BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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

FEBRUARY, 1938.

Stark effect in hydrogen and deuterium. J. S. Foster and H. Snell (Proc. Roy. Soc., 1937, **A**, **162**, 349—356).—The observed asymmetric Stark intensity patterns for D are nearly mirror images of those for H. Variations from the Epstein spacing of components are found to be in fair agreement with the Schlapp theory of fine structure. A novel form of canal-ray tube is described. G. D. P.

Excitation of light by canal rays from hydrogen and deuterium. R. Junkelmann (Z. Physik, 1937, **107**, 561—578).—Measurements of the excitation of He, A, and H_2 by canal rays from H and D with energies between 8 and 50 kv. are reported. Excitation of the He line λ 3888 shows a sharp rise in intensity which occurs at a lower energy but higher velocity with H atoms than with D atoms. This agrees with deductions made by Döpel from other canal-ray measurements. Excitation of A and H_2 lines show intensity maxima also produced at a lower energy but higher velocity by H atoms than by D atoms. The excitation of H_γ and D_γ produced by the collisions was measured. The kinetics of the collisions involved are examined and results discussed on the basis of Döpel's models. H. C. G.

Excitation of potentials of the levels $B_3\Pi$ and $C_3\Pi$ of the nitrogen molecule. R. Bernard (Compt. rend., 1937, **205**, 793—794).—The *2P* and *1P* bands of N_2 are easily excited by electrons of energies <12 and 10 e.v., respectively, in presence of He and Ne, results which cannot be obtained with pure N_2. By extrapolation it is inferred that the excitation potentials of the $B_3\Pi$ and $C_3\Pi$ levels are respectively approx. 7·5 and 11 e.v. R. S. B.

Energy levels of neon and argon. J. B. Sampson (Physical Rev., 1937, [ii], **52**, 1157—1158; cf. Shortley, A., 1933, 1226; A., 1935, 556).—The energy levels for the Ne $2p^53d$ and A $3p^55d$ configurations have been calc. from the first-order perturbation theory and compared with observed vals. N. M. B.

Spectrum of silicon. T. Takamine, T. Suga, and M. Kamiyama (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **33**, 247—271).—Full data are given and discussed for part of the Si spectra in the extreme ultra-violet, 1300 to 150 A., at successive stages of ionisation when a strong condensed discharge is passed through a fine quartz capillary in H_2 at low pressure. The change of many Si I and Si II lines from emission to absorption with increased spark energy, and the marked difference in ease of reversal for different Si II lines were observed. The relation between stellar temp. classification and the temp. of the experimental light source is discussed. N. M. B.

Low terms in Cr III, Cr IV, Mn IV, and Fe V. I. S. Bowen (Physical Rev., 1937, [ii], **52**, 1153—1156; cf. A., 1935, 1045).—Extensive data and classifications of the strong lines arising from the d^3, d^24s, and d^24p configurations of Cr IV, and the d^4, d^34s, and d^34p configurations of Cr III, Mn IV, and Fe V are tabulated. The presence of forbidden lines of these ions in astronomical sources is discussed. N. M. B.

Stark effect in iron and the contrast with pole effect. S. F. Panter and J. S. Foster (Proc. Roy. Soc., 1937, **A**, **162**, 336—348).—A discharge tube suitable for investigation of the Stark effect in the spectra of metals of high m.p. is described. Of over 200 lines of the Fe spectrum recorded photographically, 33 were found to be displaced by fields up to 150 kv. per cm., 8 towards the red and 25 towards the violet. It is concluded that the pole effect, *i.e.*, a change of λ at the pole as compared with the centre of the arc, is not identical with the Stark effect. The Stark displacements of lines not yet examined are predicted. G. D. P.

Hyperfine structure in [the spectrum of] germanium. L. Sibaiya (Current Sci., 1937, **6**, 152).—The seven arc lines studied are single, showing the absence of isotope displacements in the levels examined, and indicating that the ^{73}Ge nucleus has a very small magnetic moment. A. J. E. W.

Absorption spectrum of liquid bromine. D. Porret (Proc. Roy. Soc., 1937, **A**, **162**, 414—419).—The absorption of liquid Br has been investigated between 20,000 and 40,000 cm.$^{-1}$ by a method for which increased accuracy is claimed. The extinction coeff. curve is compared with those of gaseous Br and a solution of Br in CCl_4. The observed differences are discussed. G. D. P.

Pressure effects of rare gases on the second doublet of the rubidium principal series. N. T. Zé and C. S. Yi (Physical Rev., 1937, [ii], **52**, 1158—1161).—The displacement, asymmetry, and broadening of the second doublet of the Rb principal series perturbed by He, Ne, and A up to 13 atm. were investigated. Results are compared with those for K and Cs (cf. Watson, A., 1934, 1) and discussed in relation to Margenau's theory of pressure effects of foreign gases on spectral lines. N. M. B.

First spark spectrum of indium, In II. F. Paschen and J. S. Campbell (Ann. Physik, 1938, [v], **31**, 29—75).—The hyperfine structure has been measured and analysed from 9246 to 2078 A. λλ are tabulated. O. D. S.

Influence of addition of gas and of a magnetic field on the degree of polarisation of fluorescence of iodine vapour. M. S. Mrozowski (Bull. Acad. Polonaise, 1937, **A**, 295—311).—The degree of polarisation of fluorescence of I vapour admixed with He, Ne, A, N_2, and H_2 (*p*, 0—30 mm.) has been determined using Al–Cd spark λλ 3200, 3460, and 4400 A. (unpolarised) and Hg arc λ 5461 A. (polarised) as exciting radiations. The influence of the variation of the life period of the excited mol. is investigated by repeating measurements in a magnetic field (22,000 gauss) and corrections for this variation are calc. The mechanism of depolarisation of fluorescence by collision is discussed. F. J. L.

Nuclear moment of barium. A. N. Benson and R. A. Sawyer (Physical Rev., 1937, [ii], **52**, 1127—1131).—In view of discordant reported vals. for the nuclear moment of the odd isotopes of Ba, new data on the hyperfine structure of several lines were obtained. Investigations of the separation of the $6^2S_{\frac{1}{2}}$ and $7^2S_{\frac{1}{2}}$ components from the centre of gravity, and of the spacing and patterns of the 5^3D_3 and 6^3P_2 terms, indicate the val. $I = 1\frac{1}{2}$ for the nuclear moment. N. M. B.

Probability of stepwise excitation of mercury atoms. V. Fabrikant and I. Cirg (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 263—266).—The mechanism by which excited Hg atoms are excited to higher levels by electron impacts is investigated by measurement of the radiation intensity from Hg vapour at const. v.p. (10^{-3} mm. Hg) and various electron concns. $Q_a(V_{ma})$, the effective section of excited atoms at the max. of the function of excitation, is 16 cm.^{2}/cm.^{3} When atoms obey the Boltzmann distribution law the excitation of the upper levels is stepwise. F. J. L.

Intensity ratios of some intercombination lines in the mercury spectrum. J. L. Verhaeghe (Bull. Acad. roy. Belg., 1937, [v], **23**, 790—799).—Calculations of the intensity ratios of lines 6716, 6234, 5803, 5549 with intercombination lines 6072, 5676, 5316, 5102 from the same upper electron level by the method of Wolfe gave results quite different from the theoretical; deviations are not explained by reabsorption. S. C.

Recombination in the afterglow of a mercury discharge. F. L. Mohler (J. Res. Nat. Bur. Stand., 1937, **19**, 559—566; cf. A., 1938, I, 2).—The ionic density and ionic current to the wall of the bulb have been determined at various brief intervals after cutting off a Hg-arc discharge (4 or 6 amp. in a 500-c.c. bulb; v.p. of Hg $2{\cdot}7 \times 10^{-4}$ mm.) by short-circuiting two anodes. The recombination coeff. is $2{\cdot}3 \times 10^{-10}$, and the electron temp. decreases with time from 3000° K. at 10^{-3} sec. to 1600° K. at 6×10^{-3} sec. It is inferred that the reaction is probably not a spontaneous two-body recombination. J. W. S.

Longitudinal field strength of the positive column in the low-pressure discharge in gas mixtures at varying current strengths and pressures. H. Alterthum and A. Lompe (Ann. Physik, 1938, [v], **31**, 1—28).—The longitudinal field strength *X* in the positive column has been measured by means of a probe method in an a.c. discharge in mixtures of Ne and A, containing 0—50% A, at pressures from 2 to 10 Torr and currents from 10 to 200 ma. The addition of A to Ne causes a decrease in *X* and an alteration in the form of the curve of *X* against current. O. D. S.

Temperature rise in the dark space of the glow discharge. A. Günther-Schulze and W. Bär (Z. Physik, 1937, **107**, 642—652).—With A in a discharge vessel consisting of plane electrodes separated by a glass ring, the mean max. rise in temp. was found to be about 10°. This indicates that only a very small fraction of the energy dissipated at the cathode is conveyed to the gas, which is heated mainly by electron impact. The implications of this result are discussed. H. C. G.

Effect of a magnetic field on the electrodeless high-frequency discharge. E. W. B. Gill (Nature, 1937, **140**, 1061). L. S. T.

Photographic study of the vacuum spark discharge. J. A. Chiles (J. Appl. Physics, 1937, **8**, 622—626).—Vac. spark discharges between several metallic electrodes have been photographed. Except in the case of Sn, luminosity appears first at the anode; the time interval is of the order of 10^{-8} sec. When the potential is first applied there is a pure electron discharge which vaporises the anode by bombardment and gives rise to a cloud of ions; these after an initial field acceleration recombine and continue across the gap, the luminosity being caused by electronic bombardment. On reaching the cathode or by increasing the field emission from points on it the temp. is raised and the cathode hot spot is formed. F. J. L.

Absorption of solar radiation by the atmosphere in the *A* band. P. Lejay (Compt. rend., 1937, **205**, 585—588).—Absorption of solar radiation in the O_2 band at 7718—7593 A. has been investigated. The variation of the effective width of the band and its fine structure lines with the quantity of O_2 traversed is discussed, and the effective thickness of atm. O_2 at different periods of the year deduced. Absorption in this region is not due to H_2O vapour. A. J. E. W.

Degree of variability of calcium content in atmospheres of *A*-type stars. J. W. Abrams and E. Öpik (Astrophys. J., 1937, **86**, 203—211).—The abundance of Ca is relatively uniform in stars of the same spectrum and abs. magnitude. L. S. T.

Magnesium hydride in Arcturus and Antares. D. N. Davis (Astrophys. J., 1937, **86**, 109—118).—Previously unidentified lines between 4979 and 5211 A. in the spectrum of Arcturus are attributed to the 5211 band of MgH, whilst other lines are blends of MgH, TiO, C_2, and at. lines. The more conspicuous features of the MgH spectrum appear less intense in that of Antares. L. S. T.

Possible origin of the shift of spectral lines in nebulæ. L. Sibaiya (Current Sci., 1937, **6**, 152—153).—The shift observed in certain absorption lines is attributed to the presence of foreign gases in the absorbing media. Cases are discussed in which H_2 or a rare gas at up to 400 atm. pressure, present with absorbing Ca II atoms, may cause the observed effects. A. J. E. W.

Ionising radiations of small quantum emitted spontaneously by ordinary metals. G. Reboul and J. Reboul (Compt. rend., 1937, **205**, 789—791).—The radiations emitted spontaneously by Sn, Pb, Fe, Zn, Al, Cu, and Ni have been shown to be due partly to the action of cosmic rays, and partly to a spontaneous natural emission of low penetration in the region of soft *X*-rays. R. S. B.

Thermionic emission. E. W. B. Gill (Phil. Mag., 1937, [vii], **24**, 1093—1103).—The thermionic emissions of both "bright" and coated filaments have been measured over the voltage range 4—900 v. The results are discussed, and compared with Schottky's theory. K. S.

Electron and ion current density distribution in wall-free gas discharges. A. Sibold (Helv. phys. Acta, 1936, **9**, 123—159; Chem. Zentr., 1936, i, 4264).—Langmuir probe investigations on the W arc in N_2 are recorded. J. S. A.

Ionisation and conductivity in gases at high pressures. J. Clay (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 824—836).—A general review of available data, and a discussion of factors affecting the determination of intensities of *X*-rays, γ-rays, β-rays, and cosmic rays by ionisation of He, air, Ne, A, Kr, and Xe at various pressures and field strengths. N. M. B.

Metallic reflexion and the surface photoelectric effect. R. E. B. Makinson (Proc. Roy. Soc., 1937, **A**, **162**, 367—390).—The effect of the electron density within the metal, calc. according to Sommerfeld's model, on an incident light wave is investigated. An expression for the photo-electric current is obtained and is compared with experimental results for K. The lack of agreement is discussed. G. D. P.

Electron mirrors. G. Hottenroth (Ann. Physik, 1937, [v], **30**, 689—712; cf. A., 1937, I, 99).—The properties as electron mirrors of potential fields of various types have been investigated experimentally. The influence of stray fields and of space charge is unimportant. Suitable arrangements for both converging and diverging mirrors are described. O. D. S.

Electron excitation and ion reflexion on bombardment of metals with K^+ ions. W. Veith (Ann. Physik, 1937, [v], **30**, 688; cf. A., 1937, I, 338).—A correction. O. D. S.

Positive ion emission from heated nickel wire in oxygen and hydrogen. R. Goto (Proc. Imp. Acad. Tokyo, 1937, **13**, 320—324).—Curves for the rate of decrease in current and pressure and for current–voltage with Ni wires with and without O_2 treatment after preliminary heating and evacuation in H_2 indicate that there is positive ion emission in both O_2 and H_2 and that it is enhanced on the oxidised surface. N. M. B.

Equilibrium between large and small ions in gas. O. Te-Tchao and A. Langevin (Compt. rend., 1937, **205**, 1049—1051).—If small positive and negative ions are formed in the presence of neutral particles, they are pptd. on to the particles to form large positive and negative ions, which then tend to recombine either with themselves or with smaller ions. The equilibrium conditions are investigated in terms of the ionic mobilities. If M is the no. of neutral particles, P of positive ions, and N of negative ions in equilibrium, P/M is approx. 0·07 and $N/P = 1{\cdot}4$. J. A. D.

Passage of very rapid protons through matter. M. Drăgano (Compt. rend., 1937, **205**, 897—899).—Mathematical. A. J. E. W.

Positive rays of heavy metals, particularly of lead. A. Poirot and M. Auclair (Compt. rend., 1937, **205**, 908—909; cf. A., 1936, 130).—Positive rays of Pb have been obtained from $PbBr_2$ by the hot-anode method using high anode potentials. The bluish-violet light emitted in the path of the rays gives the Pb arc spectrum. Positive rays of all metals can probably be obtained by similar methods. A. J. E. W.

First report of the Committee on atoms of the International Union of Chemistry. F. W. Aston, N. Bohr, O. Hahn, W. D. Harkins, and G. Urbain (J.C.S., 1937, 1910—1912; cf. A., 1937, I, 592).—A table showing the isotopes of the elements with their relative abundance, embodying results reported during 1936, is given. A. J. M.

Sixth report of the Committee on at. wts. of the International Union of Chemistry. G. P. Baxter, O. Hönigschmid, and P. Lebeau (J.C.S., 1937, 1893—1900).—A report covering the period Sep. 30th, 1934, to Sep. 30th, 1935. The at. wts. of Ta and Ra have been changed to 180·88 and 226·05, respectively, and Pa is given the val. 231. Determinations of the at. wts. of K, Cr, As, Te, Tb, Eu, radio-Pb, Ra, Ba, and Pa are reviewed. A. J. M.

Seventh report of the Committee on at. wts. of the International Union of Chemistry. G. P. Baxter, O. Hönigschmid, and P. Lebeau (J.C.S., 1937, 1900—1909).—A report covering the period Sep. 30th, 1935, to Sep. 30th, 1936. Changes in the at. wts. of C, Rb, Gd, Pb, and U, to 12·01, 85·48, 156·9, 207·21, and 238·07, respectively, are made. Determinations of the at. wts. of O, H, C, K, Ga, Ge, Rb, Ag, Cd, Gd, Er, Ta, Pb, U, Mo, and W are reviewed. A. J. M.

Problems and methods of modern alchemy. A. Dorabialska (Rocz. Chem., 1937, **17**, 455—476).—A lecture. R. T.

Periodicity of the elements. L. Thayer-Ojeda (Separate, Valparaiso, 1937).—Speculative theory. F. R. G.

At. wt. of phosphorus. O. Hönigschmid and W. Menn (Z. anorg. Chem., 1937, **235**, 129—138).—$POCl_3$ was purified by treatment with P_2O_5 and fractional distillation, and the ratios $POCl_3 : 3Ag$ and $POCl_3 : 3AgCl$ were determined. The at. wt. of P is 30·978, in exact agreement with vals. obtained by the mass-spectrograph (A., 1936, 920) and from the density of PH_3 (A., 1930, 1104). F. J. G.

Recent discoveries in isotopy, with special reference to isotopes of hydrogen. E. Józefowicz (Rocz. Chem., 1937, **17**, 557—566).—A lecture. R. T.

New parabolic mass-spectrograph and determination of the relative abundance of the argon isotopes. W. Schütze (Wiss. Veröff. Siemens-Werken, 1937, **16**, 89—98).—The construction of a new mass-spectrograph based on the parabola method is described. The positive rays are produced in a metal discharge tube, pass into a charging chamber, and thence through a slit which can be finely adjusted outside the apparatus. They then pass between two magnetic poles in the form of plates, which are also the plates of a condenser. Finally they are recorded photographically. The apparatus was used to determine the relative abundance of the isotopes of A, with the result $^{40}A : {}^{38}A : {}^{36}A = 99{\cdot}64 : (0{\cdot}06 \pm 0{\cdot}005) : (0{\cdot}31 \pm 0{\cdot}02)$, in good agreement with other workers. The intensities of parabolas due to H_3^+, OH_3^+, and AH^+ are considered, and the existence of H_3^+ is discussed. A. J. M.

Extreme intervals between radioactive emissions. II. E. J. Gumbel (J. Phys. Radium, 1937, [vii], **8**, 446—452; cf. A., 1933, 659).—Comparisons of the observations on the extreme intervals between radioactive emissions obtained by different methods in general agree well with theory, but certain discrepancies make it desirable to reconsider the calculations in the light of precise observations in order that the mean interval between emissions may be known more accurately. W. R. A.

Shape of the continuous β-spectrum of thorium-*C*.*C*′. H. O. W. Richardson and A. Leigh-Smith (Proc. Roy. Soc., 1937, **A**, **162**, 391—403).—By use of a radioactive vapour of Th-*B* + *C* in a cloud chamber about 200 Th-*C*.*C*′ disintegrations were photographed, and the energies of the nuclear electrons estimated. A large proportion of electrons having energies as low as 15 kv. are observed and it is concluded that the energy distribution curve does not pass through the origin. The curve agrees with the predictions of the (0, 1) interaction formula of Konopinski and Uhlenbeck (cf. A., 1935, 1048). G. D. P.

Analysis of the β-rays of rubidium by means of absorption with coincident counters. Z. Ollano (Nuovo Cim., 1937, **14**, 314—321).—By means of the arrangement of two counters described, which is suitable for the absorption analysis of low-energy particles, two groups of particles have been observed in the β-radiation from Rb, viz., a group with an absorption coeff. in Al of 422 cm.$^{-1}$ and another softer, non-homogeneous group with a mean absorption coeff. in Al of 1050 cm.$^{-1}$ No harder β-radiation could be found. With a modified single-counter arrangement the emission of weak *X*-rays from the disintegration product of Rb (^{87}Sr) has been observed. O. J. W.

β- and γ-Rays from radioactive bodies. J. Surugue (Ann. Physique, 1937, [xi], **8**, 484—554).—Using the method of deviation and focussing, in a uniform magnetic field produced by a large permanent magnet, of β-rays formed by internal conversions, an investigation was made of the Ac group and of active Th deposit, in order to determine the energy of the secondary β-rays and hence the energy of the primary γ-rays produced in the course of successive transformations. From these are constructed nuclear energy level schemes in each case. Full data and results are tabulated. N. M. B.

Absorption of hard γ-rays by the photonuclear effect in beryllium. J. Rotblat (J. Phys. Radium, 1937, [vii], **8**, 477—480).—The activity excited in Ag by neutrons formed in the photodissociation of Be by the hard γ-rays of Ra-*C* is obtained as a function of the absorption of neutrons by different thicknesses of Pb, Cu, and Al. Exponential absorption curves are obtained indicating that the photonuclear effect in Be results from only the hardest γ-rays of Ra-*C*. λλ of the active γ-rays and their energy are given. Reasons are given for the contradictory results of Gentner (A., 1934, 938). W. R. A.

Influence of temperature on the capture of neutrons by various elements. J. L. Michiels and J. A. Saxton (Proc. Roy. Soc., 1937, **A**, **162**, 441—449).—The radioactivity induced by neutrons which have passed through a layer of wax at 90° K. is 30—60% > that induced in the same material by neutrons which have passed through wax at 290° K. The materials examined are In, Au, Na, As, Mn, Br, Al, and Ag. The fraction of the activity due to group *C* neutrons is determined. It is concluded either that Cd absorbs neutrons other than those of thermal energy or that all elements do not conform to the same absorption law. The activity produced in In by group *D* neutrons is not affected by the temp. of the wax. G. D. P.

Neutrons from the disintegration of nitrogen by deuterons. W. E. Stephens, K. Djanab, and T. W. Bonner (Physical Rev., 1937, [ii], **52**, 1079—1082).—The energy distribution of the neutrons from the disintegration of N by 0·93 m.e.v. deuterons was investigated by measuring the ranges of recoil protons in a high-pressure cloud chamber. Three groups of recoil protons had max. energies 5·7, 2·7, and 1·9 m.e.v., with relative intensities 2 : 1 : 3. The 2·7 group is attributed to D_2 contamination on the target. The other two groups are from the reaction $^{14}_{7}N + {}^{2}_{1}H = {}^{15}_{8}O + {}^{1}_{0}n + Q_1$, where $Q_{10} = 5{\cdot}1 \pm 0{\cdot}2$ and $Q_{11} = 1{\cdot}1 \pm 0{\cdot}2$ m.e.v. N. M. B.

Neutron resonance levels of iridium and rhodium and the mutual overlapping of their resonance regions. R. Jaeckel (Z. Physik, 1937, **107**, 669—679).—Measurements of neutron absorption with Ir as indicator and Rh as absorber give the relative positions of Ir and Rh levels. Absorption by both Ir and Rh in the region of thermic neutrons is due mainly to a single resonance level. H. C. G.

Angle relationships for the scattering of neutrons by protons. E. Philipp (Z. Physik, 1937, **107**, 683—708).—A mathematical analysis of the mutual interaction of neutrons and protons in the light of recent experimental work. H. C. G.

Artificial radioactivity of antimony induced by slow neutrons. K. Alexeeva (Compt. rend. Acad.

Sci. U.R.S.S., 1937, **17**, 13—14; cf. A., 1934, 1284; 1935, 910; 1936, 1315).—Irradiation of Sb for 42 days with slow neutrons (from γ-rays on Be retarded by paraffin) yields a product of half-life period 45 days which emits both β- and γ-rays, half the former being absorbed by 0·3 mm. of Al. This activity is attributed to the formation of $^{122}_{51}Sb$ and $^{124}_{51}Sb$. J. W. S.

Nuclear reaction Be (α, n) and mass of neutron by a new method. J. Crussard and S. Gorodetzki (Compt. rend., 1937, **205**, 1060—1062).—Be is bombarded with α-particles from Po; resulting neutrons are detected by the disintegration of a B coating covering the interior walls of an ionisation chamber. The neutrons are retarded by paraffin wax. The suggested reaction is: $^{9}_{4}Be + ^{4}_{2}He \rightarrow 3^{4}_{2}He + ^{1}_{0}n + Q$. If the masses of the particles are considered to be known, Q can be compared with experiment; conversely if Q is measured experimentally the mass of the neutron can be calc. The val. $^{1}_{0}n = 1{\cdot}0090$ so obtained agrees well with other determinations. J. A. D.

Energies of electrons and positons emitted in certain nuclear reactions. C. Magnan (Compt. rend., 1937, **205**, 1147—1149).—The max. energy limits of the positons emitted during α-particle bombardment of F, Na, K, and Al have been determined, using a spectrograph with magnetic focussing. Bombardment of Cl_2 with α-particles gives a spectrum showing three sharp peaks, attributed to γ-rays; the corresponding energies are approx. equal to the differences of energy between the three groups of protons emitted in the reaction $^{35}_{17}Cl + ^{4}_{2}He \rightarrow ^{38}_{18}A + ^{1}_{1}H$. A. J. E. W.

Nature of cosmic-ray particles. Y. Nishina, M. Takeuchi, and T. Ichimiya (Physical Rev., 1937, [ii], **52**, 1198—1199).—Investigations on the penetration of Pb in a cloud-chamber indicate that 80—90% of the cosmic rays consist of heavy particles containing some of both signs and of higher penetration than protons of the same momentum. Results support the existence of a new particle of mass $\frac{1}{7}$—$\frac{1}{10}$ that of the proton and initial momentum $7{\cdot}4 \times 10^5$ gauss-cm. (cf. Neddermeyer, A., 1937, I, 390). N. M. B.

Origin of cosmic radiation. H. Alfven (Z. Physik, 1937, **107**, 579—588).—An extension of earlier work (cf. A., 1937, I, 6, 340) in which it is shown that by assuming a weak magnetic field in interstellar space the more important properties of cosmic radiation may be explained by means of classical electrodynamics. L. G. G.

Production of hard cosmic-ray showers. K. Schmeiser and W. Bothe (Naturwiss., 1937, **25**, 833).—The effect of the intensity of hard cosmic-ray showers on the metal (Pb or Fe) used was investigated. The max. of the Rossi curve corresponding with soft showers is lower for Pb than for Fe, but the max. due to hard showers is approx. the same for both. The intensity of hard showers is, therefore, more nearly $\propto$ at. no. than to (at. no.)^2. The hard showers are produced by the hard component of the primary rays. Hard showers may themselves give rise to soft ones, and occur in the free atm. A. J. M.

Production of cosmic-ray showers at great depths. W. H. Pickering (Physical Rev., 1937, [ii], **52**, 1131—1134).—Experiments proving the existence of cosmic-ray showers, consisting of at least three particles, at depths down to 30 m. of H_2O below sea level are described. The no. of showers and of vertical coincidences decrease with depth in a similar manner. The effect of Pb on the showers at great depths is discussed. N. M. B.

Focalisation of bundles of charged particles by circular deviation in a transverse magnetic field. L. Cartan (J. Phys. Radium, 1937, [vii], **8**, 453—470).—The theory and application of various methods are considered. W. R. A.

Molecular viewpoints in nuclear structure. J. A. Wheeler (Physical Rev., 1937, [ii], **52**, 1083—1106).—Mathematical. A wave-functional study of the three-body nucleus leading to a concept of resonating group structure whereby various calculations on nuclear motion are made. N. M. B.

Mathematical description of light nuclei by the method of resonating group structure. J. A. Wheeler (Physical Rev., 1937, [ii], **52**, 1107—1122; cf. preceding abstract).—Mathematical. N. M. B.

Theory of the neutrino. II. J. Solomon (J. Phys. Radium, 1937, [vii], **8**, 433—438).—Mathematical. An extension of previous work (A., 1937, I, 390) by introducing a special operator gives the general form of the β-ray spectrum of radioactive disintegration as well as the interaction of protons and neutrons. It is possible to determine the operator so that good agreement between the theory and experimental data is obtained. W. R. A.

Symmetry between particles and antiparticles. G. Racah (Nuovo Cim., 1937, **14**, 322—328).—Mathematical. O. J. W.

Wave-mechanical investigation of repulsion between neutral inert gas atoms. B. O. Grönblom (Soc. Sci. fenn. Comment. phys.-math., 1936, **8**, No. 13, 9 pp.; Chem. Zentr., 1936, i, 4113).—Theoretical. J. S. A.

Quantum exchange and nuclear isomerism; determination of nuclear isomerism. T. Kahan (Compt. rend., 1937, **205**, 899—900).—Nuclear isomerism in the atoms of a diat. mol. can be detected by the absence of alternations of intensity in the band spectrum. Absence of diffusion with quantum exchange during internuclear collision processes is also an indication of isomerism. A. J. E. W.

Orthogonal systems of electronic optics and their application to spectroscopy. M. Cotte (Compt. rend., 1937, **205**, 974—976).—Theoretical. E. S. H.

Probability of collisions of the second kind between atoms and free electrons. V. Fabrikant (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 249—259).—Mathematical. A quant. application of the Klein–Rosseland relation is developed. N. M. B.

Use of charge-conjugated wave functions in the hole theory of the electron. H. A. Kramers

(Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 814—823).—Mathematical. N. M. B.

Wave functions for large arguments by the amplitude-phase method. J. A. Wheeler (Physical Rev., 1937, [ii], **52**, 1123—1127).—Mathematical. Simplified methods are considered. Vals. of the amplitude and phase of the Coulomb functions needed in the treatment of the scattering of α-particles in He are tabulated. N. M. B.

Rôle of argon in the production of Swan bands. N. R. Tawde and D. D. Desai (Proc. Indian Acad. Sci., 1937, **6**, **A**, 266—280).—The intensity changes which take place in a discharge tube with C and Al electrodes near the C electrode, in the presence of A ($p = 10$, 15, 20, 25, 30 mm. Hg), show no marked regularity. The most probable transition in the C_2 (Swan) system of bands is indicated and a mechanism for their production is put forward. F. J. L.

Ultra-violet absorption spectrum of atmospheric ozone. G. Déjardin and A. Arnulf (Compt. rend., 1937, **205**, 1000—1002).—The absorption spectrum has been determined between 3660 and 3134 A. The results are compared with published data for O_3. E. S. H.

Possible interpretation of ozone bands. L. Herman and H. Montagne (Compt. rend., 1937, **205**, 1056—1057).—The energy levels of the mol. O_3 are represented by terms which explain the observed bands in the O_3 spectrum. J. A. D.

Atmospheric absorption and ozone absorption. G. Déjardin, A. Arnulf, and R. Falgon (Compt. rend., 1937, **205**, 1086—1088).—The effective thickness of the atm. O_3 content has been calc., taking into account the increase of absorption at lower temp. J. A. D.

Properties of ozone and their geophysical consequences. E. Vassy (Ann. Physique, 1937, [xi], **8**, 679—777; cf. A., 1936, 774, 1208).—Variations with temp. of the intensity of the band systems of O_3 were investigated by comparison of the coeffs. of max. and min. absorption at different temp. with a view of finding a relation by which the $[O_3]$ may be determined spectrographically. These results are applied to the estimation of the variation of $[O_3]$ in the atm. with altitude. The wide variation with temp. of the rate of decomp., studied in the range 95—156°, shows, in conjunction with atm. temp. at high altitudes, that the former controls the existence of O_3 in the atm., and indicates that it is not present at altitudes >60 km., and that the auroral electrons are not responsible for its formation. N. M. B.

