14**, **B**, 444—449).—The sorption of D_2O vapour by cellulose has been measured over the range −25° to 23·4°. The curves for D_2O and H_2O are closely similar, and at any given relative v.p. the ratio of the sorbed wts. of D_2O and H_2O is approx. ∝ (mol. wt. D_2O)/(mol. wt. H_2O). A permanent increase (0·6—0·9%) in the wt. of the dry cellulose observed after desorption is attributed to an exchange reaction. F. L. U.

Adsorption of arsenic trioxide by clays. N. A. Schipinov (Kolloid. Shurn., 1936, **2**, 403—408).—Above 8—12 millimols. per litre the adsorption is negative. J. J. B.

Base-exchanging properties of synthetic alumino-silicate materials. J. R. Patton and

J. B. Ferguson (Canad. J. Res., 1937, **15**, **B**, 103—112; cf. B., 1936, 986).—The base exchanges between $Na^{\cdot}$ and $Ca^{\cdot\cdot}$, and $Na^{\cdot}$ and $Ba^{\cdot\cdot}$, have been studied for Doucil gel at 9—21° using as anions Cl′, OAc′, and NO_3'. The Ca content of the gel is less using OAc′ than with Cl′ and NO_3', and increases with temp. for conc. solutions. It is difficult to disentangle the influence of gel capacity and cation content from the results, which do not agree with the equation of Rothmund and Kornfeld (A., 1920, ii, 36). At const. anion normality $1/E$ (E = milliequivs. of entering cation in final gel) is a linear function of $1/P$ (P = equiv. % of cation in final solution). R. S. B.

Adsorption of amino-acids and other nitrogenous substances from aqueous extracts. H. Fuchs (Z. physiol. Chem., 1937, **246**, 278—279).—It is shown that NH_2-acids, sarcosine, taurine, creatinine, choline, and glycocyamine are effectively (>50%) adsorbed by "acid" adsorbents ("frankonite-KL" and Lloyd's reagent) from $0{\cdot}01M$ solutions in 5 wt.-% H_2SO_4. The absorption is > that by "neutral" adsorbents (*e.g.*, fuller's earth). The adsorbed material is recovered by elution with saturated aq. $Ba(OH)_2$. F. O. H.

Adsorption on foam. F. Schütz (Nature, 1937, **139**, 629—630).—A technique for increasing the concn. of capillary-active substances is described. Cholic acid can be separated from its Na salt by this method. The foam has a temp. > that of the liquid from which it is produced, an effect which appears to be an essential condition for the formation of any foam. L. S. T.

Theory of surface tension of aqueous solutions of inorganic acids. K. Ariyama (Bull. Chem. Soc. Japan, 1937, **12**, 109—113).—The anomalous increase in γ of H_2O produced by addition of inorg. acids is quantitatively explained by H-bond formation at the surface. F. R. G.

Theory of surface tension of ternary solutions. K. Ariyama (Bull. Chem. Soc. Japan, 1937, **12**, 114—116).—The author's views (this vol., 76 and preceding abstract) are confirmed by vals. recorded by Belton (A., 1935, 1316; this vol., 76). F. R. G.

Rapid method for determining the lowering of tension of exposed water surfaces; surface tension of the sea and of inland waters. N. K. Adam (Proc. Roy. Soc., 1937, **B**, **122**, 134—139).—The behaviour of drops of a non-spreading heavy oil containing different amounts of a spreading substance ($Me{\cdot}[CH_2]_{11}{\cdot}OH$) has been examined. These solutions are calibrated by reference to solutions of known σ; the accuracy is approx. 1 dyne per cm. For H_2O from the sea and rapidly flowing rivers σ is normal, except in and near harbours, sewage outfalls, etc., where it may be lower by 20 dynes per cm. F. A. A.

Surface tension of aqueous solutions of cyanamide and carbamide. A. Wiadrowski (Przemysł Chem., 1936, **20**, 245—246).—The σ of H_2O is lowered by both substances. R. T.

Surface tension of simple mixtures. V. K. Sementschenko, A. F. Gratscheva, and E. A. Davuidovskaja (Sotzial. Rekons. Nauk., 1935, No. 5, 159—160).—In ternary mixtures the surface tension at 0—80° does not depend on the concn. of any one component, and cannot, therefore, serve to show the presence of a particular component. Ch. Abs. (*e*)

Influence of surface impurities on measurements of the interfacial tension. E. Vellinger and A. Grégoire (Bull. Soc. chim., 1937, [v], **4**, 716—717).—Data are recorded for the interfacial tension between a pure hydrocarbon oil layer and a H_2O layer contaminated with mineral oil, and having a surface tension of 55—73 dynes per cm. H. J. E.

Electric charge at an oil–water interface. W. C. M. Lewis (Trans. Faraday Soc., 1937, **33**, 708—713).—The max. charge density at the interface H_2O–org. liquid is calc. on the assumption that the energy of the condenser formed by the Helmholtz double layer can be measured by the adhesional work at the interface. The vals. so obtained (4—6×10^4 e.s.u. per sq. cm.) lead to a reasonable val. for the capacity of the double layer, in approx. agreement with that furnished by electrocapillary data for a Hg–aq. electrolyte interface. F. L. U.

Interfacial tensions of some mercury–hydrocarbon oil systems. J. L. Culbertson and F. A. Hedman (J. Physical Chem., 1937, **41**, 485—491).—The interfacial tensions, γ, between Hg and refined white oils between 25° and 125° decrease approx. linearly with rise of temp. Unrefined motor oils show at first a sharp decrease in γ with rise of temp., then a temp. range of almost const. γ, followed by a further decrease in γ. The presence of adsorbable components in the unrefined oils is considered to afford an explanation of their behaviour. C. R. H.

Effects of traces of metallic ions on films at interfaces and on the surface of water. R. J. Myers and W. D. Harkins (Nature, 1937, **139**, 367—368).—Traces of Ca, Cu, and Zn affect considerably the properties of surface films, and, apart from experiments in a strongly acid solution, previous results reported are probably vitiated by such contamination. Quartz or very heavily paraffined glass troughs and very pure salts should be used in all future work. L. S. T.

Relations between surface p_H, ion concentrations, and interfacial tension. J. F. Danielli (Proc. Roy. Soc., 1937, **B**, **122**, 155—174).—Data are given for the influence of p_H on the lowering, by long-chain fatty acids, of the interfacial tension, γ, at the PhBr–H_2O interface; with increase of p_H, γ is lowered. Dilution of the buffer solutions with H_2O displaces the curves along the p_H axis; dilution with neutral salt solutions (cation concn. kept const.) produces little or no effect. $Ca^{\cdot\cdot}$ added to alkaline solutions produces marked rises in γ. From the results it is calc. that the p_H at an interface may differ by ± 2 p_H units from that of the bulk aq. phase (*e.g.*, physiological salt solutions). F. A. A.

Validity of Traube's rule for liquid–liquid interface. S. Boas-Traube and M. Volmer (Z. physikal. Chem., 1937, **178**, 323—335).—The rule is valid for the surface activity of the first six members of the fatty acid series at a C_6H_6–H_2O interface. Application of Szyszkovski's surface tension equation shows that the space occupied by fatty acid mols. at this interface is only from one third to a half of that occupied at an air–H_2O interface. At the interface and in the aq. phase the acids are present as single mols., but in C_6H_6 the higher members are present as double mols. R. C.

Spreading of liquids on filter-paper. I. K. Prosad and B. N. Ghosh (Kolloid-Z., 1937, 79, 19—29; cf. A., 1934, 840).—The formula previously deduced for the rate of spreading of single drops has been confirmed by measurements on 21 liquids. The consts. in the formula appear to be systematically related to the chain length of unbranched aliphatic compounds, but in other cases depend also on structure. F. L. U.

Effects of traces of metallic ions on monolayers. J. S. Mitchell, E. K. Rideal, and J. H. Schulman (Nature, 1937, 139, 625—626; cf. this vol., 300).—Traces of metallic impurities, especially of Cu or Ni, can play a predominating part in chemical reactions occurring in unimol. films. The electrical potential at phase boundaries may also be affected. Examples are quoted in illustration of these effects, which are probably of great biological significance. L. S. T.

Effects of traces of metallic ions on monolayers. C. Robinson (Nature, 1937, 139, 626; cf. preceding abstract).—The interfacial tension between oil and H_2O in presence of the Na salts of long-chain acids is markedly lowered by traces of metallic ions present as impurities in distilled H_2O. The effect of salts in lowering the interfacial tension of oil depends primarily on the valency of the cation. L. S. T.

Unimolecular layers. I. Use of an electrometric valve for the measurement of variations in the air–liquid contact potential. D. G. Dervichian and C. O'Ceallaigh. **II. Direct registration of the electric effect of unimolecular layers.** D. G. Dervichian (J. Phys. Radium, 1935, [vii], 6, 427—428, 429—432).—I. Rapid registration of variations in contact potential can be obtained by the use of a valve electrometer.

II. The surface tension and contact potential of the film are registered simultaneously. O. D. S.

Oxide films on copper and iron. U. R. Evans and H. A. Miley (Nature, 1937, 139, 283).—New electrical measurements of the thickness of oxide films responsible for interference colours on Cu and Fe show good agreement with vals. obtained optically, and in the case of Fe by gravimetric methods also. The rapid growth of invisible oxide on Cu in a desiccator at 18° or in a furnace at 62° has been measured by the electrical method. L. S. T.

Thickness of oxide films on iron. H. A. Miley (Iron & Steel Inst. Carnegie Schol. Mem., 1936, 25, 197—212).—New vals. have been obtained for the thickness of the oxide films responsible for the interference colours on Fe, by measuring the millicoulombs needed for their cathodic reduction. The method has been used to measure the O_2 uptake at room temp. Vernon's observation that no bright colours appear on Fe below 200° is confirmed. It is believed that the oxide formed below 200° is γ-Fe_2O_3 (cubic), whilst that formed above 200° is α-Fe_2O_3 (hexagonal); if the γ-Fe_2O_3 is in optical continuity with the Fe base (cubic), it will afford no adequate lower reflecting surface, whereas if the α-Fe_2O_3 is crystallographically discontinuous with the base, it will provide the conditions necessary for interference. A. J. K.

Photo-electric Schottky effect in films of sodium and potassium on tungsten. R. C. L. Bosworth (Trans. Faraday Soc., 1937, 33, 590—596; cf. A., 1936, 793).—The surface diffusion properties of films of K and Na on W have been examined in the light of Langmuir's patch theory of the Schottky effect. For K films, whether dil. or conc., formed by condensation, the variation of the photo-electric emission under white light is in accordance with the Schottky theory, whilst for dil. films formed by evaporation the variation is far greater and indicates heterogeneity of the film. Dil. Na films give a Schottky coeff. of 2—3 times the normal val. calc. from the image field of an electron escaping from the surface. F. L. U.

Elasticity of thin films in relation to cell surface. E. N. Harvey and J. F. Danielli (J. Cell. Comp. Physiol., 1936, 8, 31—36).—Measurements of γ and elasticity made on bubbles of soap, lecithin, egg-white, and various mixtures of these show that only films containing protein have elastic properties. M. A. B.

Influence of surface layers of insoluble substances on the velocity of evaporation of water. M. Baranaev (J. Phys. Chem. Russ., 1937, 9, 69—76).—The velocity of evaporation of H_2O has been measured in the presence of monolayers of lauric, palmitic, stearic, and oleic acids, of palmitonitrile, hexadecyl acetate, and cetyl alcohol. For "condensed" layers $\log w_0/\log w = \text{const.} \times \sigma/T$ (w_0 is velocity of evaporation of pure H_2O, w that of H_2O in presence of a monolayer corresponding with the surface tension σ). The largest effect is shown by cetyl alcohol ($w_0/w = 1820$) and the effect of "stretched" monolayers is much smaller than that of "condensed" layers. A formula is derived on the assumption that evaporation takes place through "holes" in the monolayers. E. R.

Physical properties of chlorophyll films. E. A. Hanson (Proc. K. Adad. Wetensch. Amsterdam, 1937, 40, 281—285).—The smallest area of the chlorophyll-$a + b$ mol. occurring in films on solutions of p_H 4·4 is 106 A., indicating that the coloured nucleus may be a plane structure. This is supported by the strong *X*-ray refraction line corresponding with a period of 4·2 A. Owing to hydration, the mol. surface area increases from 106 to 123 A.^{2} when the p_H increases from 4·4 to 8·5. At high p_H vals., mol. area–pressure curves indicate that dehydration by pressure occurs discontinuously. Below p_H 4·4 the Mg is replaced by H, forming phæophytin, which has a larger surface and a higher tolerated pressure than chlorophyll at p_H 4·4. J. W. S.

Phosphatide auto-complex coacervates as ionic systems and their relation to the protoplasmic

membrane. II. H. G. B. de Jong and G. G. P. Saubert (Proc. K. Acad. Wetensch. Amsterdam, 1937, **40**, 295—301; cf. A., 1935, 1321).—The previously postulated interactions between hydrocarbon chains of fatty acids and sensitiser mols. have been confirmed experimentally. The double film conception is extended to embrace zwitterion–cation–anion double films (this vol., 39) which account for the condensing action of suitable bivalent cations, *e.g.*, $Ca^{\cdot\cdot}$. J. W. S.

Optical contact. (Lord) Rayleigh (Proc. Roy. Inst., 1937, **29**, 432—440).—A lecture.

Interpretation of osmosis and osmotic pressure. A. Thiel (Z. physikal. Chem., 1937, **178**, 374—388).—The bombardment theory of osmotic pressure, P, is rejected. The usual equation connecting P and v.-p. depression can be derived by regarding P as a suction which must be applied to the solvent to reduce its v.p. to that of the solution, and prevent osmosis. It is impossible for any non-volatile solute to exert a thermal pressure on a semipermeable membrane. The properties of such membranes are best explained by supposing that the solvent passes through in the mol. dispersed state. R. C.

Osmotic anomalies in the system water–ethyl acetate–salt. N. V. Saposhnikova and S. G. Linetzkaja (J. Phys. Chem. Russ., 1936, **8**, 943—952).—From f.p. data for aq. solutions of EtOAc + KCl, NaCl, Na_2SO_4, $MgCl_2$, $MgSO_4$, and $BaCl_2$ average ionic radii have been calc. J. J. B.

Dependence of osmotic pressure in solutions of high-molecular substances on concentration. O. Kratky and A. Musil (Österr. Chem.-Ztg., 1937, **40**, 144—147).—The rapid increase of the relative osmotic pressure P/c with c in dil. solutions of high mol. wt. substances with thread-like mols. is explicable without recourse to supplementary osmotic effects or to large solvent envelopes, if the expression for P contains a term or terms representing the interaction of solute and solvent mols., such interaction being assumed $\propto$ the total chain length rather than to the no. of macromols. Using an expression formally analogous to that of Ostwald (A., 1932, 570) the theory is developed in a semiquant. manner. F. L. U.

Constants of ebullioscopy. C. S. Hoyt and C. K. Fink (J. Physical Chem., 1937, **41**, 453—456).—Ebullioscopic consts., K_b, for 18 solvents calc. on the basis of Rosanoff and Dunphy's equation agree with vals. calc. from the usual thermodynamic equation, provided the gas const. in the latter is corr. by the Berthelot equation. The average decrease in the val. of K_b for each 1 mm. decrease in atm. pressure is 0·025. C. R. H.

Density and molecular volume in solution. I. Method of density measurement and the molecular volume of dissolved carbamide. O. K. Skarre, S. G. Demidenko, and A. E. Brodski (Acta Physicochim. U.R.S.S., 1937, 6, 297—305).—A differential pyknometric method is described which permits d to be measured to $\pm 1 \times 10^{-6}$. d^{25} has been determined for KCl and for $CO(NH_2)_2$ solutions. The difference in variation of mol. vol. with concn. for these two compounds is in accord with theory. J. W. S.

Partial molar volume of water and deuterium oxide in dioxan solution. R. A. Robinson and R. P. Bell (Trans. Faraday Soc., 1937, **33**, 650—652).—In view of the possibility that the observed relation of the mol. vols. of liquid D_2O and H_2O $(D_2O > H_2O)$ may be due to the pseudo-cryst. structure of H_2O, the apparent mol. vol. (ϕ) of each compound dissolved in dioxan, in which such effects would be eliminated, has been determined. Over a range up to 17 mol.-% the ϕ of D_2O is about 0·5% $<$ that of H_2O, in agreement with theory. F. L. U.

Diamagnetism of solutions of iodine. C. Courty (Compt. rend., 1937, **204**, 1248—1250).—The magnetic susceptibility of I has been examined in 1—20% solutions of I in Et_2O, CS_2, PhMe, $CHCl_3$, CCl_4, and C_6H_6. Deviations from additivity are greatest for the red and red-brown, and least for the violet, solutions. R. S. B.

Individuality of osmotic behaviour of alkali carbonates. F. Ender (Z. Elektrochem., 1937, **43**, 234—238).—The mol. f.-p. depression and osmotic coeff. of K_2CO_3 are $>$ those of Na_2CO_3 over the whole concn. range. The parallelism between osmotic coeff., solubility, and heat of dissolution is discussed in relation to the hydrophilic properties of the dissolved ions. E. S. H.

Abnormal vapour pressures in potassium chloride solutions. H. N. Parton (Trans. Faraday Soc., 1937, **33**, 617—623).—V.p data obtained (1) by calculation from the measured activities of KCl, (2) directly, and (3) by Hill's thermopile method are shown to be consistent, and afford no evidence of the abnormalities reported by Weir (A., 1936, 678). F. L. U.

***X*-Ray diffraction and electrolytic dissociation. I. Sulphuric acid and sulphates.** R. S. Krishnan (Proc. Indian Acad. Sci., 1936, **4**, **A**, 661—666).—Pure H_2SO_4 gives only one sharp intense *X*-ray diffraction max., with very little scattering on either side. On dilution with H_2O the ring becomes broader and more diffuse until 50% H_2SO_4 gives only a bright corona surrounding the central spot, the edge of the corona corresponding with the outer edge of the H_2O-ring. With further dilution, the halo again appears, and in very dil. solutions its max. coincides with that of H_2O. 34% aq. $KHSO_4$ shows the same pattern as 30% H_2SO_4, whilst 10% aq. $KHSO_4$ or 20% aq. K_2SO_4 or Li_2SO_4 gives patterns similar to those of very dil. H_2SO_4. The results are explained on the basis of the two-stage dissociation of H_2SO_4 in H_2O, observed in Raman spectra. J. W. S.

Viscosity and plasticity of disperse systems. I. M. P. Volarovitsch (Kolloid. Shurn., 1936, **2**, 557—560).—Vals. are recorded for clay, dough, peat, soap, and printing-ink. J. J. B.

Pyrosols. E. Heymann (J. Proc. Austral. Chem. Inst., 1937, **4**, 38—51).—A lecture (cf. A., 1930, 286, 992; 1935, 1063). F. L. U.

Synthesis of hydrosols of sparingly soluble salts by electrolysis. Hydrosols of copper arsenate and copper arsenite. B. Zaprometov and Z. Kamsolova (Kolloid. Shurn., 1936, **2**, 577—588).—The sols have been prepared by electrolysis of $0\cdot005N$-Na_3AsO_4 or -Na_3AsO_3 with a Cu anode at 80°. They are negative. Positive Cu arsenate sols are formed when Cu salts are electrolysed with a $Zn_3(AsO_4)_2$ cathode. All the sols may be used as insecticides for plants. J. J. B.

Heterogeneous chemical reactions under the silent electric discharge. XV. Preparation of colloidal solutions. IV. S. Miyamoto (J. Chem. Soc. Japan, 1935, **56**, 1359—1364).—Hydrosols and alcosols of Cu_2O were prepared from $CuSO_4$ by the action of at. H produced by a silent electric discharge. Hydrosols and alcosols of CuS (from CuS), hydrosols of Hg (from $HgNO_3$) and of HgS [from HgS and from $Hg(CNS)_2$] were prepared similarly. Ch. Abs. (e)

Colloidal state induced by the action of zinc on natural waters. L. Bouchet (Compt. rend., 1937, **204**, 1068).—Blue colloidal solutions are obtained by prolonged immersion of pure Zn in the H_2O. A. J. E. W.

Distribution of concentration of colloids in sedimentation equilibrium produced by ultracentrifuging. T. Katsurai (Kolloid-Z., 1937, **79**, 30—31; cf. A., 1936, 680).—An alternative derivation of the formula resulting from the solution of Lamm's differential equation is given. The experimental data for *R*-phycoerythrin fall on a curve similar to that calc. by the formula. F. L. U.

Measurement of the dispersion of aërosols. N. Fuchs (Acta Physicochim. U.R.S.S., 1937, **6**, 143—160).—The various methods of measuring the sizes of particles in aërosols are described and critically compared. J. W. S.

Electrochemical properties of palmitic acid hydrosols. S. Mukherjee (J. Indian Chem. Soc., 1937, **14**, 17—36).—The p_H of palmitic acid sol varies irregularly, but tends in all cases to 5·0 with time. The total acidity found by electrometric or conductometric titration varies with the base used, in the order $Ca(OH)_2$, $Ba(OH)_2 > NaOH > NH_3$. The phenomena accord with the view that the sol is a two-phase system, the differences in behaviour towards different bases being dependent on the solubility, degree of hydrolysis, and adsorption of the salts formed. J. S. A.

Viscosity–concentration relations of colloidal solutions. I. Critical valuation of viscosity–concentration formulæ. II. Classification of colloids according to shape of particles. H. L. Bredée and J. de Booys (Kolloid-Z., 1937, **79**, 31—43, 43—49; cf. A., 1933, 460).—I. A no. of η-concn. formulæ are discussed, the majority of which are formally reducible, for dil. sols, to Einstein's expression, but with different material consts. Three of the formulæ examined reproduce satisfactorily the η-concn. curves for several natural polymerides, but not for synthetic resins. More than one const. is needed in order to include substances yielding particles of markedly anisodimensional shape. Four recent formulæ of this type are discussed.

II. Two empirical two-const. formulæ are proposed, in which the material const. is modified by a correction factor containing a second const. relating to the spatial extension of the particles. The correction term vanishes for spherical particles, and its magnitude increases with increasing chain length for substances such as PhOH–CH_2O resins and polystyrenes. Within certain limits evaluation of the extension const. enables a distinction to be drawn between micellar and molecularly dispersed colloids. Examples are given. F. L. U.

Electric properties of colloidal silicic acid. Korgin *et al.* (Sotzial. Rekons. Nauk., 1935, No. 5, 112).—Neutral H_2SiO_3 sols, prepared by hydrolysis of $SiCl_4$ and by oxidation of SiH_4 with O_3 in H_2O, have no appreciable charge. The acidity is due to traces of strong acids. On mixing aq. Ca salts with colloidal H_2SiO_3 adsorption compounds are formed. Ch. Abs. (e)

Comparative electrochemical studies of highly purified lyophilic sols. I. Gum arabic sol. II. Silicic acid sol. W. Pauli and L. Palmrich (Kolloid-Z., 1937, **79**, 63—69, 69—77; cf. A., 1933, 349; 1926, 574).—I. Gum arabic (I) sol, purified by electrodialysis and electrodecantation, has been used for measurements of conductivity, $H^\cdot$ activity, and conductometric titrations with NaOH and $Ba(OH)_2$. The equiv. wt. calc. from the titration agrees with that deduced from the wt. of Ag_2O which can combine with the acid, and supports the chemical evidence that (I) consists of five hexose units linked to an aldobionic acid. The dissociation const. of (I) increases with concn. and tends to a limit about $1\cdot5 \times 10^{-3}$. Possible causes of this are discussed.

II. Similar measurements have been carried out with ten different silicic acid (II) sols. The calc. mean dissociation const. is $4—5 \times 10^{-7}$. The colloidal complex is considered to be stabilised by a metadisilicic acid which, in consequence of the small second dissociation const., functions as a monobasic acid. With this assumption, the colloid equiv. = 4000 approx. Addition of KCl increases $[H^\cdot]$, but causes the conductivity to be < that calc. additively. The conductivity increases linearly and reversibly with temp. F. L. U.

Stability of emulsions. H. M. Cassel (Acta Physicochim. U.R.S.S., 1937, **6**, 289—296).—A criterion of the stability of emulsified films is deduced thermodynamically, and it is shown that the region of stability of films of given curvature is determined by the course of the adsorption isotherm. The theory is in accord with existing data on emulsions. It also explains qualitatively the action of protective colloids. J. W. S.

Optical method of determining the relative coagulating powers of electrolytes. C. V. Jogarao (Proc. Indian Acad. Sci., 1937, **5**, A, 193—199).—The coagulation of As_2S_3 sols has been followed by measuring the depolarisation factor for horizontally polarised light (indicating the size of the particles), and for vertically polarised light (showing the deviation from sphericity). The coagulating powers correspond with the series: $HCl > NH_4Cl > KCl > NaCl$; $CaCl_2 > SrCl_2 > BaCl_2$; $FeCl_3 > AlCl_3$. The As_2S_3 particles remain approx. spherical throughout the coagulation, and their final size is $\propto$ the valency of the coagulating ion. R. C. M.

Coagulation of acetylcellulose sols. V. A. Kargin and A. A. Stepanova (Acta Physicochim. U.R.S.S., 1937, **6**, 183—194).—The changes in viscosity, osmotic pressure, and turbidity of cellulose acetate sols during coagulation have been measured. Addition of gel to the sols greatly accelerates the coagulation. The velocity of coagulation is not greatly influenced by temp. J. W. S.

Influence of gelatin on the stability of silver bromide sols. K. S. Amelina (J. Phys. Chem. Russ., 1937, **9**, 100—111).—Cataphoretic velocities and optical densities were measured at various concns. of gelatin (0—0·4%) and varying p_H (2·8—6·9). At lower concns. the stabilisation is due to the gelatin communicating its charge to the sol; at higher concns. (>0·005%) the absorption of gelatin by the sol particles converts the lyophobic sol into a lyophilic sol. Adsorption is complete at 0·005—0·01% gelatin; further increase in concn. does not affect the cataphoretic velocity, which is equal to that of gelatin itself. The isoelectric point of gelatin is not affected by the presence of AgBr. E. R.

Kinetics of aërosol coagulation by the diffusion method. L. V. Radushkevitsch (Acta Physicochim. U.R.S.S., 1937, **6**, 161—182).—The deposition of particles from NH_4Cl aërosols flowing through vertical glass capillary tubes has been investigated, the results indicating that as the sol passes through the capillary it diffuses towards the walls in accordance with Townsend's theory for the diffusion of gaseous ions. They also indicate that Smoluchowski's theory of coagulation applies to smokes obtained by volatilisation in an air stream which are homogeneous in the early stages. J. W. S.

Dispersion of calcium soaps by fatty compounds with [capillary-]active anions. A. Lottermoser and H. Flammer (Kolloid-Beih., 1937, **45**, 359—412).—A new method of determining relative dispersing power is described. The capacity for dispersing Ca laurate, stearate, and oleate has been studied for Na alkyl sulphates (C_{12}, C_{14}, C_{16}, and C_{18}), Na oleate, and Igepon-T. Curves are given to show the amount of Ca remaining on cotton material treated under standard conditions with varying concns. of the dispersing agent. Of the alkyl sulphates C_{12} is the most effective for Ca laurate, and C_{14} for the stearate and oleate. Na oleate is of the same order of effectiveness for all the Ca soaps, whilst Igepon-T is superior to the others in every case. Potential measurements in mixtures of Ca soaps and dispersing agents show that with increasing concn. of the latter the p_H increases towards a limiting val. The effect is attributed both to hydrolytic adsorption, the mechanism of which is discussed, and to hydrolysis of molecularly dispersed Ca soap. Washing tests with the same mixtures show that part of the detergent action is due to the Ca soap, and that parallelism exists between washing power and increase of [OH′]. From the results obtained the composition of soaps and dispersing agents suitable for waters of varying hardness is deduced. F. L. U.