Temperature determinations from band spectral data. H. P. Knauss and M. S. McCay (Physical Rev., 1937, [ii], **52**, 1143—1150).—A method of interpreting intensity distributions of lines in a band for determining the temp. of the emitter is developed. The method is independent of photometer calibration, the criterion being the place in the band where adjacent lines of overlapping branches are of equal intensity. Application to the Ångström bands of CO is discussed. N. M. B.

Absorption coefficient of nitrogen pentoxide in the ultra-violet and the visible absorption spectrum of nitrogen hexoxide. E. J. Jones and O. R. Wulf (J. Chem. Physics, 1937, **5**, 873—877).—Absorption spectra of the gaseous system, $N_2O_5 + O_3$, during the decomp. of O_3 and the subsequent decomp. of N_2O_5 are discussed. The absorption coeff. of N_2O_5 increases in val. in the direction of shorter λ, no max. being observed as far as 2400 A. Spectra of NO_3 in the visible at various stages of the reaction are recorded. W. R. A.

(A) Spectrum of SnF. (B) Spectrum of AgCl. F. A. Jenkins and G. D. Rochester (Physical Rev., 1937, [ii], **52**, 1135—1140, 1141—1143).—(A) Using a C tube furnace, measurements of the SnF absorption bands and resolution of the Sn isotope effect are reported for the first time. Analysis of the frequencies of the band heads shows four doublet systems, $\lambda\lambda$ 2660—3260, 2556—2635, 2100—2350, and 2060—2300, all due to transitions from a doublet normal state, of separation 2317·3 cm.$^{-1}$, and two continuous bands.

(B) Absorption of AgCl vapour investigated with high dispersion below λ 2500 shows a new band system, an equation for which is found, and a fragment of another similar system. Strong continuous absorption is observed at higher pressures. N. M. B.

Band spectrum of TiCl. K. R. More and (Miss) A. H. Parker (Physical Rev., 1937, [ii], **52**, 1150—1152).—The emission spectrum of TiCl, excited by high- and low-frequency discharges through a continuous flow of $TiCl_4$ vapour in a discharge tube, consists of one strong group of bands at 4200—4100 A., attributed to a transition between doublet electronic levels, and several weaker groups at 4100—3700 A., all degraded to shorter $\lambda\lambda$. Data and analyses are given. N. M. B.

Absorption spectra and photodissociation of halides and oxyhalides of sulphur, selenium, and tellurium. S. L. Hussain and R. Samuel (Proc. Physical Soc., 1937, **49**, 679—692; cf. A., 1936, 775).—An investigation of the absorption spectra of $SOBr_2$, $S_2O_5Cl_2$, $SeCl_4$, $SeOCl_2$, Se_2Cl_2, $SeBr_4$, Se_2Br_2, $TeCl_2$, $TeCl_4$, $TeBr_2$, and $TeBr_4$ in the vapour state is reported; photodissociation processes and linking energies are determined and detailed conclusions are discussed. N. M. B.

Emission spectrum of silicon tetrabromide. R. K. Asundi and S. M. Karim (Proc. Indian Acad. Sci., 1937, **6**, **A**, 281—286).—The emission spectrum of $SiBr_4$ under different conditions of flowing vapour, using condensed and uncondensed discharge, has been measured. With $p > 0·5$ mm. Hg, continuous bands $\lambda\lambda_{max.}$ 4220, 3570, 3435, 3345, 3120, 2910, 2780—2710, 2640—2630, 2420, 2370 A. are observed; with p at 0·2 mm. all disappear except the first. At $p = 0·05$ mm. a narrow set of bands between $\lambda\lambda$ 3700 and 3930 A. appear, probably due to triat. $SiBr_2$, and between $\lambda\lambda$ 3350 and 2700 a large no. of bands, some degraded towards the long and some towards the short λ, probably due to SiBr mols. or $SiBr^+$. F. J. L.

Absorption of copper sulphate and the effect of heavy water of crystallisation. B. Duhm (Z. Physik, 1937, **107**, 589—594).—The absorption spectra of $CuSO_4,5H_2O$ and $CuSO_4,5D_2O$ crystals were measured over the range 190—1800 mμ. Replacement of H by D results in a narrowing and lowering in intensity of the Cu^{++} band at 790 mμ. L. G. G.

Light absorption of potassium permanganate. A. L. S. Rao (Current Sci., 1937, **6**, 154—155; cf. A., 1932, 557).—The spectrum in the λ range 2000—9000 A. consists of three distinct regions, red to 4250 A. (containing seven bands), 3900—2750 A. (containing two bands, one showing discrete structure), and 2600—2000 A. (also containing two bands, the one of lower λ becoming a region of continuous absorption at high concns.). A. J. E. W.

Photodecomposition and absorption spectrum of potassium permanganate. A. L. S. Rao (Proc. Indian Acad. Sci., 1937, **6**, **A**, 293—300).—See preceding abstract. Photodecomp. is investigated using monochromatic light; there is no strongly selective λ, but the regions λλ 2900—3200 and 2250—2000 A. are most active. F. J. L.

Absorption of ultra-violet light by some organic substances. XLIII. W. Bednarczyk and L. Marchlewski. **XLIV.** R. Grinbaum and L. Marchlewski. **XLV. Derivatives of phenanthrene and indole.** R. Grinbaum and L. Marchlewski. **XLVI.** W. Bednarczyk and L. Marchlewski (Bull. Acad. Polonaise, 1937, **A**, 140—155, 156—170, 171—186, 187—200; cf. A., 1937, I, 343).—XLIII. The existence of continuous or banded absorption spectra is applied to determine the presence of the aldo- and keto-groups, respectively, in various sugars. Fructose, in aq. and MeOH solutions, shows a banded absorption (max. 2800 A.); melibiose, maltose, cellobiose, and trehalose in aq. solution all show continuous absorption which changes to a band absorption in the presence of alkali (p_H 11—13). The derivatives of glucose with ring structures all show continuous absorption.

XLIV. The absorption spectra (2200—4000 A.) for aq. solutions of aspartic, glutamic, and kynurenic acids, cystine, creatine, creatinine, uracyl, and EtOH solutions of piperonylic acid, piperonal, and the nitroanilines are examined and the extinction coeffs. given. The effects of free $H^{\cdot}$ and OH' ions are described.

XLV. The spectrum of phenanthrene, in EtOH solution, shows maxima at 2515 and 2937 A. The tetrahydrophenanthrenes (in EtOH) show maxima at 2287 and 2525 A., 2285 and 2565 A. for compounds with b.p. 310° and 302°, respectively. The 2-, 3-, 4-, and 9-NO_2-derivatives show, in addition to a max. at about 2500 A., a broad band between 3100 and 3800 A. Octachlorophenanthrene shows a spectrum similar to those of the NO_2-compounds, whereas that of dibromophenanthrene is very similar to that of the hydrocarbon. All the indole derivatives show similar spectra with absorption maxima in the regions 2800 and 2200 A.

XLVI. The spectra of 8-hydroxyquinoline, $COPh_2$ and its oxime, allyl alcohol, linalool, and geraniol in EtOH solution; farnesol, *o*-*p*-toluoylbenzoic acid and its oxime in EtOH solution; diketopiperazine in aq. solution, and phytol in EtOH–Et_2O solution are described. K. S.

Absorption of ultra-violet light by fluorocyclene and products of its transmutations. W. Bednarczyk and L. Gizler (Bull. Acad. Polonaise, 1937, **A**, 455—461).—The ultra-violet absorption spectra of fluorocyclene and its H_4-, H_8-, and H_{12}-derivatives, diacenaphthylidene, and decacyclene have been measured. All show selective absorption and obey Beer's law, the spectrum of the parent hydrocarbon being less continuous than those of the hydrogenation products. F. J. L.

Light absorption of organic compounds. VIII. Azo-compounds. A. Burawoy (J.C.S., 1937, 1865—1869).—The absorption spectra of a no. of azo-compounds have been investigated, the absorption max. and mol. extinction coeffs. (usually in C_6H_{14} solution) being determined. The results confirm the classification into *K*- and *R*-bands previously suggested (A., 1933, 62, 208, 590). A. J. M.

Absorption spectra of organic substances in concentrated sulphuric acid. I. Carbohydrates F. Bandow (Biochem. Z., **294**, 124—137).—The absorption spectra in 96% H_2SO_4 of glucose, arabinose, rhamnose, mannose, sorbitol, gluconic acid, saccharic acid, lævulic acid, mannitol, glycuronic acid, ascorbic acid, glyceraldehyde, furfuraldehyde, digitonin, salicin, and pancreatin have been measured; also that of mannose in conc. H_3PO_4 and furfuraldehyde in different acid–alcohol–H_2O solutions. In conc. H_2SO_4 most substances show a marked absorption band between 2500 and 3500 A.; on dilution a strong band at 2900 A. appears. Glycuronic acid has the same spectrum as glucose. Mannitol, sorbitol, gluconic, saccharic, and lævulic acids give irregular and weaker absorption bands. C. C. N. V.

Light absorption of porphin dyes; relation to structure. A. Hagenbach, F. Auerbacher, and E. Wiedemann (Helv. phys. Acta, 1936, **9**, 3—26; Chem. Zentr., 1936, i, 4304—4305).—Absorption spectra for λ = 240—700 mμ. in Et_2O containing a little C_5H_5N are recorded; the results are correlated with structure. It is concluded that in hæmin the Fe is equally bound to the four N atoms. H. N. R.

Absorption spectrum of vitamin-*C*. B. Skarzynski (Bull. Acad. Polonaise, 1937, **A**, 462—476).—The absorption spectrum of vitamin-*C* has been measured at various p_H (2·4—6·1) in aq. and EtOH solutions. In aq. solutions the absorption band is λλ 2640—2660 A., and the extinction coeff. is 48,000—55,000; at p_H 2·4 $\lambda_{max.}$ is 2400—2450 A., extinction coeff. 40,000. In 96% EtOH $\lambda_{max.}$ is 2450 A. in conc. solution, and 2650 A. in dil. solution, extinction coeff. 40,000—46,000. The band at 2650 A. is due to the dissociated mol. and that at 2450 A. to the undissociated mol. The buffer solutions used are Na_2HPO_4 + citric acid and HCl + Na citrate. F. J. L.

[Infra-red] absorption spectrum of water in the liquid state. A. Carrelli (Nuovo Cim., 1937, **14**, 245—256).—Measurements of the infra-red absorption spectra of saturated solutions of KCl, NaCl, and $CaCl_2$ and of solid $CaSO_4,2H_2O$ give results which support the classification of the absorption bands of H_2O by other workers. The absorption of $CaSO_4,2H_2O$ is different along different crystallographic axes. Anhyd. $BaSO_4$ gives two bands at 4·7 and 3·5 μ. The interpretation of the 4·7 μ. band is discussed. O. J. W.

Structure of water, studied in the infra-red. J. Errera (J. Chim. phys., 1937, **34**, 617—626; cf. A., 1937, I, 495).—The absorption spectrum of water near 3 μ., with varying physical state, temp., solvent, and concn., is further described and compared with similar data for alcohols (A., 1937, I, 9, 167). The free mol. vibrations occur in the vapour, and in low concn. in inert solvents (CCl_4, CS_2). In solvents containing O (dioxan) by transitory H bond solute–solvent interaction the O·H band of H_2O at 3640 $cm.^{-1}$ is split and displaced to higher λ (3515, 3575 $cm.^{-1}$). With increasing concn., or in liquid water and ice, the H linking of H_2O mols. gives bands at $\sim$3250, 3400 $cm.^{-1}$; these are ascribed to lattice and non-lattice modes respectively, the latter being involved in the dielectric const. anomalies of ice. I. McA.

Absorption bands (CH) of saturated and ethylenic hydrocarbons between 6000 and 9500 A. P. Barchewitz (Compt. rend., 1937, **205**, 976—978).—The third, fourth, and fifth harmonics of the fundamental band characteristic of (CH) have been studied. The saturated can be distinguished from the ethylenic hydrocarbons, and in the latter it is possible to estimate approx. the length of the C chain and the extent of branching from the intensity of the CH_2 and CH_3 bands. E. S. H.

Plane fundamental modes of vibration of deuteroethylenes. C. Manneback (J. Chem. Physics, 1937, **5**, 989).—The reasons by which it was possible for Wu (A., 1937, I, 397) to assign the plane vibration frequencies of the three isomeric $C_2H_2D_2$ mols. are discussed and it is pointed out that quant. results had previously been obtained by different authors. W. R. A.

Infra-red association band of a heavy alcohol. G. Bosschieter (J. Chem. Physics, 1937, **5**, 992).—Comparison of the infra-red spectra of a substance in the liquid and vapour states yields information regarding association of the substance. In $CH_2D{\cdot}OD$ the CH_2D band remains unaltered in both states but the O–D band, unimol. in the vapour state at 2721 $cm.^{-1}$, appears as a broad association band at 2500 $cm.^{-1}$ in the liquid state; this agrees with recorded data on other alcohols. Analogous effects are found by examining the spectra of gaseous, liquid, and solid H_2O and solutions of H_2O in CCl_4, CS_2, or dioxan. W. R. A.

Infra-red spectra. Absorption of some hydroxy-compounds in the region of 3 μ. J. J. Fox and A. E. Martin (Proc. Roy. Soc., 1937, **A**, **162**, 419—441).—Absorption measurements have been carried out in the range λ = 2·5 to 3·9 μ. The substances investigated are PhOH, $CH_2Ph{\cdot}OH$, $CHPh_2{\cdot}OH$, $Bu^{a}OH$, $Bu^{\gamma}OH$, stearyl alcohol, and $C_{16}H_{33}{\cdot}OH$, in solution in CCl_4, CCl_4 + 17% C_2Cl_6, C_2Cl_4, and $CHCl_3$. The changes in intensity and position of both OH and CH absorption bands are discussed. G. D. P.

Spectroscopic studies of the hydrogen bond. II. Shift of the O–H vibrational frequency in the formation of the hydrogen bond. R. M. Badger and S. H. Bauer (J. Chem. Physics, 1937, **5**, 839—851; cf. A., 1937, I, 495).—The association spectra of a no. of acids and alcohols, observed both in solution and in the pure liquids, between 9000 and 11,000 A. show a broad band with max. near 10,000 A. whilst the alcohols show an additional weaker band near 9000 A. From its behaviour with change of concn. and temp. the 10,000 A. band is identified with the O·H group. New evidence is given that a weak intermol. linking is formed between $COMe_2$ and MeOH. O–H absorption for intermol. H bonds is discussed. A relation between the energy of the H bond and the shift of the O–H vibrational frequency is indicated and its use in the interpretation of certain spectra suggested. W. R. A.

O–H band in the vapours of some organic acids and of tertiary amyl alcohol in the region of 9700 A. S. H. Bauer and R. M. Badger (J. Chem. Physics, 1937, **5**, 852—855).—Absorption bands corresponding with the third harmonic of the O–H vibration have been observed in the vapours of HCO_2H, AcOH, $EtCO_2H$, and $CCl_3{\cdot}CO_2H$. Only HCO_2H gave a band with resolvable fine structure; rotational consts. and the moments of inertia for the HCO_2H mol. have been evaluated. The structures of the org. acid mols. are discussed and compared with HNO_3. In *tert.*-amyl alcohol a broad max. at about 10,414 $cm.^{-1}$ was found. W. R. A.

Characteristic frequencies of chlorates, bromates, and iodates. M. Parodi (Compt. rend., 1937, **205**, 607—609).—λλ of absorption bands of MXO_3 (M = Na, K; X = Cl, Br, I) in the range 20—40 μ. are recorded. The deduced characteristic frequencies of XO_3 agree with the observed Raman frequencies (A., 1937, I, 218) and confirm the hypothesis of a pyramidal structure for the ions. A. J. E. W.

Transmission of oxides in the far infra-red. M. Parodi (Compt. rend., 1937, **205**, 906—908; cf. A., 1937, I, 393).—λλ of absorption bands in the range 20—60 μ. for CoO, CuO, CdO, TiO_2, MnO_2, MoO_2, PbO_2, Mn_2O_3, Ni_2O_3, Al_2O_3, and Sb_2O_3 are recorded and discussed. A. J. E. W.

Raman spectra and the structure of molecules. T. Urbański (Rocz. Chem., 1937, **17**, 477—496).—A lecture. R. T.

Attempt at classification of the Raman lines of a quartz crystal. J. Cabannes and C. Bouhet (Compt. rend., 1937, **205**, 768—771; cf. A., 1937, I, 394).—The polarisation of the Raman lines of a mol. with a ternary axis is discussed and applied to a quartz crystal, for which the following frequencies have been obtained: 466, 207 and 356 (completely symmetrical), 266 and 798 (degenerate of the first kind), 128, 394, 1163, and 696 (degenerate of the second kind), 1163—1227, 1064, 798, and 501 cm.$^{-1}$ (probably the fundamental frequencies of SiO_4). R. S. B.

Low and high frequencies for water. J. H. HIBBEN (J. Chem. Physics, 1937, **5**, 994).—Redetermination of the Raman spectrum of H_2O using a low-pressure Hg arc with filters capable of absorbing all radiation $<$2537 A. reaffirms previous results (A., 1937, I, 218) which had been attributed by Rao and Koteswaram (*ibid.*, 496) to Hg lines. The frequencies at 4023 and 5100 cm.$^{-1}$ are discussed and the explanation of Rao and Koteswaram is shown to be erroneous. W. R. A.

Infra-red studies. III. Absorption bands of hydrogels between 2·5 and 3·5 μ. A. M. BUSWELL, K. KREBS, and W. H. RODEBUSH (J. Amer. Chem. Soc., 1937, **59**, 2603—2605; cf. A., 1937, I, 443).—Films of β-amylose, agar, or glucose show absorption at 3 μ. ($O{:}H{:}O$), which appears ∝ their H_2O content, but show no absorption at 2·75 μ. (OH). Gelatin shows absorption at 3, 3·2, and 3·4 μ., but not at 2·75 μ. Montmorillonite shows absorption at 3 and 2·75 μ.; the height of the 3 μ. band is more strongly affected by H_2O content than is that of the 2·75 μ. band. E. S. H.

Raman spectrum of solid hydrogen sulphide. S. C. SIRKAR and J. GUPTA (J. Chem. Physics, 1937, **5**, 990).—Polemical against Murphy and Vance (A., 1937, I, 496). W. R. A.

New line in the Raman spectrum of solid carbon dioxide. S. C. SIRKAR and J. GUPTA (Current Sci., 1937, **6**, 214).—A new line with $\Delta\nu =$ 58 cm.$^{-1}$ has been observed. It is twice as strong as the intense line 1388 cm.$^{-1}$, and may be due to intermol. oscillations in loosely polymerised groups formed at the low temp. L. S. T.

Raman spectrum of D_3AsO_4 and its salts. F. FEHER and G. MORGENSTERN (Naturwiss., 1937, **25**, 831).—The Raman frequencies of D_3AsO_4 (86·5%), NaD_2AsO_4, and Na_2DAsO_4 are given and compared with those of H_3AsO_4, NaH_2AsO_4, and Na_2HAsO_4, respectively. The spectra of the corresponding compounds are the same with the exception of a slight displacement of one line in each spectrum. A. J. M.

Raman spectra of $CMeF_3$ and $CCl_2{:}CF_2$. J. B. HATCHER and D. M. YOST (J. Chem. Physics, 1937, **5**, 992—993).—Raman frequencies for the liquid state are given and discussed. $CMeF_3$ in the gaseous state absorbs in the ultra-violet with consequent decomp. of the gas. W. R. A.

Raman spectra of the methyl alcohols, $CH_3{\cdot}OH$, $CH_3{\cdot}OD$, and $CH_2D{\cdot}OD$. J. O. HALFORD, L. C. ANDERSON, and G. H. KISSIN (J. Chem. Physics, 1937, **5**, 927—932; cf. A., 1936, 1180).—$CH_3{\cdot}OD$ was prepared by treating dry $Mg(OMe)_2$ with 99·8% D_2O; $CH_2D{\cdot}OD$ was made from D_2O and CH_2N_2 in the presence of a small amount of D_2SO_4. Data for the frequencies of the Raman displacements and microphotometric curves are given and used to assign provisionally the fundamental frequencies. The significance of the character of the OH and OD bands to the problem of internal rotation is discussed. A new approximation to a potential const. for the $C{\cdot}O$ linking is given. W. R. A.

Raman effect and some cases of allyl–propenyl isomerism. R. DELABY, L. PIAUX, and A. GUILLEMONAT (Compt. rend., 1937, **205**, 609—611; cf. A., 1935, 197; 1936, 702).—The Raman spectra of the Br, S, and CN derivatives of $OH{\cdot}CHBu{\cdot}CH{:}CH_2$, and of the S derivative of $OH{\cdot}CHEt{\cdot}CH{:}CH_2$, have been investigated; the products consist predominantly of *trans*-$R{\cdot}CH{:}CH{\cdot}CH_2X$, with a small quantity of $R{\cdot}CHX{\cdot}CH{:}CH_2$. Frequencies of the constituent groupings are deduced. Br and S atoms in the α-position have approx. equiv. effects on the $C{:}C$ linking frequency. No conjugation occurs between the $C{:}C$ and $C{:}N$ linkings. A. J. E. W.

Raman spectrum of deuterated benzenes and the symmetry of the benzene molecule. A. KLIT and A. LANGSETH (J. Chem. Physics, 1937, **5**, 925—926).—The totally-symmetrical frequency (ν_1) of about 992 cm.$^{-1}$ can appear in the spectrum of all deuterated benzenes but the trigonally-symmetrical frequency (ν_{12}) of about 1010 cm.$^{-1}$ is forbidden by selection rules from appearing in the spectrum of C_6H_6, C_6D_6, p-$C_6H_4D_2$, and p-$C_6H_2D_4$. Experimental vals. of these frequencies are recorded for C_6H_6 and all the deuterobenzenes. On the assumption that the substitution of a D atom will bring about a corresponding diminution in the frequency, vals. for these two frequencies are computed for the different compounds. This leads to the prediction that the frequency will have identical vals. for isomeric benzenes; this is not substantiated by experiment, except for o-$C_6H_4D_2$ and o-$C_6H_2D_4$. Consideration of the symmetry of the various compounds shows that ν_{12} is antisymmetrical to the twofold axis in o-$C_6H_2D_4$ but is symmetrical to the twofold axis in all other compounds of the same symmetry. In certain compounds ν_1 is $<$ the calc. val. and ν_{12} is higher by about the same amount, and this increased separation between the two frequencies is accompanied by an enhanced intensity of the ν_{12} frequency. This behaviour is attributed, on the assumption of D_{6h} (plane hexagonal) symmetry for C_6H_6, to resonance between ν_1 and ν_{12}, and can occur for all the symmetries exhibited by the partly-deuterated benzenes except the symmetry of o-$C_6H_2D_4$. The evidence strongly favours the D_{6h} structure of C_6H_6. W. R. A.

Raman spectra of acrylic acid and of unpolymerised and polymerised methyl methacrylate. D. MONNIER, B. SUSZ, and E. BRINER (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 104—106).—ν and intensities are recorded. The $C{:}O$ frequency is increased on passing from the acid to the ester. The $C{:}C$ and $>C{:}CH_2$ frequencies are not observed in the polymerised ester, but a CH_3 frequency is strongly intensified; polymerisation is thus probably due to breaking of $C{:}C$ linkings and chain formation. A. J. E. W.

Raman effect. LXXVI. Hydrazine and derivatives. LXXVII. Association of benzene derivatives containing the CO group, especially benzoyl chlorides. L. KAHOVEC and K. W. F. KOHLRAUSCH (Z. physikal. Chem., 1937, **B**, **38**, 96—118, 119—139).—LXXVI. The Raman spectrum shows that N_2H_4 does not consist solely of the *trans*-form $NH_2{\cdot}NH_2$, or of $NH_3{:}NH$. The presence of an equilibrium mixture of the two is not excluded, but on other grounds is regarded as unlikely. The Raman spectrum of the hydrate resembles that of N_2H_4 so closely that it is inferred that it is actually a hydrate, N_2H_4,H_2O, the O and N probably being linked by a single-electron linking of the H_2O. On the other hand, the formulation of the hydrochlorides as $NH_2{\cdot}NH_3{\cdot}Cl$ and $NH_3Cl{\cdot}NH_3Cl$ is confirmed. Evidence of association of N_2H_4 and its alkyl derivatives is discussed. The Raman spectra of Me- and Ph-substituted hydrazines and of $(NH{\cdot}CO_2Et)_2$ have been determined.

LXXVII. The Raman spectra of substituted derivatives of PhCHO, EtOBz, and of BzCl have been determined. The results are discussed in relation to the C:O frequency. For OH-derivatives of PhCHO and OH- and NH_2-derivatives of EtOBz the results suggest that in the *o*-compounds intramol. H bridges are present, and that the *m*- and *p*-derivatives are associated, owing to the presence of intermol. H bridges. Substituted derivatives of BzCl are associated, H atoms of the ring apparently being capable in certain circumstances of constituting intermol. bridges. R. C.

Raman effect. LXXVIII. Nitrogen compounds. VIII. Nitriles. A. W. Reitz and R. Sabathy (Monatsh., 1937, **71**, 100—108; cf. A., 1937, I, 497).—Data are recorded for *n*-butyro-, methylethylaceto-, α-hydroxy*iso*butyro-, *n*- and *iso*-hexo-, diethylaceto-, α-hydroxy*iso*valero-, *n*-hepto-, and β-chloro-*n*-butyro-nitriles and methylethylacetaldoxime. Constitutive influences in these spectra and their relationships to those of C_2H_2 derivatives are discussed. J. W. S.

Photoluminescence of solutions of rare-earth salts. J. Larionov and A. Seidel (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 443—445).—Dil. (0·1 0·3%) solutions of Gd salts give a bright narrow photoluminescent band at 3110 A., corresponding with one of the absorption bands of Gd solutions, the excitation region lying between 2400 and 2700 A. The band at 3108 A. previously detected in solutions of Eu salts is ascribed to the presence of traces of Gd. The application of photoluminescence to analysis is discussed. C. R. H.

Fluorescence of bivalent rare earths. Colouring and luminescence under the influence of Becquerel rays. K. Przibram (Z. Physik, 1937, **107**, 709—712; cf. A., 1936, 1321).—Recent work on the fluorescence bands of Sm and Tu is discussed. H. C. G.

Fluorescence of octahydrofluorocyclene. S. Pienkowski (Bull. Acad. Polonaise, 1937, **A**, 269—277).—The fluorescence spectrum of octahydrofluorocyclene ($C_{14}H_{36}$) has been measured in the vapour and solid state and in solution in C_6H_6, *o*-, *m*-, *p*-xylene, AcOH, CCl_4, $CHCl_3$, etc., using Hg light λλ 4358—3650 A. Bands are observed at ~ 5350, 5426, 4660, 4400, and 4150 A. The thermal decomp. is discussed. F. J. L.

Fluorescence and absorption of diacenaphthylidene. B. Twarowska (Bull. Acad. Polonaise, 1937, **A**, 278—284).—The fluorescence spectrum of "red" diacenaphthylidene (I) [obtained by heating the hydrocarbon (II) at 300°] in *o*-xylene is identical with that of (II) but the spectra of the crystals are different; it is probably a dimorphic form. The absorption spectrum of gaseous (I) has four bands λλ 3740, 3665, 3525, 3480 A. corresponding with the absorption bands of (II) and a region of fine structure λλ 3338—3150 A. corresponding with the absorption band in acenaphthene. F. J. L.

Dependence of fluorescence yield of diacenaphthylidene solution on the wave-length of the exciting light. (Mlle.) Z. Lewkowicz (Bull. Acad. Polonaise, 1937, **A**, 285—294).—The intensity of the fluorescence spectrum of the hydrocarbon in C_6H_6 has been measured. The fluorescence yields for the lines λλ 4035, 3805, 3605, 3418 A. are 1, 2·3, 7·8, and 30·9, respectively. F. J. L.

Method of determination of the real fluorescence polarisation of solutions at high concentrations. S. I. Vavilov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 255—258).—Theoretical. A method of calculating the fluorescence polarisation of solutions of high concn. is outlined for the conditions (*a*) the absorption and fluorescence spectra independent of concn., (*b*) the thickness of the liquid layer is sufficient to absorb all the exciting light. F. J. L.

Fluorescence polarisation of solutions at high concentration. S. I. Vavilov, P. G. Gluchov, and I. A. Chvostikov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 259—261; cf. preceding abstract).—The fluorescence polarisation of solutions in glycerol, concn. 10^{-5}—10^{-2} g. per c.c., using exciting λ 4900 A. has been measured at temp. 20—70°. F. J. L.

Study of fluorescence in layers of thickness comparable with the wave-length. F. S. Barisanskaja (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 99—102).—The dependence of the intensity of the fluorescent light on the concn. of fluorescein (H_2O or MeOH solution) in the film is examined and discussed. K. S.

Dichroism of flowing [solutions of] dyes. S. Nikitin (Compt. rend., 1937, **205**, 1058—1060; cf. A., 1937, I, 317).—Dichroism is due to anisotropic orientation of the mols. when flowing, and the coeff. of absorption of the incident light then depends on the direction of vibration of the incident beam. From the absorption in different directions of the radiation, dichroism is measured. J. A. D.

Phenomena of chemiluminescence, in the visible spectrum, of molecules containing an amide group. C. Courtot and A. Bernanose (Compt. rend., 1937, **205**, 989—991).—Amide or hydrazide groups in an aromatic ring produce chemiluminescence when oxidised with H_2O_2 in aq. KOH. The phenomenon is not exhibited by aliphatic amides. E. S. H.

Invisible radiation emitted during chemical reactions. II. K. Jabłczyński and A. Cholewicki (Rocz. Chem., 1937, **17**, 387—391).—Radiation is observed in the reactions $2KMnO_4 + 5H_2O_2 + 4H_2SO_4 \rightarrow 2KHSO_4 + 2MnSO_4 + 8H_2O + 5O_2$, and

$2HCl + H_2O_2 \rightarrow 2H_2O + Cl_2$, but not in the reaction $2FeCl_2 + H_2O_2 + 2HCl \rightarrow 2FeCl_3 + 2H_2O$. Radiation is observed in the reaction between HCl and NaOH only at such concns. as would involve crystallisation of the NaCl formed; the effect is due to the latter process, and not to the reaction $H^{\cdot} + OH' \rightarrow H_2O$.
R. T.

Variation of phosphorescence of zinc phosphors with temperature. V. Antonov-Romanovski (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 95—98).—Measurements of the decay of the phosphorescence at temp. between 25° and 262° are recorded; the phosphorescence decreases with rising temp.
K. S.

Regularities and irregularities in the ionosphere. I. E. V. Appleton (Proc. Roy. Soc., 1937, **A**, **162**, 451—479).—Bakerian lecture.
G. D. P.

Thermodynamic calculation of ionisation. K. H. Riewe (Z. Physik, 1937, **107**, 680—682).—Saha's formula for the degree of ionisation of a gas may be derived from Planck's summation of state for a partly ionised gas. H. C. G.

Halogen films on tungsten in the surface ionisation of potassium halides. J. O. Hendricks, T. E. Phipps, and M. J. Copley (J. Chem. Physics, 1937, **5**, 868—872).—Mol. rays of K halides were directed in high vac. against W and W–O_2 surfaces and the resulting positive ion current was measured as a function of surface temp. Degrees of ionisation on O_2-free surfaces were calc. assuming each halide mol. to produce one positive ion on striking a W–O_2 surface. Results on O_2-free filaments at 1800—2380° K. indicate surface dissociation of the K halide followed by partial ionisation of the K atom and liberation of the halogen as an atom. In the temp. range 1600—1800° K., a progressive change in the surface with fall in temp., leading to surfaces of const. high work function, indicates the formation of halogen layers on the W. W. R. A.

Electrical and optical properties of semiconductors. XIII. G. Bauer (Ann. Physik, 1937, [v], **30**, 744).—Corrections (cf. A., 1937, I, 600).

Method of measuring the periodic internal potential of crystals. A. Hautot (Compt. rend., 1937, **205**, 1161—1163).—The terms $V_{\alpha\beta\gamma}$, which are a measure of the variation of potential in the interior of a crystal lattice, can be determined by measurement of the width of electron-diffraction rings produced by the crystal. Vals. are recorded for Ni, Au, Cu_2O, and graphite; their order of magnitude is approx. ten times the vals. calc. by the Thomas–Fermi method for Ag, and by Bethe (A., 1928, 1303) for Ni.
A. J. E. W.

Contact potential of the cleavage face of a zinc crystal cleaved *in vacuo*. F. B. Daniels and M. Y. Colby (Physical Rev., 1937, [ii], **52**, 1200).—Crystals grown in H_2, CO_2, N_2, and in vac. were cleaved in vac. by a special device and contact p.d. measured against Pt was plotted against time. After a rapid initial rise, the decrease, at 10^{-5} mm. pressure, over about 1 hr. is very small. N. M. B.

Volta effect in a vacuum. E. Perucca (Nuovo Cim., 1937, **14**, 310—313).—A criticism of the work of Krüger and Schulz (A., 1936, 778).
O. J. W.

Initial currents in thin paraffin layers. W. Scislowski (Acta phys. polon., 1935, **4**, 123—134; Chem. Zentr., 1936, i, 4264).—The current–time characteristics for various applied voltages up to 100 kv. per cm. are discussed. Temp. has little effect in the initial current, but this increases rapidly on irradiation with γ-rays. J. S. A.

Fluorine at low temperatures. VII. Determination of dielectric constants of condensed gases. E. Kanda (Bull. Chem. Soc. Japan, 1937, **12**, 473—479).—The dielectric consts. of liquid F_2, O_2, and Cl_2 vary from 1·556 (89·51°) to 1·487 (87·62°), 1·567 (57·40°) to 1·517 (83·21°), 2·147 (208·00°) to 2·048 (239·96°), respectively, figures in parentheses being °K.; the respective mol. moments are zero. Liquid HCl varies from 11·80 (160·01°) to 9·12 (182·76°), and solid HCl from 11·01 (101·50°) to 13·06 (153·50°). The liquid has a high moment. A cryostat using H_2 vapour for temp. from 23° to 78° K. (±0·05°) is described.
D. F. R.

Dielectric polarisation and form of the carbon dioxide molecule. K. L. Ramaswamy (Current Sci., 1937, **6**, 153—154; cf. A., 1932, 216).—ε for CO_2 has been measured at 80—200°; the calc. polarisation vals. are const. over this temp. range, and thus do not support the theory that a transition from a straight to a bent mol. occurs at 140—145°. A. J. E. W.

Dielectric properties of solid hydrogen bromide in the transition interval near 89° K. G. Damköhler (Ann. Physik, 1938, [v], **31**, 76—96).—The variation with temp. of ε for HBr has been investigated between 81° and 95° K. A hysteresis effect is observed. At const. temp. ε varies with time but the hysteresis is unaltered. It is concluded that a rotation transition takes place in HBr at 89° K., and that the hysteresis effect is best explained by a difference in probability of rotation between the random and ordered molecular arrangements (cf. Eucken and Veith, A., 1937, I, 74). O. D. S.

Molecular association of bromobenzene and of the mono-substituted halogen derivatives of benzene. P. Trautteur (Nuovo Cim., 1937, **14**, 265—271).—Measurements of *d*, ε, and *n* for solutions of PhBr in C_6H_6 are recorded. The moment of PhBr is calc. to be 1·48±0·05 D. In the pure liquid about 39% of the mols. are associated. The results are discussed in relation to similar data for the F-, Cl-, and I-derivatives of C_6H_6. O. J. W.

Dipole moments of vapours. IV. Aliphatic ethers and amines. Magnitude of atomic polarisation. V. Aromatic compounds. L. G. Groves and S. Sugden (J.C.S., 1937, 1779—1782, 1782—1784; cf. A., 1937, I, 115).—IV. Measurements are recorded for Me_2O, Et_2O, Pr^{a}_2O, Bu^{a}_2O, NH_2Me, $NHMe_2$, and NMe_3 and calc. moments are compared with those of Sänger (cf. A., 1932, 337). Results are analysed by the method of least squares. Data for Et_2O over 288—476° are treated in detail and considered in relation to the Debye equation.

V. Measurements for 16 compounds are recorded.

In the case of $C_6H_4Cl_2$ and $C_6H_4Cl{\cdot}NO_2$ observed moments for the *m*- and *p*-forms agree with those calc. by the simple vector addition of group moments, but the *o*-forms show large discrepancies. N. M. B.

Dipole moments of vapours. VI. Bond moments and mesomeric moments. L. G. Groves and S. Sugden (J.C.S., 1937, 1992—2000).—An approx. method of calculating induced moments produced in the non-polar parts of a mol. by induction from a primary dipole, based on a method of graphical integration due to Frank (A., 1936, 150), is given. Allowing for these induced moments, experimental data for the dipole moments of aliphatic compounds yield fairly consistent bond moments for polar groups. When these are used to calculate the dipole moments of aromatic compounds, the results do not agree with those obtained experimentally. The aromatic compounds have additional moments which are the mesomeric moments corresponding with the electron drifts assumed in electronic theories of org. chemistry. All the *o*-*p*-directing groups give a large negative mesomeric moment, but the *m*-directing groups give a smaller, positive val. The results agree throughout with the direction of mesomeric moments required by considerations of org. reactions. A. J. M.

Dielectric polarisation and internal friction of *o*-, *m*-, and *p*-chloronitrobenzene in the liquid state. A. Jagielski (Bull. Acad. Polonaise, 1937, **A**, 312—319).—The dielectric polarisation (*p*) of *o*-, *m*-, and *p*-$C_6H_4Cl{\cdot}NO_2$ has been measured at different temp. (θ). d*p*/d(1/θ) is 309, 716, 1500, whence the dipole moments are 6·17, 4·26 and $2{\cdot}18 \times 10^{-18}$ e.s.u., respectively. The variation of viscosity with θ indicates that the *o*- and *m*-compounds are associated and the *p*-isomeride is normal. F. J. L.

Dipole moments and molecular structure. Dipole moments of *p*-hydroxyazobenzene and its derivatives compared with those of phenol and its derivatives. F. L. Warren (J.C.S., 1937, 1858).—Data for $Ph{\cdot}N_2{\cdot}C_6H_4{\cdot}OH$-*p* (I) and PhOH confirm those of Bergmann (cf. A., 1936, 1183). Data for PhOBz and $Ph{\cdot}N_2{\cdot}C_6H_4{\cdot}OBz$-*p* are tabulated, and results show close agreement between the moments of the corresponding C_6H_6 and azobenzene derivatives, supporting the view that (I) in C_6H_6 exists almost wholly in the azo-form. N. M. B.

Dipole moments of some aromatic diazoamino-compounds. R. J. W. Le Fèvre and H. Vine (J.C.S., 1937, 1805—1809).—Measurements of ε, *d*, and *n* of solutions in C_6H_6 of diazoaminobenzene and some derivatives are given, and dipole moments are calc. Results indicate that the two aryl groups are mutually inclined at about 140°. The change with concn. of the polarisation of the parent substance is considered in relation to the nature of the association which it undergoes. N. M. B.

Refractive indexes of helium I and II. E. F. Burton (Nature, 1937, **140**, 1015).—For He I, n_{5461} is $1{\cdot}0206 \pm 0{\cdot}0012$ and $1{\cdot}0269 \pm 0{\cdot}0004$ at 4·22° and 2·26° K., respectively. The second val. is the same as that for He II at 2·18° K. *n* changes by $<0{\cdot}00007$ in passing from a point in He II to a point with the same *d* in He I. L. S. T.

Refractivity intercept and the specific refraction equation of Newton. II. Electronic interpretation of the refractivity intercept and of the specific refraction equations of Newton, Eykman, and Lorentz–Lorenz. S. S. Kurtz, jun., and A. L. Ward (J. Franklin Inst., 1937, **224**, 697—728; cf. A., 1938, I, 13).—The refractivity equation of Eykman is superior to those of Gladstone and Dale, Lorentz and Lorenz, and Clausius and Mosotti as regards agreement with observed data for the variation of *n* and *d* of hydrocarbons, the effect of temp. on dielectric const. (ε) and *d*, and the effect of pressure on *n* and ε. The interpretation of refractive index data for hydrocarbons on the basis of the electron theory is considered. The Sellmeier–Drude equation is compared with dispersion equations based on quantum mechanics. The characteristic frequencies and the no. of dispersion electrons are calc. for hydrocarbons of different series. There is one dispersion electron per formula bond (C·C, or C·H) in saturated hydrocarbons. For unsaturated hydrocarbons the no. is <1 if all formula bonds are taken into account, but it is again 1 if only single linkings are considered. The characteristic frequencies of vibration are for paraffins $2{\cdot}95 \times 10^{15}$, for naphthenes, $2{\cdot}90 \times 10^{15}$, and for aromatic hydrocarbons, $2{\cdot}2 \times 10^{15}$. A. J. M.

Electrical birefringence of liquefied gases. R. Guillien (Ann. Physique, 1937, [xi], **8**, 555—678).—A preliminary report of investigations on N_2 and O_2 (cf. A., 1937, I, 13) is amplified and extended to H_2, CH_4, and C_2H_4. In each case the calc. Kerr const. is > the observed vals. The Kerr const. of liquid O_2, pure or diluted with N_2, studied with special reference to absorption, shows a variation with temp. slightly > the variation predicted by Langevin's theory. Variations from the law of mixtures are small. For N_2 and C_2H_4 the temp. variation of the const. is < the theoretical variation. The sp. Kerr const. of CH_4 is independent of temp., and this can be explained by quantum theory. An explanation of results on the basis of modifications of the Langevin theory as applied to liquids is examined. N. M. B.

Study of the tertiary amine oxide double linking by means of absorption spectra and rotatory dispersion. H. S. French and C. M. Gens (J. Amer. Chem. Soc., 1937, **59**, 2600—2603).—Absorption spectra for $NPhMe_2O$ and its hydrochloride, NPhMeEtO,HCl, β-$C_{10}H_7{\cdot}NMeEt$ and its oxide in EtOH solution have been determined. The rotatory dispersion of β-$C_{10}H_7{\cdot}NMeEtO$ into (but not through) the region of absorption has been measured and expressed by means of an equation. The non-homogeneity of the absorption band of the amine oxide group and its relation to the CO group are discussed. E. S. H.

Rotatory dispersion of configuratively related unsaturated secondary carbinols and their corresponding chlorides. P. A. Levene and A. Rothen (J. Chem. Physics, 1937, **5**, 980—984).—The ethylenic linking possesses a partial rotation of significant val. and this val. undergoes a periodic change in sign as the distance of the double linking from the asymmetric centre is progressively increased. W. R. A.

Rotatory dispersion of configuratively related alkyl azides. P. A. Levene and A. Rothen (J. Chem. Physics, 1937, **5**, 985—988).—The rotatory properties of azides and corresponding halides are compared since the azide group possesses properties analogous to those of the halogen atoms. The correlation of the primary and secondary azides is discussed. Partial rotations of the azide group and of the halogen atom may be of opposite sign in configuratively related substances. In a homologous series of secondary azides the rotation in the visible region and the partial rotation of the azide group unexpectedly change sign in passing from the second to the third member; a tentative explanation is given. The absorption band at 2880 A. is insignificantly, if at all, anisotropic. W. R. A.

Application of "viravals," units of affinity. J. Gnezda (Separate, Zagreb, 1937, 25 pp.).—Assuming the tervalency of H, diagrams of supposed structure, based on the conception of "viravals" (cf. A., 1933, 450), are assigned to many inorg. compounds. F. L. U.

Structure of boron hydrides. M. M. Platonov (J. Gen. Chem. Russ., 1937, **7**, 1567—1571).—Theoretical. The hydrides of B are represented as being composed of the dipolar elements $B^{III}H_3$ and B^IH. R. T.

Properties of ions. III. Theory of isomerisation of complex compounds. B. V. Nekrassov (J. Gen. Chem. Russ., 1937, **7**, 1594—1609; cf. A., 1936, 401).—In equilibrium mixtures of geometrical isomerides of Pt or Co complexes the dominating isomeride is distinguished by the *trans*-position of the most labile substituent to that one which most strongly polarises the central atom. R. T.

Constitution of complex metallic salts. VI. Phosphine and arsine derivatives of silver and aurous halides. Configuration of co-ordinated argentous and aurous complex. F. G. Mann, A. F. Wells, and D. Purdie (J.C.S., 1937, 1828—1836).—The trialkyl-phosphine and -arsine derivatives of AgI possess four-fold macro-mols., $[R_3P(As)\rightarrow AgI]_4$, having the same structure and configuration as the Cu_3I derivatives previously described (cf. A., 1937, I, 15). Hence the 4-covalent Ag^I complex is tetrahedral, and the 3-covalent I atom can be regarded as being at one apex of a tetrahedron with its three valencies directed towards the remaining apices. The phosphine and arsine derivatives of the Au^I halides are unimol., $[R_3P(As)\rightarrow AuX]$, and the 2-covalent aurous complex is probably linear. The PH_3–Au compounds are stable and can be distilled without decomp. The electronic significance of the results is discussed. The following are described: *tetrakis*(*monoiodotrialkylphosphinesilver*), $[R_3P\rightarrow AgI]_4$, R = *Et*, m.p. 208—209°, *Prᵃ*, m.p. 258—265°, *Buᵃ*, m.p. 43°; *tetrakis*(*monoiodotrialkylarsinesilver*), $[R_3As\rightarrow AgI]_4$, R = *Et*, m.p. 182—185°, *Prᵃ*, m.p. 219—221° (decomp.); *monohalogenotrialkylphosphinegold*, $[R_3P\rightarrow AuX]$, R = *Et*, X = *I*, m.p. 67°, b.p. 195—200°/0·03 mm.; R = *Prᵃ*, X = *Cl*, m.p. 40°, b.p. 205—207°/0·04 mm.; R = *Buᵃ*, X = *Cl*, b.p. 215—225°/0·03 mm.; R = *Buᵃ*, X = *I*, b.p. 220—225°/0·2 mm.; *monohalogenotrialkylarsinegold*, $[R_3As\rightarrow AuX]$, R = *Me*, X = *Cl*, m.p. 165—175° (decomp.), X = *I*, m.p. 176—178° (decomp.), and X = *CNS*, m.p. 127—128° (decomp.) when rapidly heated; R = *Et*, X = *Cl*, m.p. 94—95°, and X = *I*, m.p. 77° (slight decomp.); *monochlorodiethylsulphinegold*, $[Et_2S\rightarrow AuCl]$, m.p. 38—40° (slight decomp.). N. M. B.

New conception of chemical inertia. P. Renard (Compt. rend., 1937, **205**, 1068—1070).—Mechanical analogies, involving time rate of change of states, are considered. J. A. D.

Molecular interaction and chemical affinity. P. Girard and P. Abadie (J. Phys. Radium, 1937, [vii], **8**, 439—445; cf. A., 1936, 666).—The times of relaxation of dipolar mols. indicate that in addition to van der Waals forces there are two important factors which have to be taken into account. One arises from the fact that in certain mols. the C valencies are not satisfied, and the second is due to chemical affinity existing between two types of mols. W. R. A.

Energetical interpretation of the semipolar double bond. R. Samuel (Proc. Indian Acad. Sci., 1937, **6**, A, 257—265).—Theoretical. The formation of SO_3 is not brought about by the combination of unexcited SO_2 in its ground state $^1\Sigma$ plus unexcited O atoms in the ^3P term; the SO_2 is in an excited state 4·3 e.v. above the ground state. The same conditions hold in the corresponding N mols., and it is considered that this affords evidence against the existence of co-ordinate links in simple inorg. mols. of the first order. F. J. L.

Determination of linking moments from infra-red absorption measurements. R. Mecke (Z. Physik, 1937, **107**, 595—598).—Previously derived equations (A., 1936, 1052) are tested with existing data for H_2O and HCl. The dipole bond moments, μ_{OH} and μ_{HCl}, so calc. are in good agreement with vals. from electrical measurements. L. G. G.

Mechanical analyser for the solution of secular equations and the calculation of molecular vibration frequencies. D. P. MacDougall and E. B. Wilson, jun. (J. Chem. Physics, 1937, **5**, 940—944).—A set of coupled harmonic oscillators has been constructed in such a way that it can be used to solve the numerical secular equations which occur in the theory of the vibration of polyat. mols. Details of the construction and operation of the apparatus are given. W. R. A.

Force constants and molecular structure H. W. Thompson and J. W. Linnett (Nature, 1937, **140**, 1065; cf. A., 1937, I, 500).—The force-consts. of the linkings in the mol. of C_3O_2 have been recalc. using additional data (*ibid.*, 495) on the infra-red spectrum. The new vals. strengthen the view that the bonds are intermediate between double and triple, and that the mol. is a resonance hybrid. L. S. T.

Relation between frequency and reduced mass in diatomic molecules. A. Carrelli and P.

Trautteur (Nuovo Cim., 1937, **14**, 301—309).—Curves are given showing the relationship between fundamental frequency, ω_e, and $1/\mu$, where μ = reduced mass of the mol., for a large no. of diat. halides. For the halides of each group in the periodic table the points lie either wholly on a parabola for which $\omega_e c\mu$ = const., or partly also on a straight line for which $\omega_e c\sqrt{\mu}$ = const. These results, when combined with the empirical relationships of Allen and Longair (A., 1935, 685) or of Badger (A., 1934, 477), show that r_e^3, the equilibrium interat. distance, is const. for the linear and $\propto \mu^{\frac{1}{2}}$ for the parabolic portions of the afore-mentioned curves. O. J. W.

Additive properties of log γ/L, and the calculation of molecular radius. G. L. Starobinetz and V. F. Romisch (J. Gen. Chem. Russ., 1937, **7**, 2022—2025).—The radius of mols. is given by $0{\cdot}067L/\gamma$, where L is the mol. heat of vaporisation, and γ is the surface tension at the b.p. R. T.

Molecular attraction in liquids at the b.p. under constant pressure. G. Duch (J. Chim. phys., 1937, **34**, 649—690; cf. A., 1937, I, 291; 1936, 787).—Treatment of a liquid as an aggregate in hexagonal close-packing of effectively spherical mols. (radius r) subject to mutual forces $F = k^n m^2 d^{-n}$ (m = mass, d = inter-distance of mols., k, n, parameters) permits expression of k, n, and mechano-chemical quantities in terms of γ, r, m, or γ, ρ, M (γ = surface tension, ρ = density, M = mol. wt.). From measurements of γ and ρ, for aromatic liquids, at the b.p./745 mm. $n = 5{\cdot}82$, and confirmation of the relation $\gamma^3 . d^{-(n+1)} . M^{n-5}$ = const. gives a method of finding mol. wts. Extension of this relation to homologous series shows $5 < n < 6{\cdot}5$, n increasing in the order: formates < ethers < alcohols < aromatic hydrocarbons < *cyclo*hexane < *n*-paraffins. The calc. surface energy of disruption of 1 mol. (aromatic series) $\doteqdot L/4$ and is discussed with reference to the Eötvös const. and the Ramsay–Shields relation. I. McA.

Structure of H_3, H_3^+, and H_3^-. IV. D. Stevenson and J. Hirschfelder (J. Chem. Physics, 1937, **5**, 933—940; cf. A., 1937, I, 551).—Mathematical. An extension of previous work on H_3 and H_3^+ to include calculation of the force const. for binding the linear H_3 and H_3^+. The energy of linear H_3^- has been calc.; the val. indicates that it is energetically unstable with respect to $H_2 + H^-$ and therefore incapable of being observed experimentally. W. R. A.

Calculation of the important constants of metallic strontium and barium. P. Gombás and G. Péter (Z. Physik, 1937, **107**, 656—661; cf. A., 1936, 925; 1937, I, 224).—Theoretical. Lattice consts. and energy and heat of sublimation are calc. by means of a statistical approximation method without the help of empirical or semi-empirical parameters. L. G. G.

Diffusion in condensed systems. H. Mark and R. Simha (Naturwiss., 1937, **25**, 833—834).—Theoretical. Some of the results obtained by Rabinovitch (A., 1937, I, 568) are improved by modifications in the method of calculation. A. J. M.

Revised calculation of the translational fluctuation effect in gaseous dielectrics. J. H. Van Vleck (J. Chem. Physics, 1937, **5**, 991).—A revised quantum-mechanical calculation substantiates the formula of Kirkwood (A., 1936, 1321) previously criticised (A., 1937, I, 446). W. R. A.

Solid indicators for direct detection of photodissociation products. H. Neujmin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 447—450).—An amorphous deposit of MoO_3 is a sensitive indicator for the presence of H atoms produced by photodissociation, an intense blue colour being produced. The indicator has been used to study the photodissociation of vapours of H_2O, NH_3, and alcohols. The data for H_2O vapour suggest that dissociation follows $H_2O + h\nu \rightarrow H + OH$ rather than $H_2O + h\nu \rightarrow H_2 + O$ (in ^1D state). Similarly, the photodissociation of NH_3 appears to follow $NH_3 + h\nu \rightarrow NH_2 + H$ rather than $NH_3 + h\nu \rightarrow NH + H_2$. The formation of H atoms from alcohols is slight and may be due to the presence of H_2O or to secondary reactions. C. R. H.

Fluorine at low temperatures. VI. Surface tension of liquid fluorine [and oxygen]. E. Kanda (Bull. Chem. Soc. Japan, 1937, **12**, 469—472).—The surface tension of liquid F_2 from 57·1° to 84·9° K. varies from 14·61 to 9·85 and of liquid O_2 from 58·1° to 89·5° K. varies from 21·25 to 13·55 dynes per cm. measured by the capillary-rise method. D. F. R.

Fundamentals of crystal optics. IV. General dispersion condition, especially for *X*-ray fields. P. P. Ewald (Z. Krist., 1937, **97**, 1—27).—Mathematical. A comprehensive treatment of the dynamic interference theory. I. McA.

Precision determination of lattice constants by the Debye–Scherrer method. K. Moeller (Z. Krist., 1937, **97**, 170—196; cf. A., 1933, 213).—Sources of error, methods of correction, and previous results in precision measurements are critically reviewed. Using Wyckoff's method, technique and results are given for Ag, Pt, LiF, NaCl, and TlCl, proposed as calibration standards. Variations in the "constants" derived from different planes are discussed in terms of the deviation from Bragg's law; these are greatest for well-defined crystallite surfaces and larger grain-size (20 μ.), but at. no. has little effect. The ultimate preferred vals. for *a* are at 25°: Ag, 4·07800; NaCl, 5·6261, 5·6283; TlCl, 3·8340 A.; at 20°: Pt, 3·9145; LiF, 4·0198, 4·0199 A. W, 3·1588 A.; these confirm vals. calc. from *d* and mol. wt. I. McA.

Intensity distribution of Debye rings due to various fibre structures. III. Distribution of microcrystals in regenerated silk fibres. C. Matano (J. Soc. Chem. Ind. Japan, 1937, **40**, 358—360B).—Mathematical. The theory previously developed is extended and applied to the analysis of *X*-ray diffraction patterns of regenerated silk fibres (cf. A., 1937, I, 118). C. R. H.

Resolving power in *X*-ray spectra. V. Dolejšek and M. Tayerle (Compt. rend., 1937, **205**, 1143—1145; cf. A., 1935, 3, 686).—High resolving power has been obtained in a single-grating instrument of moderate dimensions, using a curved gypsum crystal (A., 1938, I, 100) as grating A. J. E. W.

Fine structure of *X*-ray absorption edges as an aid in crystal structure determination. F. Schoszberger (Monatsh., 1937, **71**, 109—121).—The application of the fine structures of the *X*-ray absorption edges of metals to the determination of structure factors and parameter vals. is discussed. J. W. S.

Grain-like structure of solids. (Sir) W. Bragg (Nature, 1937, **140**, 954—956).—A lecture. L. S. T.

Interference theory. M. Renninger (Z. Krist., 1937, **97**, 95—106).—Theoretical. For unsymmetric Bragg reflexion of *X*-rays from a plane crystal surface, expressions are derived relating the glancing angle θ and the integrated reflexions R for ideal and mosaic crystals to the angle ϕ between the crystal surface and reflecting lattice planes. Vals. of R for ideal and mosaic crystals are discussed for low vals. of the structure factor. The results are applied to the (222) reflexion of diamond. I. McA.

***X*-Ray study on the distribution of charge in the diamond lattice.** M. Renninger (Z. Krist., 1937, **97**, 107—121; cf. A., 1936, 128).—Abs. intensities for the (111), (311), (222) planes of diamond, using Cu $K\alpha$ rays, are measured by Bragg reflexion from the octahedral surface and compared with theory and previous experiment. For the forbidden (222) reflexion involving "indirect" excitation (A., 1937, I, 117), $F_{222} = 1{\cdot}1$ electrons per cell, still 4 times the calc. val. of Ewald and Hönl (A., 1936, 412, 1185). With Mo $K\alpha$ rays the forbidden (622) reflexion is not observed, whence F_{622} is $<0{\cdot}2$ electron per cell. I. McA.

Unit cell and space-group of monoclinic sulphur. J. T. Burwell II (Z. Krist., 1937, **97**, 123—124).—The unit cell contains 48 atoms, possibly as puckered-ring S_8 mols. (A., 1935, 285), and has a 10·90, b 10·96, c 11·02 A., β 83° 16′. The space-group is C_{2h}^5 ($P2_1/a$). I. McA.

Structure of metals. A. Müller (Nature, 1937, **140**, 1011—1012).—*X*-Ray photographs from Ni and Au discs under conditions of high dispersion, using the β_1-line of Fe and the α_2-line of Ni, respectively, as incident radiations, show that sharp reflexions from individual crystal grains are obtained, but they are scattered over a wide range indicating lattice variations of the individual crystals of the order of 1 in 10^3 to 1 in 2×10^3. Precision data on lattice dimensions for metals are thus to be regarded as statistical averages of figures varying over this comparatively wide range, and the reproducibility of the lattice const. of an individual grain is $\ll$ that of the average. The ordinary process of annealing is probably incapable of producing equilibrium among the crystal grains. L. S. T.

Crystal structure of some intermetallic compounds of the rare earths. A. Iandelli and E. Botti (Gazzetta, 1937, **67**, 638—644).—An *X*-ray investigation of the systems A–B (A = La, Ce, Pr; B = Zn, Cd, Hg) containing 50 at.-% of each metal. The Zn and Cd alloys consist of a single cube-centred phase, with the vals. of a for LaZn 3·766, CeZn 3·706, PrZn 3·712, LaCd 3·966, CeCd 3·908, PrCd 3·913 A. The Hg alloys consist of two or more phases, and are readily oxidised on exposure to air, the Ce amalgam being spontaneously inflammable. O. J. W.

Cobalt and the cobalt–carbon system. W. F. Meyer (Z. Krist., 1937, **97**, 145—169).—Pressed Co rods, heat-treated in the range 0—1200°, alone or in a stream of C_6H_6 vapour or coal gas, were *X*-rayed. Hexagonal and cubic forms of Co with transition point 467° are confirmed. Hendricks' transition point at $\sim$1100° is unconfirmed; above 900° only the cubic form exists. Coexistence of forms, time-lag in transition, quality of spectra, results of mechanical treatment, and thermodynamical considerations indicate that a lattice deformation hinders the glide-plane transition. With coal gas at 230—470°, Co catalyses the decomp. of CO and forms with C an unstable brown mixed crystal the *X*-ray spectrum of which is that of Co. At 500—800° the stable *carbide*, Co_3C,, isomorphous with Fe_3C, is formed; the rhombic cell has a 4·52, b 5·08, c 6·73 A. Above 800°, only Co forms exist. I. McA.

Structure of zirconium silicide, $ZrSi_2$. S. von Náray-Szabó (Z. Krist., 1937, **97**, 223—228).—A complete and corr. analysis is made of Seyfarth's data (A., 1929, 18). The rhombic cell has a 3·72, b 14·61, c 3·67 A., 4 $ZrSi_2$ in cell, space-group D_{2h}^{17} ($Cmcm$). In a non-ionic layer-lattice structure, 4 Zr, 4 Si_I, and 4 Si_{II} occupy the positions: $(0,y,\frac{1}{4})$, $(0,\bar{y},\frac{3}{4})$, $(\frac{1}{2},\frac{1}{2}+y,\frac{1}{4})$, $(\frac{1}{2},\frac{1}{2}-y,\frac{3}{4})$ where $y = 0{\cdot}106$, 0·750, 0·355 respectively. Interat. distances are given. I. McA.

***X*-Ray determination of the structure of liquids and glass.** B. E. Warren (J. Appl. Physics, 1937, **8**, 645—654).—A review of the methods of *X*-ray analysis applied to liquids. Vitreous SiO_2, liquid Na, and H_2O are particularly considered. Although liquids show a structure this is not to be interpreted as a cryst. structure. A. J. M.

Structure of glass. A. Ganguli (Z. Krist., 1937, **97**, 88—90).—A review of factors involved in the formation and stability of states of matter, including glass. I. McA.