[Study of] peptisation of hydrated oxides by conductometric titration. A. Lottermoser and R. Schmied (Kolloid-Beih., 1937, **45**, 211—252).—The possible mechanism of peptisation of hydrated oxides of Al, Fe, and Cr through the formation of complex hydroxo-salts is discussed in the light of Werner's theory. Results of conductometric titration of $AlCl_3$, $Al(NO_3)_3$, $Al(ClO_4)_3$, $Al_2(SO_4)_3$, hexa-, penta-, and tetra-aquo-Cr chlorides, hexa-aquo-Cr nitrate and sulphate, and $Fe(NO_3)_3$ with NaOH are given, and supplemented by back titration of the solutions with the corresponding acids. In the Al and Cr salts internal hydrolysis occurs at room temp., but the evidence in the case of Fe is inconclusive. Basic salts are formed during the early stages of peptisation of $Al(OH)_3$ and $Cr(OH)_3$. F. L. U.

Sensitising effect of small amounts of alkali on silicic acid sol. V. N. Krestinskaja and N. E. Natanson (Kolloid. Shurn., 1936, **9**, 599—607).—Mixtures of SiO_2 sol and NaOH have been titrated potentiometrically. In explanation of the sensitising effect (cf. Freundlich and Cohn, A., 1926, 677) it is suggested that small amounts of NaOH produce a lyophobic polymeride of SiO_2 whilst with higher [NaOH] lyophilic Na_2SiO_3 is formed. J. J. B.

Physico-chemical properties of araban. T. K. Gaponenkov (Kolloid. Shurn., 1936, **2**, 561—575).—An improved prep. of araban (I) from hydratopectin is described. Vals. are recorded for the osmotic pressure, *d*, *n*, and η of aq. solutions of (I). The conductivity and [H$^\cdot$] of mixtures of (I) and electrolytes show that (I) binds alkali. The Ca derivative of (I) may be pptd. by EtOH; its aq. solution is scarcely affected by CO_2. J. J. B.

Influence of salts on viscosity of gelatin solutions and rôle of the activity coefficient. W. Ostwald and W. W. Stuart (Kolloid-Z., 1937, **79**, 49—55).—Curves representing respectively the variation of the relative η of a gelatin sol and the activity coeff. of the anion (f') with salt concn. are similar in shape and relative position for NaCl, Na_2SO_4, and $Na_4Fe(CN)_6$. Using exact data for the η of 1·4% gelatin sol at p_H 4·7 (this vol., 240), a linear relation is found between η and f' for KCl up to 0·75*N*. With more dil. sols the lines exhibit curvature at low salt concns. F. L. U.

Dependence of the rate of gelatinisation of gelatin of various ages on the concentration and the frequency of melting. I. Bulankin and S. Tverdun (Kolloid. Shurn., 1936, **2**, 533—537).—The rate of gelatinisation decreases during the process of ageing. The ageing is less rapid in highly conc. solutions; it is accelerated by frequent meltings and gelatinisations. J. J. B.

Gelatinisation of proteins by bases. W. Kopaczewski (Kolloid-Z., 1937, **79**, 102—103; cf.

A., 1935, 374).—Comments on papers by Donnelly (A., 1935, 1320; this vol., 81). F. L. U.

Recent advances in the electrochemistry of the proteins. E. J. Cohn (Trans. Electrochem. Soc., 1937, **71**, Preprint 24, 269—275).—A discussion of the dielectric and other electrochemical properties of certain proteins. J. W. C.

Pectin as protective colloid. E. Sauer and K. Sanzenbacher (Kolloid-Z., 1937, **79**, 55—63).—Data are given for the influence of heat, ageing, acids, alkalis, and neutral salts on the η of solutions of citrus and apple pectin. Sols of Cu and Ag prepared by reduction with N_2H_4 are stabilised by 0·01—0·2% of pectin. The protective action is not diminished by partial degradation of the pectin. F. L. U.

Free and bound water in the proteins of wheat and their dependence on p_H. V. I. Utotschkin (Kolloid. Shurn., 1936, **2**, 399—401).—The negative adsorption of sucrose from H_2O by gluten has been measured between p_H 1·95 and 9·28. It is max. at p_H 4. J. J. B.

Electrophoretic analysis of colloidal mixtures. A. Tiselius (Trans. Faraday Soc., 1937, **33**, 524—531).—Apparatus suitable for the separation of colloidal solutes of different mobilities is described; the principal feature of this is the interposition of large vols. between the reversible electrodes and the moving boundaries. Disturbances due to thermal convection are examined in detail, and it is shown that the permissible potential gradient may be increased tenfold by using tubing of flat section and operating at about 4°. The apparatus is specially useful in separating proteins, suitable mobilities being secured by adjustment of the p_H. F. L. U.

Electrokinetic study of lyophilic properties of cellulose derivatives. I. Swelling and ζ-potential of cellulose nitrate in organic liquids. K. Kanamaru and S. Ueno (Kolloid-Z., 1937, **79**, 77—91).—The liquids used were EtOH, Et_2O, $COMe_2$, EtOAc, and C_6H_6. Cellulose nitrate with N 13·5%, immediately after immersion, exhibits a ζ-potential which is the higher the greater is the degree of swelling. The ζ-potential falls, rapidly at first, to a min., rises more slowly to a max., and finally approaches a const. val. asymptotically. The rate of the initial fall is the greater, the greater is the degree of swelling. The observations are discussed theoretically. F. L. U.

Electrophoretic mobility of purified tristearin. II. Alkaline region. A. L. Roberts (Trans. Faraday Soc., 1937, **33**, 643—650; cf. this vol., 79).—Mobilities in solutions of Na salts, determined in the region p_H 7—12, show a gradual rise with increase of p_H, and are not affected by the exchange of Cl′ for borate ions. The curves for salt-free dispersions and those containing different concns. of Na salts are approx. parallel, the mobilities decreasing with increasing [Na˙]. Ba˙˙ has a more strongly depressing effect than Na˙, whilst OH′ is unique in its influence on the mobility. F. L. U.

Electrokinetic potential of natural calcium carbonates. V. M. Gortikov and N. P. Malinovskaja (Kolloid. Shurn., 1936, **2**, 429—433; cf. this vol., 152).—Calcite, aragonite, marble, etc. are positive; corals, chalks, and tuffs are negative. J. J. B.

Relation between the lyotropic series and free energies. L. H. N. Cooper (Nature, 1937, **139**, 284—285).—The order of the anions in the Hofmeister series is closely parallel with that of the Gibbsian standard free energies of formation from their elements. The free energies of formation of the halide ions $\propto$ their standard electrode potentials, and hence for these ions the lyotropic series may be determined by the readiness of electron transfer. L. S. T.

Crystal transfer mechanism. II. Iodine–iodide crystal exchange reactions in silica gel. M. A. Miller (J. Physical Chem., 1937, **41**, 375—378).—Sols prepared with equal quantities of water-glass (d 1·06) and N-AcOH, and containing 0·1N-KI, were, after solidification, separately covered with 0·5N-$HgCl_2$, 0·5N-$Pb(OAc)_2$, and saturated Br–H_2O, and the formation and movement of cryst. I, PbI_2, and HgI_2 were observed. Replacements brought about by covering gels containing PbI_2 or HgI_2 with Br–H_2O or by covering those containing I with 0·5N-$Hg(NO_3)_2$ or -$HgCl_2$ were also observed. In some cases crystals composed of two materials, *e.g.*, I and HgI_2, were obtained, and under certain diffusion conditions single-crystal pseudomorphs of rhombic HgI_2 and tetragonal I were possible. C. R. H.

Mathematical expression of the process of swelling of soluble and insoluble colloids. G. I. Romaschev (Kolloid. Shurn., 1936, **2**, 443—460).—Changes of vol. during swelling are calc. J. J. B.

Potentiometric and conductometric analysis of the processes of coagulation and sign reversal of iron hydroxide sol by sodium citrate. A. M. Weintraub (Kolloid. Shurn., 1936, **2**, 479—485).—Additions of Na citrate alter both the electrokinetic potential of $Fe(OH)_3$ particles and the potential of a bright Pt electrode in the sol in an analogous manner. J. J. B.

Separation in crystalloidal neutral salt solutions, analogous to complex coacervation of biocolloid sols. H. G. B. de Jong and K. C. Winkler (Z. anorg. Chem., 1937, **232**, 119—132).—Separation of a liquid phase occurs when solutions of hexol nitrate and $K_3Co(CN)_6$ within certain concn. ranges are mixed. The droplets are subject to electrophoresis in a direction which depends on which reagent is in excess. The concn. relations and the influence of neutral salts resemble the effects observed in the coacervation of colloid systems. E. S. H.

Causes of deviations from the fundamental law of the wave theory. V. K. Nikiforov and A. P. Runtzo (Kolloid. Shurn., 1936, **2**, 461—465).—The distance between adjacent rings in the periodic reactions between KI and $Pb(NO_3)_2$ rises with the temp. (0—80°). At high temp. it corresponds with the wave theory. At low temp. the calc. mol. wt. of the diffusing electrolyte appears too large, presumably owing to hydration. J. J. B.

Laws of gas mixtures. P. Glansdorff (J. Chim. phys., 1937, 34, 96—108).—Equations for the thermodynamic properties of gas mixtures have been derived by methods similar to those used by Gibbs.
R. C.

Thermodynamics of infinitely dilute solutions in mixed solvents. I. Henry's coefficient for mixed solvents which are ideal solutions. I. R. Kritschevski (J. Phys. Chem. Russ., 1937, 9, 41—47).—Assuming that the partial mol. vol. of the solute in an ideal mixed solvent is a linear function of the composition of the solvent, the following formula is derived: $\log k = N_1 \log k_1 + N_2 \log k_2$ (k = Henry's coeff. for a mixed solvent containing N_1 mols. of a component with the coeff. k_1, and N_2 of a component with the coeff. k_2). The formula is applied to the systems H_2–N_2–H_2O, CO–C_6H_6–$C_{10}H_8$, and CO_2–H_2O–sucrose. E. R.

Solvents, acids, bases, and salts. K. Wickert (Z. physikal. Chem., 1937, **178**, 361—373).—Brönsted's concept of acid and base is not applicable to solutions in which the solvent is incapable of yielding H' ions, *e.g.*, it does not account for $SOCl_2$ and K_2SO_3 being acid and base, respectively, in liquid SO_2. A generalised theory is advanced according to which salts and bases are substances the components of which bear positive and negative charges and have a completed electronic configuration, whilst for acids and H_2O-like solvents only the negative component has a completed configuration. R. C.

Correlation of ionisation constants of organic acids with dipole moments. J. F. J. Dippy (Nature, 1937, **139**, 591).—The relation between the strengths of substituted and unsubstituted acids in the benzoic and phenylacetic series and the dipole moments of monosubstituted benzenes is discussed.
L. S. T.

Dissociation constants of polybasic acids. III. W. R. Maxwell and J. R. Partington (Trans. Faraday Soc., 1937, 33, 670—678; cf. A., 1936, 797).—Consideration of the dissociation consts. (k) of benzene-mono-, -di- (2), -tri- (3), -tetra- (3), -penta-, and -hexa-carboxylic acids leads to the conclusion that the inhibiting effect of ionised carboxyl groups is a function of their no. and distance from the dissociating group. From the magnitude of the "last" k of certain members of a series, the approx. magnitude of that of other members of the series can be predicted. Examples are given. The influence of $\cdot CO_2'$ on the k of adjacent $\cdot CO_2H$ is discussed from the point of view of thermodynamics. F. L. U.

Common ion effect in some aqueous solutions as shown by the Raman effect. J. H. Hibben (Physical Rev., 1937 [ii], **51**, 593—594).—The suppression of ionisation of aq. $ZnCl_2$ by adding the common Cl' is shown by the increase in intensity of the $\Delta\nu$ 280 Raman line. N. M. B.

Dissociation constants and structures of zwitterions. A. Neuberger (Proc. Roy. Soc., 1937, **A**, **158**, 68—96).—The influence of a charged substituent on the free energy of ionisation of a dissociating group is examined with reference to the electrostatic effect, propagated through the solvent, and the chain effect, transmitted through the mol. Approx. vals. of the dipole distances of zwitterions, obtained from a comparison of their dissociation consts. with those of related compounds, suggest that ω-NH_2-acids exist in solution as nearly straight-chain mols. Dipole distances are also calc. from comparison of dissociation consts. of zwitterions and corresponding fatty acids in H_2O and in aq. EtOH. The prep. of ω-amino-*n*-dodecoic acid hydrochloride, Et γ-amino-*n*-butyrate, and *Et δ-aminovalerate hydrochloride*, m.p. 100—102°, is described; the dissociation consts. of those and other ω-NH_2-acids, their esters, glycylglycine, and *N*-acetylglycine have been measured by means of cells involving liquid junction potentials. The apparent dissociation consts. of zwitterions change with the ionic strength of the solution in a manner different from either acids or bases. G. D. P.

Equilibrium constants in terms of activities (cryoscopic). VI. Pyridine *p*-chlorophenoxide in benzene and in *p*-dichlorobenzene. W. R. Burnham and W. M. Madgin (J.C.S., 606—608).—The true equilibrium const. $K_a = a_{AB}/a_A a_B$ has been determined for the dissociation of the chlorophenoxide in C_6H_6 and in *p*-$C_6H_4Cl_2$ at 277° and 324·3° abs. Application of these vals. to the van 't Hoff isochore gives for the heat of formation, Q, −480 g.-cal. K_a is considerably > that for other amine–phenol compounds, whilst Q is much less. It is considered that the compound may be polar. A. J. M.

Diffuse double layer. A. Voet (Kolloid-Z., 1937, **79**, 15—18).—Theoretical. The Debye–Hückel approximation cannot be used satisfactorily in calculating the potential in the diffuse double layer. When the mean thickness of the latter is small compared with the dimensions of the particles the field may be regarded as uniform, and the theory of the plane double layer is applicable. F. L. U.

Thermodynamic study of systems of the type $PbCl_2$–RCl–H_2O at 25°. VII. E. R. Hounsell and H. N. Parton (Trans. Faraday Soc., 1937, **33**, 629—633).—The e.m.f. of concn. cells containing $PbCl_2$ in presence of LiCl, NaCl, and KCl has been measured in such a way that a source of error present in earlier determinations (A., 1933, 906; 1935, 582) is eliminated. Activity coeffs. of $PbCl_2$ are calc. The formation of complex ions is indicated, KCl having the greatest, and LiCl the least, effect.
F. L. U.

Ion equilibrium in heavy water. C. Drucker (Trans. Faraday Soc., 1937, **33**, 660—670).—From measurements of the e.m.f. of Pt–H_2 and Pt–D_2 concn. cells the solution pressures of H_2 and D_2 have been shown to be equal. In liquid H_2O–D_2O mixtures equilibrium between all the components is instantaneously attained. A table of concns. of H_2O, D_2O, and HDO, and of partial pressures of H_2, D_2, and HD, corresponding with mixtures of varying composition, is given, and the ionic activities calc. from these data agree with those found from potential measurements. The relation between the velocity of mutarotation of glucose and the concn. of the several ions in H_2O–D_2O mixtures is discussed.
F. L. U.

General course of the decomposition of aqueous solutions of ferric chloride. J. Guéron (Compt. rend., 1937, **204**, 1119—1121).—For the initial stages of hydrolysis, after an induction period t_0, the electrical conductivity is given by $\lambda/\lambda_0 - 1 = [p(\log t_0 - 2{\cdot}230) + 0{\cdot}408] \log (t/t_0)$, t being measured in min.; the const. p varies with the age of the solution used, and the nature of the reaction vessel.

A. J. E. W.

Hydrolysis of inorganic salts and benzenesulphonates of copper. V. Čupr and J. Širůček (Coll. Czech. Chem. Comm., 1937, **9**, 68—75; cf. A., 1934, 599).—Measurements of e.m.f. by the quinhydrone electrode at 20° show that the p_H vals. of 0·1—1·0*M*-aq. $Cu(NO_3)_2,6H_2O$, $Cu(ClO_4)_2,6H_2O$, and $(X{\cdot}C_6H_4{\cdot}SO_3)_2Cu.xH_2O$ are given by $p_H = -\log [Cu^{\cdot\cdot}] + 3{\cdot}95$, where x is generally 6, and X is H, *o*-Me, *p*-Me, *m*-Cl, *p*-Cl, *p*-Br, *p*-I, or *p*-OH. The p_H vals. of $CuSO_4$ solutions are > those given by the equation owing to the reaction $SO_4'' + H^{\cdot} = SO_4H'$. The *salt* $(p\text{-}C_6H_4I{\cdot}SO_3)_2Cu,6H_2O$ has been prepared.

J. G. A. G.

System sodium thiosulphate–silver thiosulphate in the dissolved and crystalline state. W. Brintzinger and W. Eckardt (Z. anorg. Chem., 1937, **231**, 327—336).—In solutions containing < 30 wt.-% of $Na_2S_2O_3$ the stable complex is $Na_2[Ag_2(S_2O_3)_2]$ (I), whilst in 39—43 wt.-% of $Na_2S_2O_3$ the complex is $Na_{10}[Ag_2(S_2O_3)_6]$ (II). With 30—39 wt.-% of $Na_2S_2O_3$ the complexes coexist. Solid (I) separates from solutions in which the salts are dissolved in equimol. proportions. Solutions containing (II) yield the solid compound $Na_3Ag(S_2O_3)_2,2H_2O$, whilst solutions containing both (I) and (II) yield cryst. $Na_5Ag_3(S_2O_3)_4,2H_2O$.

J. W. S.

Composition of the dissolved single particles of sodium uranyl acetate, sodium zinc uranyl acetate, and sodium magnesium uranyl acetate. H. Brintzinger and F. Jahn (Z. anorg. Chem., 1937, **231**, 342—344).—Solutions of these compounds all contain the ion $[UO_2(OAc)_3]'$. The salts crystallising from these solutions should therefore be formulated $Na[UO_2(OAc)_3]$, $NaMg[UO_2(OAc)_3]_3,9H_2O$, and $NaZn[UO_2(OAc)_3]_3,6H_2O$, respectively. J. W. S.

Dialysis method. V. Influence of the foreign electrolyte concentration on the magnitude of the dialysis coefficient. H. Brintzinger and W. Eckardt (Z. anorg. Chem., 1937, **231**, 337—341; cf. A., 1931, 416).—For solutions of $Ag_2S_2O_3$ and Na_2CrO_4 in $Na_2S_2O_3$ the dialysis coeff. (λ) of the CrO_4'', $[Ag_2(S_2O_3)_2]''$, and $[Ag_2(S_2O_3)_6]^{10-}$ ions varies with the $[Na_2S_2O_3]$ according to the relation $\log \lambda = A - B[Na_2S_2O_3]$ where B is const. for all three ions. Hence, within the concn. limits investigated the wt. of the Ag ions is independent of the $[Na_2S_2O_3]$.

J. W. S.

Cyanide hæmochromogen. Ferriheme hydroxide–cyanide reaction: its mechanism and equilibrium as determined by the spectrophotoelectric method.—See A., III, 163.

Solubility product of thallous iodide at 25°. C. W. Davies and R. A. Robinson (Trans. Faraday Soc., 1937, **33**, 633—635).—The val. calc. from results of conductometric titrations is $6{\cdot}47 \times 10^{-8}$.

F. L. U.

Activity coefficient of thallous thiocyanate. F. Ishikawa and N. Hasegawa (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 146—151).—The solubility of TlCNS in H_2O in presence of KNO_3, K_2SO_4, $TlNO_3$, Tl_2SO_4, and KCNS has been measured at 25°; the activity coeff. is calc. from the data.

H. J. E.

Salting out of gases and volatile non-electrolytes. J. W. Belton (Trans. Faraday Soc., 1937, **33**, 653—659).—Theoretical. The activity coeff. (f) of a non-electrolyte is given by $e^{E/RT}$, where E is the electrical work involved in the passage of ions across the interface. E is calc. from the change in polarisability of the non-electrolyte mol., and the equation of Debye and McAulay is obtained. A more exact expression for f, including the permanent moment of the non-electrolyte mol., is derived, and its application to cases for which experimental data are available is discussed. F. L. U.

M.-p. diagram of refractory oxides. VIII. Systems containing cerium dioxide. H. von Wartenberg and K. Eckhardt (Z. anorg. Chem., 1937, **232**, 179—187; cf. this vol., 137).—M.p.–composition curves have been determined for the systems CeO_2–CaO, CeO_2–TiO_2, CeO_2–ThO_2, CeO_2–Fe_3O_4, CeO_2–Mn_3O_4, CeO_2–Cr_2O_3, ThO_2–TiO_2, MgO–La_2O_3, and ZrO_2–La_2O_3. The existence of *$CeCrO_3$* is indicated, but no compounds are formed in the remaining systems. The m.p. of Cr_2O_3 (2435°) has been determined. E. S. H.

Carbon–oxygen equilibrium in molten steel. S. Matoba (Tetsu-to-Hagane, 1935, **21**, 875—879).—The equilibrium has been studied at 1550—1650° by melting Fe in a CO + CO_2 atm.

Ch. Abs. (*e*)

Binary systems containing $AsBr_3$. N. A. Pushin (Bull. Soc. Chim. Yougoslav., 1936, **7**, 73—77).—The fusion diagrams of the systems $AsBr_3$–chloral hydrate, –CH_2Ph_2, –C_6H_6, –BzOH, –*m*-$C_6H_4(NO_2)_2$, –*p*-nitroaniline, –anthracene, and –phenanthrene afford no evidence of compound formation.

R. T.

Carbamide as a hygroscopic substance. E. A. Werner (Nature, 1937, **139**, 512).—When exposed at 16° to air saturated with H_2O vapour, $CO(NH_2)_2$ absorbs approx. 1·75 times its wt. of H_2O in 8 days, after which absorption ceases. The nitrate shows no increase in wt. under similar conditions. The hydrochloride absorbs much H_2O when exposed to air under ordinary conditions. L. S. T.

Equilibria in liquid systems containing furfuraldehyde. B. A. Lloyd, S. O. Thompson, and J. B. Ferguson (Canad. J. Res., 1937, **15**, **B**, 98—102).—Solubility curves and tie lines have been determined for the systems $COMe_2$–H_2O–furfuraldehyde (I), H_2O–EtOAc–(I), and H_2O–*iso*-$C_5H_{11}{\cdot}OAc$–(I) at 25°. R. S. B.

Acenaphthene compounds. N. N. Efremov, D. L. Federmeer, and K. J. Prinkmann (Bull. Acad. Sci. U.R.S.S., 1936, 515—532).—The fusion

diagrams suggest 1 : 1 compounds in the systems acenaphthene (I)–1 : 2 : 4-chloro-, m.p. 65·7°, and -bromo-dinitrobenzene, m.p. 58·6°,–*m*-$C_6H_4(NO_2)_2$, m.p. 72·6°, and –*o*-nitrophenol, m.p. 65·5° (decomp.). A 1 : 2 *compound*, m.p. 51·6°, is formed in the system (I)–3 : 4-dinitrotoluene, and a 1 : 3 *compound*, m.p. 119·5°, in the system (I)–*m*-nitroaniline. Compound formation is not observed in the systems (I)–*o*-$C_6H_4Cl{\cdot}NO_2$ and *o*-, –*m*-, and –*p*-$C_6H_4Br{\cdot}NO_2$, –2 : 5-dinitrotoluene, and –2 : 4-dinitrophenol.
R. T.

Differential tensimeter without a tap. Vapour pressure of deuterates of copper sulphate. H. Perpérot and F. Schacherl (J. Phys. Radium, 1935, [vii], 6, 439—440).—Apparatus is described. Preliminary measurements show that the v.p. of $CuSO_4,5D_2O$ and $CuSO_4,3D_2O$ are < those of the corresponding hydrates. O. D. S.

Physical studies of non-aqueous solvates. II. Vapour pressure of magnesium bromide–diethyl ether solutions. H. H. Rowley (J. Amer. Chem. Soc., 1937, **59**, 621—625; cf. A., 1936, 1194).—Data for Et_2O saturated with $MgBr_2$ have been obtained at 0—25°; further data are recorded for other solutions at 25°. The vals. are greatly affected by the presence of small amounts of H_2O. E. S. H.

Tertiary system potassium nitrate–nitric acid–water. V. I. Nikolaev, S. K. Chirkov, and A. G. Kogan (Kalii, 1935, No. 7, 23—27).—Equilibrium data are given. The compound $KNO_3,2HNO_3$ is very stable in presence of excess of HNO_3 and yields 99·8% pure HNO_3 and pure KNO_3 when heated to 100—120°. Ch. Abs. (*e*)

Ternary systems barium hydroxide and water with barium chloride, thiocyanate, chlorate, or acetate at 25°. H. W. Foote and F. C. Hickey (J. Amer. Chem. Soc., 1937, **59**, 648—650).—Equilibrium data are recorded. The existence of *BaOH·CNS* is established and that of $BaOH{\cdot}Cl,2H_2O$ confirmed. No basic chlorate or acetate is formed at 25°. E. S. H.

Dispersion-type of solid solutions in the system $NiCl_2$–NH_4Cl–H_2O. N. S. Kurnakov and V. S. Egorov (Bull. Acad. Sci. U.R.S.S., 1936, 507—514).—At 25° and 50° the solubility curve consists of three parts, one of which relates to hydrated $NiCl_2$ and the two others to the two series of solid solutions which are found to exist. The composition of the solid phases corresponds throughout with $NiCl_2 : H_2O = 1 : 2$. The max. amount of $NiCl_2$ in solid solution at 0° is 5%. At 50° in the NH_4Cl-rich solid solution the $NiCl_2$ content reaches 24·2%, at which val. it is in equilibrium with a solid solution of the second series containing 26·8% $NiCl_2$. At 50° the max. amount of $NiCl_2$ present in the second series is 51·2%. Examination of the crystals indicates that $NiCl_2,2NH_4Cl,2H_2O$ does not exist. The second series of solid solutions is produced by dissolution of NH_4Cl in $NiCl_2,NH_4Cl,2H_2O$ whilst the first series represents a solution of Ni-carnallite in NH_4Cl. D. C. J.

Equilibria in aqueous lead chloride solutions. L. Wilkinson, N. O. Bathurst, and H. N. Parton (Trans. Faraday Soc., 1937, **33**, 623—628).—Data for the system PbO–HCl–H_2O at 50° and 80° are given. Basic salts can exist in equilibrium with HCl up to 0·006*M* at 50° and 0·02*M* at 80°. The existence of $2PbO,PbCl_2$, $3PbO,PbCl_2,H_2O$, and $4PbO,PbCl_2$ is indicated. Data are also given for NH_4Cl–$PbCl_2$–H_2O and NH_4Br–$PbBr_2$–H_2O at 25°, and compared with those of previous workers.
F. L. U.

Equilibrium reactions of importance in chemical analysis. Equilibrium constants of the reactions : I. $BaCO_3 + SO_4'' \rightleftharpoons BaSO_4 + CO_3''$, II. $CaC_2O_4 + Pb^{\cdot\cdot} \rightleftharpoons PbC_2O_4 + Ca^{\cdot\cdot}$, III. $BaC_2O_4 + CO_3'' \rightleftharpoons BaCO_3 + C_2O_4''$. N. A. Tananaev (J. Appl. Chem. Russ., 1937, **10**, 340—348, 349—353, 354—359).—I [with S. J. Schnaiderman]. At equilibrium, attained in 12 days at room temp., 86% of the Ba is present as sulphate and 13·7% as carbonate. The equilibrium const. *K* found experimentally agrees with the theoretical val. if a correction for increased *K* due to hydrolysis of $BaCO_3$ is applied.

II [with A. I. Volkova]. 98% of the C_2O_4'' is present as PbC_2O_4 at equilibrium, which is attained after 55 hr. at 8°.

III [with N. V. Junitzkaja]. 95·3% of the Ba is present as $BaCO_3$ at equilibrium, attained after 55 hr. at room temp. The val. of *K* found does not agree with that calc. from the solubility products.
R. T.

Solid–liquid equilibria in systems of organic components. VI. Ternary systems with limited miscibility in the molten state. K. Hrynakowski, H. Staszewski, and M. Szmyt (Z. physikal. Chem., 1937, **178**, 293—305; cf. A., 1936, 1340).—The equilibrium diagrams for the systems $NHPh_2$–$CO(NH_2)$–resorcinol and S–α-$C_{10}H_7{\cdot}NH_2$–resorcinol have been determined. If into a system of two components *A* and *B* partly miscible in the molten state a third substance *C* is introduced which forms an additive compound with *A* and a homogeneous liquid phase with *B*, then in the system *AC*–*B* there is a large miscibility gap owing to the weakened residual affinity of *C* for *B*. R. C.

Portion of the system CaO–Al_2O_3–Fe_2O_3. H. F. McMurdie (J. Res. Nat. Bur. Stand., 1937, **18**, 475—483).—The solidus–liquidus relations in the CaO–$4CaO,Al_2O_3,Fe_2O_3$–CaO,Al_2O_3 region have been studied. Solid solutions are formed to a limited extent between the Fe compound and the three Ca aluminates (cf. A., 1928, 367). F. J. G.

Equilibria between metals, sulphides, and silicates in the melt. V. Equilibria Fe + CoO $\rightleftharpoons$ Co + FeO and Ni + CoO $\rightleftharpoons$ Co + NiO in the melt. W. Jander and A. Krieger (Z. anorg. Chem., 1937, **232**, 39—56; cf. A., 1934, 365, 734).—Both these equilibria obey the ideal mass action law to a first approximation. With increase of temp. their equilibrium consts. (*K*) increase according to $\log K = A - B/T$. On addition of SiO_2, *K* increases with increasing $[SiO_2]$ for the first equilibrium, but decreases for the second. The heats of reaction deduced, however, are not in complete accord with thermal data. This may be qualitatively explained by the change of O content in the metal.

J. W. S.

Slag systems. R. Hay, J. White, and A. B. McIntosh (J. West Scotland Iron Steel Inst., 1935, **42**, 99—104; cf. A., 1935, 35).—The non-existence of grunerite, FeO,SiO_2, is indicated by thermal and optical data. A previously unidentified substance (*n* 1·74) is a eutectic of fayalite and SiO_2. Data are given for the system FeO–MnO–SiO_2. In the system MnO–Al_2O_3, addition of Al_2O_3 lowers the m.p. of MnO from 1785° to the eutectic (1520°, 24% Al_2O_3). The compound MnO,Al_2O_3 melts at 1560°. Al_2O_3 is sol. in solid MnO. The reaction of FeO–MnO–SiO_2 slags with C has been studied at 1310°.

Ch. Abs. (*e*)

Thermodynamics of irreversible processes. M. V. Tovbin (Bull. Sci. Univ. Kiev, 1936, **2**, 143—158).—Theoretical.

R. T.

Franck's principle of photochemical energy balance and its application to reversible oxidation–reduction reactions. G. Holst (Acta Physiochim. U.R.S.S., 1937, **6**, 137—141).—The application of Franck's principle (A., 1925, ii, 1077) to reversible oxidation–reduction systems in which the free energy change can be measured potentiometrically is illustrated by reference to the systems: methylene-blue + NHPh·NH·SO_3' $\rightleftharpoons$ leuco-base + PhN:N·SO_3' (cf. A., 1936, 292), quinone $\rightleftharpoons$ quinol, and $(\cdot CH_2\cdot CO_2H)_2 \rightleftharpoons (:CH\cdot CO_2H)_2$ in presence of succinodehydrogenase and a suitable colouring matter.

F. L. U.

Heat of dissolution and dilution of saturated aqueous solutions of certain salts. A. S. Fedorov and G. F. Siltschenko (Ukrain. Chem. J., 1937, **12**, 53—60).—Dissolution of anhyd. salts (KCl, KBr, KNO_3, NH_4Cl, NH_4Br, and NH_4NO_3) and dilution of the solutions are endothermic processes. In the case of salts forming crystal hydrates ($BaCl_2$, $CuCl_2$, $CuSO_4$, $ZnSO_4$) evolution of heat takes place until sufficient H_2O has been added to form the hydrate, after which heat is absorbed up to formation of a saturated solution, dilution of which is associated with evolution of heat.

R. T.

Thermochemistry of hydrocarbons. M. Brutzcus (Compt. rend., 1937, **204**, 574—576; cf. this vol., 223).—The intrinsic calorific val. (*P*) of a free gaseous C atom, deduced from vals. for the hydrocarbons, is 456·6 kg.-cal. per g.-atom, in accord with previous results. For any hydrocarbon C_mH_n $P = 456{\cdot}6(m + n/4)$ kg.-cal. per g.-mol. Thermal data suggest that double or triple linkings do not occur in unsaturated hydrocarbons, C^{II} being present. C_6H_6 contains 9 C·C linkings.

A. J. E. W.

Heats of formation of ethylene oxide, ethylene glycol, and of some homologues. H. Moureu and M. Dodé (Bull. Soc. chim., 1937, [v], **4**, 637—647).—Heats of combustion and of formation of $(CH_2\cdot OH)_2$ and 8 homologues, and of $(CH_2)_2O$ and 2 homologues are recorded.

H. J. E.

Heats of combustion and refractivity data of pentenoic esters. E. Schjånberg (Z. physikal. Chem., 1937, **178**, 274—281; cf. A., 1936, 166).—The energy of fission of the C:C linking, which has been calc. from measurements of the heat of combustion of esters of valeric and the three pentenoic acids, is a max. when the double linking is in the αβ position and a min. when in the γδ position to the CO_2H group. It falls with increasing size of the alkyl groups of the alcohol component. The refractivity and dispersivity increment of the C:C linking differ appreciably according as this is in the αβ or βγ position. It is inferred that there is an interaction of the fields of the C:C and C:O linkings which varies with the size of the alkyl radical.

R. C.

Conductivity of univalent electrolytes in water. R. A. Robinson and C. W. Davies (J.C.S., 1937, 574—577).—The data of Shedlovsky (A., 1932, 699) for the variation of conductivity with concn. (*c*) of aq. solutions of LiCl, NaCl, KCl, and HCl at 25° can be expressed by Onsager's limiting equation, for $c < 0{\cdot}001N$; by $\Lambda = \Lambda_0 - b(c^{\frac{1}{2}} - c + 0{\cdot}001)$ for $c = 0{\cdot}002$—$0{\cdot}02N$, and by $\Lambda = \Lambda_0 - b\,.\,f(c)$ for $c > 0{\cdot}02N$. $f(c)$ is the same for all electrolytes, and *b* is const. These equations, applied to the data of Shedlovsky for KNO_3 and $AgNO_3$, indicate that these salts are incompletely dissociated, the dissociation consts. (25°) being 1·6 and 1·5, respectively. The conductivities of aq. solutions of $TlClO_4$ and TlOAc have been determined at $c < 0{\cdot}01N$, and the dissociation consts. of $TlClO_4$, TlOAc, $TlNO_3$, and TlCl calc.

A. J. M.

Measurement of conductance of electrolytes. VIII. Re-determination of the conductance of Kohlrausch's standard potassium chloride solutions in absolute units. G. Jones and M. J. Prendergast (J. Amer. Chem. Soc., 1937, **59**, 731—736; cf. A., 1935, 449).—The abs. sp. conductances of 1*N*-, 0·1*N*-, and 0·01*N*-KCl for use as reference standards in conductivity measurements have been redetermined. Corrections to be applied to conductance data have been calc.

E. S. H.

Conductivities and potentials of higher alkylpyridinium chlorides. A. Lottermoser and H. Frotscher (Kolloid-Beih., 1937, **45**, 303—358).—The prep. of alkylpyridinium chlorides (I) is described. The m.p. are: *octyl*- about 30°; *decyl*- 54·5°; *dodecyl*- 82·5°; *tetradecyl*- 75·5°; hexadecyl- 82°; *octadecyl*- 86°. Conductivities over a wide range of concn. have been determined at 25°, 40°, 50°, and 60°. Temp. coeffs. and cationic mobilities are calc. Cl′ potentials have been measured under the same conditions, and the Cl′ activity coeffs. (*f*′) calc. The Λ–concn. and *f*′–concn. curves are similar except at high dilutions. There are no qual. differences between the physicochemical behaviour of (I) and that of substances with capillary-active anions. Colloidal properties are barely detectable in the C_8 member, Surface tension (σ) measurements show (I) to be less capillary-active than the corresponding Na alkyl sulphates. The min. σ occurs at a concn. slightly above that at which mol. aggregation is shown by the electrical measurements to begin.

F. L. U.

Conductance of electrolytic systems. M. A. Klotschko (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 197—201).—Theoretical. The variation

of conductance with temp. and viscosity is discussed from the point of view of Kurnakov's theory.
O. D. S.

Electro-chemical study of group II and V bromides in solutions of aluminium bromide in ethyl bromide. E. J. Gorenbein (Bull. Sci. Univ. Kiev, 1936, 2, 115—128).—Ca, Sr, and Ba bromides are only very slightly sol. in EtBr–$AlBr_3$ mixtures, the conductivity (κ) of which is scarcely affected by their presence. Solubility and κ rise in the series $ZnBr_2 < CdBr_2 < HgBr_2$; $BiBr_3 < SbBr_3 < AsBr_3$. Electrolysis results in deposition of Hg, Cd, Sb, or Bi at the cathode. R. T.

Transport number of silver in solutions of sodium thiosulphate practically saturated with silver chloride. P. van Rysselberghe and S. M. Knapp (J. Amer. Chem. Soc., 1937, 59, 762—763).—Measurements at 25° afford direct evidence for the existence of AgS_2O_3'. E. S. H.

Transport of ions in presence of colloids. J. J. Bikerman (Trans. Faraday Soc., 1937, 33, 560—564).—The mobility of $NH_4^{\cdot}$ ions is diminished by the presence of colloidal As_2S_3. Causes of the observed retardation are discussed. F. L. U.

Relations among fundamental electrochemical quantities. III. I. Uhara (J. Chem. Soc. Japan, 1935, 56, 1364—1367).—The relative vals. of the electrode potentials of non-metals have been calc. from thermodynamic considerations.
Ch. Abs. (e)

Mercurous acetate electrode. W. D. Larson (J. Physical Chem., 1937, 41, 493—498).—From measurements made in presence of 0·05—2·0 mol. AcOH, the calc. e.m.f. of the electrode $Hg|Hg_2(OAc)_2,OAc'$ is $-0·5109\pm0·0002$ volt at 25°. C. R. H.

Electrode potentials of lithium, rubidium, and calcium in liquid ammonia. V. A. Pleskov (Acta Physicochim. U.R.S.S., 1937, 6, 1—10; cf. A., 1936, 161).—The normal potentials of Li, Rb, and Ca have been calc. from measurements of the potential of the respective amalgams in liquid NH_3. The vals. are: Li 2·99, Rb 2·68, Ca 2·39, referred to the H electrode in H_2O. F. L. U.

Electromotive force of non-aqueous cells. III. Sulphate and hydrogen electrodes in anhydrous hydrazine. H. Ulich and K. Biastoch (Z. physikal. Chem., 1937, 178, 306—314; cf. this vol., 188).—The electrodes Zn amalgam$|ZnSO_4$ and Cd amalgam$|CdSO_4$ behave satisfactorily as electrodes of the second kind in anhyd. N_2H_4. A H electrode also yields const. and reproducible potentials. Determinations of activity coeffs. (f) of solutions of N_2H_4,H_2SO_4 have shown that N_2H_4,H_2SO_4 behaves as a ternary electrolyte and that the f–concn. curve is more nearly of the theoretical form than in H_2O.
R. C.

Electrokinetic potential at metal surfaces. J. F. Chittum and H. Hunt (Trans. Electrochem. Soc., 1937, 71, Preprint 10, 85—95).—The electrokinetic potentials of several metals in various electrolytes and colloidal solutions have been determined. Experimental evidence is adduced to show that the properties of a metallic electrode, especially its electrokinetic potential, are determined by a colloidal metallic surface layer. J. W. C.

Potential differences at the boundaries of two liquid phases. VII. K. Karczewski (Rocz. Chem., 1937, 17, 61—63).—Potentials at the interfaces iso-C_5H_{11}·OH–0·000001–1·0N-HCl, –KCl, and –KOH have been measured. R. T.

Potentials at phase boundaries in the process of flotation. B. Kamieński and L. Benis (Rocz. Chem., 1937, 17, 89—96).—The electrostatic potential of conducting substances (galena, CuS), but not of insulators (ZnS, glass), $\propto p_H$ of the solution.
R. T.

Constancy of static liquid junction potentials in complex systems and their application to the titration of weak bases. A. L. Ferguson, R. Hitchens, and K. Van Lente (Trans. Electrochem. Soc., 1937, 71, Preprint 28, 323—337).—The reproducibility and constancy of certain cells have been studied in relation to the titration of weak bases. The added bases include NH_3, NH_2Ph, and glycine, the amount of each being increased in steps up to 0·1M. The liquid junction potential method of titration is quant. for the titration of NH_3 with HCl, fairly so for NH_2Ph, but only approx. for glycine. An explanation of the form of the titration curves is advanced. J. W. C.

Behaviour of cells in which one electrode is polished. Rôle of the Beilby layer. A. Grumbach and F. Taboury (Compt. rend., 1937, 204, 1178—1179).—A polished Au or Pt electrode, immersed in an electrolyte solution by which it is not attacked, behaves as a condenser shunted by a high resistance. The effect is attributed to the presence of a Beilby layer. A. J. E. W.

Oxidation–reduction potentials. III. Relations between oxidation–reduction potential and reaction velocity. G. Holst (Z. physikal. Chem., 1937, 178, 282—292; cf. A., 1936, 292).—The velocity coeff., k_1, of the forward reaction of methylene-blue + $NHPh·NH·SO_3' \rightleftharpoons$ leucomethylene-blue + $PhN\vdots N·SO_3'$ varies considerably with the p_H and is a min. at $p_H \sim 5·2$. The velocity coeff. of the reverse reaction, k_2, changes little with the p_H. k_1/k_2 rises with falling p_H. The fall in k_1 with rising p_H up to p_H 4 is due primarily to a fall in activation energy, E, by the same amount as the change in free energy of the reaction rises, and the fall in the latter is due to rise in the reduction–oxidation potential or electron affinity of the dye by the corresponding amount. R. C.

Polarographic studies with the dropping mercury cathode. LXIV. Equations of current–voltage curves in the reversible electroreduction of a weak electrolyte, $Hg(CN)_2$. J. Tomeš (Coll. Czech. Chem. Comm., 1937, 9, 81—103).—Current–voltage curves obtained with $Hg(CN)_2$ solutions at p_H 6—13 conform generally to theoretical requirements. Deviations are found in unbuffered solutions, and in alkaline solutions probably owing to complex formation between $Hg(CN)_2$ and CN′ liberated at the cathode during electrolysis. In agreement with theory, the "half-wave" potential at $p_H \ngtr 8$ is $\pi_1 = -0{\cdot}029 \log [Hg(CN)_2] + k$, and at $p_H > 10$ is const. and independent of p_H. By adding $Cd^{\cdot\cdot}$ to $Hg(CN)_2$ solutions, the polarographic waves due to Cd and Hg are displaced, respectively, to positive and negative potentials owing to interaction of $Cd^{\cdot\cdot}$ with CN'. J. G. A. G.

Polarographic studies with the dropping mercury cathode. LXV. Catalytic effect due to ββ′-dichloroethyl sulphide (mustard gas). R. Brdička (Coll. Czech. Chem. Comm., 1937, **9**, 76—80; cf. A., 1933, 619, 681, 964).—$(CH_2Cl{\cdot}CH_2)_2S$ (I) is not directly polarographically active, but as little as $2 - 5 \times 10^{-6}$ g. in 1 c.c., when boiled with aq. NH_3 and added to ammoniacal $Co^{\cdot\cdot}$ or $Co^{\cdot\cdot\cdot}$ containing NH_4Cl, produces on the current–voltage curve a catalytic effect similar to that produced by the ·SH group. Since the effect increases with concn. of (I), (I) can be determined empirically. J. G. A. G.

Polarographic studies with the dropping mercury cathode. LXVI. General formulæ for the potential of electroreduction of fumaric and maleic acid. P. Herasymenko (Coll. Czech. Chem. Comm., 1937, **9**, 104—108).—By taking account of the degree of ionisation of the acids, a relation has been found between p_H and electroreduction potentials which agrees more closely with the experimental data (cf. A., 1936, 1342). J. G. A. G.

Electrolysis of potassium bromide in liquid ammonia. E. I. Achumov and L. I. Druziakova (J. Gen. Chem. Russ., 1937, **7**, 298—304).—Solubility (−84° to 98°), v.p. and conductivity (−31° to 30°) and *d* (20°) are given for $KBr–NH_3$. Electrolysis results in formation of KNH_2 at the cathode and of NH_4Br in the anode. R. T.

Overvoltage of hydrogen at amalgam [surfaces]. P. Z. Fischer and V. F. Barabanov (Bull. Sci. Univ. Kiev, 1936, **2**, 97—107).—Measurements of overvoltage at amalgam cathodes (1—80% Cd, 1—40% Pb, 5—30% Bi, and 0·5—20% Zn) in $0{\cdot}1N-H_2SO_4$ reveal deviations from additivity, which are ascribed to changes in the structure and surface tension of the amalgams. R. T.

Iodine overpotential in molten electrolytes. S. Karpatschov and O. Poltoratskaja (Acta Physicochim. U.R.S.S., 1937, **6**, 275—278).—The I overpotential at a C electrode in molten AgI + AgCl and in LiI + LiCl has been measured at various c.d. Within the limits of error, the overpotential is independent of the composition of the melt.

J. W. S.

Adsorption and overvoltage. S. von Náray-Szabó (Z. physikal. Chem., 1937, **178**, 355—360).—Various otherwise inexplicable features of overvoltage, *e.g.*, the protracted rise on bright Pt, may be accounted for by supposing that the first stage in the separation of H is the transfer of $H^{\cdot}$ ions into an adsorbed film on the electrode surface (cf. A., 1936, 297). Since adsorbed H is separated at more negative potentials than "free" H (this vol., 140), highly adsorptive metals such as Pt permit the easy separation of H, and at low c.d. H is initially separated solely in the adsorbed state, and for this reason certain theories of overvoltage are inapplicable. With increasing saturation of the surface, separation by adsorption becomes relatively unimportant, the overvoltage increases, and the above theories become valid.

R. C.

Theory of passivity. XXXI. Passivity of chromium. W. J. Müller and J. Z. Briggs (Monatsh., 1937, **70**, 113—145; cf. A., 1936, 1468).—From the action of acid on Cr and from its anodic behaviour it would appear that the metal is always covered to a considerable extent with an oxide film. On activation by use as cathode or by the action of HCl, the free surface of the metal increases to about 3%, whereas normally it is about 0·1% and decreases on anodic or self-passification to about 0·01%. Active Cr goes into solution in the Cr^{II} state at anode potentials <0·5 volt, as a mixture of Cr^{II} and Cr^{III} at 0·5—1·0 volt, and as Cr^{III} and Cr^{VI} at >1·2 volts. At >2 volts development of O_2 also occurs at the oxide film. These results are in accord with the porosity theory of anodic passivity. The behaviour of active Cr in H_2SO_4 at low potentials indicates that the pores have a mean diameter of 40×10^{-8} cm. The greater c.d. in the larger pores explains the regions over which mixed ions pass into solution. J. W. S.

Passivity of iron and steel in nitric acid solution. XV. Y. Yamamoto (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 152—165; cf. this vol., 188).—The dissolution of two active Fe electrodes in aq. HNO_3 is accelerated by the passage of an a.c. The passivity of Fe in conc. HNO_3 is destroyed by passing an a.c. at 4 volts. H. J. E.

Use of aluminium amalgam electrode for determining the activity of aluminium ions in aqueous solutions. Z. J. Berestneva and V. A. Kargin (J. Phys. Chem. Russ., 1936, **8**, 800—804).—For amalgams containing 10^{-6} to 5×10^{-6} g. of Al per g. of Hg the potential in $AlCl_3$ solutions remains const. for some min. This potential varies with $[AlCl_3]$ in agreement with Nernst's law; it becomes more positive when the Al content of the amalgam decreases. J. J. B.

Potentiometric analysis of micelle formation. M. N. Fischer and E. I. Kviat (Kolloid. Shurn., 1936, **2**, 539—542).—Changes of the potential of Pt associated with the hydrolysis of $FeCl_3$ have been measured. J. J. B.

Potentiometric titration of sodium salts of fatty acids. A. Lottermoser and A. K. Ghose (Kolloid-Beih., 1937, **45**, 253—302).—The p_H of soap solutions cannot be determined satisfactorily with the H or quinhydrone electrode, but satisfactory and reproducible results are obtainable with an Sb electrode. The latter has been used for the potentiometric titration of aq. solutions of Na salts of saturated fatty acids C_6, C_8, C_{10}, C_{12}, C_{14}, C_{16}, C_{18}, Na oleate, and Na abietate with HCl. In addition to the equivalence point, breaks in the curve corresponding with the formation of acid soaps were found in the following cases: $0{\cdot}004N-NaC_{16}$ (2); $0{\cdot}007N-NaC_{14}$ (2 at room temp., 1 at 50°); $0{\cdot}03—0{\cdot}1N-NaC_{12}$ (2); $0{\cdot}01N-NaC_{10}$ (1 at room temp.); $0{\cdot}005N$-Na oleate (1 very weak); $0{\cdot}01N$-Na abietate (1 at 50° at about 0·6 equiv. HCl).

The breaks become less marked or may vanish with increasing dilution and with rise of temp. F. L. U.

p_H of reference solutions. Y. Kauko and A. Airola (Z. physikal. Chem., 1937, **178**, 437—454).—Owing to uncertainties in e.m.f. measurements arising from liquid-junction potential, *E*, the accuracy of the p_H of the reference solutions used in p_H measurements is uncertain. For measuring the p_H of dil. solutions the use of a reference solution consisting of $10^{-4}M$-$NaHCO_3$ saturated with pure CO_2 under 1 atm. is advocated; *E* is either negligible or can be calc. The p_H of this solution has been measured at 0°, 25°, and 38° by means of a cell with a very small diffusion potential, and is reproducible within ± 0.002. The $H^{\cdot}$ activity of Veibel's solution has been determined by reference to this standard. R. C.

Transition state in chemical kinetics. M. Polanyi (Nature, 1937, **139**, 575—576).—A summary. L. S. T.

Transition state in chemical reactions. M. Polanyi (J.C.S., 1937, 629—635).—A general exposition is given of the methods and results obtained by applying the transition state concept to reaction velocity problems. J. G. A. G.

Transition state method in chemical kinetics. C. N. Hinshelwood (J.C.S., 1937, 635—641).—The transition state method and the kinetic method of treating reaction velocity problems are compared. J. G. A. G.

Thermodynamics and the rates of coupled or reversed reactions. P. van Rysselberghe (Science, 1937, **85**, 383—384). L. S. T.

Calculation of second-order reaction velocity constants. J. M. Sturtevant (J. Amer. Chem. Soc., 1937, **59**, 699—702).—Theoretical. E. S. H.

Reaction between hydrogen and oxygen above the upper explosion limits. G. von Elbe and B. Lewis (J. Amer. Chem. Soc., 1937, **59**, 656—662).—Theoretical. The mechanism is discussed. E. S. H.

Kinetics of oxidation of hydrides in the gas phase. III. Oxidation of hydrogen sulphide. B. Jakovleva and P. Schantarovitsch (J. Phys. Chem. Russ., 1937, **9**, 112—131).—The self-inflammation of $H_2S + O_2$ has been studied. In addition to the previously known region of self-inflammation at high pressures another has been found at <50 mm. It has an upper limit increasing, and a lower limit decreasing, with temp. ("peninsula" on the *p–t* inflammation diagram). The lowest temp. at which inflammation occurs in this region is 285° (for $2H_2S + 3O_2$). A slow oxidation occurs outside the self-inflammation region; this reaction is different from the explosive one. The different effects of increase in $[O_2]$ on the inflammation limits in the case of H_2S, H_2, and CO (shift to lower temp.) and in that of PH_3 and SiH_4 (no effect) are both compatible with the chain mechanism. E. R.

Mechanism of reaction of nitric oxide with oxygen, chlorine, and bromine. III. Rate of formation of nitrosyl chloride. W. Krauss and M. Saracini (Z. physikal. Chem., 1937, **178**, 245—254; cf. A., 1936, 294).—The reaction $2NO + Cl_2 = 2NOCl$ at 273·2—463° abs. follows the termol. law at all concns., the fluctuations in the termol. velocity coeff. reported by other investigators (A., 1925, ii, 552) being ascribed to experimental error. The temp. coeff. is ~ 1.2. R. C.

Second pressure limit of inflammation for spark ignition. F. A. Lavrov and A. L. Bestchastni (Acta Physicochim. U.R.S.S., 1935, **1**, 975—984).—From experiments with various CH_4–air mixtures, it is shown that a second (upper) pressure limit exists for ignition, that it depends largely on the energy of the discharge, increase of which broadens the region of inflammation, and that it disappears on reducing $[CH_4]$. It is evidently independent of any catalytic influence on the part of the walls of the reaction vessel as has been suggested by Haber and Alyea (cf. A., 1930, 1528). C. R. H.

Spectrographic studies of the explosive combustion of methane. J. Bell (Proc. Roy. Soc., 1937, A, **158**, 429—454).—Spectrographic investigation of the explosion flames of CH_4–O_2 mixtures burning under different pressures shows that H_2O is produced by thermal decomp. of intermediate oxidation products and not by the combustion of H_2. MeOH and CH_2O have been isolated in the products of combustion. G. D. P.

Explosion waves and shock waves. IV. Quasi-detonation in mixtures of methane and air. W. Payman and W. C. F. Shepherd (Proc. Roy. Soc., 1937, A, **158**, 348—367).—Small-scale experiments on CH_4–air mixtures, ignited by Al-cased PbN_6 detonators, show the explosion to differ from detonation in that the speed is not uniform. The explosion is called "quasi-detonation" because the energy maintaining the wave is not wholly derived from the combustion of CH_4. Cu-cased Hg fulminate detonators do not ignite CH_4–air mixtures. They ignite a 9·5% CH_4–O_2 mixture. PbN_6 detonators set up detonation in this CH_4–O_2 mixture at a considerably higher rate. In large-scale experiments an explosion similar to detonation was set up in a 9·1% CH_4–air mixture ignited by a charge of high explosive. This quasi-detonation is propagated at a speed of 1900 m. per sec. High flame speeds were also observed in CH_4–air mixtures ignited by detonating $2H_2 + O_2$. The effect of restrictions in and of closing the gallery at both ends is investigated. G. D. P.

Thermal decomposition of ethane. E. W. R. Steacie and N. W. F. Phillips (J. Chem. Physics, 1937, **5**, 275).—A reply to Sachsse (this vol., 248). W. R. A.

Flammability of propane–air mixtures. Range at low pressures. H. W. van der Hoeven (Ind. Eng. Chem., 1937, **29**, 445—446).—The limits of "flammability" of C_3H_8 and air under reduced pressure have been compared with the limits for CH_4–air mixtures. The "flammability" of C_3H_8–air ceases at a considerably higher pressure than that of CH_4–air. Intensity of the spark has an important influence but no explosion could be produced below 210 mm. Hg. C. C.

Two-stage mechanism for the low-temperature spontaneous combustion of hydrocarbons. B. V. Aivazov and M. B. Neumann (Acta Physicochim. U.R.S.S., 1937, **6**, 279—288).—Study of the combustion of C_5H_{12}–O_2 mixtures at 304—440° shows that the reaction proceeds in two stages, ignition or explosion being preceded by formation of a cold flame. There are two induction periods, one applying to each reaction. The results explain certain phenomena observed in the operation of internal-combustion engines. J. W. S.

Reactions between atomic deuterium and saturated aliphatic hydrocarbons. N. R. Trenner, K. Morikawa, and H. S. Taylor (J. Chem. Physics, 1937, **5**, 203—211).—The extent of deuteration of CH_4, C_2H_6, C_3H_8, and n-C_4H_{10} by D between 0° and 300° has been followed by fractionation analysis and by determination of the thermal conductivities of the products of deuteration. Approx. vals. for the activation energies of the various processes are deduced and are shown to conform to suggested mechanisms. Deuteration of alkyl radicals proceeds more quickly than deuteration of saturated hydrocarbons. The energies of the Me–H and Me–Me linkings are 108 and 97·6 kg.-cal., respectively; discrepancies between these vals. and existing data are discussed. Results derived from activation energies are subject to considerable influence from the uncertainty of the steric factor. W. R. A.