Crystal structure of "β-alumina," $Na_2O,11Al_2O_3$. C. A. Beevers and (Miss) M. A. S. Ross (Z. Krist., 1937, **97**, 59—66; cf. B., 1936, 1091). The isomorphous $Na_2O,11Al_2O_3$ and $K_2O,11Al_2O_3$ are hexagonal with a 5·584, c 22·45 A. and a 5·584, c 22·67 A., respectively; space-groups are $C6/mmc$ (D_{6h}^4). Double Fourier synthesis of measured ($h0hl$) *X*-ray intensities leads to determination of at. parameters confirming the ideal structure of Bragg, Gottfried, and West for the Na compound. The good agreement between calc. and all available intensities, especially using the Bragg–West f-curve for O, is preferred to at. distribution and bond structure in placing the alkali atoms. Parameters and interat. distances are listed. I. McA.

Parameter of pure ferrous oxide. J. Bénard (Compt. rend., 1937, **205**, 912—914).—Variation in the vals. of a for FeO prepared under different conditions is attributed to the presence of dissolved

Fe. In presence of Fe_3O_4 a const. val (4·282 A.) is obtained under all conditions. A. J. E. W.

Structure of the so-called antimony tetroxide and of the isomorphous compound $BiTa_2O_6F$. K. Dihlström and A. Westgren (Z. anorg. Chem., 1937, **235**, 153—160).—The so-called Sb_2O_4 is $Sb^{III}O{\cdot}OH,Sb^{V}{}_2O_5$. It is face-centred cubic, *a* 10·28 A., but the unit cube contains 8 Sb_3O_6OH and not 16 Sb_2O_4 (cf. A., 1928, 821; 1933, 692); the space-group is O_h^7. An isomorphous *compound*, $BiTa_2O_6F$, has been obtained by heating BiOF with Ta_2O_5; it has *a* 10·46 A. F. J. G.

Sphero-crystals. E. von Lengyel (Z. Krist., 1937, **97**, 67—87).—As in natural minerals, sphero-crystals of oxy-salts are obtainable. Growth, structure, and optical properties of those from aq. solutions of $NaHCO_3$, $CaCO_3$, $MnSO_4,4H_2O$, $Na_2S_2O_3,5H_2O$, $K_2Cr_2O_7$, and $Na_2C_2O_4$ are given and illustrated by photomicrographs. The rôle of the favourable factors, high temp., speed of evaporation, and dehydration, is discussed. I. McA.

Law of intergrowth and blending mechanism in anomalous mixed crystals of the iron ammonium chloride type. A. Neuhaus (Z. Krist., 1937, **97**, 28—58; cf. A., 1936, 1477; 1937, I, 118).—$CoCl_2,2H_2O$ is monoclinic pseudo-orthorhombic with *a* 7·15, *b* 8·47, *c* 3·60 A.; *d* (*X*-ray) 2·52. From cell data and measured optical properties, including *n* and pleochroism, for $CoCl_2,2H_2O$, $CuCl_2,2H_2O$, and $CuCl_2,2NH_4Cl,2H_2O$, the Co salt has Harker's $CuCl_2,2H_2O$ structure (A., 1936, 1327). Geometric and structural comparisons for NH_4Cl and $CoCl_2,2H_2O$ with extensive optical examination of $CoCl_2,2NH_4Cl,2H_2O$ indicate a simple salt combination in the mixed crystal so that the {100}, {110}, {210} forms of NH_4Cl correspond respectively with the $\{4\bar{4}1\}$, $\{1\bar{1}1\}$, {441} of $CoCl_2,2H_2O$, axial directions being mutually inclined, not parallel as in isomorphous mixtures. Mechanisms based on ionic, covalent, and van der Waals forces are discussed. The evidence, together with the facts of stability, solubility, and cohesion, supports that based on intercalation of simple salts with a tendency to complex formation, the forces beingi ntermediate to van der Waals and at. linking. I. McA.

Space-group of $BaCl_2,2H_2O$. S. von Náray-Szabó and K. Sasvári (Z. Krist., 1937, **97**, 235—237).—From 30° oscillation *X*-ray photographs, the monoclinic cell contains 4 mols. and has *a* 6·69, *b* 10·86, *c* 7·15 A., β (Groth) 91° 5′; space-group C_{2h}^5, $P2_1/n$. Indexed reflexions with intensities are listed; from the (0*k*0), (*hk*0) series, $y_{Ba} = 0{\cdot}16$—0·17. I. McA.

Crystal structure of potassium metaborate, $K_3(B_3O_6)$. W. H. Zachariasen (J. Chem. Physics, 1937, **5**, 919—922).—From *X*-ray evidence crystals of KBO_2 are rhombohedral and contain six mols. of KBO_2; density = 2·348. The space-group and other structural features, including interat. distances, are given. The metaborate radical is $(B_3O_6)^{-3}$, a ring of BO_3 triangles instead of the endless chain of BO_3 triangles found in CaB_2O_4. The BO_3 groups are slightly distorted, the nine atoms lie in one plane, and the K atoms are surrounded by seven O. W. R. A.

Crystallographic study of potassium nickelocyanide trihydrate. H. Brasseur and A. de Rassenfosse (Z. Krist., 1937, **97**, 239—240).—*X*-Ray spacings and vals. of *n* are given for a triclinic pseudohexagonal cell. I. McA.

Rotation in molecular lattices. C. Finbak (Tids. Kjemi, 1937, **17**, 145—146).—*X*-Ray analyses of the cryst. modifications of CBr_4 stable above 46°, $C(CH_2{\cdot}OH)_4$ above 179°, and C_2Cl_6 above 76° show that free rotation occurs about the central atom in the first two cases and unsymmetrically in the last. M. H. M. A.

Crystal and molecular structure of carbon tetraiodide and tetrabromide. H. Mark (Z. physikal. Chem., 1937, **B**, **38**, 209—210).—Comments on Finbak and Hassel's paper (A., 1937, I, 502). R. C.

***X*-Ray analysis of the dibenzyl series. IV. Detailed structure of stilbene.** J. M. Robertson and I. Woodward (Proc. Roy. Soc., 1937, **A**, **162**, 568—583).—Stilbene, m.p. 124°, crystallises in the monoclinic prismatic system. The unit cell, containing 4 mols., has parameters *a* 12·35, *b* 5·70, *c* 15·92 A., β 114·0°; $d_{calc.}$ 1·161. Fourier synthesis shows that the mols. are nearly, perhaps exactly, planar which may be attributed to conjugation of the central double linking with the Ph rings. The orientation of the mol. is given and the intermol. distances are discussed. The single linkings emerging from the Ph ring have a length only 1·44 A., indicating some double linking character in this linking. G. D. P.

Non-planar aromatic molecules. (Mrs.) K. Lonsdale (Z. Krist., 1937, **97**, 91—94).—The mol. in cryst. *s*-$C_6H_3Ph_3$ is not planar. A structure of plane hexagons having the Ph groups rotated in the same sense 25° from the plane of the central ring reconciles magnetic susceptibilities and certain *X*-ray intensities. Published results are surveyed. I. McA.

***X*-Ray investigation of the crystals of acenaphthene.** M. Prasad and L. A. De Sousa (Current Sci., 1937, **6**, 220).—Rotation photographs give *a* 8·31, *b* 14·07, *c* 7·21 A.; space-group Q_h^5; 4·017 mols. per unit cell (cf. A., 1937, I, 289). L. S. T.

Structure of crystallised azulene. L. Misch and A. J. A. van der Wyk (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 106—108).—The parameters, obtained by *X*-ray analysis, are: *a* 7·86, *b* 6·02, *c* 7·91 A.; β 75°. The unit cell contains 2 mols., which are situated with their length parallel to the *c*-axis. Space-group C_{2h}^2 or C_2^2, the former being most probable. The cleavage plane is parallel to *bc*. A. J. E. W.

Triangular sugar crystals. J. Schmutzer (Proc. Akad. Wetensch. Amsterdam, 1937, **40**, 800—802).—A 65% sucrose solution was repeatedly boiled with decolorising C or "hyflocel," filtered, and eventually evaporated until supersaturated at 60 mm. After seeding, crystallisation was considerably delayed and the sugar separated in characteristic triangular crystals, $p : p' = 79°$, $p : q = 113°$, $p' : q = 128°$, $p : a = 50° 30'$, $a : s = 32°$, $s : q = 60°$, $a : q = 78°$, having a lamellar structure parallel to faces s and p. The crystals show the normal optical properties, axial ratios, and β. S. C.

Crystalline structure of uranium. C. W. Jacob and B. E. Warren (J. Amer. Chem. Soc., 1937, **59**, 2588—2591).—*X*-Ray examination indicates an orthorhombic unit cell having *a* 2·852, *b* 5·865, and *c* 4·945 A. The space group is V_h^{17} *Cmcn*, parameter 0·105±0·005, and *d* (*X*-ray) 18·97. E. S. H.

Structure of pepsin.—See A., III, 73.

Liquid crystals obtained by sublimation. P. Gaubert (Compt. rend., 1937, **205**, 997—998).—The sublimate of *p*-azoxyanisole forms isotropic or anisotropic droplets according to the temp. of vaporisation and of condensation. The orientation of the liquid crystals is probably influenced by impurities on the surface of condensation. E. S. H.

Properties of an electron bundle of uniform velocity after penetration of a thin foil. F. Kirchner (Ann. Physik, 1937, [v], **30**, 683—687).—Velocity losses of from 1 to 3·5% were observed in an electron bundle of 45 kv. velocity after passage through thin (1 to 3·2 μ.) sheets of Al and mica. The conclusions of Trillat and Hautot (A., 1937, I, 541) are criticised. O. D. S.

Electron-diffraction study of the grain boundaries in iron. R. Morgan, (Miss) S. Steckler, and B. L. Miller (J. Chem. Physics, 1937, **5**, 953—959).—When untreated and heat-treated transformer Fe and heat-treated electro-deposited Fe were dissolved in $(NH_4)_2S_2O_8$ only the last specimen left residues suitable for investigation by electron diffraction. The presence of Fe_3C and α-FeO·OH in the grain boundaries was identified. The α-FeO·OH presumably results from chemical action between the $(NH_4)_2S_2O_8$ and either Fe or Fe oxide originally present in the grain boundary. W. R. A.

Electron study of the effect of heat on the structure of gold leaf. G. L. Clark and E. Wolthuis (J. Appl. Physics, 1937, **8**, 630—638).—The construction of an electron diffraction apparatus suitable for both reflexion and transmission is described. The diffraction pattern of commercial Au leaf shows that the (100) faces of the crystallites lie in the surface of the leaf. The pattern is unaltered by heating the leaf in an O_2-free atm. to 450°, but when O_2 is present a many-ringed pattern is produced which reverts to the original on heating the leaf in vac. at 400° for 8 hr. The many-ringed pattern is probably due to the formation of the oxide, which is decomposed on heating in vac. F. J. L.

Electron-diffraction investigation of nitrosyl chloride and nitrosyl bromide. J. A. A. Ketelaar and K. J. Palmer (J. Amer. Chem. Soc., 1937, **59**, 2629—2633).—Interat. distances recorded are: (*a*) for NOCl, Cl—O 2·65±0·01, Cl—N 1·95±0·01, N—O 1·14±0·02 A.; (*b*) for NOBr, Br—O 2·85±0·02, Br—N 2·14±0·02, N—O 1·15±0·04 A. The angles Cl–N–O and Br–N–O are 116±2° and 117±3°, respectively. The large halogen—N distances are ascribed to resonance between the normal covalent and ionic structures. E. S. H.

Volume anomaly of ferromagnetic substances. A. D. Samurcas (Bull. Soc. roum. Phys., **36**, No. 63—64, 125—130; Chem. Zentr., 1936, i, 4120—4121).—Forrer's theory of the anomalous vol. changes at the Curie point (A., 1934, 835) is in better agreement with experiment than is Bauer's, since in Fe–Si alloys negative discontinuities or continuous vol. changes may occur, according to the [Si]. J. S. A.

Technical problems of ferromagnetism in weak fields. R. Goldschmidt (Helv. phys. Acta, 1936, **9**, 33—41; Chem. Zentr., 1936, i, 4120).—The origin of the magnetic losses which are independent of amplitude and frequency is discussed. For transformer Fe, high in Si, the permeability and loss angle do not increase linearly at low fields. It is uncertain whether the effect is due to hysteresis, after-working effects, or to the effect of inclusions of different permeability. J. S. A.

Directional ferromagnetic properties of metals. R. M. Bozorth (J. Appl. Physics, 1937, **8**, 575—588).—A review of the ferromagnetic properties of various metals and alloys, and the influence of compressive stress and temp. F. J. L.

Anisotropy of cubic ferromagnetic crystals. J. H. Van Vleck (Physical Rev., 1937, [ii], **52**, 1178—1198).—Mathematical. N. M. B.

Variation of initial susceptibility with temperature, and of magnetostriction and reversible susceptibility with temperature and magnetisation in nickel. D. Kirkham (Physical Rev., 1937, [ii], **52**, 1162—1167).—Investigations previously reported (cf. Siegel, A., 1936, 785) are extended, and complete data between 21° and the Curie temp. are given. N. M. B.

Longitudinal piezoelectric effect in Rochelle salt crystals. W. G. Cady (Proc. Physical Soc., 1937, **49**, 646—653).—Experiments are described on the use as microphones, sound-emitters, piezoelectric resonators, and sources of ultrasonic waves of plates cut with their normals making equal angles with the three crystallographic axes, giving max. longitudinal effect. N. M. B.

Measurements of the optical constants of very thin metallic films. K. Försterling (Ann. Physik, 1937, [v], **30**, 745—751).—Theoretical. A formula for the independent calculation of refractive index and film thickness from optical data is derived. O. D. S.

Method of distinguishing fast and slow waves in thick crystal plates. J. Lietz (Z. Krist., 1937, **97**, 122).—The variation in double refraction caused by movement of an auxiliary quartz wedge over the specimen is noted, using the bands seen through a microscope with spectroscopic attachment. I. McA.

Birefringence by compression of quartz and its dispersion in the ultra-violet. G. Bruhat and A. Blanc-Lapierre (Compt. rend., 1937, **205**, 807—809).—The birefringence of quartz crystals has been measured for different directions of the light

rays and for different directions of compression. The birefringence is independent of the direction of compression in the plane normal to the optic axis.
R. S. B.

Phosphorus at high temperatures and pressures. R. B. Jacobs (J. Chem. Physics, 1937, **5**, 945—953).—The transition of white P into black P is irreversible and is accompanied by a "time lag" of some 12 to 15 min. White P has been heated at approx. 13,000 atm. at about 205° for six different periods, all $<$ 15 min. and varying from each other by 2 min. intervals, then the pressure was reduced to half its highest val. in order to retain the P in the solid state, and on washing with CS_2 a C-like powder was obtained in amounts bearing a close correlation to the times of heating. Visually this powder differed from the usual black P; it had *d* 2·25 compared with 2·69. Whereas the usual black P gives distinct *X*-ray diffraction lines corresponding with an orthorhombic type of crystal structure, the "new" black P gave no diffraction lines and therefore it is either amorphous or microcryst. The differences in the total heats between the various forms of P were obtained from the heats of reaction of the different modifications with Br. These data indicated that the new black P was non-cryst. and a separate polymorphic modification and that below 560° cryst. black P is the stable form. The progression of stability of the different forms of P is discussed, as well as the time–pressure–temp. relationships during the transition of white into black P. Prolonged heating of amorphous black P at about 125° yielded a brilliant violet modification of red P.
W. R. A.

Phase diagram of water to 45,000 kg. per sq. cm. P. W. Bridgman (J. Chem. Physics, 1937, **5**, 964—966).—At pressures between 20,000 and 25,000 kg. per sq. cm. ice VI is transformed into ice VII. Data for the melting curves of VI and VII and for vol. changes at high pressures are given. The triple point liquid–VI–VII is at 22,400 kg. and 81·6°. Compressibilities could not be determined with high accuracy. The decrease in vol. when the liquid freezes to VII at the triple point given is practically the same as the decrease when the liquid freezes to VI at the triple point liquid–VI–V at 6380 kg. Although the curvature of the melting curve of VII is in the normal direction, there is an abnormally great increase in latent heat.
W. R. A.

Melting of the mononitrophenols at high pressure. R. B. Dow and H. B. Hibshman (J. Chem. Physics, 1937, **5**, 960—964).—A new dynamic high-pressure method is described and has been used to determine the melting of mononitrophenols over a pressure range of 4000 kg. per sq. cm. Data agree well with those obtained using the piston displacement method of Bridgman. The application and utility of each method for investigating melting and polymorphic transitions of solids at high pressures are considered.
W. R. A.

Complexity of the solid state of sulphur trioxide and other substances. H. Gerding and R. Gerding-Kroon (Rec. trav. chim., 1937, **56**, 1229—1230).—Passages in a previous paper (A., 1937, I, 576) are explained.
F. L. U.

Nature of low-temperature transformation of deuterammonium chloride. A. Smits, G. J. Muller, and F. A. Kröger (Z. physikal. Chem., 1937, **B**, **38**, 177—186; cf. A., 1936, 555).—The mol. vol.–temp. curve of ND_4Cl, which has been determined at $-21{\cdot}2°$ to $-25{\cdot}2°$, differs considerably from that of NH_4Cl. Transformation occurs continuously and without hysteresis and increases with temp. most rapidly in a region 6·2° above the discontinuous transition temp. of NH_4Cl. These results are interpreted in terms of Smits' theory of allotropy.
R. C.

Relationship of London's equation to the acceleration theory of superconductivity. F. Bopp (Z. Physik, 1937, **107**, 623—632).—A theoretical discussion of the conception underlying London's equations.
L. G. G.

Electrical resistance of ferromagnetics. H. H. Potter (Proc. Physical Soc., 1937, **49**, 671—678).—Data and resistance–temp. curves for Fe and Ni in the range 20—1200° K. are given. Results indicate that the inflexion at the Curie point is sharp to within a small fraction of a degree, and above this point the curve is concave to the temp. axis as for a paramagnetic metal; the small change in spontaneous magnetisation at low temp. has a comparatively large effect on the resistance.
N. M. B.

Electrical resistance of manganese amalgams. L. F. Bates and P. G. Day (Proc. Physical Soc., 1937, **49**, 635—641; cf. A., 1937, I, 356).—The variation of resistance with temp. of a series of amalgams was investigated over the range $-78°$ to 340°. Curves for temp. to the ratio, resistivity difference of Hg and amalgam : resistivity of Hg are given, and an attempt is made to correlate the electrical data with previous measurements of the magnetic susceptibility of similar amalgams.
N. M. B.

Magnetic properties of silver amalgams. L. F. Bates and A. W. Ireland (Proc. Physical Soc., 1937, **49**, 642—645).—The magnetic susceptibilities of 0—5 wt.-% Ag amalgams were measured by the Gouy method; this method was found unsuitable for Au amalgams. Ag enters into solution in Hg as if it possessed mol. susceptibilities -18 to -77×10^{-6} c.g.s. units for very dil.—conc. solutions compared with the usual val. $-21{\cdot}6 \times 10^{-6}$ for solid Ag.
N. M. B.

Diamagnetic susceptibilities of some complex ions. S. R. Rao and S. Sriraman (Phil. Mag., 1937, [vii], **24**, 1025—1041; cf. A., 1937, I, 556).
K. S.

Magnetic properties of the mercuric iodides. F. Gallais (Compt. rend., 1937, **205**, 1052—1054).—The Hg atom retains its diamagnetism in the compounds with I (cf. A., 1935, 592). Previous experiments indicating that a diamagnetic metal could become paramagnetic in its complex compounds are not trustworthy.
J. A. D.

Magnetic susceptibility of organic liquids. Additive law. C. Sălceanu and D. Gheorghiu (Bull. Soc. roum. Phys., **36**, No. 63—64, 77—81; Chem. Zentr., 1936, i, 4285—4286).—The susceptibility of mixtures of $PhNO_2$ and $COMe_2$ and of 1-$C_{10}H_7Me$ and $COMe_2$ obeys an additive law; observed deviations of $COMe_2$–$CHCl_3$ mixtures cannot, therefore, be ascribed to dipole interaction. H. N. R.

Paramagnetic magneton numbers of the ferromagnetic metals. W. Sucksmith and R. R. Pearce (Nature, 1937, **140**, 970).—The magneton nos. of Ni, Co, and Fe have been calc. from measurements of the magnetic susceptibilities of Ni and Co, and of Fe–V alloys. With Fe, the V removes the γ-phase and the $1/\chi$–T curve is linear above 900°. The curve for the δ-phase of Fe is linear, and when extrapolated to lower temp. joins the α-phase at the A3 transformation. The val. for the magneton no. thus obtained (3·15) agrees with that determined from the alloys. The susceptibility curve for Co is linear between 1230° and 1450°. Continued annealing of the specimens produced parallel but displaced lines, tending to lower the paramagnetic Curie point. The curve for Ni is linear between 500° and 925°, above which the slope decreases. L. S. T.

Ferromagnetic and electrical properties. VII. Thermoelectric power, Thomson coefficient, and heat conductivity of nickel. A. Hammer (Ann. Physik, 1937, [v], **30**, 728—744).—The variation with temp. of the differential thermoelectric power of Ni against Cu, and of the thermal conductivity of Ni, have been measured, by differential methods, between room temp. and 470° and between room temp. and 420°, respectively. The Thomson coeff. is calc. and the ferromagnetic anomaly of Ni discussed. An anomalous increase in thermal conductivity was observed near the Curie point of Ni. O. D. S.

Influence of a longitudinal magnetic field on the thermoelectric power of nickel and some ferronickels, under tension. G. Simon and J. Bouchard (Compt. rend., 1937, **205**, 1141—1143).—The variation of the e.m.f. for different vals. of H, the tension in the wires forming the couple, and the temp. difference between the junctions, is described for couples of Cu with Ni and five Ni–Fe alloys. A. J. E. W.

Acoustic velocity in organic compounds. S. Parthasarathy (Current Sci., 1937, **6**, 213).—The acoustic velocities of *d*- and *l*-pinene are identical at 24°, and are comparable with those of aliphatic and not aromatic compounds. Data for PhEt, Ph_2O, indene, and Et lactate are also given. L. S. T.

Experimental determination of ultrasonic velocity in several gases at pressures between one and one hundred atmospheres. A. H. Hodge (J. Chem. Physics, 1937, **5**, 974—977).—A resonator type of acoustic interferometer suitable for studying the behaviour of ultrasonic waves in gases at pressures up to several hundred atm. is described and the variations in the acoustic velocities of several gases with changes of frequency and pressure are recorded. The availability of the method for indirect determination of sp. heat is discussed. W. R. A.

Comparison of specific heats of gases at elevated temperatures. A. Potop (Compt. rend., 1937, **205**, 1047—1049).—A flow method (cf. Henry, A., 1931, 1361) of comparing the sp. heat of gases up to 600° is described. The apparatus consisted of a Pt tube electrically heated inside a duralumin container, and the axial asymmetry of temp. gradient along the tube was used to indicate the relative sp. heats of the gases. J. A. D.

Ratio of the specific heats of air, N_2, and CO_2 as a function of pressure by the ultrasonic method. J. C. Hubbard and A. H. Hodge (J. Chem. Physics, 1937, **5**, 978—979).—Cf. A., 1937, I, 505. γ for air is 1·406 at 1 atm. and 1·580 at 100 atm., and for N_2 is 1·403 and 1·544 for these pressures. γ for CO_2 is 1·304 at 1 atm. and 3·524 at 60 atm. W. R. A.

Heat capacity of supercooled liquid glycerol. A. G. Oblad and R. F. Newton (J. Amer. Chem. Soc., 1937, **59**, 2495—2499).—Data obtained by the method of mixtures, ensuring time for the complete establishment of thermal equilibrium, disagree with those obtained by the Nernst method for temp. $<$190° K., but appear to agree with a prolongation of the curve obtained by the Nernst method above 190° K. The long times required for equilibrium to be attained indicate that conclusions relating to the applicability of the third law of thermodynamics to glasses cannot be based on measurements by the Nernst method. E. S. H.

Free rotation about carbon–carbon linkings. L. S. Kassel (J. Amer. Chem. Soc., 1937, **59**, 2745—2746).—Discrepancies in the vals of entropy for *n*- and *iso*-C_4H_{10} derived by different methods are discussed. E. S. H.

Entropy of isoprene from heat capacity measurements. N. Bekkedahl and L. A. Wood (J. Res. Nat. Bur. Stand., 1937, **19**, 551—558).—The heat capacity of cryst. and liquid isoprene shows normal variation with temp. over the temp. range 20—300° K., its val. for the liquid at 298·2° K. being 152·6 joules per g.-mol. per degree. The latent heat of fusion is 4830±15 joules per g.-mol. The entropy at 298·2° K. is calc. as 229·3±1·0 joules per g.-mol. per degree. J. W. S.

Molecular heats and transformations of condensed hydrides and deuterides of sulphur and selenium. A Kruis and K. Clusius (Z. physikal. Chem., 1937, **B**, **38**, 156—176).—D_2S, prepared by deuterolysis of Al_2S_3, has m.p. $187{\cdot}1_4$° K. and mol. heat of fusion (L) $565{\cdot}_3$ g.-cal. It has transition points at $107{\cdot}8_2$° and $187{\cdot}1_4$° K., and its mol. heat (C_p) at 92—202° K. is recorded. H_2Se has m.p. $207{\cdot}4_3$° K. and L $601{\cdot}_1$ g.-cal. It has a transition point at $172{\cdot}5_4$° and a transition region at about $82{\cdot}_3$° K., and C_p at 61—230° K. is recorded. D_2Se, prepared by deuterolysis of Al_2Se_3, has m.p. $206{\cdot}2_4$° K. and L $595{\cdot}_7$ g.-cal. It has a transition point at $176{\cdot}0_2$° and a transition region at 90·0—91·0° K., and C_p at 64—233° K. is recorded. The deuterides differ from the corresponding hydrides in having higher C_p, transition temp., and heats of transition, and lower m.p. and L. The lower transition point of D_2S and H_2S corresponds with a phase transformation of the first order, whereas the transition region of the selenides corresponds with a transformation of a higher order. R. C.

Krypton. E. Mathias, C. A. Crommelin, and J. J. Meihuizen (Ann. Physique, 1937, [xi], **8**, 467—

483).—A detailed account of investigations previously reported (cf. A., 1937, I, 231). Expressions are derived for *l*, and for the internal and external heats of vaporisation. An equation of the third degree in *T* gives the real as opposed to the rectilinear diameter, and leads to the val. $d_c = 0{\cdot}9191$ compared with 0·9085 from the rectilineal diameter. N. M. B.

Fusion point, vapour pressure, and heat of evaporation of vanadium oxytrichloride. H. Flood, J. Gørrissen, and R. Veimo (J. Amer. Chem. Soc., 1937, **59**, 2494—2495).—$VOCl_3$ has m.p. −79·5°. The v.p. has been determined for the ranges 20—60° and −15° to 15°. The calc. average heat of evaporation (−15° to 130°) is 8·7±0·2 kg.-cal. E. S. H.

Atomic heat, entropy, and heats of fusion and vaporisation of xenon. Simple apparatus for liquefying ethylene. K. Clusius and L. Riccoboni (Z. physikal. Chem., 1937, **B**, **38**, 81—95).—The following data are recorded: m.p. 161·3° K.; mol. heat of fusion, 548·5 g.-cal.; characteristic temp. of Debye function for at. heat at 10—15° K., 55°; mol. heat of vaporisation at b.p. ($165{\cdot}1_3$° K.), 3020±3 g.-cal.; caloric entropy at b.p., 37·66±0·10; statistical entropy at b.p., 37·58; v.-p. const., $1{\cdot}59_8 \pm 0{\cdot}02_2$; chemical const., $1{\cdot}58_8$. The at. heat has been measured between 10° K. and the b.p. The triple point pressure is not quite definite, probably because the element is a mixture of isotopes. An apparatus for liquefying C_2H_4 by cooling under pressure with a mixture of MeOH and solid CO_2 is described. R. C.

Establishment of temperature scale below 1° K. V. Jacnya (Bull. Acad. Polonaise, 1937, **A**, 260—268).—Theoretical. F. J. L.

Experiments on iron ammonium alum in alternating fields at very low temperatures. A. H. Cooke and R. A. Hull (Proc. Roy. Soc., 1937, **A**, **162**, 404—413).—The irreversible heating of Fe NH_4 alum by an alternating magnetic field between 0·035° and 0·11° K. has been measured. The heating effect ∝ the square of the field amplitude and the square of the frequency. It is ascribed to the existence of a time lag of about 10^{-8} sec. between applied magnetic field and induced magnetisation. The conditions under which this heating may be eliminated in calorimetric experiments with a.c. methods of temp. measurement are discussed. G. D. P.

Joule–Thomson effect and quantum statistics. D. S. Kothari and B. N. Srivasava (Nature, 1937, **140**, 970—971).—Calculations show that for a degenerate gas the Joule–Thomson expansion produces a heating effect. During an adiabatic process a degenerate gas remains degenerate, and a non-degenerate gas will remain non-degenerate. Under suitable conditions, the Joule–Thomson effect may provide an experimental test of the statistics obeyed by gases, *e.g.*, He. L. S. T.

Dilatometric researches on the tempering and annealing of boric oxide glass. E. Rencker (Compt. rend., 1937, **205**, 980—981).—Between 207° and 260° the change of vol. of B_2O_3 glass does not immediately follow change of temp. The hysteresis observed with rising or falling temp. is more pronounced the lower is the temp. E. S. H.

Abnormal dependence of the properties of water on temperature and pressure. G. Tammann (Z. anorg. Chem., 1937, **235**, 49—61).—The abnormal behaviour of H_2O can be interpreted on the hypothesis that at temp. up to approx. 60° it contains the large mol. ("H_2O I") which crystallises as ice I. The abnormal dependence of the sp. vol. on temp. and pressure for both H_2O and D_2O can be explained in this way. If the properties of H_2O below 60° depend on the concn. of H_2O I in accordance with the mixture law, then for various properties $\Delta_t/\Delta_{t=0}$ should be const., where Δ_t is the difference between the observed val. of a property and that obtained by extrapolation from higher temp. This is approx. true for *v*, *c*, *n*, and *η* (which are linear functions of temp. above 60° but not below), and also for [H˙]. Furthermore, many sparingly sol. gases, liquids, and solids have a min. of solubility at temp. between 0° and 100°. For these, the corresponding relation $\Delta l_t/\Delta l_{t=0} = \text{const.}$ (where Δl_t is the difference between extrapolated and observed solubility) is approx. true. F. J. G.

Crystal structure of aliphatic compounds. III. Relations between true density and other properties of *n*-paraffin hydrocarbons. R. Kobayasi (J. Soc. Chem. Ind. Japan, 1937, **40**, 341—345B).—The following empirical equations are fairly accurate for *n*-hydrocarbons CH_4—$C_{50}H_{102}$: $S = (3{\cdot}324 + 23{\cdot}114n)/(30{\cdot}76 + 13{\cdot}82n)$; $S/S' = 0{\cdot}2725 + 1{\cdot}105S$; $F = 587{\cdot}5S - 853{\cdot}2 = 497{\cdot}9S/S' - 931{\cdot}9$; $\log(\log B) = 0{\cdot}1329S + 0{\cdot}2393$; $O = 1{\cdot}184V/D^3 - 97{\cdot}5 = 1{\cdot}131M/D^3 - 118{\cdot}7$, where *S* and *S'* are respectively the true *d* and *d* at the m.p., *F* is the m.p. in ° C., *B* is the b.p. in ° K., *O* is the octane no., *n* is the no. of C atoms in the mol., *V* and *D* are respectively the vol. and main diameter of the mol. in A., and *M* is the mol. mass in g. × 10^{-24}. C. R. H.

Vapour pressure of phosphorus between 0° and 20°. K. Fischbeck and H. Eich (Z. anorg. Chem., 1937, **235**, 83—88).—The v.p. of P has been measured at 0°, 10°, and 20° by the streaming method, the concn. of P vapour being determined iodometrically. The vals. are, in mm.: 20°, 0·0269; 10°, 0·0085; 0°, 0·0027. The heat of sublimation is 18·1 kg.-cal. per g.-mol. (P_4). F. J. G.

Vapour pressure of zinc chloride, lead chloride, and cadmium chloride in atmospheres of chlorine or nitrogen. D. N. Tarasenkov and G. V. Skulkova (J. Gen. Chem. Russ., 1937, **7**, 1721—1728).—The v.p. of $ZnCl_2$ in Cl_2 is < in N_2 at temp. < 700°, and > in N_2 at > 700°, that of $CdCl_2$ in Cl_2 is the same as in N_2 at < 850°, and < in N_2 at > 850°, and that of $PbCl_2$ in Cl_2 < in N_2 at 693—976°. R. T.

Influence of intensive desiccation on the vapour pressure of benzene. D. A. Lacoss and A. W. C. Menzies (J. Amer. Chem. Soc., 1937, **59**, 2676—2682).—The v.p. of C_6H_6 at 80° is lowered markedly by drying with P_2O_5 at room temp., but raised slightly if drying has been at 90° or 105°. On access of ordinary air, or on heating the liquid in the sealed apparatus out of contact with P_2O_5, the v.p. reverts to the normal val. No change of v.p. occurs if the substances used are not pure and free from dust, or if BaO or $Mg(ClO_4)_2$ is used as desiccant. No change in the v.p. of CCl_4, *n*-heptane, or *cyclo*hexane is observed under conditions which cause a change in the v.p. of C_6H_6. E. S. H.

Simplified general equation of state. G. Woolsey (J. Amer. Chem. Soc., 1937, **59**, 2743—2744).—For the particular val. of the crit. coeff., $n_0 = 3{\cdot}25$, to which all data may be converted by means of the stretch formula, the vol. coeff., *B*, may be set equal to zero. The new form then becomes $[P + A/(T^{1/2}V^2 + CT^{y}V + DT^2)]V = 3{\cdot}25T + KP + q \log\ [(P/T) + 1]$. The determination of the consts. is simplified. E. S. H.

First partial derivatives of thermodynamic functions. F. Lerman (J. Chem. Physics, 1937, **5**, 994).—Corrections (cf. A., 1937, I, 607). W. R. A.

Second virial coefficient of the different modifications of light and heavy hydrogen. II. Theoretical calculation. K. Schäfer (Z. physikal. Chem., 1937, **B**, **38**, 187—208).—A theoretical interpretation of the results previously published (A., 1937, I, 453) is offered. Using the methods of the statistical theory of gases and applying Schrödinger's equation for the collision of two gas mols. and the theory of perturbations an expression for the second virial coeff. is derived. This agrees with the data previously obtained and shows that the differences between the second virial coeffs. of normal and *p*-H_2 and those of normal and *p*-D_2, respectively, are negligible. For the representation of the second virial coeffs. of D and H over a wide temp. range exponential functions are necessary. R. C.

Polymerisation of gases and equations of state. L. Herman (Compt. rend., 1937, **205**, 1065—1067).—Variations of the vals. of *a* and *b* in van der Waals' equation at high pressures and low temp. are attributed partly to polymerisation, which tends to increase as the pressure increases; *a* and *b* decrease as pressure increases. J. A. D.

Distinction between physical coefficients in the perfect gas law. Graphical representation of coefficients and correct expressions for their numerical values. P. Milianitch (Bull. Soc. Chim. Yougoslav., 1937, **8**, 47—61).—Attention is directed to the necessity for distinguishing between the different vals. assumed by the gas const. according to the particular mass of gas considered. Similar distinctions are to be made between the Avogadro no. and related quantities. F. L. U.

Mechanical characteristics of halogenoanhydride molecules. G. P. Lutschinski (J. Gen. Chem. Russ., 1937, **7**, 2116—2127).—The η, sp. vol., and crit. vol. of a series of chlorides and oxychlorides of metalloids have been derived, and certain regularities are pointed out. R. T.

Theory of liquid structure. J. Hirschfelder, D. Stevenson, and H. Eyring (J. Chem. Physics, 1937, **5**, 896—912).—Mathematical. The equation of state previously obtained (A., 1937, I, 224) is extended and the process of fusion, viscous flow, and binary liquid systems are treated. W. R. A.

Influence of magnetic fields on the viscosity of gases. H. Senftleben and H. Gladisch (Ann. Physik, 1937, [v], **30**, 713—727).—The influence of magnetic fields (1000—6000 gauss) on the viscosity of O_2 and NO has been investigated. The effect increases with field strength to a saturation val., and is a function of the ratio, H/p, of field strength and gas pressure, as was previously observed (Senftleben and Pietzner, A., 1933, 559) for the effect of magnetic field on the thermal conductivity of gases. At low pressures (<100 mm.), the effect decreases with decreasing pressure. The ratio of viscosity and conductivity effects is const. over a wide range of vals. of H/p. A differential method for the measurement of very small changes in viscosity is described. O. D. S.

Radiation stress of transverse waves and viscosity of liquids. R. Lucas (Compt. rend., 1937, **205**, 1044—1047).—The components of the stress tensor in liquid waves have been deduced following the method of Brillouin in electromagnetism. The equation of state for fluids proposed by Debye and Ratnowsky is modified by an additional term to represent this stress. J. A. D.

Measurements of thermal diffusion in gas mixtures. G. Blüh, O. Blüh, and M. Puschner (Phil. Mag., 1937, [vii], **24**, 1103—1114).—The measurement of thermal diffusion in gas mixtures by an interferometer method is described. From the measured total separations for the mixtures H_2–CO_2, H_2–N_2, He–A, and He–Ne, the Chapman theory indices of the mol. repulsive forces are calc. and show good agreement with vals. obtained by other methods. K. S.

Diffusion of pairs of gases with molecules of equal mass. L. E. Boardman and N. E. Wild (Proc. Roy. Soc., 1937, **A**, **162**, 511—520).—The coeffs. of diffusion for the pairs N_2–CO and N_2O–CO_2 have been measured. Each pair consists of gases with similar physical properties so that a close approximation to self-diffusion is obtained. Measurement of the coeff. of diffusion for the pairs H_2–CO_2, H_2–N_2, and N_2–CO_2 gives vals. from which the coeffs. of self-diffusion of N_2 and CO_2 can be calc. Good agreement is obtained. G. D. P.

Theory of binary liquid mixtures. L. Frank (Z. Elektrochem., 1937, **43**, 914—915; cf. A., 1937, I, 516).—A theoretical expression is derived for the heat of vaporisation which is in accord with experiment for $CHCl_3$-C_6H_6 mixtures. J. W. S.

Van Laar's theory of binary mixtures. P. Drossbach (Z. anorg. Chem., 1937, **234**, 298—306).—Attention is called to the importance of the work of van Laar in combining the van der Waals equation with thermodynamic relations (cf., *e.g.*, A., 1910, ii, 583). F. J. G.

Cohesive energy of liquid mixtures. II. A. J. Staverman (Rec. trav. chim., 1937, **56**, 1189—1195; cf. A., 1937, I, 507).—A qual. explanation is offered of the relation between concn. and heat of mixing of two liquids one of which is polar. The theory is discussed with special reference to the observations of Wolf (*ibid.*, 138) on mixtures of C_6H_{14} with aliphatic alcohols. F. L. U.

Intra- and inter-molecular linkages studied in the near infra-red. Chemical consequences. J. Errera (Helv. Chim. Acta, 1937, **20**, 1373—1387).—A lecture. F. L. U.

Dependence of density and viscosity in the system Na_2O–SiO_2 on temperature. (Inner structure of glazes.) G. Heidtkamp and K. Endell (Glastech. Ber., 1936, **14**, 89—102; Chem. Zentr., 1936, i, 4345—4346).—Measurements of d and η for Na_2O–SiO_2 melts containing 12—60% of Na_2O up to 1650° afford no evidence of the existence of compounds in the liquid phase. η and d vary continuously with composition. The formation of true glasses is limited to the range 23—33% Na_2O. J. S. A.

Thermal conductivity of ferrous alloys. N. N. Kurnakov and S. D. Rachmanovski (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 757—769).—The thermal conductivity, k, of Fe is considerably depressed by Si. Various grades of ferrochromium with 0·11—6·25% C have similar vals. of k. For ferromolybdenum k varies little with the origin or grade. R. C.

Magnetic properties of iron–rhodium alloys. M. Fallot (Compt. rend., 1937, **205**, 558—560; cf. A., 1937, I, 559).—Alloys with 0—60 at.-% Rh are discussed in relation to their α–γ and γ–α transformation temp., Curie points, and mean at. moments. The γ–α transformation temp. has a min. val. of 550° at 15—20 at.-% Rh. With $<$6·5 and $>$28 at.-% Rh the alloys are reversible in the neighbourhood of their Curie points; with 6·5—23 at.-% Rh they are irreversible and resemble the ferronickels. The mean at. moment increases linearly with [Rh] for 0—20 at.-%. A. J. E. W.

Influence of pressure on the Curie point of nickel–copper alloy. A. Michels, A. Jaspers, J. de Boer, and J. Strijland (Physica, 1937, **4**, 1007—1016).—From measurements of the resistance of Cu–Ni alloy (Ni 70%) at pressures between 0 and 2615 atm. in the neighbourhood of the Curie point, the latter is found to increase with increasing pressure at the rate of 6×10^{-5} degree per atm. The result is discussed with reference to recent theories of ferromagnetism. F. L. U.

***X*-Ray investigation of the cause of high coercivity in iron–nickel–aluminium alloys.** A. J. Bradley and A. Taylor (Nature, 1937, **140**, 1012—1013).—*X*-Ray examination of slowly cooled Fe–Ni–Al alloys shows considerable divergences from Köster's diagram (A., 1933, 1238) and a revised diagram is given. When slowly cooled, these alloys break up into two body-centred cubic lattices of different composition, and so long as the structure remains coherent the Fe atoms are held apart in a condition of considerable strain which is the essential cause of high coercivity. L. S. T.

Microstructure and hardness of alloys consisting essentially of iron, chromium, and silicon. A. G. H. Andersen and E. R. Jette (Amer. Inst. Min. Met. Eng., Tech. Pub. 853, 1937, 8 pp.; Met. Tech., 1937, **4**, No. 7).—In the regions where the σ-phase ppts. from the α-phase the mode of occurrence of the σ-phase varies with the conditions and in turn influences the hardness of the alloy. Photomicrographs of some typical structures are shown. Hardness vals. for Fe–Cr–Si alloys with and without additions of C, Ni, or Mn are tabulated. In certain ranges the ternary alloys may be hardened by pptn. of the σ-phase from the α-phase. Age-hardening data are given. R. B. C.

***X*-Ray study of effects of adding carbon, nickel, or manganese to some ternary iron–chromium–silicon alloys.** E. R. Jette and A. G. H. Anderson (Amer. Inst. Min. Met. Eng., Tech. Pub. 852, 1937, 15 pp.; Met. Tech., 1937, **4**, No. 7).—The influence of the added metals on the α-Fe phase and the boundary between this phase and the $\alpha + \sigma$ two-phase region has been examined. The solubility of C in the α-phase is about 0·02—0·04%. The influence of Ni (up to 2·0%) or Mn (up to 4·6%) on the solubility surface of the α-phase and on the lattice parameters of both α- and σ-phases is practically negligible. No tendency to form austenite could be detected by either *X*-ray diffraction or microscopic methods even at the highest concn. of C, Ni, or Mn. The results indicate that addition of Ni or Mn for improving individual properties may be made without changing other characteristics of the alloy. R. B. C.

Structure of bismuth–cadmium, tin–zinc, tin–cadmium, and aluminium–silicon eutectics. M. Straumanis and N. Brakšs (Z. physikal. Chem., 1937, **B**, **38**, 140—155; cf. A., 1936, 23).—In the first three the constituents form parallel monocryst. layers, or rods, which are associated to form eutectic fibres or laminæ. The tendency to form layers in the crystallisation of a eutectic is greatest with metals having crystals of a low degree of symmetry; in Al there are many equiv. directions and the tendency for unidirectional growth is relatively small. The development of layers is also determined by the atoms from the melt diffusing by the shortest path to the point of crystallisation. If the eutectic temp. is far below the m.p. of one component (*e.g.*, Si in the system Al–Si), that component separates in the form of minute unoriented crystals, distributed throughout the eutectic. R. C.

Physico-chemical analysis of the system lead–cadmium. B. G. Petrenko and E. E. Tscherkaschin (Ukrain. Chem. J., 1937, **12**, 385—396).—The fusion and conductivity diagrams do not suggest compound formation. The solubility of Cd in Pb is $<$2% at 50°, and between 3 and 6% at 200°. R. T.

Physico-chemical investigation of lead–bismuth alloys. N. S. Kurnakov and V. A. Ageeva (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 735—742; cf. A., 1937, I, 30).—The equilibrium diagram has been determined. The max. concn. of Pb in solid solution in Bi is 2%. A β-phase is formed by a peritectic reaction at 182° and in slowly cooled alloys exists over a concn. range of 65—70% Pb. It may be regarded as a solid solution of Bi in a hexagonal form of Pb unstable in the pure state, or as a solid solution in some compound, probably Pb_3Bi. The max. concn. of the solid solution of Bi in Pb is 20% Bi. R. C.

Platinum–manganese alloys. V. A. Nemilov, T. A. Vidussova, and M. N. Pivovarova (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 743—752).—The f.p. curve is that of a system with complete miscibility in the solid state, and the liquidus and solidus curves have a min. The hardness–composition and temp. coeff. of the electrical resistance–composition curves show that at high temp. there is complete miscibility in the solid state, but at lower temp. the compounds $PtMn_4$, PtMn, and Pt_3Mn are formed. These form solid solutions with each other, and $PtMn_4$ forms solid solutions with Mn and Pt_3Mn with Pt. R. C.

***X*-Ray examination of platinum–ruthenium alloys.** N. V. Ageev and V. G. Kuznetzov (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 753—755).—Solid Pt dissolves 70 at.-% or more of Ru to form a single solid phase. R. C.

Magnetochemical studies. XXVI. Magnetic investigation of the system chromium–sulphur. H. Haraldsen and A. Neuber (Z. anorg. Chem., 1937, **234**, 337—352).—The magnetic properties of Cr–S preps. having between 33·3 and 59·7 at.-% S have been studied. With 52·4 at.-% S χ is independent of *H* and varies only slightly with temp. From 53·5 to 57·1 at.-% S ferromagnetism occurs over a range of temp. having not only an upper but also a lower limit. In the paramagnetic region above the upper temp. the Curie–Weiss law is not obeyed. At the lower limiting temp. ($-106°$ to $-122°$) χ falls very abruptly. No explanation of this abnormal behaviour can be advanced. At 57·1 at.-% S these abnormalities disappear, but specimens having 59·7 at.-% S become ferromagnetic at approx. $-150°$, and above this temp. they do not obey the Curie–Weiss law. The isotherms all have a sharp max. at 54—54·5 at.-% S, and at temp. above 20° there is a second max. at 50 at.-% S. These relations are compared with those shown by the Fe–S system. F. J. G.

Phase relationships in the system chromium–sulphur. H. Haraldsen (Z. anorg. Chem., 1937, **234**, 372—390).—With a view of elucidating the magnetic relationships (cf. preceding abstract) the system Cr–S has been studied by means of *X*-rays. There are two homogeneous ranges (α- and β-phases) which extend from 50 to 54 and from 54 to 59·7 at.-% S, respectively. CrS has a hexagonal super-lattice containing 24 mols. (*a* 12·00, *c* 11·52 A.). With increasing [S] up to 54 at.-% this passes continuously into the simple NiAs structure with *c/a* 1·665—1·670. The β-phase is monoclinic up to 57·1 at.-% S, then passes continuously into a NiAs structure having *c/a* 1·625, and this extends up to 59·7 at.-% S. In the α-phase the mixed crystal formation involves both addition of S atoms to vacant spaces and subtraction of Cr atoms, but in the β-phase only the latter process. The ferromagnetism at 54 at.-% S is due to the presence of the max. no. of vacant spaces in the Cr lattice that is possible without a change of structure, and the prep. with 59·7 at.-% S, which is ferromagnetic at low temp., also has a NiAs structure with many vacant spaces in the Cr lattice. F. J. G.

Magnetochemical studies. XXVII. Magnetic and röntgenographic investigations in the system chromium–tellurium. H. Haraldsen and A. Neuber (Z. anorg. Chem., 1937, **234**, 353—371).—Cr–Te preps. with 50 to 58·3 at.-% Te are ferromagnetic below 20°, whilst with 60 at.-% ferromagnetism is found at lower temp. The dependence of χ on temp. is that of typical ferromagnetic substances and the Curie–Weiss law holds above the Curie point. This lies between 70° and 80° for $<57·1$ at.-% Te, and then falls to $-80°$ at 60 at.-% Te. There are two homogeneous regions (α- and β-phases) extending from 50 to 54 and from 54 to 60 at.-% Te, respectively. The α-phase has the NiAs structure; the β-phase has a monoclinic structure up to 58·3 at.-% and then passes continuously into a NiAs structure. The max. of the χ-isotherms corresponds with the transition between the two phases. These relations are compared with those in the Cr–S system (cf. preceding abstract). F. J. G.

Application of the laws of displacement of equilibrium to heterogeneous liquid mixtures. P. M. Monval (Compt. rend., 1937, **205**, 1154—1156).—The changes of mutual solubility with temp. and pressure in the systems NH_2Ph–*cyclo*hexane, C_6H_{14}–$PhNO_2$, and NEt_3–H_2O are considered and compared with the systems KNO_3–H_2O and NH_4Cl–H_2O. A. J. E. W.

Concentrations, total and partial vapour pressures, surface tensions, and viscosities in the systems phenol–water and phenol–water–4% succinic acid. A. N. Campbell and A. J. R. Campbell (J. Amer. Chem. Soc., 1937, **59**, 2481—2488).—The temp.–composition and v.p.–composition diagrams have been determined. Comparison of the observed partial pressures with those calc. from Raoult's law indicates that PhOH accumulates at the free surface of the solution, where at a total [PhOH] of about 10%, it forms a practically continuous layer, which persists at all higher [PhOH]. This conclusion is confirmed by measurements of σ and η. Addition of succinic acid appears to have no effect on the establishment of the PhOH layer, but otherwise the PhOH appears to be more uniformly distributed in the body of solution; the deviation of observed from calc. partial pressures is even greater than with PhOH–H_2O. E. S. H.

Solubility of citric and tartaric acids in water. L. H. Dalman (J. Amer. Chem. Soc., 1937, **59**, 2547—2549).—Data are recorded for 0—100°. The curve for citric acid consists of two straight lines intersecting at 35·8°; the solid phase above the transition temp. is anhyd. citric acid and that below 35·8° is the monohydrate. The curve for tartaric acid is a straight line, corresponding with the anhyd. acid. E. S. H.

Solubility of rotenone. II. Data for additional solvents. H. A. Jones and S. Love (J. Amer. Chem. Soc., 1937, **59**, 2694—2696; cf. A., 1930, 1043).—Data at 25° are recorded for 55 solvents, and at 0—65° for CCl_4. The calc. heat of dissolution of the rotenone–CCl_4 solvate in CCl_4 is 8400 g.-cal. per mol. E. S. H.

Action of sodium glycocholate on fatty acids and soaps. I. Dissolving action of glycocholate.—See A., II, 46.

Kinetics of crystallisation. G. Birstein and M. Blumenthal (Bull. Acad. Polonaise, 1937, **A**, 399—421).—The rate of crystallisation of $C_6H_2(NO_2)_3{\cdot}OH$ from H_2O and $CHCl_3$; fumaric acid from H_2O; p-$C_6H_4(OH)_2$ from glycerol and H_2O; $(CH_2{\cdot}CO_2H)_2$ from H_2O, $C_5H_{11}{\cdot}OH$, and paraldehyde at 25—50° has been measured. The rate of crystallisation const. k is derived from $dx/dt = k(a - x)^n$ where $n = 1, 2, 3$, or 4. F. J. L.

Diffusion of hydrogen through carbonyl iron at temperatures from 800° to 1100°. C. B. Post and W. R. Ham (J. Chem. Physics, 1937, **5**, 913—919).—The diffusion (D) of H_2 through H_2-purified carbonyl Fe shows breaks in the log D–$1/\theta$ curves at certain temp., which fall on a straight line and can be fitted to a Balmer type formula. W. R. A.

Adsorption isotherms and heats of absorption of oxygen and carbon monoxide on charcoal in the temperature range 90—50° K. A. van Itterbeek and W. van Dingenen (Physica, 1937, **4**, 1169—1180; cf. A., 1937, I, 357, 510).—Adsorption isotherms determined for 5° temp. intervals, are found to agree with the Freundlich equation. The val. of $1/n$ decreases regularly with decreasing temp. in the case of O_2, but exhibits a max. near the transition point at 61·5 K. for CO. The heat of adsorption shows the usual hyperbolic relation to pressure for both gases. F. L. U.

Pressure of permanent gases at low temperatures in presence of silica gel. R. Delaplace (Compt. rend., 1937, **205**, 664—665; cf. A., 1937, I, 453).—Data for O_2, N_2, CO, and CH_4 at −182° to −134° are recorded, and a method of separating O_2 and N_2 from CO and CH_4 is suggested. A. J. E. W.

Simple formulæ relating to adsorption phenomena in mixtures. A. Boutaric (Compt. rend., 1937, **205**, 1149—1151).—Theoretical. Assuming Perrin's adsorption formula, equilibria between a solid adsorbent and two gaseous or liquid media are considered. A. J. E. W.

Dependence of exchange adsorption on dilution. E. N. Gapon and A. E. Prianischnikova (Kolloid. Shurn., 1937, **3**, 347—353).—Calculation shows that variation in the quantity of desorbed ions with change in vol. of a solution which contains a fixed amount of adsorbable ions is determined exclusively by the valency of the ions which are adsorbed or desorbed. Experiments with zeolites are described and the following systems are investigated: (1) XCa + NH_4Cl; (2) XCa + $BaCl_2$; (3) XH + $BaCl_2$. In (1), with increasing dilution the quantity of Ca desorbed falls, in (2) there is no change, whilst in (3) substitution of H by Ba increases. D. G.

Use of low-temperature van der Waals adsorption isotherms in determining the surface areas of various adsorbents. S. Brunauer and P. H. Emmett (J. Amer. Chem. Soc., 1937, **59**, 2682—2689).—Adsorption isotherms for A and N_2 at −195·8°, A, N_2, CO, and O_2 at −183°, CO_2 at −78°, and n-butane and SO_2 at 0° have been determined for a variety of adsorbents. All the adsorbents except C give S-shaped isotherms. Consistent vals. for the surface area are afforded by the different isotherms for the same adsorbent. E. S. H.

Adsorption by van der Waals forces and surface structure. J. H. de Boer and J. F. H. Custers (Physica, 1937, **4**, 1017—1024; cf. A., 1935, 2).—Consideration of experimental data already published leads to the conclusion that for adsorption by purely non-polar van der Waals forces to occur a porous structure is necessary. F. L. U.

Adsorption theory of phenomena of dissolution. A. Basiński (Rocz. Chem., 1937, **17**, 567—577).—Theoretical. R. T.

Adsorption of ions of water by precipitates. I. I. Tananaev and N. I. Mirianaschvili (J. Appl. Chem. Russ., 1937, **10**, 1921—1930).—A new type of adsorption, termed hydrolytic adsorption, is presented in the pptn. of CaF_2 on mixing NaF and $CaCl_2$ in aq. solution, when the latter becomes acid, as a result of adsorption of OH′ by the ppt.; a method for the potentiometric titration of F′, based on pptn. of CaF_2 or SrF_2 in aq. EtOH, is described. R. T.

Intermolecular forces in two-dimensional systems. R. C. L. Bosworth and E. K. Rideal (Physica, 1937, **4**, 925—940; cf. A., 1937, I, 301, 511).—Surface spreading forces are discussed. Special importance is attached to the contact potential method in studying surface films. F. L. U.

Surface activity and structure of adsorption layers of multivalent soaps. L. R. Solovjeva (Kolloid. Shurn., 1937, **3**, 303—308).—The surface activities and mol. consts. for Ca, Mg, and Al oleates and stearates have been determined. The surface activities of Ca and Mg soaps are approx. equal, but are 4—8 times that of Al soaps. Oleates are more active than stearates. Graphs and tables are given. D. G.

Blue sorbates of iodine on some acetates, benzoates, and hydroxides, especially potassium and rubidium acetates. A. Kutzelnigg and W. Wagner (Z. anorg. Chem., 1937, **234**, 150—154).—KOAc and $Sr(OH)_2$, when quite dry, are coloured brown by I, but in presence of traces of H_2O the colour is blue. KOAc, AcOH, and RbOAc behave similarly, but other acetates and the K salts of other fatty acids and of substituted fatty acids do not. In addition to a definite chemical structure of the anion, a definite ionic radius of the cation is necessary for the formation of a blue colour. F. J. G.

Contact potentials of multilayer films on metal plates. E. F. Porter and J. Wyman, jun. (J. Amer. Chem. Soc., 1937, **59**, 2746—2747).—Measurements of contact potential support the view that the X and Y films of multilayers of stearic acid on metal plates have different orientations (cf. A., 1937, I, 458). E. S. H.

Copper oxide films. H. A. Miley (J. Amer. Chem. Soc., 1937, **59**, 2626—2629).—The thickness of the films produced by heating Cu in the air is determined by measuring the no. of millicoulombs required for their cathodic reduction. The parabolic law $y^2 = kt + A$, connecting film thickness and time of heating, is valid only for short periods; A is not zero for abraded surfaces. The film on heat-tinted Cu may contain CuO and Cu_2O, but under strongly oxidising conditions a sooty film (presumably CuO) obscures the later colours. E. S. H.

Flow of surface unimolecular layers. M. Joly (J. Phys. Radium, 1937, [vii], **8**, 471—476).—Adaptation of the method of capillary discharge at surface layers shows that layers possess a resistance to discharge. This type of superficial viscosity of unimol. layers is characteristic of their nature and physical state. Unimol. layers of certain triglycerides have been investigated. W. R. A.

Measurement of speed of spreading of drops of aqueous solutions on mercury. R. S. Burdon, G. R. Fuller, and E. S. H. Gibson (Trans. Faraday Soc., 1937, **33**, 1528—1531).—Photography with a cinema camera shows that for a given concn. the drop spreads with nearly uniform speed; the speed increases with increasing concn. and is accelerated slightly as the drop reaches about 3 cm. diameter. The results are discussed in relation to measurements of interfacial tension. E. S. H.

Spreading with uniform acceleration. W. D. Allen, K. Grant, and R. S. Burdon (Trans. Faraday Soc., 1937, **33**, 1531—1532).—Heavy paraffins, after irradiation with ultra-violet light even in absence of air, spread on a H_2O surface. Initially the rate of increase of surface ∝ the area already covered, but after the diameter of the drop has reached 1 cm. an exact linear relation holds between the diameter and the square of the time. E. S. H.

Surface energy and flotation. S. G. Mokruschin (Kolloid. Shurn., 1937, **3**, 291—296).—The mechanism of flotation with particular reference to the manner of adhesion of the mineral particles to the air bubbles, with formation of foams, is discussed. It is considered that the "laminar theory," *i.e.*, film to film adhesion, is the most probable explanation of the process. D. G.

Relation between surface phenomena and dissociation constant of weak electrolytes in aqueous solutions. B. Kamienski (Bull. Acad. Polonaise, 1937, **A**, 422—429).—The influence of $[H^{\cdot}]$ on the dielectric potential and surface tension of solutions of org. acids, bases, and amphoteric electrolytes is discussed theoretically. Two types of isoelectric point are foreseen in amphoteric electrolytes and are typified by narceine and hydrocupreine. F. J. L.

Thermodynamical considerations on the dielectric potential and surface tension. B. Kamienski (Bull. Acad. Polonaise, 1937, **A**, 430—440).—The p.d. at a H_2O-air interface is determined by the orientation of the H_2O dipoles; the no. of oriented H_2O dipoles decreases on addition of capillary-active substances and this produces a change in dielectric const. at the interface. The function connecting the p.d. and surface tension is complex and depends on the electrochemical behaviour and capillary activity of the solute. The p.d. at the H_2O-air interface is estimated at 600—1100 mv. by extrapolation. F. J. L.

Heats of wetting of cellulose by alcohols and their aqueous solutions. J. L. Morrison, W. B. Campbell, and O. Maass (Canad. J. Res., 1937, **15**, **B**, 447—456).—The heat of wetting (H) of cellulose by MeOH, EtOH, $Pr^{\alpha}OH$, and $Pr^{\beta}OH$, and aq. solutions of the alcohols, has been determined at 25°. H is linear for 0—100% of MeOH, but for the other alcohols H is linear only for 0—80 mol.-% of alcohol, and at >80 mol.-% H decreases. H for pure MeOH is comparable with that for H_2O, but for the other alcohols is very much less, and decreases in the order of increasing mol. wts. The time of evolution of $0{\cdot}75H$, as calc. from the equation $H - H_t =$ const. $\times \log t$ ($t =$ time), is 1·5 × the val. for H_2O in the case of MeOH, but the remaining alcohols require much greater times for the evolution of $0{\cdot}75H$. Solutions of the alcohols higher than MeOH require rapidly increasing times for the evolution of $0{\cdot}75H$ at 75—80 mol.-% of alcohol. Desorption experiments were also made with cellulose containing 7—8% of H_2O which was immersed in pure alcohol, when a cooling effect was observed. It is inferred that H_2O is preferentially adsorbed by cellulose. R. S. B.