Equilibrium and kinetics [of diene synthesis] in the gaseous state and in solution. G. A. Benford, (Miss) B. S. Khambata, and A. Wasserman (Nature, 1937, **139**, 669—670).—The reaction 2 × *cyclo*pentadiene → di*cyclo*pentadiene is homogeneous and bimol. both in the gaseous state and in paraffin solution. L. S. T.

Ternary and quaternary explosion regions and Le Chatelier's formula. A. La Fleur (Rec. trav. chim., 1937, **56**, 442—473).—The following explosion limits in air were obtained: 3·0—3·2 and 13·9—14·4% C_2H_4; 7·7 and 72·6% H_2; 18·3 and 72·7% CO; 6·7 and 12·4% $C_2H_4Cl_2$; 5·2 and 5·6% Bu^aBr. Three quaternary systems, viz., H_2–C_2H_4–CO–air, H_2–C_2H_4–CO_2–air, and N_2–C_2H_4–CO_2–air, were investigated and examined graphically from the point of view of Le Chatelier's law. A closed explosion region was found in the second system. Three ternary systems, viz., C_2H_4–air–$C_2H_4Cl_2$, C_2H_4–air–$C_2H_4Br_2$, and C_2H_4–air–Bu^aBr, were similarly examined. C. R. H.

Thermal decomposition of methyl nitrite. A. G. Carter and M. W. Travers (Proc. Roy. Soc., 1937, **A**, **158**, 495—498).—In disagreement with the results of Steacie and Shaw (A., 1934, 1312) the decomp. of MeO·NO is found not to be a first-order reaction. G. D. P.

Influence of pressure on spontaneous ignition and limits of inflammability of ether–air mixtures. D. T. A. Townend and E. A. C. Chapman (Proc. Roy. Soc., 1937, **A**, **158**, 415—429).—The influence of pressure on the ignition temp. of 1, 2, 5, and 10% Et_2O–air mixtures has been determined. The results are similar to, but not identical with, those observed for the higher paraffin hydrocarbons. The analogy between the influence of pressure on ignition points and limits of inflammability is discussed. G. D. P.

Reaction velocity and solvatation. Theory of the hydrolysis of ethylene bromide with alcoholic alkali hydroxide. A. L. Bernouilli and J. Kaspar (Helv. Chim. Acta, 1937, **20**, 462—468; cf. A., 1934, 36).—A general equation is derived theoretically for the velocity coeff. of this hydrolysis. Its variation with temp. and with addition of H_2O is also deduced. J. W. S.

Kinetics of bimolecular reactions in solution. J. K. Syrkin (Acta Physicochim. U.R.S.S., 1935, **1**, 855—870).—The no. of mol. collisions and the probability of a collision being followed by a reaction are discussed mathematically. (Cf. A., 1936, 165.) C. R. H.

Kinetics of oxidation of cobalt in ammoniacal solution. M. Châtelet (Compt. rend., 1937, **204**, 857—858).—The rate of oxidation is dependent on $[NH_4Cl]$ and $[NH_3]$, the initial velocity with const. $[NH_4Cl]$ being $\propto$ the concn. of $[Co(NH_3)]^{\cdot\cdot}$ present (cf. A., 1936, 797). The max. extent of oxidation increases with $[NH_3]$, reaching a limit at which one atom of O is absorbed per atom of Co. A. J. E. W.

Formation and decomposition of quaternary ammonium salts in solution. W. C. Davies and R. G. Cox (J.C.S., 1937, 614—621).—The kinetics of the reversible reaction p-$C_6H_4Br{\cdot}NMe_2 + C_3H_5Br \rightleftharpoons p$-$C_6H_4Br{\cdot}NMe_2{\cdot}C_3H_5\}Br$ have been investigated in 5—15% aq. $COMe_2$ and $CHCl_3$ at 35—65°. The formation of the salt is bimol. and the decomp. is unimol. At equilibrium at approx. 65°, the salt is almost completely decomposed in $CHCl_3$ but is only half decomposed in 10% aq. $COMe_2$ and the yield increases with $[H_2O]$. The velocity coeff., k, and the equilibrium const. K for aq. $COMe_2$ are almost independent of concn. of reactants, but in $CHCl_3$ K increases with dilution, possibly owing to complex formation. In $CHCl_3$, k also increases with dilution, but in very dil. solutions, $k \propto$ initial salt concn. and this is attributed to a negative catalysis. p-*Fluoro-*, *-chloro-*, m.p. 153°, and *-iodo-phenyldimethylallylammonium bromide*, m.p. 150—160°, were prepared and their decomp. investigated. J. G. A. G.

Functional relation between the constants of the Arrhenius equation. R. A. Fairclough and C. N. Hinshelwood (J.C.S., 1937, 538—546).—The rates of alkaline hydrolysis of MeOAc and EtOBz, the formation of methylpyridinium iodide, and the hydrolysis of EtBr were determined in mixtures of H_2O with EtOH, dioxan, and $COMe_2$–EtOH at 0—80°, and a correlation was found between vals. of E and $\log PZ$ defined by the reaction rate equation $k = PZe^{-E/RT}$. These results, in conjunction with data from the lit., show that the correlation is probably not fortuitous. An interpretation is based on statistical principles and the assumption of a time interval between activation and reaction. Factors controlling the magnitude of P are discussed. J. G. A. G.

Hydration of unsaturated compounds. V. Rate of hydration of acetylene in aqueous solu-

tion of sulphuric acid and mercuric sulphate. R. H. Frieman, E. R. Kennedy, and H. J. Lucas (J. Amer. Chem. Soc., 1937, **59**, 722—726; cf. this vol., 135).—The initial rate of hydration of C_2H_2 in aq. H_2SO_4–$HgSO_4$ is of the first order with respect to $[C_2H_2]$ and of the second with respect to $[HgSO_4]$. Reaction is probably formation of $C_2H_2,2Hg(HSO_4)_2$, followed by hydration. At later stages the rate of reaction $\propto [C_2H_2]^{4/3}$, but this is complicated by and may be due to irregular interference by MeCHO. C_2H_2 is determined by $KBrO_3$–KBr in presence of $Hg^{\cdot\cdot}$ ($\not<$ 1 atom per Br) and back-titration in presence of NaCl. R. S. C.

Comparative study of oxidation of glucose 6-phosphate and glucose.—See A., II, 177.

Kinetics of the hydrolysis of dialkyl phosphites. I. By hydrogen and hydroxyl ions. II. Acid and base catalysis. P. Nylén (Svensk Kem. Tidskr., 1937, **49**, 29—52, 79—96).—I. The hydrolysis of Me, Et, Pr^a, Pr^β, and Bu^a di- to mono-phosphites has been followed iodometrically. 0·01—2·0*N*-HCl, 0·25—2·0*N*-HBr, and 0·25—2·0*N*-$HClO_4$ were used with addition of the corresponding Na salt to keep the ionic strength const. The salt effect is weakly positive. $H^{\cdot}$ catalysis falls with increasing concn. of acid, but no satisfactory explanation can be found. Alkaline hydrolysis is very rapid and was studied in 0·01*N*-$Ba(OH)_2$. For $H^{\cdot}$ hydrolysis $k_1/k_2 = 10$ approx., and for OH′ 10^6 approx. in every case.

II. Measurements with Et_2HPO_3 are in agreement with the Brönsted theory of acid and base catalysis. H_2O and H_2CO_3 give anomalous results. M. H. M. A.

Calculation of the activation energy of the rearrangement of ergosterol to calciferol. J. R. Owen and A. Sherman (J. Amer. Chem. Soc., 1937, **59**, 763—764).—The activation energy lies between 72 and 92 kg.-cal. The mechanism is discussed. E. S. H.

Influence of temperature on periodic reactions. V. K. Nikiforov and A. P. Runtzo (Kolloid. Shurn., 1937, **3**, 45—59; cf. this vol., 183).—The const. of periodicity of the reactions $AgNO_3 + K_2Cr_2O_7$ and $AgNO_3 + Na_3AsO_4$ in gelatin and agar increases with rising temp. or in the presence of citric acid or KNO_3; $Ca(NO_3)_2$ diminishes this const. J. J. B.

Method of study of chemical systems by variation of mass with linearly variable temperature. II. Theoretical study of curves and applications. P. Vallet (Ann. Chim., 1937, [xi], **7**, 367—423; cf. B., 1936, 506).—The mathematics of thermal decomp. reactions, as determined by loss-of-wt. measurements, at const. and with linearly rising temp. are discussed with reference to published data. E. S. H.

Relation between absorption of gases by liquid absorbents and the viscosity of the latter. E. M. Preis, M. A. Nikolaeva, and P. M. Tscherkasskaja (J. Appl. Chem. Russ., 1936, **9**, 2179—2191).—The rate of absorption of CO_2 by aq. KOH containing glycerol or sucrose inversely $\propto \eta$ of the medium. Substances lowering surface tension increase the rate of absorption by solutions of high η. R. T.

Physical influences on the rate of dissolution of polyoxymethylenes.—See A., II, 228.

Comparison of the initial velocities of the reactions between iron oxides and hydrogen, carbon oxide, and mixtures thereof. G. I. Tschufarov and E. P. Tatievskaia (J. Phys. Chem. Russ., 1936, **8**, 933—942). H_2 reduces magnetite at 500° about 20 times, and at 800° about 10 times, as rapidly as does CO; for hæmatite the corresponding ratios are 15 and 6. In mixtures, CO restrains the reduction by H_2. All the reactions are slower at 800° than at 500°, owing to disappearance of active centres. J. J. B.

Oxidation of nickel spherules. G. Valensi (Bull. Soc. chim., 1937, [v], **4**, 668—670; cf. this vol., 88).—Data for Ni spheres of 1·6 mm. and 0·8 mm. diameter are recorded (1073—1288° abs.). At const. temp., a function of *m*, the fraction of the Ni oxidised, defined by $F(m) = 2{\cdot}471 - (1 - m)^{3/2} - 1{\cdot}471(1 + 0{\cdot}68m)^{2/3} = (38{\cdot}14/r_0^2)e^{-22420/T}t$, $\propto$ the time, *t*. H. J. E.

Luminosity phenomena produced by the detonation in air and in a vacuum of certain priming explosives. H. Muraour and A. Langevin (J. Phys. Radium, 1936, [vii], **7**, 417—419).—By using a photographic film mounted on a rotating drum a tracing has been obtained of the luminous effects produced by the detonation of certain explosives in air and in a vac. The speeds of the various condensation waves set up by the detonation have been evaluated; they are of the same order of magnitude as the calc. speed of sound within the products of the explosion at high temp. W. R. A.

Spectrographic study of the detonation of priming explosives in a vacuum. H. Muraour (J. Phys. Radium, 1936, [vii], **7**, 411—416).—By detonating certain priming explosives in a vac., particularly the nitrides and fulminates of heavy metals, it is possible to obtain excitations of the free atoms of the metal not obtainable by ordinary flame spectra. The phenomenon might be used to elucidate the mechanism of detonations. W. R. A.

Inhibition of thermal decomposition of *n*-butane by nitric oxide. L. S. Echols and R. N. Pease (J. Amer. Chem. Soc., 1937, **59**, 766—767).—Decomp. of *n*-butane at 500° is inhibited by small amounts of NO. The mechanism is discussed. E. S. H.

Effect of iodine on rates of decomposition of formaldehyde, acetaldehyde, and propaldehyde. G. K. Rollefson and R. F. Faull (J. Amer. Chem. Soc., 1937, **59**, 625—629).—The rates of decomp. of MeCHO and EtCHO at 500° are markedly accelerated by I, but that of CH_2O is hardly affected. The mechanism of reaction is discussed. E. S. H.

Catalysis of maleic–fumaric isomerisation by hydrogen ions.—See A., I, 228.

Halogens as catalysts. H. J. Schumacher (Trans. Electrochem. Soc., 1937, **71**, Preprint 26, 297—312).—Thermal and photochemical reactions catalysed by halogen atoms and mols. are summarised and discussed. J. G. A. G.

Effect of negative catalysts on thermal decomposition of hydrogen peroxide in solution. B. J. Dain and K. M. Epstein (J. Phys. Chem. Russ., 1936, **8**, 896—903).—The rate of unimol. decomp. of H_2O_2 in absence of a catalyst is decreased by PhOH > $COEt_2$ > COMeEt > MeOH > $COMe_2$. J. J. B.

Influence of admixtures on polymerisation of butadiene in the presence of sodium. N. A. Tschajanov and Z. N. Nemtzova (Kolloid. Shurn., 1936, **2**, 487—494).—The polymerisation of $(CH_2{:}CH\cdot)_2$ is retarded by alcohols (EtOH, $CH_2{:}CH\cdot CH_2\cdot OH$), aldehydes (especially by *o*-$OH\cdot C_6H_4\cdot CHO$), and ketones (especially by $CH_2Ac\cdot COPr^{\beta}$). These admixtures also alter the properties of the polymerides. J. J. B.

Temperature coefficients in the anion-catalysed decomposition of nitramide. E. C. Baughan and R. P. Bell (Proc. Roy. Soc., 1937, **A**, **158**, 464—478).—The velocity of decomp. of nitramide has been studied at 15°, 25°, 35°, and 45°, the catalysts used being H_2O (the "spontaneous" reaction), $Bu^{\gamma}CO_2'$, OAc', OBz', HCO_2', *o*-$OH\cdot C_6H_4\cdot CO_2'$, $CH_2Cl\cdot CO_2'$, $CHCl_2\cdot CO_2'$, and *o*-$NO_2\cdot C_6H_4\cdot CO_2'$. The results show that Brönsted's equation relating catalytic const. to dissociation const. is valid and that Arrhenius' equation is obeyed by each catalyst. The variation in the consts. of this equation for different catalysts is discussed. G. D. P.

Synthetic dehydrogenases. Synthetic carboxylases.—See A., II, 261.

Mechanism of catalytic exchange reactions of heavy hydrogen. A. Farkas and L. Farkas (Trans. Faraday Soc., 1937, **33**, 678—690).—The rate of exchange between gaseous D_2 and H_2O, Bu^aOH, β-ethylhexanol, Et_2O, $COMe_2$, and C_6H_6 in both the gaseous and liquid states has been studied, and compared with that of the *ortho–para* H_2 conversion. A Pt catalyst was used. With H_2O and the alcohols the reaction is much faster in the vapour than in the liquid, whilst with $COMe_2$ and C_6H_6 the difference is much smaller. In the vapour phase the exchange rates are similar for H_2O and the alcohols, and much smaller for Et_2O and C_6H_6. Pt effects the exchange only of the hydroxylic H in alcohols. The exchange rates with H_2O and alcohols in the vapour phase, and with all the compounds in the liquid phase, differ only slightly from that of the *para*-H_2 conversion. The results are explained by assuming that dissociation into atoms occurs on the catalyst, and that both partners are present in the adsorption layer. F. L. U.

Catalytic union of hydrogen and oxygen on copper and copper–gold alloys. A. B. van Cleave and E. K. Rideal (Trans. Faraday Soc., 1937, **33**, 635—643; cf. A., 1930, 1129; 1936, 422).—In the reaction between H_2 and O_2 (4 : 1, 2 : 1, and 1 : 1) on Cu at 170—250° at pressures ≯0·15 mm., the gases disappear in the ratio 1 : 1, 1 mol. of Cu_2O being formed for each mol. of H_2O. The apparent energy of activation in the early stages (on freshly reduced Cu) is 13·0 kg.-cal., and later on the partly oxidised surface 6·0 kg.-cal. True catalytic union occurs only on surfaces containing a large proportion of CuO, with an activation energy of 9 kg.-cal. The rate-determining process is considered to be activated migration of O retained as Cu_2O into remoter layers of Cu, probably through the reaction $Cu_2O \rightleftharpoons CuO + Cu$. The mechanism suggested is supported by experiments with Cu–Au alloys. F. L. U.

Catalytic decomposition of ozone at metal surfaces. L. I. Kaschtanov, N. P. Ivanova, and V. P. Rishov (J. Appl. Chem. Russ., 1936, **9**, 2176—2178).—The catalytic activity at 100° falls in the series Ag > Zn–Hg > Cu–Hg > brass > steel > Zn > Fe > Au > Ni > Pt > Sn > Pb > Cu > Al. R. T.

Mechanism of the catalytic combustion of ammonia. M. Bodenstein (Trans. Electrochem. Soc., 1937, **71**, Preprint 25, 277—296).—Experiments with NH_3–O_2 mixtures at 0·005–0·02 mm. impinging on a Pt strip at 1140—1350° and subsequently striking the wall of the vessel cooled by liquid air, whereby products were condensed, show that NH_2OH and HNO_2 are intermediate products in the combustion of NH_3. The data are consistent with the processes: (1) $NH_3 + O_{(adsorbed)} = NH_2OH$, (2) $NH_2OH + O_2 = HNO_2 + H_2O$, (3) $NH_2OH + NH_3 = N_2 + H_2O + 2H_2$, (4) $NH_2OH + O = HNO + H_2O$, (5) $2HNO = N_2O + H_2O$. It is probable that NH_2OH rather than NH is a primary product. Some of the main secondary reactions appear to occur in the gas phase. J. G. A. G.

Sulphuric acid catalysis with ferric oxide. B. Neumann and G. Heintke (Z. Elektrochem., 1937, **43**, 246—254).—The dissociation pressures of $FeSO_4$, $Fe_2(SO_4)_3$, and $Fe_3(SO_4)_4$ have been determined in the range 300—700° and partial SO_3 pressures and heats of dissociation have been calc. $Fe_2(SO_4)_3$ does not form a basic salt. The mechanism of catalysis of H_2SO_4 production is reviewed in the light of the data obtained. E. S. H.

Vanadium catalysts [for sulphuric aicd].—See B., 1937, 434, 435.

Influence of SO_2 and SO_3 on the activity of tin–chromium catalysts. I. E. Adadurov and D. V. Gernet (J. Appl. Chem. Russ., 1937, **10**, 245—256).—The catalyst (1 : 1 Cr_2O_3–SnO_2 + 3% $SbCl_3$) does not react with dry SO_2 or SO_3 at 200—400°, and is only slightly reversibly inactivated by the wet gases. The *X*-ray diagram given by 1 : 0·433 Cr_2O_3–SnO_2 does not exhibit lines characteristic of SnO_2; it is concluded that Sn is present as a complex compound. The constituent crystallites of the catalyst have a diameter of $\not> 10^{-5}$ cm. R. T.

Adsorption and decomposition of carbon monoxide on zinc oxide catalysts. R. L. Burwell, jun., and H. S. Taylor (J. Amer. Chem. Soc., 1937, **59**, 697—699).—When CO is passed over ZnO at >184° the reaction $2CO \rightarrow C + CO_2$ occurs at the surface. The deposited C is removed by H_2 in the same temp. region, probably as CH_4. E. S. H.

[Catalytic] synthesis of methane from carbon monoxide and hydrogen.—See B., 1937, 414.

"True" and "conjunct" catalytic polymerisation of olefines.—See A., II, 223.

Catalytic toxicity and chemical structure. I. Relative toxicity of sulphur compounds in catalytic hydrogenation. E. B. MAXTED and H. C. EVANS (J.C.S., 1937, 603—606).—In the hydrogenation of crotonic acid catalysed by Pt powder and of olive oil catalysed by Ni on kieselguhr, the relative inhibiting effects per g.-atom of S are $H_2S < S < CS_2 <$ thiophen $<$ cysteine. The results are discussed with reference to the widely different activity of the catalysts and the effect of the attached atoms or groupings on the inhibiting effect of the S atom. J. G. A. G.

Nickel as a catalyst. O. B. J. FRASER (Trans. Electrochem. Soc., 1937, **71**, Preprint 33, 397—457).—The prep. and use of Ni, Ni compounds, and Ni alloys as catalysts are summarised with full lit. references. J. W. S.

Metallic oxides as catalysts in certain organic chemical processes. P. K. FROLICH (Trans. Electrochem. Soc., 1937, **71**, Preprint 20, 223—240).—The catalysis of reactions involving mainly hydrogenation, dehydrogenation, hydration, and dehydration is reviewed. J. G. A. G.

Decomposition of tetralin peroxide. IV. Effect of sulphur and sulphur compounds. T. YAMADA (J. Soc. Chem. Ind. Japan, 1937, **40**, 44—47B).—S, $(C_5H_{11})_2S$, PhSH, and PrSH change the reaction from one of the first order to an autocatalytic reaction. The formation of a decomp. product having a strongly catalytic effect on the reaction is offered in explanation. C. R. H.

Determination of oxygen in activation of alkaline-earth oxide cathodes. H. ISENSEE (Z. physikal. Chem., 1937, **B**, **35**, 309—316).—The liberation of O_2 by electrolytic decomp. of BaO used as a cathode activator has been followed by using the H_2–O_2 reaction under low pressure, amounts of O_2 down to 2×10^{-6} g. being determinable. With a Pt cathode coated with a mixture of alkaline-earth oxides the proportion of the conduction which is electrolytic, n, is $\sim 0{\cdot}2\%$ at the start of activation, and when about $0{\cdot}2\%$ of the oxide mols. have been electrolytically reduced to Ba by the emission current the conduction is entirely electronic. With pure BaO protected from reducing agents n remains const. With pure SrO at 950—1080° there is no electrolysis. In the activation of technical oxide cathodes electrolysis plays only a minor part. The activated state of alkaline-earth oxide cathodes largely persists even after treatment with O_2. BaO often contains an excess of Ba, and it is possible that when it is anodically polarised at high temp. the electrons of the excess of Ba tend to migrate towards the surface and so increase its emissivity. R. C.

Electrolytic growth of metal crystals. II. Growth of silver crystals from molten salts. T. ERDEY-GRÚZ and R. F. KARDOS. **III. Growth of copper crystals from aqueous solutions.** T. ERDEY-GRÚZ and E. FRANKL (Z. physikal. Chem., 1937, **178**, 255—265, 266—273; cf. A., 1935, 450).—II. In the growth of spherical Ag single crystals in molten Ag salts relations quite different from those prevailing in growth in aq. solutions are observed. Only some of the cryst. faces required by Stranski's theory of crystal growth appear and their rates of growth are not in the theoretical sequence. No satisfactory growth occurs in halide melts. Voltage–current curves in $AgNO_3$ and $AgNO_3$–KNO_3 mixtures indicate that the rate of separation of Ag is determined by the rate of growth of the surface layers or rate of supply of ions to the growing points.

III. No regular growth of spherical Cu single crystals occurs in Cu^{II} salt solutions, but in complex solutions of Cu_2Br_2 and Cu_2Cl_2 crystals in which the prevailing form is the tetrakishexahedron or ikositetrahedron combined with the octahedron or rhombododecahedron are formed. Not all the faces required by Stranski's theory appear. The voltage–current curves suggest that the rate of the cathodic process is determined at low c.d. and overvoltage by the rate of supply of ions and at high c.d. and overvoltage by the rate of discharge of the ions. R. C.

***KZ* and *KG*$_{II}$ in anodic deposition of silver peroxide.** A. GLAZUNOV and R. SOUČEK (Chem. Listy, 1937, **31**, 129—133).—Anodic deposition of Ag_2O_2 takes place according to the same laws as cathodic deposition of Ag. R. T.

Electrolytic lead plating of [iron] chemical apparatus.—See B., 1937, 453.

Adhesion of electrodeposited nickel to nickel.—See B., 1937, 452.

Structure of electrodeposited copper.—See B., 1937, 452.

Electrolysis of deuteroacetic acid.—See A., II, 226.

Formation of ethylene during the electrolysis of propionic acid.—See A., II, 227.

Electrolytic reduction of aromatic trinitro-compounds to their respective triamines.—See B., 1937, 459.

Electrolysis of soap solutions.—See B., 1937, 462.

Active hydrogen, oxygen, and nitrogen at pressures up to 20 mm. P. HARTECK and E. ROEDER (Z. physikal. Chem., 1937, **178**, 389—406).—By passing a luminous discharge through Ne under 25 mm. containing a small amount of H_2, O_2, or N_2 it has been possible to obtain mixtures of the active gases with Ne under such pressure that they could be passed into liquids and their reactions with these examined. The concns. of the active gases were determined. R. C.

Formation of a higher nitrogen oxide (NO_3) in the action of the glow discharge on the gaseous system NO_2–O_2. A. KLEMENC and W. NEUMANN (Z. anorg. Chem., 1937, **232**, 216—224).—NO_3 is not formed by the action of the discharge on NO_2 and O_2, but is produced by vaporisation of a mixture of NO_2 and O_3. E. S. H.

Oxidation of nitrogen in the high-frequency luminescent dicharge. II. E. N. EREMIN, S. S. VASSILIEV, and N. I. KOBOSEV (J. Phys. Chem. Russ., 1937, **9**, 48—64).—The dependence of yield of NO per unit energy on discharge frequency has been measured. At low energies (*e.g.*, 70 watts) high frequency (*e.g.*, $2·7 \times 10^5$ Hz) gives much more NO than low frequency (50 Hz). At high energies ($\nless$approx. 90 watts) the relation becomes reversed. The yield is unchanged from 2·7 to 10×10^5 Hz, showing the absence of resonance effects. Dependence of yield or composition of the gas (20—80% N_2) is the same for low and for high frequency. The optimal composition depends on discharge energy, not on frequency. Spectroscopic and electrical characteristics of the discharges used are given and the different chemical actions of high and low frequencies are explained by different electronic temp. and their dependence on energy input.

E. R.

Photo-reaction of chlorine monoxide and hydrogen. T. Iredale and T. G. Edwards (J. Amer. Chem. Soc., 1937, **59**, 761).—The photo-decomp. of Cl_2O is accelerated by H_2. The mechanism is discussed. No evidence of the alleged explosive decomp. of Cl_2O in bright light was found.

E. S. H.

Bromine-sensitised decomposition of chlorine monoxide in green light. A. G. Brown and J. W. T. Spinks (Canad. J. Res., 1937, **15**, **B**, 113—123).—The decomp. of Cl_2O has been studied at 19° in light of λ 5460 and 3650 A. for which the quantum yields are 4·3±10% (sensitised by Br) and 5·3 (unsensitised) respectively, which suggests that both reactions have similar mechanisms. A slow dark reaction occurs in both cases. A photochemical decrease in pressure occurs near the end of the sensitised reaction, probably due to the formation of Cl_2O_6 on the walls, from the Br-sensitised decomp. of ClO_2. The chain mechanism is discussed and it is considered that the bulk of the evidence favours sensitisation by Br_2 mols.

R. S. B.

Primary process of photodissociation in sulphur trioxide. G. Kornfeld (Trans. Faraday Soc., 1937, **33**, 614—617).—SO_2 absorption bands are produced by irradiation of SO_3 with ultra-violet light of $\lambda > 2760$ A. This agrees with the assumption that the primary decomp. yields a SO_2 mol. and an O atom in the normal state.

F. L. U.

Theory of photodichroism (Weigert effect). S. Nikitine (Compt. rend., 1937, **204**, 973—975).

A. J. E. W.

Low-intensity solarisation of four emulsions. H. P. Griggs (J. Opt. Soc. Amer., 1936, **26**, 384—385).—Investigations previously reported (cf. A., 1935, 1211) are extended, and, with three additional emulsions, reversals of a higher order than the second are reported.

N. M. B.

Effect of pre-exposure in spectrum photography. D. Norman (J. Opt. Soc. Amer., 1936, **26**, 407—408).—An investigation of pre-exposure for five types of Eastman plates is described. The effect was the same in each case. Fading of the latent image amounting to a density decrease of 0·07 at a density level of 0·8 was observed in plates developed 12 hr. after exposure.

N. M. B.

Optical investigation of the latent image and the print-out effect of photographic emulsions. A. van Kreveld and H. J. Jurriëns (Physica, 1937, **4**, 285—296).—Changes in light absorption due to latent image formation were measured for several types of emulsion. The increase in absorption $\propto$ the time of exposure. The latent image and the printing out effect are both due to formation of Ag. The regression theory of solarisation is rejected. Emulsions which are initially insensitive to red light show an auto-accelerating absorption effect with time of irradiation, as Ag accumulates. The effect of red light is $\ll$ that of blue light and the two effects are independent. Ag deposited in the printing out process had an approx. uniform light absorption at $\lambda\lambda$ 5000—7000 A., as compared with the selective absorption (max. 7000 A.) observed by Hilsch and Pohl (A., 1930, 1342) for cryst. AgBr after irradiation.

H. J. E.

Action of light and of electrons on silver halides. J. J. Trillat and H. Motz (J. Phys. Radium, 1936, [vii], **7**, 89—92).—*X*-Ray analysis shows the presence of cryst. Ag in photographic emulsions of AgBr after solarisation. The quantity of Ag increases with the time of exposure. The electron diffraction patterns of pure AgBr show no evidence of cryst. Ag after prolonged exposure to electrons or to light. Exposure to electrons causes crystallisation of an amorphous film of AgBr.

O. D. S.

Photoreduction of ferric chloride in alcoholic solutions in light of quartz mercury-vapour lamp. M. Prasad and V. B. Mohile (Proc. Nat. Acad. Sci. India, 1936, **6**, 261—268).—At const. $[FeCl_3]$ the reaction is of zero order; the rate of reduction is a function of the $[FeCl_3]$.

J. S. A.

Mercury-sensitised reactions of methane, deuteromethanes, and the hydrogen isotopes. K. Morikawa, W. S. Benedict, and H. S. Taylor (J. Chem. Physics, 1937, **5**, 212—225; cf. A., 1935, 457).—A study of the interactions between CH_4 and D_2, MeD and H_2, and CH_4 and MeD under the influence of Hg 2537 A. at >40° shows that the processes involving formation of deuteromethanes are very complex and the activation energy cannot be accurately determined. Exchange reactions were followed by measurement of the infra-red absorption of products (A., 1937, II, 131) and condensation processes by measuring pressures at const. vol. The quantum efficiency (γ) of the exchange increases about 100-fold in the range 100° to 490° and the inconstancy of the temp. coeff. demands a chain mechanism, increasing in length at higher temp. Variation of the light intensity indicates a change in mechanism as the temp. rises. Exchange between CH_4 and MeD is $\ll$ that between CH_4 and D_2, but the temp. effect and the variation of γ and of the temp. coeff. are analogous. The rate of exchange between CH_4 and D_2 approx. = that between MeD and H_2. Reactant concns. were varied for the reaction of CH_4 and D_2 at 196° and 392° and the results postulate different kinetics at the two temp. For 98° the composition of the products differs from the equilibrium distribution usually found at higher temp. Only saturated higher hydrocarbons condensed from CH_4 were found at all temp. except the highest, 490°, at which definite traces of unsaturated hydrocarbons were identifiable. With increasing temp. the extent of condensation decreases; its rate increases as the temp. increases up to 296° but decreases at higher temp. The rate of CH_4 condensation increases with $[CH_4]$, and in presence of D_2 is $>$ in presence of H_2. From consideration of [D] and the life of D it is concluded that diffusion cannot be neglected at higher temp. That the excited Hg is quenched by CH_4 and by MeD giving Me and H or D is adduced from several distinct experimental results. Fifteen possible processes taking place in different temp. ranges are outlined. At $<200°$ the exchange is between CH_4 and D giving principally MeD and to a smaller extent $CH_2D + H$ and $CH_2 + HD$. Near 200° the reaction is $Me + D_2 \rightarrow MeD + D$, whilst at 300° it is $CH_4 + D \rightarrow Me + HD$. In condensation reactions alkyl radicals recombine to form the higher hydrocarbons and the sources of such radicals at different temp. are reviewed. Experimental data are analysed on the basis of these mechanisms. W. R. A.

Photochemical formation of tetrachloroethane from *trans*-dichloroethylene and chlorine. K. L. Müller and H. J. Schumacher (Z. physikal. Chem., 1937, **B**, **35**, 285—297).—The formation of $CHCl_2{\cdot}CHCl_2$ from $C_2H_2Cl_2$ vapour and Cl_2 in light of λ 436 mμ at 80—95° is a chain reaction, and for reactants under 100 mm. pressure at 80° and a light absorption of 10^{16} quanta per min. the quantum yield is $\sim 7 \times 10^3$ mol. For $C_2H_2Cl_2$ pressures >20 mm. the rate is given by $d[C_2H_2Cl_4]/dt = kI^{\frac{1}{2}}_{abs.}[Cl_2]$, but at lower pressures is influenced by $[C_2H_2Cl_2]$. The temp. coeff. is $1{\cdot}13 \pm 0{\cdot}03$. The probable reaction scheme is $Cl + C_2H_2Cl_2 = C_2H_2Cl_3$, $C_2H_2Cl_3 + Cl_2 = C_2H_2Cl_4 + Cl$, $2C_2H_2Cl_3 = (2C_2H_2Cl_2 + Cl_2)$ or $(C_2H_2Cl_2 + C_2H_2Cl_4)$. O_2 markedly retards the reaction, apparently by reacting with $C_2H_2Cl_3$ radicals. R. C.

Photo-iodination of the butenes, propylene, and ethylene at low temperatures. Preparation and photolysis of αβ-di-iodobutane. G. S. Forbes and A. F. Nelson (J. Amer. Chem. Soc., 1937, **59**, 693—697).—The photo-reaction was conducted in $CHCl_3$ at −55° in light of λλ 436, 546, and 644 mμ. The quantum yield for const. concn. and light intensity varies 40-fold for the different olefines, and falls with decreasing frequency to about 0·01 at λ 644 mμ. The prep. of *αβ-di-iodobutane* (I), m.p. $-15 \pm 1°$, and *βγ-di-iodobutane*, m.p. $-11 \pm 2°$ (decomp.), is described. Photolysis of (I) was conducted at −60°, −20°, and 25°; the quantum yield at 25° is almost the same as that for symmetrical $C_2H_4I_2$. E. S. H.

Asymmetric photochemical decomposition of complex salts. R. Tsuchida, A. Nakamura, and M. Kobayashi (J. Chem. Soc. Japan, 1935, **56**, 1335—1338).—The optical rotatory power of $K_3[Co(C_2O_4)_3]$ for λ 4990 A. is −5725°. On illumination by dextrocircularly polarised light (λ 5890 A.) the aq. solution of racemic $K_3[Co(C_2O_4)_3]$ becomes lævorotatory. The rotation increases to a max. with time and then decreases. Ch. Abs. (*e*)

Photochemical formation of peroxides. VII. Oxidation of acetic, propionic, butyric, and *iso*valeric acids by molecular oxygen with ultraviolet light. R. Cantieni (Z. wiss. Phot., 1937, **36**, 90—95).—The concns. of peroxides formed (*e.g.*, AcO_2H from AcOH) after 1 min. exposure of CH_2O (cf. A., 1936, 1492), AcOH, $EtCO_2H$, $PrCO_2H$, and $Bu^{\beta}CO_2H$ to ultra-violet light are 3·0, 2·2, 10·0, 8·5, and 3·1, respectively; after 1 hr. exposure, 8·2, 16·8, 172·0, 96·0, 33·0, respectively. Atm. O_2, dried if necessary, was bubbled through during the exposures. The results show that the stability of the per-acids to ultra-violet light passes through a max. with increasing no. of C atoms in the mol. The rate of oxidation and final concns. obtained vary considerably with the concn. of the original acids. J. L.

Photochemical formation of carbonyl chloride. IX. Development and dying out of chain mechanism at beginning and end of illumination. M. Bodenstein, W. Brenschede, and H. J. Schumacher (Z. physikal. Chem., 1937, **B**, **35**, 382—402; cf. A., 1935, 457).—The formation of $COCl_2$ on intermittent illumination of $CO\text{–}Cl_2$ mixtures has been studied. Reaction continues for about 2 sec. after illumination has ceased, or, if a little O_2 is present, about 25 sec. after. Since small amounts of O_2 retard the stationary photochemical formation of $COCl_2$ but do not disturb the equilibrium $CO + Cl \rightleftharpoons COCl$ the above effect of O_2 must be ascribed to the formation of an active O-containing intermediate product which has a longer life than Cl and COCl formed in absence of O_2 and initiates new chains in the dark whilst itself slowly decomp. The development and dying out of the chain mechanism can be quantitatively accounted for by the reaction scheme previously proposed and various consts. of the reactions have been calc. In the Cl-sensitised photochemical formation of CO_2 from CO and O_2 on intermittent illumination the after-effects are of similar length to those in the formation of $COCl_2$ in presence of a little O_2. R. C.

Course of the photolysis of carbonic acid. E. Baur (Helv. Chim. Acta, 1937, **20**, 387—390).—Photochemical assimilation of CO_2 by plants may occur through carbonates or CO_2H groups. Analogy is drawn with electrolytic oxidation–reduction processes, by which H_2CO_3 can yield H_2CO_4 and HCO_2H, respectively. Photochemical sensitisers produce H_2O_2 in presence of $H^{\cdot}$ and O_2, and with CO_3'' this gives H_2CO_4. H_2CO_4 with H_2O_2 yields some CH_2O (cf. following abstract), which may be removed by other processes as formed. The photosensitiser may lose CO_2 by the process, this being succeeded by reabsorption from polyphenols, as in the production of pyrogallol and salicyl ion from pyrogallolcarboxylic acid ion and PhOH. J. W. S.

Photochemical formation of formaldehyde from chlorophyll and eosin. E. Baur and H. Fricker (Helv. Chim. Acta, 1937, **20**, 391—398).—In the presence of org. or inorg. " redox " materials, EtOH solutions of chlorophyll yield traces of CH_2O (from reduction of its CO_2H groups) on exposure to light. Eosin S shows the same effect, but gallocyanine, pseudopurpurin, eosin G, and an azo-dye do not. J. W. S.

Attempted theory of photosynthesis. J. Franck and K. F. Herzfeld (J. Chem. Physics, 1937, 5, 237—251).—A quant. explanation of the photosynthetic production of O_2 is attempted by assuming four photochemical steps and two dark reactions, in which a peracid, HCO_2H, and a peraldehyde occur. Photolytic decomp. of the per-compounds initiates back chain reactions by which light saturation can be explained. Agreement between observed and calc. vals. is good. Plant acids are photosynthesised in the same way but these can be photo-oxidised in a reaction sensitised by chlorophyll. W. R. A.

Decomposition of air-free water by alpha rays. C. E. Nurnberger (J. Physical Chem., 1937, 41, 431—435).—H_2O, carefully freed from dissolved air, is decomposed by α-rays. The actions of X-rays and α-rays on H_2O are considered to be essentially different. C. R. H.

Chemical concentration of the radioactive gold isotope. V. Majer (Naturwiss., 1937, 25, 252—253).—Na Au thiosulphate was irradiated with neutrons, and was then shaken with Hg. After removal of the Hg and addition of some Au the Hg was distilled, and the Au remaining was proved to have a sp. activity $>$ that of the Au in the thiosulphate residue. Another method consisted in irradiating a Au sol on the point of coagulation with neutrons. The sp. activity of the pptd. Au was $>$ that of the Au still remaining in suspension. A. J. M.

Supersonics in chemistry. E. Baumgardt (Chim. et Ind., 1936, 36, 686—695).—The effect of exposing various chemical reactions to supersonic vibrations is discussed. Increased stability of emulsions, ease in obtaining colloidal states, expulsion of dissolved gas, and various biological effects under the action of supersonics are mentioned. W. P. R.

Mechanism of chemical action of supersonics. L. R. Solovjeva (J. Phys. Chem. Russ., 1937, 9, 77—83).—Oxidation of KI under the influence of supersonic waves yields KIO_3. No H_2O_2 is formed from H_2O. $FeSO_4$ in Mohr's salt is oxidised to $Fe_2(SO_4)_3$. E. R.

Deuterium as a research tool in the physical and biological sciences. H. L. Johnston (Ohio J. Sci., 1935, 35, 362—387).—A summary. Ch. Abs. (*e*)

Separation of isotopes by diffusion in fast streaming mercury vapour. D. MacGillavry (Rec. trav. chim., 1937, 56, 330—342).—A rapidly moving stream of Hg vapour is used as the membrane for the separation, by diffusion, of the isotopes of the light elements. A simplified theory is developed, in which expressions for the fractionation ratio and rate of flow are derived, but these are not in complete agreement with the experimental results, probably because of neglect of back diffusion and the use of an incorrect diffusion const. The diffuser has been used successfully for the concn. of D_2 in a mixture of H_2 and D_2. F. J. L.

Attempt at increasing the concentration of heavy water in ordinary water by fractional crystallisation. M. Deželić (Bull. Soc. Chim. Yougoslav., 1936, 7, 65—72).—The solidus–liquidus curves of the system D_2O–H_2O coincide, indicating that concn. of D_2O cannot be achieved by fractional crystallisation. R. T.

Sodium tripolyphosphate. H. Huber (Angew. Chem., 1937, 50, 323—326; cf. this vol., 91).—Melts of $NaPO_3$ with $Na_4P_2O_7$ yield $Na_4P_2O_7$ as the primary product of crystallisation. Chilled melts show evidence of the formation of $Na_5P_3O_{10}$, into which they are converted completely by a solid reaction when heated between 250° and the m.p. The existence of $Na_5P_3O_{10}$ as a separate entity, and its amount when present, may be determined by measurement of its dispersive action on Ca soaps, due to the formation of sol. complexes. $Na_5P_3O_{10}$ is converted on melting into $Na_4P_2O_7$ + an amorphous polyphosphate. Mixtures of $Na_4P_2O_7$ and $NaPO_3$, tempered below the m.p. and then chilled, show a max. Ca-soap val. at the composition $Na_6P_4O_{13}$, which is slowly converted into $Na_5P_3O_{10}$ by heating below 500°. The behaviour parallels that of the polymetaphosphates, and points to the existence of a series of polyphosphates of the general formula $Na_{n+2}P_nO_{3n+1}$. J. S. A.

Crystallisation of silica in $NaPO_3$. G. Peyronel (Z. Krist., 1937, 95, 274—281).—Heating SiO_2 gel in molten $NaPO_3$ produces cristobalite. In Na_2WO_4 tridymite is formed; the condition is probably that of the lattice type of the compound of the SiO_2 and the mother-liquor, which for SiO_2,P_2O_5 is very similar to that of cristobalite. Various other factors are discussed, and it is concluded that cristobalite can be formed only in neutral melts. B. W. R.

Linear corrosion of metals. I. Selective corrosion of metals on three-phase boundaries. L. G. Gindin, D. I. Mirlis, and F. M. Schemjakin (J. Phys. Chem. Russ., 1937, 9, 84—90).—The corrosion of Cu by aq. NH_3, of Fe by H_2SO_4, and of Mg by HCO_2H and AcOH occurs strongly on the three-phase boundary metal–paraffin–corrosive liquid, causing the formation of deep rills around a paraffin spot on the metal surface. This linear corrosion is sometimes a periodic process. The linear corrosion on the phase boundary does not depend on surface activity of the corroding liquid and is not affected by addition of surface-active substances. E. R.

Etching of copper by ferric chloride solutions. —See B., 1937, 452.

Existence of crystalline cupriperiodates. L. Malaprade (Compt. rend., 1937, 204, 979—980).—The prep. of cryst. salts having $Cu^{3+} : I^{7+} : Na = 1 : 2 : 7$ and $1 : 2 : 5$ is described. A. J. E. W.

Hydrolysis of copper benzenesulphonate. (Mlle.) M. Quintin (Compt. rend., 1937, 204, 968—970; cf. A., 1936, 172).—For aq. solutions of $(PhSO_3)_2Cu$, $[Cu^{\cdot\cdot}] = K[H^{\cdot}]^3$; hydrolysis occurs by intermediate formation of $Cu(OH)_2$. The mechanism of the hydrolysis of heavy-metal salts depends on the nature of the anion involved. A. J. E. W.

Ketimine compounds formed in the microdetection of magnesium and beryllium. J. V. Dubský, A. Langer, and E. Wagner (Mikrochem., 1937, 22, 108—116).—Metallic complex salts of

naphthazarin (I) and quinalizarin (II), on treatment with aq. NH_3, are converted into ketimine complexes. Treatment with $(CH_2 \cdot NH_2)_2$ similarly forms naphthazarin– and quinalizarin–$(CH_2 \cdot NH_2)_2$ compounds. *Salts* are described of (I) with Cu ($+H_2O$); of naphthazarinimine with Cu ($+9H_2O$), Mg ($+10 \cdot 5H_2O$), Ni ($+10 \cdot 5H_2O + 0 \cdot 5NH_3$), Ca, and Ba; of quinalizarinimine with Cu ($+7H_2O$), Ni [$+Ni(OH)_2 + 10H_2O$]; of (I)–$(CH_2 \cdot NH_2)_2$ with Ni ($+21H_2O$) and Be ($+4H_2O$); and of (II)–$(CH_2 \cdot NH_2)_2$ with Ni [$+(CH_2 \cdot NH_2)_2 + 5H_2O$], Cu ($+10H_2O$), and Be [$+Be(OH)_2 + 14H_2O$].
J. S. A.

Reactions in the solid state at high temperatures. XIV. Intermediate state in the formation of zinc aluminate from zinc oxide and aluminium oxide in the solid state. W. Jander and K. Bunde (Z. anorg. Chem., 1937, **231**, 345—364; cf. A., 1935, 944; 1936, 574).—The reaction between solid ZnO and Al_2O_3 at 400—1200° has been studied by *X*-ray measurements, catalytic action of the products on a $2CO + O_2$ mixture, their sorptive power for dyes, and solubility in NH_4Cl, HCl, and H_2SO_4. There is initially a surface reaction which yields a thin layer of product, which ages, forming faulty crystals which finally transform into ideal crystals.
J. W. S.

Compounds of cyclic diamines with metallic salts. Zinc salts.—See A., II, 238.

Reaction of metal chlorides with phenol and β-naphthol.—See A., II., 188.

Synthesis under pressure of hydrated calcium silicates. (Mlle.) J. Foret (Compt. rend., 1937, **204**, 977—979; cf. A., 1936, 1079).—At 130—300°, the silicates xCaO,SiO_2,aq. ($x = 2$—4) behave as CaO,SiO_2,aq. in which the excess of CaO is absorbed. If x is <1, free SiO_2 is present.
A. J. E. W.

Chemistry of sulphide phosphors. R. Schenck (Naturwiss., 1937, **25**, 260—269).—Reactions between heavy-metal sulphides and alkaline-earth sulphides in the prep. of phosphors have been studied. In the presence of alkaline-earth sulphide, heavy-metal sulphide is much more difficult to reduce by H_2 than when pure. This is due, in some cases, to the formation of complexes, *e.g.*, $SrSb_2S_4$, $CaSb_2S_5$. These complexes are formed more easily by BaS and SrS than by CaS. The effect of light on such phosphors is to liberate electrons from the complex anions (which are thereby converted into the free radicals) which are taken up by the alkaline-earth cations. The emission of light from the phosphor is accompanied by the reverse change. A similar process can also occur in those cases where complex ions are not formed (*e.g.*, CaS + Bi_2S_3; CaS and SrS + Ag_2S). Phosphors may be regarded as light "accumulators." The e.m.f. of an accumulator, dependent on the affinity of the reaction occurring within it, has its counterpart in the λ of the light emitted by the phosphor. Additive anionic and cationic effects are to be expected, as with galvanic cells. Where the reactions occurring in the phosphors are similar, such an approx. additive effect is found. This is also considered from the viewpoint of the affinity of the reactions.
A. J. M.

Calcium carbide. I. New crystalline phase of calcium carbide. H. H. Franck, M. A. Bredig, and G. Hoffmann [with A. Füldner]. **II. Preparation of pure calcium carbide and the discovery of a third crystalline phase of calcium carbide.** H. H. Franck, M. A. Bredig, and K. H. Kou (Z. anorg. Chem., 1937, **232**, 61—74, 75—111).—I. Commercial CaC_2 has normally a face-centred tetragonal structure (*a* 5·48, *c* 6·337 A.) (CaC_2 I), but when it is formed in presence of $CaCN_2$ a form is produced of lower degree of symmetry (CaC_2 II), which is capable of absorbing $\not>15\%$ of $CaCN_2$. CaC_2 II reacts with N_2 much more readily than CaC_2 I. SrC_2 prepared in presence of $SrCN_2$ is isomorphous with CaC_2 II, but no equiv. Ba compound could be obtained.

II. White CaC_2 (99·2%) has been prepared by heating pure $CaCN_2$ with or without C, first at 1130° and then for a short time at 1250—1300°. The product, CaC_2 III, differs in structure from CaC_2 I or II. When heated with CaS or Ca it is converted into CaC_2 I, whilst CaC_2 I passes into CaC_2 II when heated in a high vac. When heated with $CaCN_2$, CaC_2 III passes into CaC_2 II. Formation of CaC_2 from CaO and C in a vac. occurs from about 1420°, even without fusion of the reactants. Below this temp. Ca vapour is formed. Neither SrC_2 nor BaC_2 could be obtained in forms isomorphous with CaC_2 III.
J. W. S.

Action of barium metal on barium oxide at high temperatures. M. Schriel (Z. anorg. Chem., 1937, **231**, 313—326).—Contrary to the results of Guntz and Benoit (A., 1924, ii, 610), no suboxide could be produced by heating Ba with BaO at 1150°, and no development of heat could be detected. On evaporation, the Ba is relatively easily removed to a composition 2·5 Ba + 1 BaO, but further removal is slower. BaO appears to dissolve in molten Ba (20% at 725° and 45% at 1150°), but is redeposited on cooling.
J. W. S.

Fluorotetraborates, oxidotetraborates, and a new method of preparing boron fluoride. W. Hellriegel (Ber., 1937, **70**, [*B*], 689—670).—KBF_4 and B_2O_3 at about 518° give *K fluorotetraborate*, KF,B_4O_6, analogous to K_2O,B_4O_6, and BF_3 which is conveniently obtained thus.
H. W.

Electrolytic dissociation processes. II. Friedel–Crafts reaction. F. Fairbrother (J.C.S., 1937, 503—506).—Isotopic interchange experiments with $AlCl_3$ (containing radio-Cl) and AcCl and Bu$^{\gamma}$Cl, respectively, in C_6H_6 solution show that a complete interchange of Cl atoms occurs. An interchange of Cl takes place between $AlCl_3$ and AcCl in the absence of any solvent. The first stage in the Friedel–Crafts reaction is therefore the "ionisation" of the covalent aliphatic chloride under the influence of $AlCl_3$, with formation of $[AlCl_4]^-$ and a carbonium ion.
A. J. M.

Substitution products of cryolite. A. H. Nielsen (Z. anorg. Chem., 1937, **232**, 155—160).—By treating finely-divided Na_3AlF_6 with boiling aq. Ca, Sr, or Ba salts the *compounds* $Ca_3Al_2F_{12}$,$3H_2O$, $Sr_3Al_2F_{12}$,$3H_2O$, and $Ba_3Al_2F_{12}$,H_2O are formed. The optical properties of these compounds have been determined.
E. S. H.

Reaction of lanthanum oxide with ammonium iodide. R. C. YOUNG and J. L. HASTINGS (J. Amer. Chem. Soc., 1937, **59**, 765—766).—The prep. of LaI_3 is described. E. S. H.

Hydrogen effect in certain oxides. E. L. NICHOLS and C. L. STANFORD (J. Opt. Soc. Amer., 1936, **26**, 91—98).—If black PrO_4 heated to about 1000° is subjected, at various stages of cooling, to the action of a jet of H_2, the temp. rises 80—200°. CeO_2 and Gd_2O_3 give similar results; grey Pr_2O_3 is inert to H_2, and when heated reverts to the black form. The activity of different oxides is compared in a series of normal heating curves for MgO, CaO, La_2O_3, Nb_2O_3, Al_2O_3, SiO_2, Gd_2O_3, and Nd_2O_3 under specified conditions, and abnormalities due to departure from these conditions are discussed. N. M. B.

Formation of graphite in the pyrolysis of organic compounds. W. HOOK (Iron and Steel Inst. Carnegie Schol. Mem., 1936, **25**, 81—91).—The formation of C in the solid phase has been studied by investigating the carbonisation of glucose, sucrose, starch, lignin, gelatin, and glycine. A crit. temp. at which pronounced changes take place in the physical and chemical properties of the carbons exists in the neighbourhood of 700°. This crit. temp. is that at which liberation of metallic electrons occurs, or graphitisation commences. It is suggested that O and N may be bonded in a similar manner in the graphite lattice. A. J. K.

Reaction of hydrogen cyanide with sulphuric and phosphoric acids. A. W. COBB and J. H. WALTON (J. Physical Chem., 1937, **41**, 351—363).—An equimol. *compound* (I) of HCN and H_2SO_4 is formed by long interaction at 0°. With excess of H_2SO_4 the reaction is of the first order, but with increasing [HCN] the reaction becomes one of zero order due to the autocatalytic effect of the reaction products. The reaction rate is unaffected by glass or light but is reduced in presence of H_2O. H_3PO_4 also forms an equimol. *compound* (II) at room temp., the reaction being of the first order since it occurs in the H_3PO_4 phase and [HCN] can be considered const. (I) and (II) are insol. in most org. solvents and with H_2O form HCO_2NH_4 and H_2SO_4 or H_3PO_4. With EtOH (I) forms $(NH_4)_2SO_4$ and HCO_2Et. The thermal decomp. of (I) and (II) has been studied in conc. acid solutions by measuring the CO evolved. The decomp. of (I) is a max. in 78—79% H_2SO_4 at 80—100°. The mechanism of the decomp. is discussed and the following formulæ are suggested: (I) $O{:}CH{\cdot}NH{\cdot}SO_3H$; (II) $O{:}CH{\cdot}NH{\cdot}PO(OH)_2$. C. R. H.

Formaldehyde from percarbonate. E. BAUR (Helv. Chim. Acta, 1937, **20**, 398—401).—No CH_2O is obtained by reduction of K_2CO_4 (neutral or acid) cathodically or by HCO_2H or H_2O_2. It is formed, however, by distilling K_2CO_3 or K_2CO_4 with H_2O_2 and PbO_2 (cf. A., 1923, i, 1271). No CH_2O is formed in absence of PbO_2 or prior to distillation with it present. The reaction is strongly endoenergetic, and it is concluded that it proceeds in each case through K_2CO_4, and that distillation is necessary for isolation of the CH_2O because only very small traces exist in the mixture at equilibrium. The catalytic action of the PbO_2 is not clear. J. W. S.

Reactions in the solid state, with special reference to the reactions between silica, sodium carbonate, calcium carbonate, and alumina. J. E. STANWORTH (J. Soc. Glass Tech., 1937, **21**, 155—169T).—The various theories of solid reactions are critically discussed. Some of the theories cannot be distinguished in the early stages of the reaction, the mechanism of which can be determined only if the whole range of 0—100% decomp. is studied. It is not yet possible to describe completely the mechanism of the reaction between Na_2CO_3, $CaCO_3$, and SiO_2, but it appears to consist of the decomp. of $CaCO_3$ in presence of Na_2CO_3, followed by the interaction of SiO_2 and Na_2CO_3. J. A. S.

Silicon fluorochlorobromides. W. C. SCHUMB and H. H. ANDERSON (J. Amer. Chem. Soc., 1937, **59**, 651—653).—The prep. of *$SiFClBr_2$* and *$SiFCl_2Br$* is described. $SiFClBr_2$ has m.p. −99·3°, b.p. 59·5°, v.p. $\log P = 7{\cdot}5669 - 1558/T$. $SiFCl_2Br$ has m.p. −112·3°, b.p. 35·4°, v.p. $\log P = 7{\cdot}0982 - 1301/T$. The compounds are hydrolysed completely by H_2O or moist air. New methods of preparing Si chlorobromides are described. E. S. H.

Mechanism of the polymerisation of the phosphonitrile chlorides $(PNCl_2)_x$. A. M. DE FICQUELMONT (Compt. rend., 1937, **204**, 867—869; cf. this vol., 226).—Equilibria exist between the lower members of the series. Polymerisation is probably due to the formation of monomeric $PNCl_2$, which subsequently reacts with another member of the series, giving a higher polymeride. A. J. E. W.

Tetrametaphosphates. P. BONNEMAN (Compt. rend., 1937, **204**, 865—867; cf. A., 1904, ii, 26; 1924, ii, 856).—The prep. of $Na_4(PO_3)_4$ (I) is described and *X*-ray diffraction data for (I) and a hydrate are given. (I) gives $Na_3(PO_3)_3$ at <500°, and $Na_6(PO_3)_6$ at the m.p. A. J. E. W.