Capillary systems. XIX (5). Permeability of channelled and latticed capillary systems for gases. E. Manegold (Kolloid-Z., 1937, **81**, 269—294; cf. A., 1938, I, 27).—Experimental data relating to the permeability of porous systems are discussed and recalc. when necessary in c.g.s. units. The sp. permeability (P) (= permeability × thickness × η of gas or liquid) is an important structural const. for the system considered. The systems reviewed include paper and membranes with a cellulose basis, wood, leather, SiO_2 gel, minerals, artificial stone and bricks, constructional and heat-insulating materials, powders, soils, silk fabric, and graphite. Measurements of P are made more easily and rapidly with gases than with liquids, and are better suited to characterise a given capillary system. P is independent of the nature and temp. of the fluid used, except when the channels in the material are very fine or when the substance itself is turgescible, in which case P (liquid) is < P (gas). F. L. U.

Metal membranes. Silver membranes. F. A. Santalov and R. E. Neuman (Kolloid. Shurn., 1937, **3**, 273—280).—Ag-Zn plates containing 74—77 wt.-% Ag were heated in vac. at 650—700° and the total vol. of the pores in the remaining Ag plate calc. (*a*) by comparing the *d* of the plate in H_2O before and after treatment, and (*b*) by subtracting from the vol. of the evaporated metal the shrinkage due to recrystallisation. The pore vol. is max. (about 23%) after heating for about 4 hr., when the evaporation of Zn is nearly complete and the recrystallisation of Ag still small. The radius of the pores measured by Bechhold's method is, *e.g.*, 7×10^{-6} cm. after 1½ hr. and $>10^{-4}$ cm. after 6 hr. of heating. All the membranes are permeable to methylene-blue. J. J. B.

Thermodynamic analysis of ultrafiltration. Ultrafiltration of sucrose and colloidal solutions.

L. B. Flexner (J. Biol. Chem., 1937, **121**, 615—630).—The free energy changes during ultrafiltration are said to be related to the partial molal vols. of the substances in the mother-liquor, the pressure during filtration, and the activities of the substances in the mother-liquor and filtrate. The theory is confirmed by data for aq. sucrose and casein and gum-arabic sols. The ultrafiltrate of a colloidal solution is equiv. in composition to a dialysate only when the filtration pressure is very low and the membrane sufficiently permeable. The equation derived can be used to decide whether the components of a body-fluid satisfy the requirements of an ultrafiltrate of blood-plasma. J. W. S.

Increase in the dipole moment of a diatomic molecule on dissolution in a non-polar liquid. F. Fairbrother (Trans. Faraday Soc., 1937, **33**, 1507—1513).—The secular equation for a linking of mixed type is derived, and it is shown that the increase in dipole moment can be accounted for by the lowering of the energy levels of the ionic state relative to the covalent state by the solvation effect of the medium. E. S. H.

Partial molal volumes of potassium chloride, potassium bromide, and potassium sulphate in sodium chloride solutions. H. E. Wirth (J. Amer. Chem. Soc., 1937, **59**, 2549—2554).—Data are recorded for solutions up to a vol. ionic strength of 1 at 25°. The partial mol. vols. of KCl and KBr depend only on the total vol. ionic strength of the solution; that of K_2SO_4 depends on the vol. ionic strength in dil. solutions, but in more conc. solutions of NaCl it is $>$ the val. in H_2O. E. S. H.

Vapour pressures and partial molal volumes of aqueous solutions of the alkali sulphates at 25°. J. N. Pearce and H. C. Eckstrom (J. Amer. Chem. Soc., 1937, **59**, 2689—2691).—V.p. and *d* of aq. Li_2SO_4, Na_2SO_4, and K_2SO_4 have been determined and the activity of the solvent, mean activity coeffs., and partial and apparent mol. vols. of the solutes calc. E. S. H.

Measurement of turbidity in coloured media. F. W. Zerban and L. Sattler (Science, 1937, **86**, 501).—A formula for the abs. turbidity of a coloured solution is given. L. S. T.

Viscosity of suspensions and solutions. F. Eirich and R. Simha (Monatsh., 1937, **71**, 67—94).—A summary. J. W. S.

Electron microscope as an aid in colloid studies. D. Beischer and F. Krause (Naturwiss., 1937, **25**, 825—829).—A review.

Electron microscope as an aid to colloid research. D. Beischer and F. Krause (Angew. Chem., 1937, **50**, 933—934).—The more detailed structure of a system given by the greater resolving power of the electron microscope is illustrated by reference to a Au ruby glass, the formation of fibrous Fe and Ni by the decomp. of $Fe(CO)_5$ and $Ni(CO)_4$, and an electrolytically-prepared and etched Ag membrane. L. S. T.

Pure colloidal carbon. J. Milbauer (J. Chim. phys., 1937, **34**, 691).—Colloidal C, prepared by the action of hot conc. H_2SO_4 on C_2H_2 and sucrose, has been examined with reference to the purity of the product. I. McA.

Preparation of a pure silver iodide sol. J. Eeckhout (Natuurwetensch. Tijds., 1937, **19**, 237—242).—Small amounts of $Fe^{\cdots}$, $Pb^{\cdot\cdot}$, and $Zn^{\cdot\cdot}$ present in AgI sols are found to be derived from the H_2O used in the electrodialysis. H_2O which has been repeatedly distilled in SiO_2, Pyrex, or Jena glass apparatus contains these metallic impurities, which are entrained in the vapour. Zn may also be derived from the rubber connexions used in the apparatus. Purer AgI sols have been prepared by using a limited amount of H_2O and a longer time for electrodialysis. S. C.

Formation of colloids by hydrogen. C. Zenghelis and E. Stathis (Compt. rend., 1937, **205**, 982—983).—Stable sols of Ag, Au, Pt, and Pd are obtained by reducing the appropriate aq. salts at 60° with Al and NaOH in presence of gum. E. S. H.

Influence of size of colloidal particles on their optical anisotropy. W. Heller (Compt. rend., 1937, **205**, 971—973).—Measurements of the birefringence and dichroism of α-Fe_2O_3 sols show that there is a spectral displacement of these effects in the direction of longer λ as the size of the particles increases. E. S. H.

Effect of high-frequency electric field on colloids. I. J. Schaferstein (Kolloid. Shurn., 1937, **3**, 181—186).—A high-frequency field (λ 3—12 m.) has no detectable influence on the viscosity, p_H, conductivity, surface tension, resistance to pptn., or protective power of blood-serum. R. C.

Influence of ultrasonic waves on colloidal phenomena. IV. Peptisation of mercuric sulphide. N. Sata and Y. Niwase (Kolloid-Z., 1937, **81**, 294—300; cf. A., 1938, I, 29).—The peptisability of pptd. and washed HgS is not affected by boiling with H_2O unless it is alternately boiled and washed (hot) by decantation. It then becomes stable towards H_2S, and after 40—50 days' treatment, stable also towards ultrasonic waves. The peptisability is attributed to minimal quantities of a third substance at present unidentified. F. L. U.

Nature of the inactivation of ions in solutions of lyophilic colloids. A. M. Kotschanovski (Kolloid. Shurn., 1937, **3**, 321—326).—The pptn. of AgCl from solutions of $AgNO_3$ in gelatin, agar, and starch by solutions of NaCl is studied. A simple and visual qual. method for determining the inactivation of ions by lyophilic colloids is described. It is found that inactivation is due to the adsorption of ions by the micelles of lyophilic colloids. D. G.

High-frequency conductivity of colloidal electrolytes. III. Dispersion of the conductivity of caseinate solutions. G. Schmid and T. R. Aalto (Z. Elektrochem., 1937, **43**, 907—914; cf. A., 1936, 1461, 1466).—The conductivities of alkaline and alkaline-earth caseinates have been measured at frequencies corresponding with 12, 20, 50, and 100 m. The results support the theory previously advanced. J. W. S.

Characteristic properties of acidic substances in colloidal solution as distinguished from

molecularly dispersed acids. J. N. Mukherjee, R. P. Mittra, and S. Mukherjee (Kolloid-Beih., 1937, 47, 1—90).—A review of previously published work (cf. A., 1933, 460, 1116; 1934, 729; 1935, 1202). F. L. U.

Dielectric measurements with hydrophilic colloids. III. Measurements with wavelength 0·857 m. H. R. Kruyt and J. T. G. Overbeek (Kolloid-Z., 1937, **81**, 257—269; cf. A., 1937, I, 615; 1938, I, 29).—Apparatus and procedure are described. The accuracy of the measurements is 0·1—0·2%. The lowering of ϵ by dissolved Na arabinate, Na-agar, sol. starch, ovalbumin, and gelatin is $\propto$ the concn. In the range 20—49° ϵ increases with rise of temp. except for starch and ovalbumin, which are not affected. Little or no change is produced by alteration of p_H (gelatin and ovalbumin), gelatinisation (gelatin, agar), addition of tannin, complex coacervation, or reduction of the ζ-potential by electrolytes. The general conclusion is that hydration does not give rise to a decrease of ϵ, but probably to a slight increase. F. L. U.

Coalescence of aërosols of water by chemically hygroscopic substances. V. I. Saitschuk and O. G. Narskich (Kolloid. Shurn., 1937, **3**, 231—245).—A mist of H_2O was found to be stable for 5 min., that of 1% NaCl solution for 22 min., and that of 50% $CaCl_2$ solution for 131 min. After introduction of a fine dust of NH_4NO_3, $NaNO_3$, $CaCl_2$, etc. the H_2O mist collapsed within 10 sec. J. J. B.

Emeraldin sols. III. Influence of the acidity of the solution when oxidising aniline on the dispersity, colour, and amount of oxidation products. V. Ptschelin (Kolloid. Shurn., 1937, **3**, 247—255; cf. A., 1936, 1068).—Oxidation of NH_2Ph by CrO_3 in aq. HCl gives a blue substance which gradually changes into emeraldin. J. J. B.

Isothermal and reversible immobilisation of the particles in thixotropic sols. W. Heller and (Mlle.) G. Quimfe (Compt. rend., 1937, **205**, 1152—1154).—Cessation of Brownian movement in thixotropic sols containing magnetic, anisotropic particles can be followed by observing the birefringence or dichroism produced in a magnetic field, the dichroism decreasing as solidification proceeds. A. J. E. W.

Properties of polymerides in solution. VII. Solubility of homologous series and homologous polymerides. VIII. Micelle formation in solutions of substances with chain-like molecules. IX. Gelatinisation. K. H. Meyer and A. van der Wyk (Helv. Chim. Acta, 1937, **20**, 1313—1320, 1321—1330, 1331—1334; cf. A., 1937, I, 413).—VII. The solubility of the higher paraffins in non-polar solvents can be represented by $N_2 = Ae^{-Bz}$, in which N_2 is the mol. fraction and z the no. of C atoms in the solute, and A and B are consts. related to the heat of fusion per C atom, the m.p., and the gas const. The expression, which, although not empirical, involves simplifying approximations, agrees satisfactorily with observation for $C_{34}H_{70}$ and $C_{60}H_{122}$ at different temp. The solubility of amorphous liquid polymerides is determined mainly by their mol. heat of dilution. Ostwald's "solid-phase rule" is a necessary consequence of the mol. heterogeneity of the substances to which it applies.

VIII. The chief cause of micelle formation between long chain mols. carrying a H_2O-sol. group is the cohesion of the solvent. By applying the law of mass action an expression is deduced from which can be calc. the distribution of wt.-concn. of micelles of varying complexity. Curves are drawn to show this distribution for different vals. of the association const. The osmotic effects (mean mol. wt., van 't Hoff factor) calc. from the curves are in agreement with those obtained cryoscopically.

IX. Temp.-reversible gelatinisation in solutions of soaps, starch, and gelatin is susceptible of a simple explanation in terms of a large % change in solubility over a small temp. range, which is characteristic of long-chain compounds. F. L. U.

Lyophilic colloids. XXVIII. Comparative study of solutons of amylose, amylophosphoric acid, and cellulose. P. Koets and H. R. Kruyt (Kolloid-Beih., 1937, **47**, 100—132; cf. A., 1936, 1200).—Addition of aq. NaOH to a solution of amylose (I) first increases the η to a max. at 0·12N, beyond which η falls at a decreasing rate, becoming nearly const. at 1·2N. This behaviour is correlated with the ζ-potential of the particles, measured by the amount of hexol nitrate required to produce electrokinetic neutrality. From these and other observations it is inferred that in H_2O the dissociation of the OH groups of (I) is too slight to produce the ζ-potential required for stability. Addition of NaOH, by removing $H^{\cdot}$, results in increased dissociation and leads to a stable sol being formed between 0·12 and 0·13N-NaOH. Further increase of [NaOH] leads to attack of intramicellar OH groups and disruption of the micelles, whilst the smaller particles thus formed build up a double layer which gives rise to a high ζ-potential and to considerable hydration. Dehydration, leading to gelatinisation, is effected by addition of EtOH or by NaOH concns. >3·5N. Addition of HCl to (I) suppresses dissociation of the OH groups, but when the suppression is complete a residual electrokinetic activity persists, which is attributed to oriented H_2O dipoles. In amylophosphoric acid the degree of ionisation is sufficient to enable a stable sol to be formed in H_2O without the addition of NaOH. Cellulose, freshly regenerated from the xanthate, forms stable dispersions in aq. NaOH between 1·5 and 3·6N. It is shown by analysis that with increasing [NaOH] a gradual exchange of $Na^{\cdot}$ and $H^{\cdot}$ occurs until, at 3·5N-NaOH, the cellulose contains 3 combined Na atoms per glucose residue. This complete exchange is shown only by freshly regenerated cellulose. F. L. U.

Solubility and swelling of cellulose and of its derivatives. II. E. Gut and Z. Rogovin (Kolloid. Shurn., 1937, **3**, 327—335).—A general discussion of the solubility and swelling of cellulose and its derivatives when the solvent is (*a*) a pure liquid and (*b*) a mixture of different liquids. D. G.

Mechanism of deformation and fine structure of hydrocellulose. II. Mechanism of deformation, anisotropy of swelling, and mechanical properties of strongly swollen hydrocellulose

gels. P. H. Hermans and A. J. de Leeuw (Kolloid-Z., 1937, **81**, 300—326; cf. A., 1938, I, 29).—The prep. of isotropic threads of cellulose xanthate and of hydrocellulose is described. Such threads have been used in determinations of swelling anisotropy at various degrees of extension and in the examination of their elastic properties. The results are incompatible with the conception of independent rotatable particles imbedded in a viscous medium but are in substantial agreement with deductions from a theory which assumes a network of thread-like particles attached at their points of intersection. The micelles in a cellulose xanthate sol are partly cryst. and partly amorphous (bundles of parallel oriented mols. with frayed ends), a proportion of the latter becoming attached during gelatinisation. Extension of the coagulum results in an increasingly parallel alignment of the micelles, and brings into play fresh points of attachment, so that the degree of swelling decreases with increase of extension. The fraction of the total extension which is truly elastic decreases with increasing extension, reaching a min. at 60—70% extension. Measurements of the double refraction afford qual. confirmation of the deductions from the swelling experiments. F. L. U.

Deformation mechanism, swelling anisotropy, and fine structure of hydrous cellulose gels. P. H. Hermans and A. J. de Leeuw (Naturwiss., 1937, **25**, 794—795; cf. A., 1937, I, 515).—The work of Kratky (A., 1935, 286) is acknowledged. A. J. M.

Vapour pressure and bound water of starches. Z. P. Tschescheva (Kolloid. Shurn., 1937, **3**, 121—127).—The H_2O content–v.p. curves for potato, maize, and wheat starches have been determined, and the radii of the capillaries calc. Determination of the H_2O-binding power by Dumanski's method (A., 1934, 26) has shown that potato starch binds most H_2O and maize starch least. This method probably gives more trustworthy results than the v.-p. isotherms for the amount of bound H_2O, since in the isotherms it is difficult to distinguish between capillary condensation and sorption. R. C.

Effect of temperature on hydration of potato starch. T. A. Granskaja and N. E. Sakun (Kolloid. Shurn., 1937, **3**, 117—120).—The power of starch to bind H_2O, derived from the change produced in concn. of 0·25—1% aq. glucose solution, falls with rise of temp. from 0° to 50°, but with 5% glucose solution the influence of temp. is negligible. It seems that in the H_2O envelopes of the micelles the orientation of the dipoles is destroyed with rise of temp. and that this occurs the more readily the more remote these are from the micelle surface. R. C.

Evaluation of measurements of depolarisation of light scattered by protein solutions. E. Wöhlisch (Biochem. Z., 1937, **294**, 145—152; cf. A., 1937, III, 412).—A formula is deduced enabling the depolarisation of light scattered by the dispersed material in a protein solution to be calc. from measurements of the total depolarisation at different concns. The results obtained by applying the method to data for fibrinogen solutions show an improvement on the uncorr. vals. F. L. U.

Heterogeneity of protein systems and homeomerism of their components. A. Bonot (Ann. Chim., 1937, [xi], **8**, 425—455).—A general discussion of the theory of homeomerism as developed by Urbain. Dilatometric data obtained at 22—60° with serum-albumin fractions cryst. from conc. solutions of $(NH_4)_2SO_4$ demonstrate the thermo-elastic homeomerism of the fractions. The limiting solubility of a mixture of the fractions is a linear function of the limiting solubilities of the components. C. R. H.

Physical chemistry of amino-acids, peptides, and related substances. X. Solubility of cystine in solutions of chlorides and sulphates. T. L. McMeekin, E. J. Cohn, and M. H. Blanchard (J. Amer. Chem. Soc., 1937, **59**, 2717—2723; cf. A., 1938, I, 30).—The solubility of cystine in H_2O and $EtOH–H_2O$ in presence of salts has been determined at 25°. The solvent action of $CaCl_2$ is $>$ that of NaCl; Na_2SO_4 and $(NH_4)_2SO_4$ have a solvent action in dil., but a pptg. action in conc., solution. Solvent action is approx. a function of the ionic strength; differences in solubility at the same ionic strength are ascribed to the salting-out effect. The vals. of the salting-out consts. for the above electrolytes have been determined. It is deduced that the dipole moment of cystine is $23—28·5 \times 10^{-18}$ e.u. Empirical equations have been developed for the interaction between ions and dipolar ions which describe the shape of the solubility curve at all concns. of the salts. E. S. H.

Properties of solutions of pectins. T. K. Gaponenkov and V. N. Kazakov (J. Gen. Chem. Russ., 1937, **7**, 1878—1879).—Pectin sols are stabilised by sugars, citric acid, or glycine. R. T.

Influence of neutral salts on the optical rotation of gelatin. VI. Rotatory dispersion of gelatin in sodium chloride solutions. D. C. Carpenter and F. E. Lovelace (J. Amer. Chem. Soc., 1937, **59**, 2213—2216; cf. A., 1937, I, 134).—The [α] of solutions of gelatin in aq. NaCl at 0·5° and 40° for five λλ obeys a single-term Drude equation with a band at 2200 A. At 40° the const. of the Drude equation $\propto$ [NaCl], but at 0·5° the relation is logarithmic, attributed to a second form of gelatin. The consts. in presence of Na salts increase in the order NaCl $<$ NaBr $<$ NaI. F. R. G.

Complex coacervation of the system gelatin–saponin. R. Ruyssen and E. Verstraete (Bull. Acad. roy. Belg., 1937, [v], **23**, 739—748).—The vals. of η for mixtures of saponin and gelatin sols are almost additive at $p_H > 4·75$ (the isoelectric point of gelatin), but at lower p_H considerable departures are observed, minima being reached at high saponin concns. ($>$90%). This is attributed to mutual electric saturation of the oppositely charged colloids. At p_H 2·60 no coacervation occurs; at p_H 3·04 it occurs only with mixtures containing 80—90% of saponin, but at p_H 3·9 and 4·15 pronounced and instantaneous coacervation is obtained over wide ranges of concn. The coacervates are dispersed on addition of NaCl, $COMe_2$, or EtOH. J. W. S.

Liesegang rings in gels. J. Obrist (Kolloid-Z., 1937, **81**, 327—330).—A modification of the usual method of producing Liesegang rings in gelatin plates is described. The gelatin containing one of the reactants is enclosed between two parallel glass plates, and is in contact with a relatively large vol. of the other reactant through a hole bored centrally in the upper plate. Drying of the gelatin is thus avoided and the concn. of the liquid reactant remains nearly const. F. L. U.

Influence of electrical contact with the soil on physicochemical reactions. F. Vlès and M. Gex (Arch. Phys. biol. Chim.-Phys. Corps organ., 1935, **12**, 74—137; Chem. Zentr., 1936, i, 4267).—The results of Philippson (A., 1912, ii, 914) are confirmed and extended to other systems. J. S. A.

Strength of strong mineral acids. H. von Halban and M. Seiler (Z. physikal. Chem., 1937, **181**, 70—78; cf. A., 1935, 1203).—Extinction coeff. measurements show that the relative effects of alkali perchlorates, nitrates, and chlorides on the dissociation const. of 2 : 4-dinitrophenol are independent of the cation, and that if the relative effects of the free acids (at concns. of 5×10^{-3} to 10^{-2}N) are equal to those of the salts the degree of dissociation of the acids is $>99 \cdot 9\%$ (cf. A., 1936, 799). R. C.

Ionisation constant of lactic acid at 0—50° from conductance measurements. A. W. Martin and H. V. Tartar (J. Amer. Chem. Soc., 1937, **59**, 2672—2675).—Conductances of Na and K lactates and of lactic acid have been measured for a wide concn. range at 25° and at a single concn. from 0° to 50°; empirical equations for the conductance–concn. function have been derived. The ionisation const. has a max. val. of $1 \cdot 389 \times 10^{-4}$ at 22·5°. The ionisation const., and the changes in free energy, heat content, and entropy accompanying ionisation, are tabulated for the temp. range 0—50°. E. S. H.

Comparison of basicity of aliphatic amines in different solvents. C. Li and T. D. Stewart (J. Amer. Chem. Soc., 1937, **59**, 2596—2599).—A method for determining the relative strengths of org. bases in different solvents is described. Data are recorded for $NHEt_2$ and NEt_3 in EtOH, MeOH, PrOH, $Bu^{\gamma}OH$, dioxan, and CCl_4. Inversion of the relative base strengths occurs in some of the solvents. E. S. H.

Relation between equilibrium constants in water and in other solvents. Partition coefficients of ions. I. M. Kolthoff (Chem. Weekblad, 1937, **34**, 785—792).—Theoretical. The equilibrium const. in another solvent can be calc. from its val. in H_2O if the partition coeffs. of all the reactants are known. Expressions are derived for calculating the product of the partition coeffs. of two ions from distribution experiments and their quotient from e.m.f. measurements. Published data for the solubilities and partition coeffs. of electrolytes and the normal potentials of ions in different solvents are considered in the light of the expressions evolved. The variation of oxidation–reduction potentials and of the dissociation consts. of complex ions with the solvent is also considered. D. R. D.

Determination of the total hydration of the ions of strontium nitrate. F. Bourion and E. Rouyer (Compt. rend., 1937, **205**, 662—664; cf. A., 1937, I, 362, 411).—Cryoscopic data for solutions of resorcinol in 0·25M-$Sr(NO_3)_2$ suggest that the salt is associated with 21·4 mols. of H_2O; assuming no hydration of NO_3', this H_2O is associated with one $Sr^{\cdot\cdot}$ ion in agreement with the val. found for $Sr^{\cdot\cdot}$ in 0·25M-$SrCl_2$ solution. A. J. E. W.

Studies on the aqueous solutions of some chromic salts. I. Spectrochemical studies of the chloro-aquo-compounds. H. Sueda (Bull. Chem. Soc. Japan, 1937, **12**, 480—487).—Absorption spectra measurements have been made on solutions of Cr^{III} chloride and sulphate hydrates of various p_H. Solutions of violet Cr^{III} sulphate and of Cr alum contain respectively $[Cr(H_2O)_6]_2(SO_4)_3$ and $K[Cr(H_2O)_6](SO_4)_2$. The transformation of chloro-aquo-chromic salts into hydroxo-penta-aquo-chromic salts at $p_H > 4$ is confirmed. Shift of the absorption band towards increasing λ is caused by the substitution of Cl for H_2O. D. F. R.

Aqueous solutions of some per-salts obtained by action of hydrogen peroxide. (Mme.) M. E. Rumpf (Ann. Chim., 1937, [xi], **8**, 456—527).—Raman spectra, η, and ion transport data for solutions of $TiCl_4$ in dil. and conc. HCl show that H_2TiCl_6 exists in solution, and that on hydrolysis acids of the type $H_2[Ti(OH)_nCl_{6-n}]$ are formed. Absorption spectral data have been applied to the study of solutions of pertitanates, pervanadates, and perchromates. The formula $H_2[Ti(OH)_5 \cdot O \cdot OH]$ is ascribed to the compound formed by interaction of 1 mol. of H_2O_2 with 1 mol. of $H_2Ti(OH)_6$. Its dissociation const. at 20° is $1 \cdot 12 \times 10^{-4}$. The colour change which occurs when solutions of $NaVO_3$ are acidified with dil. HCl is due to the formation of $VO_2 \cdot Cl \cdot OH'$, for which $K_{20} = 4 \cdot 4 \times 10^{-3}$. With high [HCl] $VOCl_3$ is formed. 1 mol. of H_2O_2 reacts with 1 mol. of $VOCl_3$ to form VO_2Cl_3, for which $K_{20} = 2 \cdot 36 \times 10^{-4}$. Acid solutions of chromates and dichromates form, with H_2O_2, salts of H_2CrO_6 for which $K_{20} = 0 \cdot 43 \times 10^{-4}$. With neutral solutions of K_2CrO_4, $K_2CrO_4,(H_2O_2)_2$ is formed for which $K_{20} = 0 \cdot 185 \times 10^{-2}$. This is not a true per-salt but an additive compound. C. R. H.

Conditions governing the solubility of iron. L. H. N. Cooper (Proc. Roy. Soc., 1937, **B**, **124**, 299—307).—Max. activities of $Fe^{\cdot\cdot}$, $FeOH^{\cdot\cdot}$, and $Fe^{\cdot\cdot\cdot}$ which may exist in sea-H_2O have been calc. by use of existing data for the solubility products of Fe^{II} and Fe^{III} hydroxides and for the ion $FeOH^{\cdot\cdot}$. The activity of the $Fe^{\cdot\cdot\cdot}$ ion and the oxidation–reduction potential of the system control the max. activity of $Fe^{\cdot\cdot}$ ion. The max. activities of the three ions at equilibrium in sea-H_2O are tabulated. Other tables show equilibrium conditions over a range of oxidation–reduction potentials and $[H^{\cdot}]$. After equilibrium has been attained, the total quantity of Fe in true solution in H_2O does not exceed 3×10^{-8} mg. Fe per cu. m. at p_H 8·5, 4×10^{-7} at 8·0, 4×10^{-5} at 7·0, and 5×10^{-3} at p_H 6·0, and of this the greater part consists of $Fe^{\cdot\cdot}$ and $FeOH^{\cdot\cdot}$ ions. It may be necessary, in more acid solutions, to take ferrichloric acids into account. These vals. apply to Fe in sea-H_2O, in natural waters, and in many physiological fluids. F. B. P.

Dissociation pressures of sodium deuteride and sodium hydride. E. F. Sollers and J. L. Crenshaw (J. Amer. Chem. Soc., 1937, **59**, 2724—2726).—Data are recorded for NaH at 310—380° and for NaD at 270—360°; the vals. for NaD are approx. twice those of NaH. Calc. heats of formation are: NaH 14,440, NaD 15,800 g.-cal. E. S. H.

Comparative study of dissociation pressures of sodium and potassium hydrides and deuterides. A. Borocco (Compt. rend., 1937, **205**, 983—985).—Employing a differential method of measurement at 260—350°, the dissociation pressures of NaD and KD are shown to be > those of NaH and KH, the difference increasing with rise of temp. E. S. H.

Affinity. LXXVII. Lower phosphides of manganese. Thermal analysis of the system Mn–MnP. F. Wiechmann (Z. anorg. Chem., 1937, **234**, 130—141).—The only *subphosphides* are Mn_4P and Mn_2P, *d* 6·02. The compounds Mn_3P and Mn_5P_2 previously recorded do not exist. The equilibrium diagram up to 43 at.-% P is given, and the conclusions derived from it are confirmed by *X*-ray analysis. F. J. G.

Thermal analysis of the binary systems: aluminium iodide–iodides of other metals. A. T. Nishnik (J. Gen. Chem. Russ., 1937, **7**, 1935—1947).—The fusion diagrams for the systems AlI_3–KI, –HgI_2, and –SbI_3, but not –AsI_3, –SnI_4, and –I, suggest formation of 1 : 1 compounds. Compound formation is associated with conducting power in the above systems. R. T.

Sodium dihydrogen orthoarsenate and its hydrates. P. Genet (Compt. rend., 1937, **205**, 732—734).—Data for solubility and *d* for the range from −20° to 120° are recorded. The solid phases recognised are: ice, $NaH_2AsO_4,2H_2O$, α- and β-NaH_2AsO_4,H_2O, $\mathit{NaH_2AsO_4},0{\cdot}5\mathit{H_2O}$, and NaH_2AsO_4. E. S. H.

Investigation by physico-chemical analysis of reaction of stannic chloride and bromide with esters of dibasic acids and other organic substances. N. S. Kurnakov and N. K. Voskressenskaja (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 797—822; cf. A., 1937, I, 295).—M.p. and viscosity–composition curves indicate that compounds SnX_4,E are formed (E = ester of dibasic acid), in which Sn is bound to two non-hydroxylic O atoms. At a given temp. $SnCl_4$ is more reactive than $SnBr_4$. In systems with a given halide, replacement of the alkyl radical by a more complex one does not, in general, alter the character of the system. There is compound formation in the system $SnBr_4$–EtOH, but not in the system $SnBr_4$–PhOH. R. C.

Thermal analysis of binary mixtures containing esters of nitric acid. V. T. Urbański (Rocz. Chem., 1937, **17**, 585—590).—Mannitol hexanitrate (I) gives a 1 : 1 *compound*, transition point 55°, with *o*-$NO_2{\cdot}C_6H_4{\cdot}CHO$, and 1 : 2 *compounds*, transition points 46° and 48°, respectively, with *o*- and *m*-nitroanisole. Simple eutectic mixtures are formed in the systems (I)–*p*-$NO_2{\cdot}C_6H_4{\cdot}CO_2Me$ and erythritol tetranitrate–1 : 2 : 4 : 5-$C_6H_2Me(NO_2)_3$. R. T.