Deozonisation of air and oxygen; properties of deozonised air and oxygen. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, **20**, 451—457).—A gas containing very little O_3, *e.g.*, air containing about 10^{-6}% of O_3, can be effectively deozonised by heating at $\nless 800°$ but < the temp. at which the equilibrium $[O_3]$ is of the order of the $[O_3]$ in the gas. Deozonised air and O_2 have no oxidising action on solutions of PrCHO in C_6H_{14}. J. W. S.

Dichlorosulphuryl chlorosulphonate. G. P. LUTSCHINSKI and A. I. LICHATSCHEVA (J. Gen. Chem. Russ., 1937, **7**, 405—414).—M.p., d, η, and coeff. of expansion data for the system SO_3–SO_2Cl_2 suggest formation of *dichlorosulphuryl chlorosulphonate*, m.p. −19·1°, which decomposes at the b.p. to yield SO_3 and SO_2Cl_2. R. T.

Behaviour of polonium in presence of sulphur dioxide. M. HAÏSSINSKY (J. Chim. phys., 1937, **34**, 94—95).—The separation of Po from an aq. solution of Ta fluorosulphate when H_2SeO_3 is added and the Se then pptd. with $NaHSO_3$ (A., 1931, 1026) is due to adsorption of the Po by the pptd. Se. R. C.

Introduction of radioactive halogens into organic molecules.—See A., II, 224.

(A) "**The Evans effect occurs on impure iron and is due to active dusts**" (Ronceray). U. R. Evans. (B) **A correction.** P. Ronceray (Bull. Soc. chim., 1937, [v], 4, 762—763, 763).—Polemical (cf. A., 1936, 1218). H. J. E.

Inner complex salts of iron and manganese.—See A., II, 247.

Metal carbonyls. XXIV. Mode of formation and metallic salt reactions of cobalt carbonyl hydride. W. Hieber and H. Schulten [in part with E. A. Ehmann]. **XXV. Preparation and properties of free cobalt carbonyl hydride.** W. Hieber and H. Schulten (Z. anorg. Chem., 1937, **232**, 17—28, 29—38).—XXIV. $Co(CO)_4H$ in aq. NH_3 (I) reacts with $HgCl_2$ and with $AgNO_3$ forming respectively, the *compounds* $[Co(CO)_4]_2Hg$ and $[Co(CO)_4]Ag,0{\cdot}5CO,0{\cdot}5H_2O$ (II), insol. in H_2O and dil. acids, but readily sol. in Et_2O, $COMe_2$, and EtOH. Ammoniacal aq. $Zn^{\cdot\cdot}$, $Cd^{\cdot\cdot}$, and $Cu^{\cdot\cdot}$ solutions yield no ppt. on cooling with (I). With $[Co(NH_3)_6]Cl_2$ (I) gives a trace of the *compound* $[Co(CO)_4]_2[Co(NH_3)_6]$, which is also formed in traces by the action of conc. NH_3 on $Co(CO)_4$ at 0° and by action of gaseous NH_3 on $Co(CO)_4$. With $[Ni(NH_3)_6]Cl_2$, (I) yields traces of the *compound* $[Co(CO)_4]_2[Ni(NH_3)_6]$. With $[Co(Phthrl)_3]Cl_2$ and $[Ni(Phthrl)_3]Cl_2$ (Phthrl = *o*-phenanthroline), (I) yields the *compounds* $[Co(CO)_4]_2[Co(Phthrl)_3]$ and $[Co(CO)_4]_2[Ni(Phthrl)_3]$, both insol. in H_2O. The formation of the orange-yellow colour of the latter compound is a good test for $HCo(CO)_4$. A solution of (II) in $COMe_2$ with 2 : 2′-dipyridyl gives the insol. *compound* $Co(CO)_4[Ag,dipyridyl]$, also formed from (I) and $AgNO_3$,dipyridyl.

XXV. Pure $HCo(CO)_4$ has been obtained by decomp. of the product obtained from $Ba(OH)_2$ and $Co(CO)_4$ with HPO_3, distilling off the product, drying over P_2O_5 and condensing at −190°. It has m.p. −26·2°, yielding a bright yellow liquid which decomposes rapidly at −18°. Its v.p. over the range −37° to −29° indicates a latent heat of 18·25 kg.-cal. per mol., a val. which is compared with those for other carbonyls and carbonyl hydrides. J. W. S.

Interactions of cobalt chloride and ethylenediamine. H. D. K. Drew and N. H. Pratt (J.C.S., 1937, 506—510).—$(CH_2{\cdot}NH_2)_2$ with aq. $CoCl_2$ gives a ppt. of trans-*hydroxoaquobisethylenediaminocobaltic cobaltochloride* (I) which affords the trans-*plato salt* with K_2PtCl_4 and trans-*trichloroethylenediaminocobaltiethylenediamine hydrochloride* with conc. HCl. The filtrate from (I) with conc. HCl gives trans-*dichlorobisethylenediaminocobaltic cobaltochloride* ($+H_2O$). The reactions and configurative relationships of these compounds are considered. J. G. A. G.

Werner complexes. Substitutions in optically active chlorinated complexes. J. P. Mathieu (Bull. Soc. chim., 1937, [v], 4, 687—700; cf. A., 1936, 551).—The *compound* $[Co\,en_2(H_2O)_2]Cl_3,2H_2O$ was prepared and resolved, and its rotatory dispersion and circular dichroism studied. On dissolving active $[Co\,en_2Cl_2]Cl$ (I) in H_2O active $[Co\,en_2Cl,H_2O)Cl_2$ is first formed, and it then racemises. Replacement of Cl by H_2O in solution leads to active ions in solution such as $[Co\,en_2NH_3,H_2O]^{3+}$, $[Co\,en_2NO_2,H_2O)^{++}$, $[Co\,en_2NCS,H_2O]^{++}$ and $[Co\,en_2(H_2O)_2]^{3+}$. The substitution of 2 NO_2 for 2 Cl in (I) by treatment with NO_2 results in only partial racemisation. Replacement of Cl by NCS, however, gave an inactive product. H. J. E.

Tridiaminocyclohexane salts of tervalent cobalt.—See A., II, 237.

Oxidation of nickel hydroxide by sodium persulphate in an alkaline medium. F. François and (Mlle.) M. L. Delwaulle (Compt. rend., 1937, **204**, 1042—1044; cf. A., 1930, 700).—For low concns. of $Na_2S_2O_8$ (I), oxidation is quant., the product being Ni_2O_3. With (I) in excess, the product has O : Ni >1·5, this ratio increasing as $[Na_2S_2O_8]$ and [NaOH] increase; the max. observed val. was 1·88. A. J. E. W.

Preparation of nickel tetracarbonyl. K. Mayer and J. P. Wibaut (Rec. trav. chim., 1937, **56**, 356—358).—CO is passed over NiC_2O_4 (pptd. on infusorial earth and treated with H_2SO_4) heated first at 450° and then at 100°. F. J. L.

Reaction between nickel carbonyl and thiocarbonyl chloride and the supposed polymeric carbon monosulphide of Dewar. K. Mayer and J. P. Wibaut (Rec. trav. chim., 1937, **56**, 359—364).—The amorphous brownish-black product of the reaction is of variable composition, containing covalent Cl; C : S = ~1 : 0·8—0·9 (reaction in solvents) or 1·03 (vapour-phase reaction) (cf. A., 1910, ii, 1155). F. J. L.

Action of hydrogen phosphide on solutions of nickel salts. R. Scholder, A. Apel, and H. L. Haken (Z. anorg. Chem., 1937, **232**, 1—16).—The action of PH_3 on solutions of Ni salts yields generally alloy-like products containing 0·4—1 g.-atom of P to 1 g.-atom of Ni. Ppts. containing >0·67 g.-atom of P are obtained only from EtOH solutions. Under special conditions of concn., p_H, etc. pure Ni_5P_2, Ni_2P, and NiP can be prepared. J. W. S.

Halogeno-salts of rhodium. J. Meyer and K. Hoehne (Z. anorg. Chem., 1937, **231**, 372—382).—Previously described methods of preparing $RhCl_3,(CH_2{\cdot}NH_2,HCl)_2$ and $RhCl_3,4NH_3MeCl$, have been confirmed. By the action of the appropriate base on the Rh salt in suitable acid solutions the following *compounds* have been prepared: $RhBr_3,2(CH_2{\cdot}NH_2,HBr)_2$; $4RhI_3,3(CH_2{\cdot}NH_2,HI)_2$; $2RhBr_3,3NH_3MeBr$; $RhBr_3,4NH_3MeCl$; $RhCl_3,4NH_3MeBr$; $RhBr_3,2(C_3H_6N_2H_6Br_2)$ (from propylenediamine); $RhCl_3,4NH_2Me_2Br$; $2RhBr_3,3NHMe_3Br$; $2RhBr_3,2NH_3EtBr$; $2RhBr_3,3NH{:}C(NH_2){\cdot}NH_3Br$ (from guanidine); $2RhBr_3,3C_5H_5NHBr$; $RhBr_3,4C_5H_5NHBr,3H_2O$; $2RhBr_3,3C_5H_3Me_2NHBr$ (from lutidine); $2RhBr_3,3C_5H_2Me_3NHBr$ (from collidine); $2RhBr_3,3C_9H_7NHBr$ (from quinoline); $4RhBr_3,3C_{19}H_{22}N_2H_2Br_2$ (from cinchonine). J. W. S.

Dipole measurements on isomeric plato-complexes. III. K. A. Jensen (Z. anorg. Chem., 1937, **231**, 365—371; cf. A., 1936, 12;

this vol., 14).—The compounds $[PtCl_2(PhNC)_2]$ and $[PtCl_2(PhCN)_2]$ which are known only in one form both have dipole moments (μ) $12{\cdot}5 \pm 1 \times 10^{-18}$ e.s.u., and are therefore *cis*-compounds. Action of Ph_2S (3·72 g.) in EtOH (25 c.c.) on K_2PtCl_4 (4·15 g.) in H_2O (50 c.c.) yields the *compound cis*-$[PtCl_2(Ph_2S)_2]$ which is easily sol. in C_6H_6 and $CHCl_3$, but very sparingly sol. in EtOH. It has m.p. 195° and $\mu = 5{\cdot}5 \times 10^{-18}$ e.s.u. The less sol. compound produced by the action of Ph_2Se on K_2PtCl_4 is probably *cis*-$[PtCl_2(Ph_2Se)_2]$. The action of Ph_2Te (2·8 g.) in EtOH (10 c.c.) on K_2PtCl_4 (2·08 g.) in H_2O (25 c.c.) yields the *compound cis*-$[PtCl_2(Ph_2Te)_2]$ insol. in ordinary solvents, with m.p. about 200° with decomp. Action of Et_2Te (1·85 g.) on K_2PtCl_4 (2·1 g.) in H_2O (25 c.c.) yields the *compound cis*-$[PtCl_2(Et_2Te)_2]$, readily sol. in $CHCl_3$, sparingly sol. in C_6H_6 and cold EtOH, with $\mu = 6{\cdot}0 \pm 0{\cdot}5 \times 10^{-18}$ e.s.u. The results indicate that when compounds of this type are obtained in only one form, this is not always the *trans*-form, as has been generally supposed. J. W. S.

Sedimentometric analysis of suspensions. N. A. FIGUROVSKI (Zavod. Lab., 1936, 5, 829—840).—Known methods are reviewed. R. T.

Quantitative spectral analysis. E. BADUM and K. LEILICH (Angew. Chem., 1937, 50, 279—282).—The accuracy of measurements by the internal standard method is affected by variations in electrode distance and discharge voltage. Photo-electric control of the intensity of the spark during the exposure is recommended. Measurements should be preceded by a preliminary period of sparking, of $\nless 3$ min., to bring about constancy of sparking conditions. J. S. A.

Quantitative spectral analysis. H. KAISER (Metallwirts., 1937, 16, 301—306).—The determination of the degree of accuracy, relation to chemical analysis, and standardisation of methods of measurement are discussed in a general manner. C. E. H.

Recovery of 8-hydroxyquinoline. S. T. BALIUK (Zavod. Lab., 1936, 5, 878).—The filtrates after pptn. of cations with 8-hydroxyquinoline (I) are treated with $CuSO_4$, the Cu salt of (I) is collected and dissolved in HCl, and Cu is pptd. by H_2S. The filtrate is made alkaline and steam-distilled; (I) is recovered from the distillate. R. T.

Conductometric titration of salts of weak bases (acids) with a dissociation constant greater than 10^{-4}. M. I. LAPSCHIN (Zavod. Lab., 1936, 5, 1419—1422).—Straight lines are drawn through the first two and the last two points of titration curves; the equiv. point is at the point of intersection of the lines. The method is verified for titration of 0·0126 and 0·003N-$NHMe_2$,HCl and of 0·00565N-NH_4Cl in 0·00315N-$NHMe_2$,HCl with 0·1 and 0·5N-KOH. R. T.

Determination of p_H with electrolytic saturation of the electrode with gas. V. S. FINKELSCHTEIN and I. S. TARTAKOVSKI (Zavod. Lab., 1936, 5, 1417—1418).—The H electrode is a piece of platinised Pt foil saturated electrolytically (7—10 min.) with H_2 in the solution the p_H of which is to be measured. Trustworthy results are obtained for 0·01—1N-acids and alkalis, and for phosphate buffers at p_H 6—8, but not for salts (Na_2SO_4), or in electro-titration. R. T.

Application of the glass electrode to measurement of hydrogen-ion concentration in alkaline solutions. J. POWNEY and D. O. JORDAN (J.S.C.I., 1937, 56, 133—137T).—Glass and H electrode potentials are compared. The anomalous behaviour of the glass electrode above p_H 9 caused by the presence of cations in the solution is confirmed. An empirical relationship is obtained connecting p_H, $[Na^{\cdot}]$, and glass electrode correction factor at 22° 40°, 60°, and 80°. The variation of p_H with concn. has been determined for several alkalis.

Titration errors in neutralisation. H. ARNFELT (Svensk Kem. Tidskr., 1937, 49, 96—105).—A mathematical analysis is given. M. H. M. A.

Chromotropic acid as indicator in fluorescence titrations. E. A. KOCSIS and Z. VON S. NAGY (Z. anal. Chem., 1937, 108, 317—321).—The bluish-green fluorescence of $1:8:3:6$-$(OH)_2C_{10}H_4(SO_3H)_2$ (I) in neutral or acid solutions is extinguished at p_H <3—4, enabling (I) to be used as indicator in strong-acid–base titrations. The concomitant colour change from red to yellow can be used for the titration of alkalis with acids, but not for the reverse action. J. S. A.

Absorption of hydrogen in liquid reagents. Solution for the determination of hydrogen in gas mixtures. D. T. BONNEY and W. J. HUFF (Ind. Eng. Chem. [Anal.], 1937, 9, 157—162).—The use of a reagent consisting of aq. Na anthraquinone-2 : 7-disulphonate and colloidal Pd, peptised by Na protalbinate, is recommended for absorption of H_2. The used reagent is regenerated by contact with O_2 or air. The application of the reagent to standard gas analysis practice is discussed. E. S. H.

Recent work on analytical problems. J. J. FOX (Oil and Col. Tr. J., 1937, 91, 993, 995).—Analytical methods in use at the Government Laboratory are described. H_2O in powders is determined by three methods: (1) determination of loss in wt. on drying at 100°, using specially designed desiccators and balances for quick work; (2) determination of dielectric const. (accurate to 0·25%); (3) distillation with heptane. Potentiometric titration and the addition of a third liquid to assist in the fractionation a binary liquid mixture by forming azeotropic mixtures are also referred to. D. R. D.

Determination of small quantities of heavy water. N. PERPEROT and F. SACHERL (J. Phys. Radium, 1935, [vii], 6, 319—322).—A modification of the method of Goldfinger *et al.* (A., 1934, 856) in which the equilibrium temp. of the micro-float is determined from the velocity of its motion through the mixture, is described. A. J. M.

Conductometric determination of water in salts. N. A. MALOV and V. M. VOLKIND (Zavod. Lab., 1936, 5, 945—947).—The resistance R of a column of finely powdered material under const. pressure is measured, when the H_2O content is given by KR^{-n}, where K and n are const. for a given substance. The abs. error is $\not> 0·1\%$ for $(NH_4)_2SO_4$, NaCl, and NH_4NO_3, and 0·5% for $Ca(OH)_2$. R. T.

Distillation method of determination of chlorides. V. M. Zvenigorodskaja and R. G. Gotsdiner (Zavod. Lab., 1937, **6**, 44—47).—A mixture of the substance with 2·5 g. of $KMnO_4$ and 75 ml. of 20% H_2SO_4 is heated in a distilling flask until the vol. is reduced to 35 ml., collecting the distillate in a cooled flask containing 50 ml. of 2% KI, and the I liberated is titrated with $0·02N$-$Na_2S_2O_3$, or is determined colorimetrically. R. T.

Quinine sulphate as a fluorescent indicator for precipitation reactions. J. Grant (Analyst, 1937, **62**, 285—286).—If quinine sulphate is present, the end-point of the titration of $AgNO_3$ with NaCl or of a Zn salt with $K_4Fe(CN)_6$ solution (0·1—0·01N) is indicated by a change from bright pale blue to dull purple in filtered ultra-violet light (cf. Fleck *et al.*, A., 1935, 315). Coloured solutions may be titrated in this way. J. G.

Successive titration of iodides and bromides in presence of large amounts of chlorides. S. K. Tschirkov and M. S. Schnee (Zavod. Lab., 1937, **6**, 40—44).—Traces of I′ ($\not> 0·02\%$) and Br′ ($\not> 0·15\%$) in aq. chlorides are titrated potentiometrically with NaOCl. R. T.

Colorimetric determination of fluorine in minerals. I. P. Alimarin (Zavod. Lab., 1936, **5**, 1440—1442).—More exact results are obtained using Merwin's method (A., 1909, ii, 942) when neutralisation is effected with 30% H_2SO_4 in presence of *p*-nitrophenol. R. T.

Analysis of very dilute ozone. II. Determination of the ozone concentration in the air at Geneva. E. Briner and E. Perrottet (Helv. Chim. Acta, 1937, **20**, 458—461; cf. this vol., 260).—By the method described previously, it has been found that Geneva air at 400 m. contains $7 \times 10^{-7} \pm 0·3 \times 10^{-7}\%$ of O_3. J. W. S.

Micro-Carius determination of sulphur by the volumetric method. A. Friedrich and F. Mandl (Mikrochem., 1937, **22**, 14—33).—The material is heated with $HNO_3 + NaNO_3$ at 340—350°. The residue is evaporated down with 10% AcOH, and is dissolved in 2 c.c. of H_2O or, for small amounts of S, in a measured vol. ($\not> 2$ c.c.) of $0·02N$-H_2SO_4. The H_2SO_4 in solution is pptd. with an 8% solution of benzidine (Bzd) hydrochloride, saturated with $2Bzd,H_2SO_4$. The ppt. is washed with saturated aq. $2Bzd,H_2SO_4$, and is purified from co-pptd. Bzd,HCl by treatment with alcoholic $AgNO_3$. KI is added to convert AgCl into AgI, the ppt. is dissolved in hot neutralised H_2O (Me-red), and is finally titrated with $0·02N$-NaOH. J. S. A.

Determination of sulphur in iron ores.—See B., 1937, 444.

Determination of sulphur in coal.—See B., 1937, 404.

Iodometric determination of sulphides in cyanide solutions. V. D. Djatschkov and L. P. Sajzeva (Z. anal. Chem., 1937, **108**, 326—328).—The solution is acidified with HCl, and treated with an excess of $0·1N$-I, whereby Na_2S alone is oxidised. The excess of I is then titrated back with $Na_2S_2O_3$. J. S. A.

Indirect titration of sulphate with barium chloride using sodium rhodizonate (or sodium tetrahydroxybenzoquinone) as indicator in solution. II. A. Mutschin and R. Pollak (Z. anal. Chem., 1937, **108**, 309—316; cf. this vol., 148).—For the titration of SO_4'' in presence of Zn or Cd, a considerable excess of $BaCl_2$ must be added. Fe, Al, and PO_4''' must first be removed; NO_3' is removed by evaporation with HCl. In presence of Ca, excess of $BaCl_2$ is added before adding $COMe_2$, to avoid pptn. of $CaSO_4$. >1% of $NH_4^{\cdot}$, $Na^{\cdot}$, $K^{\cdot}$, or $Mg^{\cdot\cdot}$ hinders the indicator action and leads to low results. The derivation of an empirical titre for use in such titrations is discussed. Pptn. of $BaSO_4$ from solutions containing 10% of $COMe_2$ gives a macrocryst., immediately filterable ppt. J. S. A.

Volumetric determination of sulphate ion. L. M. Fridberg (Zavod. Lab., 1936, **5**, 872).—Bucherer's method (A., 1920, ii, 702) is recommended. R. T

Polarographic determination of sulphate ion. J. P. Gochschtein (Zavod. Lab., 1936, **5**, 1444—1447).—The solution of sulphate in $0·01N$-NEt_4I is adjusted to p_H 10 with LiOH, and titrated polarographically with 0·05—0·1N-$BaCl_2$; NO_2', NO_3', $K^{\cdot}$, $Na^{\cdot}$, and traces of Fe^{III} do not interfere. R. T.

Determination of sulphate by Schtscherbatschev's method. A. V. Vinogradova (Zavod. Lab., 1936, **5**, 1382—1383).—The method (B., 1934, 831) is recommended. R. T

Determination of sulphate ion. Micro-volumetric chromate method. G. G. Manov and P. L. Kirk (Ind. Eng. Chem. [Anal.], 1937, **9**, 198—200).—The sources of error have been investigated and modified procedure is recommended. E. S. H.

Determination of sulphites in the presence of nitrates and nitrites. J. G. Sherratt (Analyst, 1937, **62**, 267—271).—To 100 ml. of 5% N_2H_4,H_2SO_4 solution are added in succession 20 ml. of 20% NaOH, the test sample, and 10 ml. of H_3PO_4, and the mixture is distilled in a current of CO_2 in the Monier-Williams apparatus. The NO_3' and NO_2' are reduced, the SO_2 evolved being absorbed in H_2O_2 in the usual way. Applications to meat, pickles, bacon, and ham are described. J. G.

Standardisation of 0·1N-sodium thiosulphate solutions with potassium dichromate. E. Tschirch (Pharm. Ztg., 1937, **82**, 450—451).—Procedure is reviewed critically. The solution is best acidified with 20 c.c. of 25% HCl. J. S. A.

Quantitative drop analysis. VI. Total nitrogen by diffusion. G. T. Bentley and P. L. Kirk (Mikrochem., 1937, **21**, 260—267).—A sample containing 0·001—0·03 mg. of N is digested with H_2SO_4 in presence of $CuSO_4$, and is clarified with H_2O_2. The liquid is transferred to a diffusion flask, in which, when closed, it is mixed with an excess of NaOH at 50°. NH_3 diffuses into an excess of H_2SO_4, contained in a suitably suspended cup, and the excess of acid is subsequently titrated back. J. S. A.

Determination of nitrogen in coal.—See B., 1937, 404.

Sources of error in detection of ammonia in drinking water by means of Nessler's reagent.—See B., 1937, 504.

Determination of small amounts of ammonia and other bases by the use of boric acid.—See A., III, 246.

Contact candles. II. Gas reactions with contact candles, especially the determination by gas analysis of nitrous oxide, nitric oxide, and methane with palladium, platinum, and rhodium. E. Biesalski and A. Wacker (Z. anorg. Chem., 1937, **232**, 205—215; cf. A., 1933, 135).—The use of porous porcelain "candles," in which the catalyst is distributed, is demonstrated. E. S. H.

Rapid interferometric determination of nitrogen oxides.—See B., 1937, 436.

Rapid separate determination of nitrogen peroxide and nitric oxide in the gases of tower-process sulphuric acid factories.—See B., 1937, 434.

Reaction of diphenylamine with nitrates and nitrites. G. I. Barannikov (J. Appl. Chem. Russ., 1937, **10**, 394—395).—The reaction is given by active O, which may be produced when H_2SO_4 is added to natural H_2O; the reaction is thus not sp., and should be applied for detection of NO_2' and NO_3' only under strictly standardised conditions. R. T.

Determination of yellow and red phosphorus and its oxidation products. T. A. Kriukova (Zavod. Lab., 1937, **6**, 47—51).—Yellow P is extracted with CS_2, and determined as $Mg_2P_2O_7$. The residue is extracted with H_2O, and H_3PO_2, H_3PO_3, and H_3PO_4 are determined in the extract by known methods. The residue is boiled with N-$AgNO_3$ for 2 hr., and excess of $AgNO_3$ not reacting with P_4O is titrated. Red P is calc. by difference. R. T.

Photo-electric determination of phosphorus in estuarine waters. C. E. Brambel and R. P. Cowles (Science, 1937, **85**, 341—342).—A photo-electric colorimeter has been devised to measure the colour production by the Denigès method. Compared with distilled H_2O, the presence of salts decreases the amount of colour, but for salinities from 0·5 to 3% the effect of salts on the colour production is small. The salt effect on the determination of PO_4''' is covered by the use of calibration curves. $CuSO_4$, $FeSO_4$, and $Fe_2(SO_4)_3$ up to 5 times the amounts found in estuarine waters have no effect on the colour production in distilled H_2O or in artificial sea-H_2O. L. S. T.

Colorimetric determination of phosphorus in steel and iron.—See B., 1937, 447.

Separation of phosphoric acid in qualitative analysis. G. Charlot (Bull. Soc. chim., 1937, [v], **4**, 676—682).—$FeCl_3$ in excess of the H_3PO_4 present is added to the acid solution from group II. NaOH is added until a slight ppt. remains; this is cleared with a drop of acid. $5M$-aq. $NaNO_2$ in excess of the amount to cause pptn. is added, and the ppt. containing $FePO_4$ and $AlPO_4$ is filtered. The p_H is 4·0. The filtrate contains most of the Cr and is free from Fe. $Co^{\cdot\cdot}$ if present with $K^{\cdot}$ or $NH_4^{\cdot}$ must first be separated as sulphide by pptn. with H_2S and redissolution of the remaining sulphides in $2N$-HCl saturated with H_2S. H. J. E.

Reaction of sparingly soluble salts with phosphoric, arsenic, and arsenious acids, and the application of these salts to separation of arsenic from phosphoric acid in qualitative analysis. A. D. Vorobieva (J. Appl. Chem. Russ., 1937, **10**, 380—387).—AsO_4''' and PO_4''', but not AsO_3''', are removed from neutral solution by heating with $PbCO_3$. The ppt., containing Pb, Fe^{III}, Al, and Cr^{III} phosphates, is further analysed by the usual methods. R. T.

Modification of the Bettendorf test as a confirmatory test for arsenic in qualitative analysis. J. Cornog (J. Chem. Educ., 1937, **14**, 130).—The As sulphide ppt. is heated with 10 ml. of $6M$-$HClO_4$ until the acid fumes strongly. 10 ml. of $12M$-HCl and 5 ml. of $0·5M$-$SnCl_2$ are added, the mixture is heated to the b.p. and kept for 1 min. Should no brown coloration indicating As result, 1 ml. of a $0·025M$-$HgCl_2$ solution is added, the liquid is stirred, and kept for 10 min. L. S. T.

Determination of arsenic in ferrous and non-ferrous metals.—See B., 1937, 451.

Determination of small amounts of arsenic in iron and steel.—See B., 1937, 448.

Reduction of silver nitrate by arsine and its use for determining mininum amounts of arsenic. J. H. Křepelka and J. Fanta (Coll. Czech. Chem. Comm., 1937, **9**, 47—67).—Although AsH_3 is completely absorbed by neutral and ammoniacal $AgNO_3$, the AsH_3 does not, in general, liberate stoicheiometric proportions of Ag, and H_2 accompanying the AsH_3 also reduces $AgNO_3$. Therefore, the process is untrustworthy for determining traces of AsH_3 by means of the nephelometric determination of the Ag liberated. J. G. A. G.

Determination of silicon in cast iron and steel.—See B., 1937, 444, 445, 447.

Determination of silicic acid in presence of organic colloids. P. N. Grigoriev and P. I. Posharskaja (Zavod. Lab., 1936, **5**, 1443—1444).—Rapid coagulation of SiO_2 is effected in presence of albumin, casein, or gelatin (1%), or agar-agar (0·2—0·5%). R. T.