Graphical representation of the Boudouard equilibrium. W. J. Müller and E. Graf (Feuerungstech., 1937, **25**, 42—44).—Curves are given to show the equilibrium concn. of CO and CO_2 in presence of C at various temp. and pressures. R. B. C.

Activation of oxides by added oxides. II. Activation of copper oxide. R. Schenck and F. Kurzen (Z. anorg. Chem., 1937, **235**, 97—109).—The O_2 tensions and dissociation isotherms for mixtures of CuO with Cr_2O_3, Al_2O_3, Fe_2O_3 and Mn_2O_3 in the proportion CuO : M_2O_3 = 3 : 1 have been studied. In all cases the tension of O_2 is > for CuO alone, particularly in the case of Cr_2O_3. With Mn_2O_3 the curves indicate the existence of a no. of phases besides Cu_2O,Mn_2O_3, viz.: a *compound* $CuO,2(Cu_2O,Mn_2O_3)$ and two solution-phases which in equilibrium at 1000° have the approx. compositions $23(Cu_2O,Mn_2O_3) + 4CuO$ and $11(Cu_2O,Mn_2O_3) + 3CuO$. F. J. G.

Polytherms of the ternary system HNO_3–HCl–H_2O and the binary systems HNO_3–H_2O, HCl–H_2O, and HCl–HNO_3. A. G. Kogan and V. I. Nikolaev (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 823—846; cf. A., 1937, I, 517).—For the system HCl–H_2O the cryohydric temp. is −70·5°. R. C.

Rare earth metals and their compounds. III. Ternary systems cerium group nitrates–nitric acid–water at 25° and 50°. L. L. Quill and R. F. Robey (J. Amer. Chem. Soc., 1937, **59**, 2591—2595; cf. A., 1937, I, 517).—The order of decreasing solubility of the nitrates in aq. HNO_3 is Ce > Pr > La > Nd > Sm; the solubility of $La(NO_3)_3$ is anomalously low. The hexa-, tetra-, and tri-hydrated nitrates and the anhyd. salts exist as solid phases, crystallising from aq. HNO_3 solutions, but no evidence for the existence of a pentahydrate was found. In fractional crystallisation of the hexahydrates Ce and Pr should separate in the first fractions. E. S. H.

Stratification in ternary systems. I, II. V. F. Ust-Katschkintzev (J. Gen. Chem. Russ., 1937, **7**, 2063—2068, 2069—2079).—I. Theoretical.

II. The phase diagrams for the systems H_2O–PhOH–AcOH (15°), –$CCl_3{\cdot}CO_2H$ (15°), –H_2SO_4 (15°, 100°, 180°), –H_3PO_4 (60—150°), and –$H_2C_2O_4$ (50—68°) are described. R. T.

Isomorphous salts as solid phase of saturated solutions of three salts of the same ion and of reciprocal salt pairs. E. Jänecke (Z. Elektrochem., 1937, **43**, 924—935).—The systems K_2SO_4–K_2CrO_4–K_2MnO_4–H_2O, KCl–NH_4Cl–RbCl–H_2O, and the reciprocal salt pairs $K^{\cdot}$–$Rb^{\cdot}$–Cl′–Br′–H_2O, $K^{\cdot}$–$NH_4^{\cdot}$–SO_4''–CrO_4''–H_2O, and $K^{\cdot}$–$NH_4^{\cdot}$–Cl′–SO_4''–H_2O have been studied at 25°. J. W. S.

Equilibrium studies on the reduction, oxidation, and carburisation processes of iron. XIV. System iron–oxygen–lime. R. Schenck, A. Laymann and E. Jenckel (Z. anorg. Chem., 1937, **235**, 65—76).—Previous work (A., 1930, 43) on the system Fe–O–CaO has been extended and three new phases have been identified, viz., X, a saturated solution of CaO,Fe_3O_4 in FeO, approx. $2(CaO,Fe_3O_4) + 3FeO$; Y, a saturated solution of $2CaO,Fe_2O_3$ in FeO, approx. $32{\cdot}5FeO + 4{\cdot}37(2CaO,Fe_2O_3)$; and Z, FeO saturated with CaO, approx. 49FeO + CaO. These, with the phases already known, give rise at 900° to seven univariant systems which are tabulated. F. J. G.

Simultaneous solubility of aluminium, sodium, potassium, and ferric nitrates in aqueous nitric acid. I. A. I. Zaslavski and I. L. Ettinger [with E. A. Ezerova] (J. Gen. Chem. Russ., 1937, **7**, 1948—1958).—Compound-formation is not observed in the system $Al(NO_3)_3$–$NaNO_3$–KNO_3–H_2O, at 0—60°. The solid phases are $Al(NO_3)_3,9H_2O$, KNO_3, and $NaNO_3$. R. T.

Third law of thermodynamics. F. Simon (Physica, 1937, **4**, 1089—1096).—A general discussion. F. L. U.

Electrostatic activity coefficients in solvents of medium dielectric constant. P. Gross, P. Kuzmany, and M. Wald (J. Amer. Chem. Soc., 1937, **59**, 2692—2694).—The influence of $AgNO_3$, $NaNO_3$, and $PhSO_3Na$ on the solubility of $AgBrO_3$ in $Pr^{\beta}OH$–H_2O of dielectric const. 25·6, and of LiCl on the solubility of $KBrO_3$ in EtOH (dielectric const. 25·78) has been investigated within the concn. range 10^{-3}—10^{-4}M. An approx. linear relation is observed between the logarithm of the activity coeff. and the sq. root of the ionic strength. Neither the individual properties of the ions (radius) nor the sp. properties of the solvent (except its dielectric const.) are of appreciable significance in relation to the val. of the activity coeff. E. S. H.

Integral free energies of dissolution of sodium chloride and potassium bromide. F. Ishikawa and K. Moriwaki (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 1244—1250).—The free energies have been calc. from published data. E. S. H.

Free energies of dissolution of zinc chloride and cadmium halides. F. Ishikawa and T. Takai (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 1251—1261).—Differential and integral free energies of dissolution and the differential free energy of dilution have been determined from e.m.f. data for reversible cells and from v.p. data for the aq. solutions. E. S. H.

Silver oxide: heat capacity from 13° to 300° K., entropy, heat of dissolution, and heat and free energy of formation. Heat of formation and entropy of silver ion. K. S. Pitzer and W. V. Smith (J. Amer. Chem. Soc., 1937, **59**, 2633—2639).—Data recorded for 25° are: entropy of Ag_2O 29·09 g.-cal. per degree per mol.; heat of dissolution of Ag_2O in dil. HNO_3 10,430±60 g.-cal.; calc. heat of dissolution of AgCl in H_2O −15,740 g.-cal.; entropy of $Ag^{\cdot}$ 17·54±0·15 g.-cal. per degree; heat of formation of $Ag^{\cdot}$ 25,285±60 g.-cal. E. S. H.

Silver chlorite: its heat capacity from 15° to 300° K., free energy, and heat of dissolution and entropy. Entropy of chlorite ion. W. V. Smith, K. S. Pitzer, and W. M. Latimer (J. Amer. Chem. Soc., 1937, **59**, 2640—2642).—Recorded data for 25° are: entropy of $AgClO_2$ 32·2 g.-cal. per degree per mol.; free energy and heat of dissolution of $AgClO_2$ in H_2O 4380±100 and 7200±100 g.-cal., respectively; entropy of ClO_2' 24·1 g.-cal. per degree. E. S. H.

Silver chromate: its heat capacity, entropy, and free energy of formation. Entropy and free energy of formation of chromate ion. W. V. Smith, K. S. Pitzer, and W. M. Latimer (J. Amer. Chem. Soc., 1937, **59**, 2642—2644).—Heat capacities have been determined from 15° K. to 300° K. Data recorded for 25° are: entropy of Ag_2CrO_4 51·8 g.-cal. per degree per mol.; heat of dissolution of Ag_2CrO_4 in H_2O 14,450±160 g.-cal.; entropy of CrO_4'' 10·5±1·0 g.-cal. per degree; free energy of formation of CrO_4'' Cr_2O_7'', and solid Ag_2CrO_4, respectively, −171,400, −305,800, and −150,800 g.-cal. E. S. H.

Heat of formation and specific heat of vanadium nitride. S. Satoh (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 1262—1269).—The true sp. heat at 0—458·6° is given by $C = 0{\cdot}1351 + 2{\cdot}064 \times 10^{-4}t - 1{\cdot}057 \times 10^{-7}t^2$. The heat of formation of VN is +66,000 g.-cal. E. S. H.

Heat of combination of liquid bases with liquid acids to form liquid salts: piperidine and aliphatic acids. E. B. R. Prideaux and R. N. Coleman (Trans. Faraday Soc., 1937, **33**, 1533—1540).—Data recorded are: C_3 9·5, C_4 9·45, C_5 9·4, C_6 9·15, C_7 9·1, C_8 9·75 kg.-cal. per g.-mol. The heat of formation of piperidine propionate in 10% C_6H_6 solution is 9·7 kg.-cal. per g.-mol. On adding excess of acid to the salt, considerable heat is evolved, whilst addition of excess of base produces a small heat effect; this phenomenon is probably due to partial reversal of mol. dissociation. E. S. H.

Heats of formation of simple organic molecules. F. D. Rossini (Ind. Eng. Chem., 1937, **29**, 1424—1430).—Heats of formation (*H*) are reviewed. For *n*-paraffin and olefine hydrocarbons and *n*-alcohols $>C_5$ there is a linear relation between *H* and the no. of C atoms, but for more complex mols. the effect of neighbouring atoms, the energy state of the C atoms, and the zero-point energy must be taken into account. I. C. R.

Thermochemistry of oxygenated hydrocarbons. M. Brutzcus (Compt. rend., 1937, **205**, 660—662; cf. A., 1937, I, 413).—The energy relations for partial and complete combustion of certain hydrocarbons and org. compounds containing O are discussed. A. J. E. W.

Electrical conductivities of metallic complexes in dilute solution. A. B. Densham (Trans. Faraday Soc., 1937, **33**, 1513—1521).—The prep. of $NEt_4[Co(NH_3)_2(NO_2)_4]$, $[Cr(C_5H_5N)_4F_2][Co(NH_3)_2(NO_2)_4]$, and $[Cr(C_5H_5N)_4F_2]$ *picrate* is described. The electrical conductivities of these and related salts have been determined in MeOH, EtOH, $COMe_2$, and H_2O as solvents. The relation between Λ_c and $\sqrt{C}$ is in good agreement with Onsager's equation. The effect of addition of H_2O agrees with that calc. from the changes of concn. and η. E. S. H.

Ion transport in the diaphragm during electrodialysis. I—III. S. Oka (J. Soc. Chem. Ind. Japan, 1937, **40**, 381B, 381B, 382B).—I. The transport nos. of the anion and cation in the negatively charged diaphragm are respectively < and > the vals. without the diaphragm. With increase in c.d. the transport nos. in the diaphragm approach the vals. without the diaphragm.

II. If the concns. on each side of the diaphragm differ, the transport nos. depend solely on the concn. on the cathodic side of the diaphragm if the latter is negatively charged, and on the concn. on the anodic side if the diaphragm is positively charged. If the transporting ions in the diaphragm are in such a combination as to form a difficulty sol. compound, the effect of the diaphragm on the transport nos. in it is small. If, however, the combination of ions is such as to form a weak electrolyte, the transport no. of the anion is small and that of the cation large when the diaphragm is negatively charged, and vice versa.

III. Where three different and independent transporting ions are present, the ratio of the transport nos. of the ions of the same sign = the ratio of the products of the concn. and ionic mobilities of the two ions. If two of the ions are OH' and $H^{\cdot}$ and the third is either independent or forms a difficultly sol. compound with either of the other two, slight decreases occur in the mobilities of an acid or hydroxide in the diaphragm according to whether OH' or $H^{\cdot}$ respectively takes part in the transportation. If the third ion forms a weak electrolyte with OH' or $H^{\cdot}$, the decreases are greater. C. R. H.

Attempt to determine the electrode potential and Raman spectrum of fluorine. Entropy of fluorine. C. S. Garner and D. M. Yost (J. Amer. Chem. Soc., 1937, **59**, 2738—2739).—E.m.f. measurements of the cells F_2 (*p* atm.), KF (in HF(l)), PbF_2(s) + Pb(s) yielded irregular results. No Raman spectrum of F could be detected. The entropy calc. from published work is 48·6 g.-cal. per degree at 25° and 1 atm. E. S. H.

Electromotive behaviour of palladium hydride. P. Nylén (Z. Elektrochem., 1937, **43**, 915—921; cf. A., 1934, 1177; 1937, I, 49).—When the H content of Pd-black is $\ngtr$ that corresponding with Pd_2H its electrode potential against a buffer solution assumes a const. reproducible val. which changes regularly with the $H^{\cdot}$ activity of the solution. The electrode may lose most of its H without change in this potential. It is inferred that the electrode potential is determined by the dissociation pressure of Pd_2H. Its val., measured against the reversible H_2 electrode, is +0·0690, 0·0596, and 0·0522 v. at 0°, 20°, and 35°, respectively. C.d.–electrode potential curves show that the electrode behaves like a metal electrode in metal salt solution. J. W. S.

Diffusion potentials. V. V. Čupr and K. Marek (Publ. Fac. Sci. Univ. Masaryk, 1937, No. 240, 14 pp.).—Conditions are discussed under which the relation $r_1/r_x + r_x/r_2 + r_2/r_1 = D = 0$ holds, where $r_2/_1$ is the diffusion potential between solutions R_2 and R_1, etc. Experimental data confirm the conclusion that if the compositions of solutions R_1 and R_2 containing three electrolytes (HCl, NaCl, KCl, and $MgSO_4$ were used) are represented by points on a tridimensional diagram, solutions R_x, which satisfy the above equation, are represented by a plane. C. R. H.

The world of concealed electrochemical potentials. B. Kamieński (Rocz. Chem., 1937, **17**, 497—528).—A lecture. R. T.

Electromotive forces between glass and molten salts. B. von Lengyel and A. Sammt (Z. physikal. Chem., 1937, **181**, 55—69).—The p.d., *E*, between glass and solutions of alkali salts in molten $PbCl_2$ at 550° have been measured. For Na glass in contact with a melt containing $>10^{-4}$ mol. Na per 100 g. of $PbCl_2$, *E* responds to changes in $[Na^{\cdot}]$ in accordance with Nernst's equation. For K glass in contact with a KCl solution the variation of *E* with log $[K^{\cdot}]$ is linear but Nernst's equation is not valid, and *E* varies from one specimen of glass to another of the same composition. Li glasses may act as Li electrodes in dil. solutions. In a melt containing both K and Na in contact with Na glass only the Na is electromotively active; apparently Na ions diffuse into the melt from the glass. With Na glass in contact with Li ions, the latter are electromotively active; Li ions in the melt and Na ions in the glass seem to be exchanged by diffusion. It is inferred that *E* is determined by the alkali ion which has the higher mobility in the glass. R. C.

Principles of construction of ideal cells, and their application to standard cells, galvanic cells, and accumulators. E. Lange and K. Nagel (Z. physikal. Chem., 1937, **181**, 1—54).—The conditions for reversibility are that within each phase at least one ion must have a sufficiently high conductivity, the diffusion of neutral substances being prevented, and that at all phase-boundaries through which the current passes the passage of ions determining potential shall be practically unhindered and the passage of other ions shall be as far as possible prevented. The requirements for the approx. realisation of these conditions are examined. In standard cells, such as the Weston cell, the H and O overvoltages must be large enough to prevent evolution of H and O at small c.d. The applications of the above principles in technical galvanic cells and in the Pb and Ni accumulators are discussed. R. C.

Electrode polarisation. I. Accurate measurement of the potential of a polarised electrode. A. Hickling (Trans. Faraday Soc., 1937, **33**, 1540—1546).—The potential of a working electrode is measured by the use of an electrical interrupter, free from moving parts, whereby the polarising current can be stopped for any desired period from 10^{-5} to 20×10^{-5} sec., with any desired frequency, the potential being measured by a special potentiometer which is left in permanent connexion with the electrode and designed to measure transient max. and min. voltages. Results accurate to 0·01 v. may be obtained free from resistance error. The method may be used for studying the rate of fall of potential of electrodes, the potentials of which decay rapidly. E. S. H.

Phenomena of overpotential. M. Lemarchands and W. Juda (Compt. rend., 1937, **205**, 730—732).—Overpotential is ascribed to the fact that under certain conditions ions are discharged at the electrode more quickly than they can be replaced from the solution. The effect caused by roughening the surface of the electrode is due to the decrease of effective c.d. caused by the increase of surface. Metals giving low overpotentials have low m.p. and are not readily roughened superficially. E. S. H.

Overpotential of hydrogen at a mercury electrode in ordinary and heavy water. J. Heyrovský (Chem. Listy, 1937, **31**, 440—447).—The reaction $H + D_2O \rightarrow HD^{\cdot} + OD'$ takes place at a Hg cathode. Since $[D^{\cdot}][OD'] = 0{\cdot}185 \times 10^{-14}$ is $< [H^{\cdot}][OH']$ all processes taking place at the cathode and involving interaction with water take place at a more negative potential in D_2O than in H_2O; to such processes belong the above, or the electro-reduction of aq. alkaline H_2O_2. On the other hand, processes involving only H or D proceed at the same rate; thus reduction of O_2, hydrogenation of fumaric or maleic acid, and deposition of cations occur at the same potential in D_2O and H_2O. R. T.

Electrodeposition of zinc on a single crystal of zinc. P. F. Michalev (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 789—795).—The potential at which Zn is deposited from aq. $ZnSO_4$ becomes less negative as deposition proceeds, probably owing to increase in the active surface, *A*, causing a fall in the effective c.d. at the cathode. The differences between the discharge potentials at various c.d. decrease as electrolysis proceeds; the greater is the c.d., the more rapidly does *A* increase. At the beginning of deposition the deposit consists of thin plates, but subsequently oriented crystals develop. With a c.d. below 3×10^{-4} amp. per sq. cm. the deposit reproduces at first the structure of the underlying electrode. R. C.

Electrolysis of molten salts. P. Drossbach (Z. Elektrochem., 1937, **43**, 891—907).—The variation of electrode polarisation with time has been studied during electrolysis of fused $PbCl_2$, $MgCl_2$–KCl mixtures, LiCl, NaCl, and mixtures of NaCl with other salts. The current yields and energy consumptions for both the anodic and cathodic processes are recorded. J. W. S.

Point action of electrolytic valve anodes. A. Günther-Schulze and H. Betz (Z. Physik, 1937, **107**, 633—641).—The threshold c.d. for the commencement of forming at Ta anodes in various electrolytes varies according to the state of the Ta surface. Roughened surfaces require larger vals. than highly polished surfaces and such effects are explained by point action at the unpolished surface. The magnitude of the threshold c.d. and forming velocity are related to the strength of binding of electrons in the anions. L. G. G.

Normal acidity potentials of 2 : 4-diketothiazolidines. H. Erlenmeyer, A. Kleiber, and A. Epprecht (Helv. Chim. Acta, 1937, **20**, 1446).—Acidity potentials and dissociation consts. have been determined for 5 : 5-dimethyl-, -diethyl-, and -diallyl-2 : 4-diketothiazolidine. F. L. U.

Velocity of chemical reactions. J. Zawadzki (Rocz. Chem., 1937, **17**, 529—556).—A lecture. R. T.

Thermal decomposition of gaseous hydrogen peroxide. L. W. Elder, jun. (J. Amer. Chem. Soc., 1937, **59**, 2737).—A reply to criticism (cf. A., 1937, I, 190). E. S. H.

Reaction velocities at low temperature in the "water-gas" equilibrium.—See B., 1938, 13.

Kinetics of bimolecular association reactions. Rates of reaction of sodium atoms with oxygen, nitric oxide, and other oxides. C. E. H. Bawn and A. G. Evans (Trans. Faraday Soc., 1937, **33**, 1580—1593; cf. A., 1937, I, 141).—The reactions of Na with O_2, NO, SO_2, SO_3, and H_2S occur in accordance with the mechanism $Na + X \rightarrow NaX^*$ (k_1), $NaX^* \rightarrow Na + X$ (k_2), $NaX^* + N_2 \rightarrow NaX + N_2$ (k_3). The velocity coeff. k_1 and the ratio k_2/k_3 have been determined. At high pressures of N_2 the reactions are bimol., whilst at low pressures the rate is determined by a triple-body collision mechanism. A general theory of the reactions is given; it is concluded that k_1 for NO and O_2 is determined by a transition probability. E. S. H.

Reaction of sodium atoms with the oxides of nitrogen, nitromethane, ethyl nitrate, and amyl nitrite. C. E. H. Bawn and A. G. Evans (Trans. Faraday Soc., 1937, **33**, 1571—1579).—The rates of reaction have been determined by the diffusion flame method of Hartel and Polanyi. The chemiluminescence observed with N_2O and NO_2, and the mechanism of reaction, are discussed (cf. A., 1937, I, 141). E. S. H.

Critical investigation and development of the "diffusion method" for determining speeds of atomic reactions. W. Heller [with S. Kodama] (Trans. Faraday Soc., 1937, **33**, 1556—1570).—The "diffusion method" of Hartel and Polanyi has been modified so as to yield quant. results. If certain experimental conditions are fulfilled the reaction velocities obtained differ by little >100% from the abs. vals. for reactions of collision no. between 5×10 and 5×10^3. E. S. H.

Study of oxy-coal gas flame by band spectra. N. R. Tawde and J. M. Patel (Current Sci., 1937, **6**, 155—156).—Intensity measurements on the Swan bands have been made, using flames supplied with different proportions of O_2 and coal gas, and the flame temp. are calc., assuming thermal equilibrium in the initial vibrational energy states. The max. calc. temp. is obtained with coal gas : $O_2 = 3{\cdot}5$, which is not in accord with the variation of flame size; the calc. temp. are $\gg$ the true temp. Thermal equilibrium of vibrational energy thus probably does not occur. A. J. E. W.

Combination of nitrogen peroxide and nitric oxide in the absence of moisture. D. L. Chapman and M. C. C. Chapman (J.C.S., 1937, 1991—1992).—There appears to be no difference between the combining properties of the very dry and of the partly dried gases. C. R. H.

Calculation of temperatures and pressures of combustion in a closed vessel. G. Ribaud (Compt. rend., 1937, **205**, 1139—1141).—An expression is derived giving the total quantity of heat (*Q*) necessary to raise the temp. of the reaction products to θ°, and to dissociate the products to the observed degree; the expression involves the relevant equilibrium consts., the heats of dissociation, and the sp. heats of the products. Knowing the heat of reaction, the final temp. reached is deduced from a Q/θ diagram; the final pressure is then calc. Vals. calc. for the oxidation of CO and H_2 by the stoicheiometric quantities of O_2 and air are given. A. J. E. W.

Slow combustion of acetylene. W. A. Bone and J. E. Carruthers (Proc. Roy. Soc., 1937, **A**, **162**, 502—511).—Mixtures in the range of composition $4C_2H_2 + O_2$ to $C_2H_2 + O_2$ between 265° and 272° at atm. pressure have been studied as regards pressure–time curves, reaction rates, and rates of formation of the products of combustion. The reaction velocity $\propto [C_2H_2]^2$ and is independent of $[O_2]$. Reaction products identified and measured were: $(CHO)_2$, CH_2O, HCO_2H, CO, CO_2, and H_2O. Traces of an unidentified oily phenolic substance were found. The evidence is consistent with the hydroxylation theory. A formula representing the successive stages of slow combustion is given. G. D. P.

Relative rates of decomposition of the potassium salts of *m*- and *p*-substituted dibenzhydroxamic acids.—See A. II., 14.

Autoxidation of unsaturated fatty acids. III.—See A., II, 41.

Effect of pressure on slow reactions in solution. A. J. Rutgers (Physica, 1937, **4**, 978—980).—The observed influence of pressure on reaction rates is explained quantitatively on the assumption that two mols. combine stably only in ternary collisions, so that the velocity is $\propto (v - b)^{-3}$. F. L. U.

Absorption of oxides of nitrogen by alkaline solutions, and the influence of the state of the liquid and gaseous phases. V. I. Atroschtschenko (Ukrain. Chem. J., 1937, **12**, 442—460).—The relative rates of absorption of NO and of NO–NO_2 mixtures by H_2O, aq. NaOH, and aq. $NaNO_3$ vary according to the rate of flow of the gas, the design of the absorber, and the composition of the gas mixture and the absorbent. For these reasons, absorption coeffs. are applicable only to strictly defined conditions. R. T.

Principle of primary recombination in relation to the velocity of thermal reactions in solution. R. G. W. Norrish (Trans. Faraday Soc., 1937, **33**, 1521—1528).—Examples of the operation of the principle in the photo-decomp. of aldehydes and ketones in solution are given. A great reduction of quantum yield occurs in passing from the gaseous phase to solution with reactions in which free radicals are formed, but little change occurs with reactions which produce finished mols. The results are generalised for thermal reactions and provide an explanation of the differentiation of reactions in solution as normal and abnormal. E. S. H.

Kinetics of the hydrolysis of carboxyphosphinic acid. P. Nylén (Z. anorg. Chem., 1937, **235**, 33—41).—The reaction $PO(OH)_2 \cdot CO_2H + H_2O \rightarrow H_2CO_3 + H_3PO_3$ has been studied at 20° in acid solutions at const. ionic strength. The reaction is unimol. at const. $[H^{\cdot}]$ and the results are interpreted in terms of a spontaneous and a $H^{\cdot}$-catalysed hydrolysis of the undissociated mol. At higher concn. the catalytic efficiency of $H^{\cdot}$ appears to decrease. F. J. G.

Bimolecular mechanism for the hydrolysis of *tert*.-alkyl halides: hydrolysis of *tert*.-butyl bromide in acetone. W. Taylor J.C.S., 1937, 1853—1857; cf. A., 1935, 452; 1937, I, 417).—The second-order velocity coeff. of the hydrolysis of $Bu^{\gamma}Br$ in $COMe_2$ remains almost const. in presence of 1 or 2 g. of H_2O per 100 c.c. of solution. In presence of 1, 2, 5, or 10 g. of H_2O per 100 c.c. of solution, the equilibrium concns., calc. on the assumption of second-order coeffs. for both reactions, are in accord with the observed vals. J. W. S.

Relative reactivities of the aliphatic iodides. Interaction of alkyl iodides with sodium guaiacoxide in ethyl-alcoholic solution. J. A. Mitchell (J.C.S., 1937, 1792—1795).—The reactions between Na guaiacoxide and eight *n*-alkyl iodides are each bimol. The variation of the velocity coeff. (*k*) with initial concn. indicates that the guaiacoxide reacts through its ion, the contribution of the undissociated mol. being negligible. The variation of *k* with temp. is in accord with the Arrhenius equation. The reactivities of the iodides decrease rapidly from MeI to $Bu^{a}I$, and then remain almost const. J. W. S.

Walden inversion: configurational effects in the solvolytic reactions of α-phenylethyl chloride. J. Steigman and L. P. Hammett (J. Amer. Chem. Soc., 1937, **59**, 2536—2542).—The reaction between CHPhMeCl (I) and AcOH at 50° is essentially of the first order; that between (I) and $NEt_4 \cdot OAc$ in $COMe_2$ at 50° is of the second order. The reactions produce *l*-phenylethyl acetate from *d*-(I), racemisation being greater in the first. It is deduced that the first-order solvolytic reactions of alkyl halides in H_2O, EtOH, and AcOH are probably multimol., involving several mols. of the solvent, and that the driving force is derived largely from the energy of solvation of the halide ion. E. S. H.

Rate and mechanism of hydrolysis and alcoholysis of *tert*.-butyl chloride. Application to the transition state theory of solvent effects. A. R. Olson and R. S. Halford (J. Amer. Chem. Soc., 1937, **59**, 2644—2647).—$Bu^{\gamma}Cl$ undergoes both hydrolysis and alcoholysis in EtOH–H_2O; the rates are bimol. and the reaction does not involve the primary breaking of a strong linking. The rates $\propto$ the product of the fugacities of the reactants, as measured by their v.p.; the proportionality const. is independent of the solvent. In terms of transition state theory the rate of reaction must be determined by the fugacity of the transition state, not by its concn. E. S. H.

Gross constants of the dissolution process of solid polyoxymethylenes.—See A., II, 42.

Theory of assimilation. III—V.—See A., III, 83.

Comparison of salt hydrates detected by dissociation [curves] with those crystallising from solution. A. Benrath (Z. anorg. Chem., 1937, **235**, 42—48).—The curves of rate of dissociation against composition for a large no. of hydrated salts when kept at const. temp. over H_2SO_4 have been plotted, and the hydrates so indicated compared with those which are known to be formed on crystallisation. As a rule only the stable hydrates are indicated by the curves. F. J. G.

Kinetics of the thermal dissociation of the alkaline-earth peroxides, CaO_2, SrO_2, BaO_2. A. Blumenthal (J. Chim. phys., 1937, **34**, 627—640; cf. A., 1936, 944).—From volumetric, tensimetric, and gravimetric measurements, decomp.–time curves are determined at temp. in the range 240—740°. In the equilibrium $MO_2 \rightleftharpoons MO + O$, high temp. and low v.p. favour the endothermic dissociation. The solid solution MO_2–MO is confirmed optically. Rhythmic decomp. marked at the lower temp. is due to transient lowering of temp. and dissociation pressure, associated with readsorption of O. Activation energies are discussed. I. McA.

Kinetics of wetting and linear corrosion of metals in polyphase systems. IV. Metal–liquid–liquid and metal–liquid–gas. D. I. Mirlis (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 273—280).—The selective linear corrosion of Fe along the three-phase boundary in the equilibrium systems Fe–aq. $R\cdot CO_2H$–C_6H_6 and Fe–aq. $R\cdot CO_2H$–air (R is saturated hydrocarbon chain) $\propto$ the surface energy of the solute. The corrosion of the Fe in the aq. phase decreases and in the C_6H_6 and vapour phase increases with increase in the length of R.

F. J. L.

Reaction velocity in the system $\text{solid}_\text{I} + \text{gas} \rightarrow \text{solid}_\text{II}$. II. Flow systems. G. S. Gardner (J. Math. Physics Mass. Inst. Tech., 1937, **16**, 77—84; cf. A., 1936, 166).—The velocity equation previously developed for closed systems has been applied to flow systems. The equation expressing the change of partial pressure of reactant gas (p) with time (t) at any point in a tube in which the reaction occurs is: $\mathrm{d}[(ap_\infty)^{\frac{1}{2}} - (a[p_\infty - p])^{\frac{1}{2}}]/\mathrm{d}t = Ap/([(ap_\infty)^{\frac{1}{2}} - (a[p_\infty - p])^{\frac{1}{2}}] + B)$, where a, A, and B are consts. Experimental data for the reaction between H_2S and Fe_2O_3 are in agreement with theory.