Determination of silicic acid as pyridine silicomolybdate. A. K. Babko (J. Appl. Chem. Russ., 1937, **10**, 374—379).—0·1—0·5 g. of mineral is fused with 1—5 g. of $KNaCO_3$, the melt extracted with H_2O, and the extract made up to a known vol. 10—30 ml. of solution, containing ≯5 mg. SiO_2, are made alkaline, warmed to 50—60°, and 5 ml. of 10% $(NH_4)_2MoO_4$ are added, followed by 0·2 vol. of conc. HCl and 10 ml. of 10% C_5H_5N in 20% HCl. The ppt. is collected after 2 min., washed with 1% C_5H_5N in 2% HCl and H_2O, and boiled with dil. H_2SO_4 and Cd in a CO_2 atm. The resulting solution is titrated with

$0{\cdot}1N$-$KMnO_4$ (1 ml. = 0·1667 mg. SiO_2). Should PO_4''' be present, $H_2C_2O_4$ is added before pptn.
R. T.

Modification of colorimetric determination of silicic acid in presence of iron, phosphorus, and fluorine. I. P. Alimarin and V. S. Zverev (Mikrochem., 1937, **22**, 89—101).—In presence of PO_4''' and Fe, the slightly acid solution is neutralised with NaOAc + AcOH. 10 ml. of 10% NH_4 molybdate per 5 mg. of SiO_2 are added, and the solution is heated at 50—60°. An excess of conc. H_3PO_4 is added, decolorising the Fe and the PO_4–molybdate complex. Interference due to F′ is eliminated by adding $AlCl_3$, and the yellow silicomolybdate colour is colorimetered.
J. S. A.

Determination of silicic acid in copper smelting slags.—See B., 1937, 448.

Determination of carbon dioxide in air.—See B., 1937, 504.

Analysis of carbonate–hydroxide–cyanide [cadmium-plating bath] mixtures.—See B., 1937, 453.

Determination of carbonate in " bicarbonate."—See B., 1937, 435.

Determination of small amounts of hydrocyanic acid. K. O. Möller and K. Stefansson (Biochem. Z., 1937, **290**, 44—57).—The methods of Schulek (A., 1923, ii, 591) and Lang (A., 1925, ii, 1009) can be used to determine 0·02—20 mg. of HCN with accuracy. The optimal conditions for production of a colour on heating CN′ in alkaline picrate are investigated. Beer's law is followed only within very narrow limits of concn. Maintaining optimal conditions, HCN can be determined down to 10^{-5} g. both colorimetrically and photometrically. The presence of H_2S, $COMe_2$, and aldehydes leads to inaccuracy.
P. W. C.

Rapid determination of cyanide in cyanide melt.—See B., 1937, 435.

Micro-reaction for potassium. A. Kniga (J. Appl. Chem. Russ., 1937, **10**, 371—373).—Aq. NaI is added to freshly pptd. PbI_2 in amount slightly < that required completely to dissolve the PbI_2; the reagent so prepared gives characteristic needles with $K^{\cdot}$ ($1{\cdot}5 \times 10^{-7}$ g.). Ions giving insol. ppts. with I′ interfere.
R. T.

Microchemical reaction for potassium. A. Kniga (Kalii, 1935, No. 7, 32—33).—The finely ground sample was fused on a Pt wire with Na_2CO_3, treated with HCl, put on a microscope glass, heated to remove excess of HCl, and treated with 1 drop of $NaMnO_4$. In 1—2 min. $KMnO_4$ crystals are visible through the microscope (sensitivity 0·04 mg. of K), Na, Mg, Ca, Sr, Ba, Zn, Al, Cd, Ni, Bi, and Cu did not interfere, but Mn, Co, Cr, I′, CN′, reducing anions, and org. matter did so. NH_4 salts, Rb, and Cs give the same reaction.
Ch. Abs. (*e*)

Photometric determination of potassium. S. Goy (Angew. Chem., 1937, **50**, 301—302).—K, present in $0{\cdot}0002N$ solution, may be determined by photometric measurement of the intensity of the red doublet in the flame spectrum, a suitable light filter being interposed.
J. S. A.

Spectro-analytical determination of potassium. W. Schuhknecht (Angew. Chem., 1937, **50**, 299—301).—A solution of the material is injected into a C_2H_2–air flame by means of a Lundegårdh atomiser. The intensity of the 7664—7699 A. K doublet is measured photometrically, a light filter of the superposed Schott glasses BG19, RG8, and BG3 being used to transmit only the desired region (7000—8500 A.). 0·01% of K_2O may be so determined in presence of 1% of Na_2O or 0·2% of CaO.
J. S. A.

Micro-determination of rubidium and cæsium in organic compounds.—See A., II, 268.

Determination of silver by the Gay Lussac method. A. Wogrinz (Metall u. Erz, 1937, **34**, 100—104).—A theoretical and mathematical discussion of the sources and magnitude of the possible errors in the determination of Ag by titration with NaCl.
A. R. P.

Microchemical contributions. XIV. L. Rosenthaler (Mikrochem., 1937, **21**, 215—223).—Ag may be detected by the characteristic habit of its compound with $(CH_2)_6N_4$, pptd. from HNO_3 solution. Cu is detected by the green colour given on shaking a Cu solution containing NaOAc with colophony in light petroleum or PhMe. A saturated solution of barbituric acid (I) in conc. HCl gives characteristic ppts. with PhCHO, anisaldehyde, cinnamaldehyde, vanillin, piperonal, and furfuraldehyde, but not with other aromatic aldehydes. Antipyrine (II), but not pyramidone or *iso*propylantipyrine, gives a characteristic ppt. with $CuSO_4$ + KBr. Caffeic acid gives a cryst. ppt. with $Ba(OH)_2$. p-$C_6H_4(NH_2)_2$, but not *p*-tolylenediamine, 2 : 5-diaminoanisole, or p-$NHPh{\cdot}C_6H_4{\cdot}NH_2$, gives characteristic reactions with $(NH_4)_2Co(CNS)_4$ and with $(NH_4)_2Hg(CNS)_4$. The crystal forms of the ppts. given by $K_3Co(CN)_6$ with alypine, β-eucaine, eumydine, $(CH_2)_6N_4$, cocaine, nycaine, and percaine are described, and also ppts. of alypine, β-eucaine, diocaine, ephedrine, pantocaine, piperazine, and benzoylmorphine with nitrobarbituric acid. Reactions of the ·CO·NH· group, *e.g.*, in purines, are discussed with special reference to the pptn. of (I) with $MgSO_4 + NH_4Cl$, of saccharin with $Pb(OAc)_2$, of allantoin with Tl + aq. NH_3, of alloxan with Zwikker's reagent, and of succinimide with I + Na_2CO_3. 1 part of HNO_2 in 10^7 may be detected by the red colour produced on making alkaline a solution of rivanol + α-$C_{10}H_7{\cdot}OH$ containing HNO_2. Conversely, 0·01 mg. of α-$C_{10}H_7{\cdot}OH$ may be so detected.
J. S. A.

Formation of sparingly soluble substances in micro-analysis. J. V. Dubský, M. Hrdlička, and V. Šoukal (Mikrochem., 1937, **22**, 119—120).—The sensitivity of reagents, *e.g.*, of *p*-dimethylaminobenzylidenerhodanine for Ag, is discussed in relation to the detection of ions in the saturated solutions of salts (*e.g.*, Ag_2CrO_4, AgCl, AgBr) of progressively smaller solubility.
J. S. A.

Development of electro-drop analysis. H. Fritz (Mikrochem., 1937, **22**, 34—43; cf. A., 1935, 1473).—0·0002 mg. of Ag, in presence of $NH_4^{\cdot}$ and

NH_3 only, may be detected in a micro-drop of solution with certainty by spotting on a bright Cu sheet. J. S. A.

Method of qualitative analysis without use of hydrogen sulphide. M. B. Rane and K. Kondaiah (J. Indian Chem. Soc., 1937, **14**, 46—50).—Ag, Sn, and Sb are pptd. by treatment with HCl and evaporation with HNO_3. Ba, Sr, and Pb are pptd. with $(NH_4)_2SO_4$. $NH_3 + (NH_4)_3PO_4$ are added to the filtrate, pptg. Al, Cr, Fe, Mn, Bi, Ca, and Mg. Co, Ni, Cu, and Cd are then pptd. with NaOH, leaving Zn, As, and the alkalis in solution. Separations within the groups so obtained follow normal lines. J. S. A.

Attempt at quantitative analysis of silver-gold alloys by optical spectroscopy.—See B., 1937, 450.

Rapid determination of lime and magnesia. Hornke (Tonind.-Ztg., 1937, **61**, 311—312).—After removing Fe and Al and determining Ca volumetrically by $KMnO_4$, Mg is pptd. as $MgNH_4PO_4$. Pptn. is complete in 30 min., even with oxalate present, if carried out in boiling solution followed by cooling and shaking. The ppt. is washed with 10% aq. NH_3, suspended in H_2O, and titrated with HCl (Me-orange). The reaction is $2MgNH_4PO_4 + 4HCl = MgH_4(PO_4)_2 + MgCl_2 + 2NH_4Cl$. As the ppt. dissolves slowly in HCl, a known excess may be added and titrated back with NaOH. G. H. C.

Potentiometric determination of barium by means of ammonium dichromate. F. K. Fischer (J. Appl. Chem. Russ., 1936, **9**, 2269—2274).—The solution, containing 12—150 mg. of Ba, is diluted to 50 ml., 10 ml. of 10% NH_4OAc are added, and 6—15 ml. of 2% $(NH_4)_2Cr_2O_7$ are added to the boiling solution. The cooled solution is filtered, the ppt. is washed with 100 ml. of 1% NH_4OAc, and the filtrate + washings are electro-titrated with standard Fe^{II}. $NH_4^{\cdot}$, $Mg^{\cdot\cdot}$, $\not>0{\cdot}002\%$ Sr, and $\not>0{\cdot}02\%$ Ca do not interfere. R. T.

Determination of precipitates by density measurements. A. Z. Jurovski and A. P. Shadanovskaja (J. Appl. Chem. Russ., 1936, **9**, 2260—2268).—Determination of the difference in *d* of a suspension of $BaSO_4$ or of NH_4 phosphomolybdate, and of the medium alone, permits the evaluation of the amount of ppt. present; a method based on that of Popper (J.C.S., 1877, ii, 638; A., 1879, 480) is described. R. T.

Iodometric determination of beryllium in complex fluorides. A. V. Novoselova and O. I. Vorobieva (J. Appl. Chem. Russ., 1937, **10**, 360—363).—2 g. of KI, 20 ml. of 2—5% KIO_3, and 20 ml. of 20% $CaCl_2$ are added to 20 ml. of the fluoride solution (containing 9—18 mg. of Be), the solution is heated at 100° for 2 hr., and the I liberated is titrated with 0·02—0·1*N*-$Na_2S_2O_3$. R. T.

Confirmatory tests for beryllium and gallium. A. A. Benedetti-Pichler and W. F. Spikes (Mikrochem., 1937, **21**, 268—272).—Be is confirmed by evaporating down with AcOH. The residue is dissolved in H_2O, and made alkaline with aq. NH_3. On sublimation at 160°, characteristic crystals of $Be_4O(OAc)_6$ are obtained. Ga, in the absence of other ions forming alums, is detected as its Cs alum by dissolving the $Ga(OH)_3$ ppt. in H_2SO_4, and adding CsCl containing some K alum. J. S. A.

Determination of magnesium in presence of excess of ammonium oxalate. V. T. Tschujko (J. Appl. Chem. Russ., 1937, **10**, 364—366).—Low results are obtained when Mg is pptd. as $MgNH_4PO_4$ in presence of > a certain limiting $[(NH_4)_2C_2O_4]$, which rises with the $[Mg^{\cdot\cdot}]$ of the solution. R. T.

Volumetric determination of magnesium by the hydroxyquinoline–permanganate method. L. D. Raskin and I. F. Drozd (Zavod. Lab., 1936, **5**, 807—808).—0·5 g. of magnesite is dissolved in acid, Ca is pptd. as oxalate, and the filtrate + washings are diluted to 500 ml. Excess of HCl and 8—10 ml. of 3% 8-hydroxyquinoline are added to 250 ml. of the solution, which is shaken for 5 min., 5 ml. of aq. NH_3 are added, the solution is again shaken, boiled 1—2 min., cooled, and filtered. The ppt. is washed with 5% aq. NH_3, dissolved in 10% H_2SO_4 (200—250 ml.), and the solution is titrated with $KMnO_4$. R. T.

Determination of magnesium by titration of magnesium ammonium phosphate. M. P. Babkin and V. T. Tschujko (Zavod. Lab., 1936, **5**, 1512—1513).—The ppt. of $MgNH_4PO_4$ is washed with EtOH, dried at 105—110°, and dissolved in standard acid, excess of which is titrated. R. T.

Determination of magnesium in presence of zinc by means of hydroxyquinoline. S. J. Fainberg and L. B. Fligelman (Zavod. Lab., 1936, **5**, 942—945).—Fe, Al, and Ca are pptd. in the usual way, and 8 ml. of 25% Na_2SO_3, 10 ml. of 30% NaOH, 23 ml. of 30% KCN, and H_2O to 300 ml. are added to the filtrate, which is heated to 70°, 7—10 ml. of 1·5% hydroxyquinoline in AcOH are added, the suspension is heated at 100° for 25 min., and filtered. The ppt. is washed with 1% NaOH, dissolved in dil. HCl, and H_2O is added to 120 ml. Standard $KBrO_3$–KBr is added, excess of which is determined iodometrically. R. T.

Rapid analysis of zinc–sodium amalgams. H. A. Liebhafsky (Ind. Eng. Chem. [Anal.], 1937, **9**, 176).—Na is determined by adding excess of acid and titrating with standard alkali; Zn, which is not readily dissolved by acids when $>0{\cdot}01\%$ is present, is determined by measuring the e.m.f. of the residual amalgam against a known conc. Zn amalgam. The accuracy is 2—5%. E. S. H.

Volumetric determination of small amounts of zinc. A. G. Bosin and S. S. Jofan (J. Appl. Chem. Russ., 1937, **10**, 367—370).—Zn ($\not<0{\cdot}6$ mg.) is separated by Schoorl's reagent from group I—III cations, the $ZnHg(CNS)_4$ obtained is decomposed by aq. Na_2S (acid solution), the HgS pptd. is treated with standard I in CS_2, and excess of I is titrated with $Na_2S_2O_3$. R. T.

Determination of zinc in cadmium.—See B., 1937, 449.

Rapid analysis of cadmium electrolyte.—See B., 1937, 453.

Determination of small amounts of lead by means of dibromohydroxyquinoline. II. A. M. Zanko and A. J. Bursuk (J. Appl. Chem. Russ., 1936, **9**, 2297—2301; cf. A., 1936, 953).—0·1 g. of tartaric acid, aq. NH_3 to an alkaline reaction, H_2O to 50 ml., and $COMe_2$ to 10%, are added to the solution (containing $\nless$0·5 mg. Pb), followed by excess of 0·5% 5 : 7-dibromo-8-hydroxyquinoline in $COMe_2$, at 50—60°. The ppt. is collected, washed with 4% aq. $COMe_2$ and H_2O, dried at 195—215°, and weighed. Sn and Sb do not interfere, but a special procedure is applied in presence of Cu. R. T.

Potentiometric determination of lead with sulphide solutions. G. I. Maheshwari and J. B. Jha (J. Indian Chem. Soc., 1937, **14**, 42—45).—A solution of Na_2S in a 0·2*N*-NaOAc + 0·2*N*-AcOH buffer solution is used. The reagent keeps well in H_2. J. S. A.

Applicability of conductometric processes with visual observation in micro-chemical investigations. I. Titration of small amounts of lead, cadmium, copper, silver, and bismuth by means of hydrogen sulphide. H. Immig and G. Jander. **II. Titration of small amounts of chlorides by means of silver nitrate. III. Titration of small amounts of silver salts in presence of large amounts of lead salts by means of sodium chloride solution.** G. Jander and H. Immig (Z. Elektrochem., 1937, **43**, 207—211, 211—214, 214—215).—I. Conditions for the conductometric titration of $Pb^{\cdot\cdot}$, $Cd^{\cdot\cdot}$, $Cu^{\cdot\cdot}$, $Ag^{\cdot}$, and $Bi^{\cdot\cdot\cdot}$ by H_2S have been determined. The procedure is capable of determining to 0·001 mg. of the metals (except Bi, 0·01 mg.).

II. Conditions for the determination of 0·7—0·001 mg. of Cl′ are described.

III. By suitable choice of conditions, the procedure is suitable for determining 1 mg. of Hg in presence of 500 mg. of Pb. E. S. H.

Electro-analytic determination of copper without the use of platinum electrodes. V. M. Schalfeev and A. P. Bezzabotnikova (Zavod. Lab., 1936, **5**, 1311—1313).—Equally good results are obtained with Ag as with Pt electrodes. Graphite anodes are suitable for solutions other than of nitrates, with a current of $\ngtr$1 amp. R. T.

Microchemical reaction for copper, using ammonium mercuric thiocyanate. I. M. Korenman and E. N. Lukascheva (Zavod. Lab., 1936, **5**, 1438—1440).—Characteristic mixed crystals are formed when $(NH_4)_2Hg(CNS)_4$ (I) is added to solutions containing Fe, Zn, Cd, Ni, or Pb, but not Co, Ag, or Bi. Excess of 10% aq. NH_3 is added to a drop of the solution, which is filtered, and 2 drops each of 20% $Cd(NO_3)_2$ and of (I) are added to 3 drops of filtrate; a violet ppt. indicates $\nless 5 \times 10^{-9}$ g. of Cu. R. T.

Coloroscopic investigations. T. A. Thomson (Mikrochem., 1937, **21**, 209—214).—10^{-10}—10^{-9} g. of cations, present in $5 \times 10^{-5} - 5 \times 10^{-6}$*N* solution, may be detected by means of colour reactions carried out in capillary tubes. 1—2 cm. length of solution and of reagent are introduced successively, and the capillary is sealed at one end. The solutions are mixed by centrifuging, and examined axially with a microscope. Cu is detected with α-benzoinoxime; Cr (as CrO_4'') with diphenylcarbazide or benzidine (I); Co with rubianic acid or 1 : 2-$NO\cdot C_{10}H_6\cdot OH$; Hg with diphenylcarbazone; and Mn with (I). J. S. A.

Rapid determination of copper in copper sulphide ores and concentrates.—See B., 1937, 448.

Determination of copper in aluminium.—See B., 1937, 450.

Polarographic analysis of brass.—See B., 1937, 452.

Detection of mercurous, mercuric, and silver ions by drop reactions. E. A. Kocsis and G. Gelei (Z. anorg. Chem., 1937, **232**, 202—204).—The drop reaction with 1 : 8 : 3 : 6-$(OH)_2C_{10}H_4(SO_3H)_2$ is suitable for the detection of 0·2 mg. of $Hg_2^{\cdot\cdot}$, $Hg^{\cdot\cdot}$, or $Ag^{\cdot}$. E. S. H.

Reagent for the detection of cerium. J. F. Miller (Ind. Eng. Chem. [Anal.], 1937, **9**, 181—182).—Arsanilic acid gives a reddish-brown colour with Ce^{IV} solutions. The presence of F′, Zr, Co, or Cr interferes. Arsanilic acid can be used as an outside indicator in the titration of $Ce(SO_4)_2$. E. S. H.

Electrometric analysis of cerium–lanthanum mixtures. J. A. Atanasiu (Z. anal. Chem., 1937, **108**, 329—333).—Ce + La are titrated together potentiometrically with $K_4Fe(CN)_6$, being pptd. as $KMFe(CN)_6$ (M = Ce or La). Ce is determined alone in a second portion by oxidation to Ce^{IV}, which is then reduced by potentiometric titration with $K_4Fe(CN)_6$. J. S. A.

Detection of traces of rare-earth elements. M. Servigne (Compt. rend., 1937, **204**, 863—865; cf. this vol., 63).—10^{-7} g. of rare earth in 1 g. of Ca tungstate or molybdate can be detected by observing the luminescence excited by an electrical discharge, at controlled temp. Mixtures of rare earths can be studied in some cases. A. J. E. W.

Micro-detection of aluminium, magnesium, and zinc with 1-aminoanthraquinone-2-carboxylic acid. J. V. Dubský and M. Hrdlička (Mikrochem., 1937, **22**, 116—118).—The sol. K salt of the acid gives a red, non-sp. lake with Al (limiting concn., 1 in 220,000). Less sensitive pptns. are given with Mg and Zn. J. S. A.

Precipitation of alumina in the Kallauner–Matejka method of analysis. K. Pfefferkorn and J. Boden (Sprechsaal, 1937, **70**, 171—172).—Stock's iodate–iodide method is recommended for determining Al in presence of SiO_2, the ppt. being evaporated with HF before weighing. Pptn. with aq. NH_3 is not complete even on long keeping. G. H. C.

Direct determination of aluminium in aluminium–iron–manganese bronze.—See B., 1937, 448.

Spectrographic analysis of silumin.—See B., 1937, 451.

Permanganate micro-titration. M. V. Alexeeva (Zavod. Lab., 1936, 5, 872—873).—The excess of $KMnO_4$ present after titration, determined colorimetrically or iodometrically, is deducted from the result; under these conditions identical results are obtained for different vols. of titrated solution $[(NH_4)_2C_2O_4]$, at 50—90°. R. T.

Rapid determination of manganese in bronzes.—See B., 1937, 448.

Drop reaction for detection of rhenium. N. S. Poluektov (J. Appl. Chem. Russ., 1936, 9, 2312—2315).—Reduction of TeO_4'' by $SnCl_2$ is catalysed by ReO_4'. A drop of $SnCl_2$ in conc. HCl is added to a drop of solution, followed by a drop of 1% Na_2TeO_4; a black ppt. is obtained in presence of $\nless 2{\cdot}5 \times 10^{-8}$ g. Re. V, W, As, Se, Os, and Mo interfere when present in > certain limiting concns. R. T.

Quantitative drop analysis. V. Determination of iron in simple and biological media. P. L. Kirk and G. T. Bentley (Mikrochem., 1937, 21, 250—259).—0·003—0·015 mg. of Fe in 1—2 drops of liquid is determined oxidimetrically. Biological fluids are ashed after addition of aq. NaOCl, and the ash is dissolved in 5% H_2SO_4. The $Fe^{\cdots}$ is reduced by shaking with 0·03 mg. of 3% Cd amalgam. An aliquot portion of the solution is oxidised with $0{\cdot}01N$-$Ce(SO_4)_2$, the excess of which is titrated back with $0{\cdot}01N$-$FeSO_4$. J. S. A.

Rapid determination of iron in electroplating electrolytes.—See B., 1937, 453.

Rapid determination of sesquioxides in caustic soda.—See B., 1937, 435.

Potentiometric determination of iron and chromium in ferrochromium.—See B., 1937, 447.

Application of gaseous precipitants in gravimetric analysis. Separation of iron, aluminium, magnesium, and calcium. E. Pozner (J. Appl. Chem. Russ., 1936, 9, 2283—2296).—Pptn. of $Fe(OH)_3$ and $Al(OH)_3$ by gaseous NH_3 is recommended. In presence of $Mg^{\cdot\cdot}$, CaC_2O_4 ppts. contain adsorbed MgC_2O_4 and other impurities; the best results are obtained by pptn. from acid solution by NH_3, with permanganometric rather than gravimetric determination of the ppt. R. T.

Solutions for colorimetric standards. VIII. Arny's series. C. T. Kasline and M. G. Mellon (J. Amer. Pharm. Assoc., 1937, 26, 227—230).—Spectrophotometric curves and the limitations as colour standards of the series (Co–Fe–Cu, Co–Cr–Cu salts) are discussed. F. O. H.

Determination of nickel in steel.—See B., 1937, 447.

Comparison of methods for determination of small amounts of CrO_3. Z. M. Leibov (J. Appl. Chem. Russ., 1937, 10, 388—393).—Direct colorimetric or iodometric determination of CrO_3 is recommended for highly coloured solutions. Where the colour due to CrO_3 is faint, diphenylcarbazide, p-$C_6H_4(NH_2)_2$, NH_2Ph,HCl, or amidol is added, and the colours are compared with standards (NO_2' interferes). R. T.

Diphenylsemicarbazide. C. F. Miller (Chem. Analyst, 1936, 25, No. 1, 10—11).—The colorimetric determination of Cr and tests for Cd and Hg are described. The more or less fugitive colour reactions of Cu, Ag, Pb, Mg, Zn, Fe, Co, Ni, and Mn are given. Ch. Abs. (e)

Electrolytic analysis of chromium ores.—See B., 1937, 449.

Determination of molybdenum in cast iron and steel.—See B., 1937, 444, 447.

Fractional reaction for tungsten, molybdenum, and vanadium. N. A. Tananaev and P. F. Vereschinia (Zavod. Lab., 1936, 5, 864—866).—2—3 ml. of solution, containing MoO_4'', WO_4'', VO_3', and all the ordinary anions and cations, are evaporated to dryness, the residue is ignited, extracted with hot 2—$5N$-H_2SO_4, and the solution is filtered. A piece of Sn is placed on the ppt., which is moistened with HCl; a blue coloration indicates presence of W. 2—3 drops of $SnCl_2$ and of aq. KCNS are added to 1 ml. of filtrate; a red coloration indicates Mo. 2—3 drops of NH_2Ph in conc. HCl are added to 1 ml. of the original solution; a blue coloration indicates V. R. T.

Separation of uranium, zirconium, and titanium from manganese, cobalt, and nickel by means of pyridine. E. A. Ostroumov (Ann. Chim. Analyt., 1937, [iii], 19, 89—93).—A solution, containing the metals as nitrates or chlorides, is exactly neutralised, and is heated at 100°. Ti, if present in large amount, is partly pptd. as basic salt. 20% aq. C_5H_5N is added until the liquid is alkaline, thereby pptg. U, Zr, and Ti quantitatively. The separation requires only one pptn. J. S. A.

Determination of the activity of radioactive substances by the method of "thin layers." (Effect of thickness of substance.) M. Francis (J. Phys. Radium, 1935, [vii], 6, 303—309).—The method of "thin layers" for determining the abs. activity of a granular substance containing an α-ray source gives erroneous results if the grains are large. The granular nature of U_3O_8 obtained by grinding in a mortar has been investigated. A. J. M.

Detection of small amounts of tin in ores by means of cacotheline.—See B., 1937, 449.

Determination of tin, stannous oxide, and stannic oxide in tablets.—See B., 1937, 496.

Application of a selenium photocolorimeter to chemical analysis. A. L. Davidov and A. M. Avrunina (Zavod. Lab., 1936, 5, 927—931).—Determination of Ti and Mn by known methods, using a Se photocolorimeter, is described. R. T.

Sensitive reaction for germanium. N. S. Poluektov (J. Appl. Chem. Russ., 1936, 9, 2302—2304).—A drop of solution is evaporated to dryness, 2—3 drops of hydroxynaphthacenequinonesulphonic acid in H_2SO_4 are added, and the solution is examined in blue light; a red coloration indicates $\nless 2{\cdot}5 \times 10^{-7}$ g. Ge. R. T.

Spectroscopic determination of germanium and beryllium in minerals and ores. A. Rusanov and V. M. Kostrikin (J. Appl. Chem. Russ., 1936, 9, 2305—2311).—Determination of Ge and Be from the emission spectra of mixtures of mineral with C–Pt is described. R. T.

Organic reagents capable of application to mineral analysis. I. 2 : 3 : 7-Trihydroxy-9-methyl-6-fluorone, special reagent for antimony cations. R. Duckert (Helv. Chim. Acta, 1937, **20**, 362—367).—2 : 3 : 7-*Trihydroxy*-9-*methyl*-6-*fluorone* (I) is obtained by mixing 1 : 2 : 4-$C_6H_3(OAc)_3$ (1 mol.) with MeCHO (1·25 mol.) dissolved in a mixture of 5—10% H_2SO_4 (1 part) and EtOH (5 parts), and heating for 1 hr. at 50—60°. H_2O is then added to ppt. (I), which is washed with H_2O and purified by dissolution in EtOH and repptn. with H_2O. At p_H 4 only $Sb^{\cdot\cdot\cdot}$ and $Sb^{\cdot\cdot\cdot\cdot\cdot}$ ions give bright red ppts. when treated with saturated solutions of (I) in EtOH, and it can be used as a sp. reagent for Sb. J. W. S.

Determination of gold. F. E. Beamish, J. J. Russell, and J. Seath (Ind. Eng. Chem. [Anal.], 1937, **9**, 174—176).—Au is pptd. quantitatively from 1·2*N*-acid solutions, without occlusion of Pt or Pd, by 1% aq. quinol. The procedure is applicable to the determination of Au in alloys with Cu, Ni, and Zn. After pptn. of Au, Pd dimethylglyoxime can be pptd. directly, and Pt can be determined in the filtrate after heating the evaporated residue to destroy org. matter and digesting with aqua regia. E. S. H.

Spectrographic determination of platinum by the constant-pair method.—See B., 1937, 450.

Determination of m.p. by measuring conductivity. L. N. Sergeev and M. S. Simonova (Zavod. Lab., 1936, **5**, 860—862).—The conductivity–temp. curves of metals exhibit a break at the m.p. R. T.

Calorimeter for measurements with liquids of high vapour pressure. K. L. Wolf and H. Frahm (Z. physikal. Chem., 1937, **178**, 411—419).—A metal-block calorimeter working isothermally and suitable for measuring sp. heats, and heats of reaction, mixing, dissolution, and dilution is described. R. C.

Demountable vacuum furnace. M. N. Saha and A. N. Tandon (Proc. Nat. Acad. Sci. India, 1936, **6**, 212—216).—A graphite tube furnace for temp. $\not>$ 2500° is described. J. S. A.

Increasing sensitivity of bimetal thermometers. J. B. Dowden (Product Eng., 1935, **6**, 388—389).—A multiple-helix form of thermometer is described. Ch. Abs. (*e*)

Thermostat with prolonged automatic regulation of low temperatures. L. J. Kurtz and V. G. Voano (Zavod. Lab., 1937, **6**, 107—108). R. T.

Self-operating temperature regulators.—See B., 1937, 399.

Blocking-layer photo-cell pyrometer. G. F. Hubing (J. Opt. Soc. Amer., 1936, **26**, 260—261).—The construction and use of an improved portable instrument are described. N. M. B.

Ray-displacement refractometer for accurate work. K. Prosad and R. P. Gupta (Indian J. Physics, 1937, **11**, 13—19).—Details of the construction of a refractometer specially suitable for thin transparent plates are given. The telescope of a spectrometer is replaced by a microscope having scale divisions in the eyepiece, and the collimator of the spectrometer is replaced by a const.-deviation spectroscope used as a monochromator. The accuracy of the instrument is discussed. W. R. A.

Use of refraction for determining mol. wt. M. M. Samigin (J. Phys. Chem. Russ., 1936, **8**, 845—848).—A knowledge of *n* and of the class of a compound is sometimes sufficient for determining its mol. wt. J. J. B.

Lamp for analytical balance. H. E. Phipps (J. Chem. Educ., 1937, **14**, 107). L. S. T.

Ultramicroscopic observations with photosensitive crystals. IV. K. Schaum and O. Scheld (Z. wiss. Phot., 1937, **36**, 121—140).—Ultramicroscopic investigations of binary crystal systems, and their sensitivity to light, are described. A. J. M.

Determination of absorption coefficients of the atmosphere. I. Method. J. Duclaux (J. Phys. Radium, 1935, [vii], **6**, 323—328).—The method consists in comparing photographically the brilliance of a distant terrestrial object and that of the adjacent sky, using monochromatic light obtained by means of filters. A. J. M.

Photoelectric Tyndall meter. W. S. Mueller (Food Res., 1937, **2**, 51—54). E. C. S.

Numeration of *X*-ray diagrams in mass photography. A. A. Kiselev (Zavod. Lab., 1937, **6**, 88—91).—Methods of marking objects of which *X*-ray photographs are to be taken are described. R. T.

Cameras for *X*-ray photography at low temperatures. E. E. Flint and V. P. Butuzov (Zavod. Lab., 1937, **6**, 91—95). R. T.

Determination of minute absorptions of light. A. van Kreveld and H. J. Jurriëns (Physica, 1937, **4**, 297—304).—A photo-electric cell is used. Changes of 0·005% of the transmitted light could be observed. H. J. E.

Micrography of metals in ultra-violet light. J. Smiles and H. Wrighton (Proc. Roy. Soc., 1937, A, **158**, 671—681).—A comparison of the results attainable by the use of a quartz objective of N.A. 1·25 designed for use with radiation of λ 2750 A. and a visual light objective of N.A. 1·60. The images obtained with ultra-violet light show greater sharpness and detail. G. D. P.

Mask for printing Laue photographs. C. H. Dwight and H. Kersten (Rev. Sci. Instr., 1937, [ii], **8**, 132—133; cf. A., 1935, 1340).—An improved method of preventing over-exposure of the central portion of a Laue photograph consists in rotating a piece of sector-shaped film between the photographic film and the light source. N. M. B.

Vacuum-cell luminescence microscope and its use in the study of luminescent materials. J. Gallup (J. Opt. Soc. Amer., 1936, **26**, 213—215).—A new type of instrument and its use in the examination and comparison of materials luminescent

under electron bombardment in vac. are described. The luminiscence of Ca silicates is discussed.
N. M. B.

Validity of the photographic reciprocity law for α-rays. R. N. Wolfe and T. R. Wilkins (J. Opt. Soc. Amer., 1936, 26, 105—110).—Validity is confirmed for a ratio of source intensities 171/1.
N. M. B.

Determination of concentrations by means of a liquid interferometer. N. A. Figurovski and K. A. Pospelova (Zavod. Lab., 1936, 5, 983—986).—Known methods are described. R. T.

Quantitative spectrographic analysis. Increased accuracy in the logarithmic sector method. H. A. Wilhelm (Ind. Eng. Chem. [Anal.], 1937, 9, 170—172).—A modified eyepiece, having internal comparison densities and an internal scale, is described. E. S. H.

Hyperfine structure spectrograph. L. P. Granath and R. K. Stranathan (J. Opt. Soc. Amer., 1936, 26, 279—281).—The instrument described consists of a Fabry–Perot etalon and prism spectrograph built as a single unit. N. M. B.

Application of punched-card equipment to the analysis of complex spectra. J. V. Atanasoff and A. E. Brandt (J. Opt. Soc. Amer., 1936, 26, 83—88).—A rapid and accurate tabulating and sorting machine method for the analysis of complex spectra into term vals. is described. N. M. B.

Spectrometer for studies at high pressures. W. J. Lyons and F. E. Poindexter (J. Opt. Soc. Amer., 1936, 26, 146—148).—The instrument consists of a liquid prism confined between elliptical plate-glass windows 6 mm. thick fastened into the ends of a short rubber sack, the whole being contained in a strong pressure cylinder in which are cut narrow observation slits. N. M. B.

Low-voltage source of ultra-violet continuum. A. E. Smith and R. D. Fowler (J. Opt. Soc. Amer., 1936, 26, 79—82).—A low-voltage H_2 discharge tube giving an intense continuous spectrum in the ultra-violet, and operating with currents as high as 20 amp., is described. Data for variations of intensity with pressure, current, and discharge voltage are tabulated. N. M. B.

Monochromator for the near ultra-violet. F. Benford (J. Opt. Soc. Amer., 1936, 26, 99—104).—An instrument for max. monochromatic energy rather than spectral purity or λ accuracy, with fused quartz Pellin–Broca prisms, is described.
N. M. B.

Filters for the infra-red. R. B. Barnes and L. G. Bonner (J. Opt. Soc. Amer., 1936, 26, 428—433).—A simple filtering system of two simply constructed Se powder filters for obtaining a pure energy spectrum with a wire grating spectrometer in the region 40—130 μ is described. Transmission curves for 1—15 and 35—130 μ are given for cellulose nitrate, Se powder, MgO powder, camphor soot, quartz particles, Al-black, paraffin, and for MgO, LiF, KCl, and NaCl melted into paraffin.
N. M. B.

Improvement of speculum gratings by the application of aluminium. A. B. Fooke (J. Opt. Soc. Amer., 1936, 26, 235—237; cf. Strong, A., 1936, 399).—If the surface is coated with Al by evaporation, the time required to obtain a photograph of a spectrum is reduced by a factor which is the ratio of the reflexion coeff. of Al to that of the speculum metal. The speed of the original grating was increased for λλ 4077 (45%), 3341 (80%), and 2536 (170%). N. M. B.

Interrupted arc for spectral analyses. J. H. McMillen and G. H. Scott (Rev. Sci. Instr., 1937, [ii], 8, 121—123).—To ensure uniform consumption of the sample, the latter is placed on the surface of a horizontal electrode which rotates on its own axis and also moves laterally into the discharge. Liquids are placed in a reservoir below the electrode and rotation causes continuous renewal of the surface layer. Motion of the electrodes is effected by motor-driven mechanism. N. M. B.

Precision two-crystal *X*-ray spectrometer; improved method of equalising the spacing of worm-wheel teeth. J. W. M. DuMond and D. Marlow (Rev. Sci. Instr., 1937, [ii], 8, 112—121).—An instrument of wide applicability for radiation in the range vac. region—about 100 X. is described. An essential feature is the use of worm gears, and effective means of correcting teeth spacing by a lapping method is given. N. M. B.

Photo-electric spectrophotometry. Apparatus for the ultra-violet and visible spectral regions: its construction, calibration, and application to chemical problems. T. R. Hogness, F. P. Zscheile, jun., and A. E. Sidwell, jun. (J. Physical Chem., 1937, 41, 379—415).—The instrument has an extended range in the ultra-violet to 2200 A., and by exposing solutions to 10^{-8} lumens, errors due to photochemical decomp. are minimised. A detailed description is given and the errors in the use of the instrument are discussed mathematically.
C. R. H.

Nephelometer–colorimeter with optical compensation. B. E. Semeikin (J. Appl. Chem. Russ., 1936, 9, 2332—2337). R. T.

Limitations of colorimetric analyses by present methods. E. L. Armstrong and M. L. Kuder (J. Lab. Clin. Med., 1935, 21, 181—187).—Errors in the colorimetric methods for analysis of sugar, non-protein-N, urea-N, and uric acid are discussed. A new type of photo-electric colorimeter is described.
Ch. Abs. (e)

Use of nephelometer for polydispersity analysis. S. I. Charin and L. G. Smirnova (Kolloid. Shurn., 1936, 2, 543—548).—The gradual decrease of the turbidity of a sol allows its dispersity to be calc. Applications to soil and clay are mentioned.
J. J. B.

Continuous determination of turbidity and coloration. G. S. Alexandrovitsch (Zavod. Lab., 1936, 5, 875—877).—A photo-electric cell is described.
R. T.

Apparatus for the measurement of low concentrations of radon. M. H. Garrigue (J. Phys.

Radium, 1936, [vii], 7, 107—109).—The construction of a portable apparatus is described. O. D. S.

Method of measuring powerful sources of α-rays. R. Garnier (J. Phys. Radium, 1936, [vii], 7, 110—112).—The intensity of the rays is determined by the measurement, by means of a photo-electric cell, of the fluorescence produced on a ZnS screen. O. D. S.

New method of focussing beams of rapid positive ions. Application to mass spectrography. L. Cartan (J. Phys. Radium, 1937, [vii], 8, 111—120).—A special electrostatic gauze "lens" is described which is capable of focussing a beam of heavy particles with high energy. 1000—5000 volts applied to the lens will focus beams of 10^6 e.v. energy. The use of the lens in a mass spectrograph enables a more intense photograph to be obtained. Changing the sign of the potential of the lens changes it from convergent to divergent. A. J. M.

Technique of electrolytic conductivity measurement. F. Ender (Z. Elektrochem., 1937, 43, 217—233).—The theoretical background of conductivity measurements is discussed, with special reference to accuracy. E. S. H.

Simple micro-electrode for determining p_H and E_h. W. A. Dorfman (Protoplasma, 1936, 25, 465—468). M. A. B.

Latent impurities in electrodes used for spectrographic research. W. A. Roach (Nature, 1937, 139, 547).—Possible impurities in the electrodes are eliminated by the prep. of small electrodes from the plant material itself by suitable treatment and carbonisation. The spectrogram thus obtainable is compared with that prepared from filter-paper to which pure salts have been added. L. S. T.

Impurities in electrodes for spectrometer work. J. G. Maltby (Chem. and Ind., 1937, 220).—The invariable occurrence of metallic impurities in graphite electrodes is confirmed; it may be avoided only by using pure C electrodes. J. S. A.

Glass electrode. G. Haugaard (Tids. Kjemi, 1937, 17, 53—57).—Apparatus is described. Asymmetrical potentials have been measured and their significance is discussed. M. H. M. A.

Vapour-cooled electrodes. O. H. Schmitt (Rev. Sci. Instr., 1937, [ii], 8, 131).—Two designs of electrode, in which a small quantity of liquid trapped within the electrode is vaporised with absorption of heat, recondenses on a large air-cooled surface, and runs back into the electrode, are described.

Electron tube and instrument for use with the glass electrode, and a rugged type of glass electrode. L. D. Goodhue (Iowa State Coll. J. Sci., 1935, 10, No. 1, 7—15).—The apparatus is described. Ch. Abs. (*e*)

Measurement of hydrogen-ion concentration with a glass electrode using a lamp voltmeter. E. C. Gelgren and T. M. Menschikova (Zavod. Lab., 1937, 6, 109—110).—Apparatus is described. R. T.

Application of the mercury cathode to determination of aluminium. S. P. Moltschanov (Zavod. Lab., 1936, 5, 1518—1519).—Apparatus is described. R. T.

Simplified potentiometric titration. A. K. Babko (Zavod. Lab., 1936, 5, 1387—1388).—Apparatus is described. R. T.

Dielectric constants. II. F. Pavelka and J. Kirigin-Mardegani (Mikrochem., 1937, 21, 273—297).—A review of dielectric const. measurements, and their analytical applications. J. S. A.

Influence of time of running and of drainage on measurements with burettes. V. Rank (Mikrochem., 1937, 21, 231—244).—The magnitude of drainage errors is discussed. J. S. A.

Micro-burette.—See B., 1937, 427.

Apparatus for reducing and titrating solutions without access of air. C. J. Rabinovitsch (Zavod. Lab., 1936, 5, 1390—1391). R. T.

Constructional devices for increasing accuracy of titration with large volumes. R. I. Alexeev (Zavod. Lab., 1937, 6, 126).—No advantage is gained by titration involving the use of a macro-burette for the bulk of the standard solution, and of a micro-burette when approaching the end-point. R. T.

Automatic pipette for sedimentation analysis. E. O. Hofman (Kolloid. Shurn., 1937, 3, 87—89). J. J. B.

Modified Hempel gas analysis apparatus. A. R. Hershberger (J. Chem. Educ., 1937, 14, 139—140). L. S. T.

Modified Bone and Wheeler gas-analysis apparatus.—See B., 1937, 405.

Foaming analysis. II. W. Ostwald and A. Siehr (Kolloid-Z., 1937, 79, 11—15; cf. A., 1936, 1080).—Improved apparatus and technique is described, suitable for solutions which form "solid" films (*e.g.*, K stearate, albumin). F. L. U.

New series of buffer mixtures covering the p_H range 1—6. W. L. German and A. I. Vogel (Analyst, 1937, 62, 271—280).—Binary mixtures in various proportions of standard solutions of p-$C_6H_4Me\cdot SO_3H$, $CH_2Ph\cdot CO_2H$, and succinic acid (I), each with its corresponding Na salt [Na_2 salt of (I)] are used for the ranges 1·3—3·3, 2·8—4·4, 3·35—5·1 and 4·8—6·3, respectively. Max. Van Slyke buffer capacities are 0·21, 0·0056, 0·0036, and 0·004, respectively. Advantages are cheapness, stability, ease of purification (methods are described) and of checking the purity, and convenience of prep. of the solutions. The data were checked electrometrically. J. G.

Air-driven centrifuge for semi-micro qualitative analysis. W. C. Vosburgh and J. H. Saylor (J. Chem. Educ., 1937, 14, 142). L. S. T.

Observation of ultracentrifugal sedimentation by the Toepler "Schlieren" method. A. Tiselius, K. O. Pedersen, and I. B. Eriksson-Quensel (Nature, 1937, 139, 546).—The no. of components and their sedimentation velocities can be directly observed during sedimentation. Approx. amounts also can be estimated. Sedimentation pictures of hæmocyanin and of a pathological serum are given. L. S. T.

Air turbine centrifuge. H. W. Beams (J. Marine Biol. Assoc., 1937, 21, 571—588).—An air turbine centrifuge capable of developing a centrifugal force from 10,000 to 500,000 times $>$ gravity is described. Temp. in the centrifuge is approx. atm., and the apparatus is cheap to construct. A modification in which the turbine drives the centrifuge rotor in vac., and is capable of giving a force $>10^6g$, is described. As the centrifuge chamber is thermally insulated, convection currents are avoided. A microscope centrifuge in which materials can be observed under the microscope while being centrifuged is described. A. J. M.

Temporary marking of chemical glassware. A. L. Bacharach (Analyst, 1937, 62, 286).—Lead-pencil writing on etched or sand-blasted areas is best removed by an ordinary rubber eraser. J. G.

Apparatus for rapid determination of moisture by the carbide method. L. M. Jolson (Z. anal. Chem., 1937, 108, 321—325).—A volumeter for determining the vol. of C_2H_2 liberated is described. J. S. A.

Preservation of starch indicator. B. Naiman (J. Chem. Educ., 1937, 14, 138).—Starch solution prepared with HgI_2 as preservative gave satisfactory results after being stored in glass-stoppered bottles for 8 years. L. S. T.

Apparent molecular volume of dissolved electrolytes. III. Dilatometer for determination of variation with concentration of apparent and partial molecular volumes. W. Geffcken, A. Kruis, and L. Solana (Z. physikal. Chem., 1937, B, 35, 317—330; cf. A., 1934, 252).—An apparatus capable of determining with a precision of 2×10^{-4} c.c. the vol. change occurring when two liquids are mixed in stages has been used to measure the apparent mol. vol. of 0·2—6·6N-NaBr. R. C.

Bulb for combustion of gases for their analysis. V. L. Matschkarin (Zavod. Lab., 1936, 5, 1520).—Cracking of glass due to rapid expansion of Pt wire embedded in it is avoided by making electrical contact through Hg, which cools the wire. R. T.

Automatic regulation of rate of flow of gases. M. M. Fainberg (Zavod. Lab., 1936, 5, 1005—1006).—Apparatus is described. R. T.

Automatic water regulator. H. R. Luthra (J. Sci. Instr., 1937, 14, 141).—The level in an open-air experimental pit is kept const. by means of a Hg seal in a wooden float which controls the inflow from a pipe. N. M. B.

Taking small samples of gas. J. I. Pali (Zavod. Lab., 1936, 5, 1386).—Apparatus is described. R. T.

Vessels for the storage of gases and liquids. J. Sendroy, jun. (Ind. Eng. Chem. [Anal.], 1937, 9, 190—191). E. S. H.

Mercury seal for stirrers. L. H. Briggs (Ind. Eng. Chem. [Anal.], 1937, 9, 168).—Modified apparatus is described. E. S. H.

Gas-tight laboratory stirring device for pasty materials. A. H. Maude (Ind. Eng. Chem. [Anal.], 1937, 9, 196). E. S. H.

Stirring under vacuum. S. H. Bertram (Chem. Weekblad, 1937, 34, 287).—An apparatus is described in which the glass stirrer shaft passes through a glass sleeve fitted into the flask stopper, a vac.-tight connexion being effected by a short length of rubber pressure tubing fitting around the shaft and secured over the top of the sleeve. The joint may be lubricated with glycerol. S. C.

Vacuum gauge for leak hunting. J. B. H. Kuper (Rev. Sci. Instr., 1937, [ii], 8, 131—132).—A circuit is described in which a 40-watt tubulated light bulb in an a.c. bridge with loudspeaker acts as a gauge. N. M. B.

High-vacuum technique. J. E. Rose (Rev. Sci. Instr., 1937, [ii], 8, 130).—A simplified leak-proof form of Du Mond high-vac. valve (cf. *ibid.*, 1935, [ii], 6, 285) and a leak-proof joint, which obviates cracking of cement by expansion and contraction, are described. N. M. B.

Sensitive adaptation of the spoon gauge. A. Lewis and D. W. G. Style (Nature, 1937, 139, 631).—The incorporation of a special form of bifilar suspension permits the measurement of pressure differences of the order 4×10^{-5} mm. of Hg. L. S. T.

Viscosimeter suitable for materials of high viscosity.—See B., 1937, 400.

Sensitive quartz spiral-spring balance. C. J. Dippel (Chem. Weekblad, 1937, 34, 317).—Using a quartz spiral-spring balance with an accuracy of 0·01 mg.-atom, the absorption energy of I on CaF_2 at 20° and 40° is shown to be about 13,000 g.-cal. per mol. The desorption isotherms show very definite hysteresis. S. C.

Geochemistry.

Thermoluminescence of crystallophyllian and eruptive rocks from Algeria. L. Royer (Compt. rend., 1937, 204, 602—604).—The crystallophyllian rocks show strong thermoluminescence, attributed to the presence of orthoclase. Eruptive rocks are weakly thermoluminescent. A. J. E. W.

Kaolin and clay. W. L. de Keyser (Natuurwetensch. Tijds., 1937, 19, 91—105).—Kaolin loses 2/3 of its combined H_2O when heated in a vac. over P_2O_5 at 350° for 200 hr. and is completely dehydrated at 1000° (loss 15·1%). Thermal analysis shows a definite decomp. point at 500° but no inflexion was observed at 650°. Kaolins from Zettlitz and " Les Eyzies " were identical in their behaviour. S. C.

Composition and nature of organic compounds in gasiferous clays of the Melitopol district. J. V. Gretschni (Ukrain. Chem. J., 1937, 12, 64—72).—The org. matter has a composition corresponding with that of humin coal. The origin of the deposits is discussed. R. T.

Alteration of spodumene to kaolinite in the Etta mine. G. M. Schwartz (Amer. J. Sci., 1937,

[v], 33, 303—307).—In one part of the mine the large crystals of spodumene are in part or completely altered to kaolinite (instead of to "killinite"; A., 1926, 379), preserving the outline and cleavage of the original mineral. Analysis shows loss of Li_2O and SiO_2 and gain of H_2O, with a porosity of about 5%.
L. J. S.

Recently discovered kaolin-sandstone occurrence in the crystalline limestone of Pargas-Ål Island, Åbo, S.W. Finland. H. Hausen (Acta Acad. Abo., Math. Phys., 1934, 8, No. 1, 59 pp.).
Ch. Abs. (e)

Geochemical constants of iron. A. E. Fersman (Uspechi Chim., 1935, 4, 731—755).—A discussion.
Ch. Abs. (e)

Iron ores of the Middleback Ranges, S. Australia. A. B. Edwards (Proc. Austral. Inst. Min. Met., 1936, No. 102, 155—207).—The geology and mineralogy of 12 bodies of bedded hæmatite (I) ore which occur in synclinal structures associated with aluminous schists and banded (I)-quartzites at various points in the Eyre Peninsula are discussed. Closely associated with the massive ores are schistose and blue powder ores derived from the leaching of (I)-rich quartzites. The (I) appears to have been produced by alteration of magnetite by the action of descending surface-waters which have sometimes carried Mn in solution; this has in places been deposited in a gel form as psilomelane, frequently rich in Fe, and in other places it has crystallised out as veins of pyrolusite, sometimes with braunite and manganite. The Fe in the gel has also crystallised as supergene magnetite; the limonite also present is apparently an alteration product of the original magnetite. The deposits are similar even in detail to those of Lake Superior, Brazil, India, and other localities, and belong to the Mosquito Series of the Pre-Cambrian period.
A. R. P.

Bituminous earths from the Kahuzi. A. Schoep (Natuurwetensch. Tijds., 1937, 19, 83—85).—Black earth from the top of the Kahuzi volcano contains 70% of a protobitumen, m.p. 75—95°, acid val. 60, sap. val. 125, of vegetable origin. S. C.

Blackish-grey chrysocolla. L. de Leenheer (Natuurwetensch. Tijds., 1937, 19, 86—90).—Two samples of blackish-grey chrysocolla from Luishia and Star of the Congo, respectively, had the following compositions: SiO_2 33·84, 33·08; CuO 37·05, 38·38; H_2O 18·55, 24·21; Fe_2O_3 3·94, 4·24; Co_2O_3 5·74, 0%. They were identical with katangite and the colour was not due to Co. S. C.

Petrographic and chemical study of the region of the valleys Neagra and Haïta. O. Nichita (Ann. Sci. Univ. Jassy, 1935, 20, 197—314).—An extensive survey is given of the rocks of the Călimani mountains and the cycles of eruption are discussed.
R. S. B.

Red and yellow Tschubarovka ochres. I. J. Mikei, I. A. Brodska, and A. T. Tschorni (Ukrain. Chem. J., 1937, 12, 73—76).—Analytical data are given. R. T.

Change of anorthite into a variety of thomsonite containing calcium. (Mlle.) S. Caillère (Compt. rend., 1937, 204, 785—786). A. J. E. W.

Dissociation of zircon. H. George and R. Lambert (Compt. rend., 1937, 204, 688—689).—Fusion followed by rapid cooling causes complete dissociation of zircon into cryst. ZrO_2 and vitreous SiO_2. The Debye–Scherrer diagram is unchanged by the process. Ignition at temp. $<$ the m.p. causes partial dissociation. A. J. E. W.

Crystalline structure of laurionite. S. Goldsztaub (Compt. rend., 1937, 204, 702—703).—The unit cell contains 4 mols. of Pb(OH)Cl, and has *a* 7·1, *b* 9·7, *c* 4·05 A.; space-group V_h^{16} *Pnam*. At. parameters are given; they show a close analogy to those of matlockite. A. J. E. W.

Genesis of some sulphur deposits of the U.S.S.R. P. M. Murzaiev (Econ. Geol., 1937, 32, 69—103).—The Knibyshev, Sukeievo, Chekur-Koyash, Kazbek, Gumur, and Kamchatka S deposits are described. The reduction of SO_4'' under natural conditions probably occurs biochemically. The S of the bedded deposits (first three mentioned above) is syngenetic. L. S. T.

Mineralogical composition and properties of Tichvin bauxites. A. N. Varschavski and G. I. Jasinskaja (J. Appl. Chem. Russ., 1937, 10, 69—81).—Fe_2O_3 is quantitatively extracted from bauxites dried at 130° by boiling with 20% HCl for 1 hr., whilst extraction of Al_2O_3 varies from 13 to 32% (1 hr.) and from 36·3 to 84·4% (8 hr. extraction), for different bauxites. 100% extraction (1—4 hr.) of Al_2O_3 and Fe_2O_3 is obtained with bauxites heated at 500—700°; at 800—1000° the yields fall rapidly. The % of TiO_2 extracted rises with temp. over the whole range. The kaolinite, diaspore, hydrargillite, and calcite contents of four bauxites are given.
R. T.

Lead-bearing tourmaline from the Maly Khingan range. A. A. Lebedev (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 127—128).—The analysis of tourmaline containing 1·25% of PbS is given.
O. D. S.

Review of the problems of the Sudbury [nickel] irruptive. T. C. Phemister (J. Geol., 1937, 45, 1—47).—Petrological. Chemical analyses are recorded and chemical relationships discussed.
L. S. T.

Occurrence of nickel in the biotite shales of the Ural emerald mines and of other emerald deposits. K. K. Matveev (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 123—126).—Ni contents of from 0·03 to 0·09% have been found by analysis in (unrepresentative) samples of biotite shale from Ural, Habachtal (Tyrol), and the Somerset mine (Transvaal). O. D. S.

Composition and paragenesis of biotites of the Carsphairn igneous complex. W. A. Deer (Min. Mag., 1937, 24, 495—502).—Biotites isolated from granite, tonalite, and a hornblende hybrid are analysed, and their composition is compared with that of the enclosing rock. In more acid rocks the biotite shows an increasing FeO : MgO ratio, and a decreasing $RO : R_2O_3$ ratio. The chemical formula of biotite is discussed in relation to its crystal structure.
L. J. S.