E. S. H.

Explosivity of systems containing potassium permanganate or dichromate and combustible substances.—See B., 1938, 51.

Influence of hydrogen and deuterium on the thermal decomposition of diethyl ether in the low-pressure region. J. W. Mitchell and C. N. Hinshelwood (Proc. Roy. Soc., 1937, **A**, **162**, 357—366).—At 525° D_2 is $<0{\cdot}1$ as efficient as H_2 in activating the chain-free decomp. At higher temp. a positive effect is ascribed to exchange reactions which give H_2. Experiments made without the addition of NO, which eliminates the influence of chains, show that D_2 has a considerable effect, although $<$ that of H_2. G. D. P.

Inhibition by nitric oxide of the decomposition of ethane. L. A. K. Staveley (Proc. Roy. Soc., 1937, **A**, **162**, 557—568).—The initial rate of thermal decomp. of C_2H_6 is reduced by the presence of NO to a well-defined limit. The effect is attributed to the ability of NO to suppress reaction chains by combining with free radicals or atoms. Vals. of the mean chain length vary between 6 and 21, according to temp. and pressure. As only a small proportion of activated C_2H_6 mols. yield radicals, the majority undergoing rearrangement to give C_2H_4 and H_2 directly, the abs. chain length must be high. The fact that the mean chain length diminishes as the C_2H_6 pressure increases suggests that H atoms are the chain carriers.

G. D. P.

Ozone as oxidising catalyst. X. Analysis of very dilute ozone. V. Influence of solvent on sensitivity of reaction. E. Briner and E. Perrottet (Helv. Chim. Acta, 1937, **20**, 1523—1528; cf. A., 1937, I, 260).—In using the method previously described, PrCHO is more sensitive than PhCHO to small traces of O_3. The extent of oxidation depends to a marked degree on the solvent, standard *iso*octane giving by far the best results. A connexion between this effect and the antiknock properties of *iso*octane is suggested. F. L. U.

Kinetics of thermal decomposition of potassium formate in presence of alkali metals. L. C. Freidlin (J. Gen. Chem. Russ., 1937, **7**, 1675—1682).—The reaction $2HCO_2K \rightarrow K_2C_2O_4 + H_2$ is catalysed by K or K–Hg. The reaction is of the second order, and involves intermediate formation of $OH\cdot CH(OK)\cdot CO_2K$. R. T.

Oxidation of manganous salts to permanganates. D. I. Eristavi (J. Gen. Chem. Russ., 1937, **7**, 1713—1720).—Oxidation of Mn^{II} to Mn^{VII} by S_2O_8'' or OBr′ is possible in presence of $AgNO_3$ or $CuSO_4$, respectively; in absence of these catalysts the reactions cannot be activated by *X*-rays or ultra-short waves. R. T.

Multimolecular solvolytic reactions: water catalysis in the alcoholysis of benzhydryl chloride. N. T. Farinacci and L. P. Hammett (J. Amer. Chem. Soc., 1937, **59**, 2542—2546).—The composition of the product of solvolysis in EtOH containing small amounts of H_2O has been determined; the proportion of $CHPh_2\cdot OH$ is $\leqslant$ would follow from hydrolysis superimposed on alcoholysis. The linear increase in rate produced by H_2O is mainly catalytic. The effect of small amounts of H_2O, heptane, and $PhNO_2$ on the rate of solvolysis is not a function of dielectric const. of the medium. The rate of reaction is reduced nearly to zero when $CHPh_2Cl$ and H_2O or EtOH are present as solutes in low concn. in $COMe_2$. The results support the view that the solvolytic reactions are multimol. E. S. H.

Inhibition by thiol-compounds of autoxidation. J. C. Ghosh and P. C. Rakshit (Biochem. Z., 1937, **294**, 330—335; cf. A., 1937, III, 104).—The autoxidation of dissolved $NaHSO_3$ at p_H 7·0 and 20° is inhibited by low concns. of oxidised or reduced glutathione (I), cystine, cysteine (II), or thiolpropionic acid (III). Approx. equiv. amounts of Cu or Hg salts counteract the effect. Inhibition by (I) is not prevented by $CH_2I\cdot CO_2Na$. Reduced (I), (II), and (III) inhibit the autoxidation of quinol (H_2S also inhibits) at p_H 8·0 and 20°, of pyrogallol at p_H 7·7 and 20°, and of $CO(CH_2\cdot OH)_2$ at p_H 7·2 and 30°, but higher concns. of the inhibitors are required than with $NaHSO_3$. The amount of inhibitor required increases but slightly when the substrate concn. is increased. For inhibition of the autoxidation of dissolved (II) approx. equimol. (I) concn. is required. The inhibitors act by forming complexes with active O, which is later liberated as mol. O_2. W. McC.

Acid–base catalysis in the depolymerisation of dimeric dihydroxyacetone. R. P. BELL and E. C. BAUGHAN (J.C.S., 1937, 1947—1953).—The reaction, which has been studied dilatometrically at 25°, is shown to be of the first order and to be subject to catalysis by acids and bases. Buffers prepared with $Bu^{\gamma}CO_2H$, AcOH, $CH_2Ph{\cdot}CO_2H$, $CH_2{:}CH{\cdot}CO_2H$, HCO_2H, $OH{\cdot}CHPh{\cdot}CO_2H$, $CH_2Cl{\cdot}CO_2H$, and $CN{\cdot}CH_2{\cdot}CO_2H$ were used, and the various catalytic consts. were calc. The catalytic const. of the undissociated acid, k_A, and of its anion, k_B, are connected with the dissociation const. of the acid, K, by the empirical relations $k_A = 0{\cdot}2K^{0{\cdot}38}$ and $k_B = 5 \times 10^{-5}K^{-0{\cdot}76}$. The catalytic consts. $k_{H_3O^{\cdot}}$ and $k_{OH'}$ are 1·72 and $4{\cdot}03 \times 10^7$, respectively, the former val. agreeing with data obtained with HCl as catalyst. The "spontaneous" rate due to H_2O mols. is 0·00255, from which k_{H_2O} is $4{\cdot}6 \times 10^{-5}$. The interpretation of k_{H_2O} is discussed, but it cannot be decided whether catalysis by H_2O mols. represents acid or basic catalysis or both. C. R. H.

Reaction mechanism of catalase and peroxidase in the light of the theory of chain reactions.—See A., III, 72.

Decomposition of hydrogen peroxide by carbon. V. SIHVONEN (Suomen Kem., 1937, **10**, B, 25—26).—The catalytic decomp. of H_2O_2 by laminar and microcryst. graphite and by sugar C is decreased in presence of $2N$-H_2SO_4 and increased in presence of $2N$-NaOH. The gas evolved contains some CO_2, especially at higher temp., and is $<$ the vol. corresponding with the decrease in $[H_2O_2]$, indicating that some O_2 is adsorbed by the C. The temp. coeff. of the decomp. by graphite is $>$ that for decomp. by sugar C. The catalytic effect is made irregular by the protective action of gas bubbles on the C. Adsorption isotherms for 1°, 20°, and 80° have been deduced. J. W. S.

***X*-Ray examination of copper–magnesium oxide catalysts.** G. G. JORIS, J. VERHULST, and H. S. TAYLOR (Bull. Soc. chim. Belg., 1937, **46**, 393—407; cf. A., 1937, I, 524).—The oxide mixtures CuO : 4MgO and CuO : 2MgO were prepared by five different methods, from oxides and by pptn. and co-pptn. of the hydroxides followed by ignition, and the catalyst formed by reduction in H_2 at 200°. The *X*-ray spectra ($K\alpha$ line) of the hydroxide, oxide, and catalyst mixtures were measured; they vary enormously with the mode of prep. For hydroxide and oxide mixtures (1 : 4) prepared by co-pptn. the spectra contain no lines corresponding with $Cu(OH)_2$ or CuO, respectively; in the corresponding catalyst the Cu is extremely finely divided. All other mixtures gave spectra containing characteristic lines of both Cu, CuO, or $Cu(OH)_2$ and MgO or $Mg(OH)_2$. K. S.

Catalytic properties of rhenium. VI. Decomposition of methyl alcohol over rhenium. M. S. PLATONOV, V. I. TOMILOV, and E. V. TUR (J. Gen. Chem. Russ., 1937, **7**, 1803—1804).—Re dehydrogenation catalysts cannot be used for the prep. of CH_2O from MeOH, as they also catalyse dehydrogenation of CH_2O. High yields of CH_2O are obtained at 400°, with high flow velocity, using Re catalysts poisoned with H_2S or As_2O_3. R. T.

Sorptional and catalytic properties of active manganese dioxide, with respect to substances in the gaseous or vapour phase. II. Influence of admixture of electrolytes on the catalytic activity of manganese dioxide. E. V. ALEXEEVSKI and A. S. SOSKIND (J. Gen. Chem. Russ., 1937, **7**, 1683—1686).—The activity of MnO_2 catalysts of oxidation of CO in damp air is abolished by addition of 0·05 g.-equiv. of alkali or alkaline-earth hydroxides, chlorides, nitrates, sulphates, or carbonates per g.-mol. of MnO_2. The anti-catalytic activity falls in the series Na $>$ K $>$ Li, and Ba $>$ Sr $>$ Ca, and $OH' > CO_3''$, $SO_4'' > Cl' > NO_3'$. R. T.

Thermal effect on the catalyst of the water-gas reaction. M. KUROKAWA and Y. TAKENAKA (J. Soc. Chem. Ind. Japan, 1937, **40**, 347B).—The resisting property of Fe_2O_3 catalyst is increased by addition of Cr_2O_3, and the further addition of MgO gives more refractoriness. A catalyst containing $Fe_2O_3 : Cr_2O_3 :$ MgO in the ratio 1 : 0·1 : 0·03 is the least sensitive to heat and most active in conversion. C. R. H.

Catalytic properties of cerium oxide. S. B. ANISIMOV (J. Gen. Chem. Russ., 1937, **7**, 1931—1934).—CeO_2 and Ce_2O_3 act as dehydrogenating catalysts of EtOH at 300—500°, the reactions being probably $2EtOH \rightarrow 2MeCHO \rightarrow EtOAc$; $2EtOAc \rightarrow COMe_2 + CO_2 + C_2H_4 + EtOH$. No hydrogenating activity was found with a C_2H_4–H_2 mixture at 450°. R. T.

Inhibition of corrosion by mixtures of passivators. A. V. SOLOVIEV (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 771—788).—The corrosive action on cast Fe and steel of aq. NaCl containing passivators has been examined. Na_2CO_3, $K_2Cr_2O_7$, Na_2SiO_3, and $NaNO_2$ delay corrosion, whilst NaOAc accelerates it. The retarding action of Na_2CO_3 is much increased by the presence of $NaNO_2$. In presence of a mixture of Na_2SiO_3 and $NaNO_2$ a film is formed on the metal, which protects it from corrosion and progressively thickens. This mixture renders passive Fe, Cu, Ni, Zn, and Cd. The anodic and cathodic polarisations in a solution of $0{\cdot}1N$-$NaNO_2$ + $0{\cdot}1N$-Na_2SiO_3 of Fe in contact with Cd, Pb, Zn, Cu, and Ni have been measured. On making contact, the electrochemical potentials of the metals approach. R. C.

Catalytic action of ozone in the oxidation of aldehydes; influence of the peracid. E. BRINER and E. PERROTTET (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 101—104; cf. A., 1937, I, 321).—The rate of absorption of O_2 on shaking with a solution of PhCHO in petroleum is considerably increased in presence of 1 in 10^7 of O_3. Presence of peracid in the PhCHO facilitates oxidation. A. J. E. W.

[Catalytic] oxidation of methane at high pressures.—See B., 1938, 35.

Optimum concentration of sulphur dioxide in the contact process of sulphuric acid production.—See B., 1938, 50.

Inactivation of ammonia catalysts by lubricating oils.—See B., 1938, 50.

Preparation and use of copper–nickel catalyst.—See B., 1938, 51.

Effect of oxygen and reduced nickel on the catalytic action of hydrogen bromide on the isomerisation of *iso*stilbene to stilbene.—See A., II, 48.

Influence of catalysts on oxidation of oils.—See B., 1938, 20.

Hydrogenation [of aromatic compounds] in presence of catalytic alloys at high pressures.—See B., 1938, 36.

Reaction mechanism at a graphite electrode. V. SIHVONEN [with (FRL.) S. WILSKA, (FRL.) U. LEHINEN, U. YLTIÄ, and T. AALTO] (Suomen Kem., 1937, **10**, **B**, 27).—In the a.c. electrolysis of dil. H_2SO_4 between Pt plate electrodes traces of H_2O_2 are formed, the yield increasing with increasing c.d. and period of alternation to a max. of about 10% of the amount of H_2 and O_2 evolved. The latter is $<$ theoretical for the current consumption. When O_2 is introduced through pores in a graphite cathode in dil. H_2SO_4 slight H_2O_2 formation occurs, and the yield reaches a limiting val. (*c*) in a few hr. (*c*) increases with increasing c.d. but is $<$ the concn. obtained when O_2 is passed through a Pt mesh cathode. The stationary state is attributed to equilibrium between the reactions $2H + O_2 \rightarrow H_2O_2$ and $2H + H_2O_2 \rightarrow 2H_2O$. Electrolysis of acid, alkaline, or neutral solutions containing ClO_3' using graphite electrodes yields no ClO_4'. Similarly no S_2O_8'' is formed at a graphite anode in conc. H_2SO_4, the main anodic products being CO_2 and CO, admixed with O_2 only when dil. acid and a high c.d. are used. After prolonged electrolysis in dil. H_2SO_4 an oxidation product of the graphite is produced which yields colour reactions with KI and diphenylamine sulphate. These reactions are also obtained after graphite has been soaked in H_2O_2 and washed and after the action of H_2O vapour on graphite at 750°. It is not obtained with sugar C. J. W. S.

Production of ozone by electrolysis. Electrolysis at low temperature. E. BRINER, R. HÆFELI, and H. PAILLARD (Helv. Chim. Acta, 1937, **20**, 1510—1523).—By using solutions of eutectic composition the electrolytic production of O_3 at temp. down to −75° has been studied. Electrolysis of 38% H_2SO_4 at −67° gives O_3 at a concn. of about 15%, and with a current yield of 8·5%. $HClO_4$ (11·3 mol.-%) at −55° gives results almost as good. Much poorer yields are obtained from H_3PO_4, KOH, and NaOH. HNO_3 furnishes no O_3. Whilst the current yield increases with the c.d. between 10° and −5°, at the lowest temp. there is an optimal c.d. Owing to the greatly increased resistance of the solutions at low temp., the energy yields are in all cases $<$ those given by silent discharge methods. F. L. U.

Higher oxygen compounds of iron. II. Electrochemical preparation of higher oxygen compounds of iron, and their analysis. B. A. PETROV and B. F. ORMONT (J. Gen. Chem. Russ., 1937, **7**, 1690—1694).—The anolyte obtained in electrolysis of 40% NaOH at 35° (Fe electrodes) contains Fe^{VI}, but not Fe^{II}, Fe^{II}, or Fe^{VIII}. The solutions are analysed by an iodometric method. R. T.

Electrochemical researches on titanium. M. HAÏSSINSKY and (MME.) EMMANUEL-ZAVIZZIANO (J. Chim. phys., 1937, **34**, 641—648).—At room temp. with Pt anode, aq. acid solutions of Ti salts have been electrolysed, [Ti], p_H, additants, cathode, and c.d. being varied. With the sulphate, when acidity and c.d. are adjusted to prevent pptn. of basic Ti salts, a Ti peroxide is recovered at the anode, and Ti^{III} or pertitanic acid derivatives remain in solution. NH_4 fluotitanate (Pb cathode) yields TiO. With the tartrate, and sulphate in excess of $Na_2SO_4,10H_2O$ (cf. A., 1936, 1468), giving Ti as an anionic complex, metallic Ti is obtainable. Optimum conditions are developed, including addition of H_2O_2. Cathode influence, and direct measurement (Poggendorf) using the Hg_2Cl_2 electrode, prove that a high negative cathode potential favours liberation of Ti^{IV} and decreases during its deposition. I. McA.

Electrolytic preparation of ammonium persulphate.—See B., 1938, 51.

Electroplating aluminium on metals.—See B., 1938, 70.

Penetration of electrolytes used in the anodic oxidation of aluminium.—See B., 1938, 71.

Electrodeposition of nickel–cobalt alloys.—See B., 1938, 70.

Electrodeposition of copper–nickel–zinc alloys from cyanide solutions.—See B., 1938, 70.

Behaviour of alloy anodes in deposition of silver–cadmium alloys from cyanide baths.—See B., 1938, 70.

Electrolytic reduction of ferric sulphate in presence of titanium sulphate.—See B., 1938, 75.

Electrolysis of mixtures of salts of fatty acids with halides and nitrates.—See A., II, 40.

Photochemical union of hydrogen and chlorine. V. Reaction at low pressures. Effect of light intensity in the absence of oxygen. G. V. V. SQUIRE and A. J. ALLMAND. **VI. Mechanism of the reaction at low hydrogen pressures in the absence of oxygen.** H. C. CRAGGS, G. V. V. SQUIRE, and A. J. ALLMAND. **VII. Effect of water vapour on the reaction at low pressures.** H. C. CRAGGS and A. J. ALLMAND (J.C.S., 1937, 1869—1877, 1878—1889, 1889—1891).—V. Vals. of the intensity exponent (*n* in the equation : rate $= kI_0^n$), determined for varying Cl_2 pressures, p_{Cl_2} (0·11—450 mm.), and at low H_2 pressure, p_{H_2} (approx. 0·1 mm.), vary between 0·05 and 1, the val. decreasing with increase in p_{Cl_2} and with increase in radiation intensity. The use of strongly absorbed radiation leads to a lower val. of *n* than weakly absorbed radiation. Rate of reaction and quantum yield pass through a max. with increase in p_{Cl_2} and then fall rapidly. Possible experimental errors due to varying

p_H, and temp. during insolation and reaction are critically discussed.

VI. At high p_{Cl_2} the fall in the val. of n with increasing radiation intensity is suspended over a finite intensity range, during which n remains const. at 0·5, and the quantum yield $\propto p_{Cl_2}^{-2}$. The influence of added HCl is complex, retardation taking place when the rate of reaction in absence of HCl is high, and acceleration when, in absence of HCl, it is low. The results are explained by assuming the existence of Cl_3. When $n = 1$ the reaction chains are terminated by adsorption of Cl atoms and Cl_3 radicals on the vessel walls. Vals. of n between 1 and 0·5 are due to gaseous reactions $2Cl_3 \rightarrow 3Cl_2$ and, probably, $Cl + Cl_3 \rightarrow 2Cl_2$. Vals. of $n < 0·5$ are the result of localised illumination and of retarded diffusion of Cl atoms out of this zone into the dark space in the reaction cell.

VII. At total pressures 1·7—2·5 mm., H_2O retards the reaction. This is probably due to adsorption of a H_2O film on the surface of the reaction vessel which accelerates the catalytic action of the walls on Cl atoms. C. R. H.

Photographic image of a dark hot body in darkness. T. Takéuchi and T. Sugita (Proc. Imp. Acad. Tokyo, 1937, **13**, 358—359).—The image of a hot, dark body projected on a phosphorescent plate excited by filtered ultra-violet light can be transferred by contact to a panchromatic plate, which is then developed as usual. F. R. G.

Validity of the Bunsen–Roscoe law for the photographic action and course of the density curves of long-wave Röntgen rays. E. Mülbach (Z. wiss. Phot., 1937, **36**, 269—282).—The reciprocity law is fulfilled for the Ag $L\alpha_1$ line ($\lambda = 4·146$ A.) and the W $M\alpha_1$ line ($\lambda = 6·969$ A.), according to experiments with widely varying I and t, giving low densities; the Schwarzschild exponent p therefore $= 1$. No threshold vals. have been detected. The density curves become progressively less steep with increasing λ. J. L.

Reactivity of selenium in light and darkness. S. E. Sterzel and I. Afzelius (Svensk Kem. Tidskr., 1937, **49**, 281—284).—The rate of attack of Se rods by aq. Na_2SO_3 is increased by illumination. Continuous illumination has a greater effect than intermittent. M. H. M. A.

Photochemical decomposition of potassium cobaltioxalate. J. G. Murgulescu (Bul. Soc. Ştiinţe Cluj, 1935, **8**, 193—203; Chem. Zentr., 1936, i, 4669).—The reaction $2K_3[Co(C_2O_4)_3] \rightarrow 2K_2[Co(C_2O_4)_2] + K_2C_2O_4 + 2CO_2$ in the presence of excess of K_2CrO_4 is of zero order for light of $\lambda > 313$ mμ. The limiting quantum yield is 2. J. S. A.

Photochemical reaction of dichromates with formates. P. Wulff and H. Ammann (Compt. rend. IX Congr. int. Phot. sci. appl., 1935, 10 pp.; Chem. Zentr., 1936, i, 4668—4669).—$HCrO_4'$ and Cr_2O_7'' are reduced completely to $Cr^{\cdots}$ by $HCO_2H + HCO_2Na$ at p_H 2·5 under the influence of filtered Hg light, whereas CrO_4'' is not photochemically reduced. The rate of reduction is independent of $[Cr_2O_7'']$ and of temp., but highly dependent on the concn. of acceptor. Mo^{VI} has a pronounced, Fe a weak, catalytic influence. The primary reaction is considered to be either $Cr_2O_7'' + h\nu \rightarrow CrO_4'' + CrO_3$ or $HCrO_4' + h\nu \rightarrow OH' + CrO_3$, CrO_3 being hydrolysed unless immediately reduced. The characteristics of the reaction are related to the photographic dichromate processes. J. S. A.

Photochemistry of alkyl nitrites. III. H. W. Thompson and F. S. Dainton (Trans. Faraday Soc., 1937, **33**, 1546—1555; cf. A., 1936, 544, 1178).—Previous work on the absorption spectra and photochemical decomp. of Me, Et, *sec.*-Bu, and *iso*amyl nitrites has been extended to include Pr^{α}, Pr^{β}, Bu^{γ}, and *cyclo*hexyl nitrites. The decomp. products have been analysed and a mechanism of reaction, involving the primary fission of the radical NOH and the formation of aldehydes or ketones, and in some cases of unsaturated hydrocarbons, has been advanced. The v.p. curves of the alkyl nitrites studied have been determined. E. S. H.

Mechanism of sensitisation of photochemical reactions by dyes, especially assimilation. G. Scheibe (Naturwiss., 1937, **25**, 795).—Positive ions of dyes are often polymerised above a certain concn. (A., 1937, I, 165). Since the polymerised dye may be composed of several hundred single mols. there is the possibility of the simultaneous absorption of many light quanta by the polymeride. There is energy exchange, if not electron exchange between the electrons of the polymeride, and this exchange occurs without loss of energy, since light absorbed is re-emitted practically without change of λ. This absorbed energy can be given up by collision, as is shown by the marked decrease in intensity of the fluorescence at higher concns. of dye. It can therefore be assumed that a foreign mol. which is coupled closely enough with this polymeride (absorption unit) could take up a large no. of quanta simultaneously with or very shortly after the absorption unit. There is thus the possibility of a concn. of quanta in the foreign mol., and the formation of very short-lived intermediate products at energy levels which could never be reached by the direct absorption of light quanta. This theory may be used to explain the process of assimilation, the absorption unit here consisting of about 2500 chlorophyll mols. It will also explain the nature of the spectra of substances with conjugated double linkings, and the photosensitisation of Ag salts by dyes. A. J. M.

Salt effects on the total light emitted by a chemiluminescent reaction.—See A., III, 69.

Production of highly concentrated emanation preparations. O. Werner (Strahlenther., 1936, **55**, 185—190; Chem. Zentr., 1936, i, 4126).—By using dry preps. of Ra dispersed as $RaCO_3$ on $Fe(OH)_3$ (cf. Hahn and Heidenhain, A., 1926, 332), in place of solutions, an 80% yield of Rn is obtainable. J. S. A.

Action of chemical agents in the preparation of pure water. F. Rimattei and J. Petit (Bull. Soc. Chim. biol., 1937, **19**, 1419—1424).—Distillation of canal-H_2O in a Pyrex glass apparatus produces a fairly good conductivity H_2O but the results are variable. By the addition of 80 c.c. of $0{\cdot}1$N-H_2SO_4 + 14 c.c. of $0{\cdot}1$N-$K_2Cr_2O_7$ to 2 l. of canal-H_2O followed by the use of 50 c.c. of saturated aq. $Ba(OH)_2$ in series, conductivity H_2O can be regularly obtained with $\kappa = 0{\cdot}85 \times 10^{-6}$. P. G. M.

Dehydration of hydrated salts containing both water and hydrogen peroxide of crystallisation. G. R. Levi and F. Battaglino (Gazzetta, 1937, **67**, 659—663).—When Na_2SO_4, Na_3PO_4, and $Na_4P_2O_7$, containing both H_2O and H_2O_2 of crystallisation, are dehydrated under suitable conditions the H_2O is more readily eliminated than the H_2O_2. O. J. W.

Preparation of large single crystals of sodium chloride. H. Walther (Rev. Sci. Instr., 1937, [ii], **8**, 406—408).—An apparatus for making single crystals of NaCl 2 × 30 cm. is described. The crystal is formed in the melt of NaCl (30° above m.p.) on the end of a Pt rod which is raised (5 cm. per hr.) and rotated (10 revs. per hr.) continuously; the temp. gradient is obtained by means of an air stream from a circular nozzle surrounding the growing crystal. The orientation of the crystal can be predetermined by placing a seed crystal on the Pt rod. F. J. L.

Action of alkali hydroxides on cupric hydroxide. M. Paić (Compt. rend., 1937, **205**, 1063—1065).—Dil., instead of conc., solutions of alkali hydroxides have been used and the absorption spectra and electrochemical properties of $Cu(OH)_2$ in these alkali solutions investigated. The solubilities in NaOH and KOH are very similar and very dil. solutions absorb very little Cu. The Cu forms complex ions of the type $[Cu(OH)_4]Na_2$ and $[Cu(OH)_4]K_2$ and the absorption spectra are almost identical in the two cases. J. A. D.

Bromocupric complexes. A. Silberstein (Compt. rend., 1937, **205**, 909—911; cf. A., 1936, 669).—The prep. of the complex salts $(NH_4)_2[CuBr_4,2X]$ ($X = NH_3$, C_5H_5N, *NH_2Ph*, and o-*$C_6H_4Me{\cdot}NH_2$*) is described, and their *d* are given. The *X*-ray powder diagram of $(NH_4)_2[CuBr_4,2NH_3]$ has the same lines as that of NH_4Br, with different intensities; the structure is cubic (*a* 8·14 A.); space-group D_{4h}^{14}. A. J. E. W.

Breakdown and reduction products of silver permanganate. F. Hein (Z. anorg. Chem., 1937, **235**, 25—32).—The products of reduction of $AgMnO_4$ at room temp. and of its decomp. at 100° are definite *compounds*, in some cases giving a characteristic *X*-ray diagram. They are: $AgMnO_2$ (I); $AgMnO_{2{\cdot}33}$ or $3Ag_2O,2Mn_2O_3,2MnO_2,O$ (II); $Ag_2Mn_2O_5,H_2O$ (III); $AgMnO_{2{\cdot}63}$ or $8Ag_2O,15MnO_2,MnO_3,O$ (IV); and $AgMnO_{2{\cdot}94},0{\cdot}5H_2O$ or $8Ag_2O,15MnO_2,MnO_3,6O,8H_2O$ (V). (I) and (III) are obtained by the prolonged and initial action of H_2 on aq. $AgMnO_4$ respectively, (II) by the action of dil. H_2O_2 on aq. $AgMnO_4$, (IV) by decomp. of dry $AgMnO_4$ at 100°, and (V) by decomp. of $AgMnO_4$ at 100° in presence of a little H_2O. (II), (IV), and (V) all contain "inactive" O which is evolved as O_2 on treatment with $H_2C_2O_4$ in presence of H_2SO_4. F. J. G.

Reactions in the solid state at high temperatures. XV. Formation of strontium aluminates from the oxides in the solid state. W. Jander and A. Krieger (Z. anorg. Chem., 1937, **235**, 89—96).—The conclusions of Lagerqvist *et al.* (A., 1937, I, 554) regarding the compounds formed in the system SrO–Al_2O_3 have been confirmed. When $SrCO_3$ and Al_2O_3 are heated at 900—1200° in CO_2 in any proportions the first product is always SrO,Al_2O_3, and this is then more slowly transformed into $3SrO,Al_2O_3$. The other two compounds are not formed on prolonged ignition at 1200°. F. J. G.

Corrosion of zinc in distilled water alone and in presence of a gaseous atmosphere. M. F. Taboury and E. Gray (Compt. rend., 1937, **205**, 985—987).—The products of slow reaction of Zn and H_2O in absence of a gas are H_2 and $Zn(OH)_2$; in presence of air reaction is relatively rapid and the products are $3ZnO,CO_2,2H_2O$ and $4ZnO,CO_2,3H_2O$; in presence of CO_2, Zn acquires a protective film. E. S. H.

Powdered zinc and cadmium for *X*-ray scattering. W. A. Bruce (Rev. Sci. Instr., 1937, [ii], **8**, 451).—Strain-free crystals of Zn of size $<10^{-4}$ cm. are obtained by distilling powdered Zn at 413° along a Pyrex tube with a temp. gradient of 10° per cm. Similar Cd crystals are obtained by distillation at 317°. F. J. L.

Chemistry and morphology of basic salts of bivalent metals. VI. Basic cadmium chlorides. W. Feitknecht [with W. Gerber] (Helv. Chim. Acta, 1937, **20**, 1344—1372; cf. A., 1937, I, 225).—By incompletely pptg. $CdCl_2$ solutions with aq. NaOH or NH_3, or by treating pptd. $Cd(OH)_2$ with aq. $CdCl_2$, a series of basic chlorides varying in composition from $CdCl_2,Cd(OH)_2$ to $CdCl_2,4Cd(OH)_2$ is obtained. Five of these are individuals which, whilst susceptible to small variations in composition, exhibit characteristic forms and distinct *X*-ray patterns. F. L. U.

Crystalline boric oxide. L. McCulloch (J. Amer. Chem. Soc., 1937, **59**, 2650—2652).—Cryst. B_2O_3 has been obtained by keeping fused B_2O_3 (containing 8—15% H_2O) at 225—250° for some days. By "seeding" the liquid the change occurs immediately. Anhyd. cryst. B_2O_3 has *d* 2·42, m.p. 460—470°; the solubility curve in H_2O has been determined. E. S. H.

Preparation of aluminium sulphide in benzine solution. S. M. Veller (J. Gen. Chem. Russ., 1937, **7**, 1819—1820).—Al_2S_3 is pptd. by H_2S from a solution of Al naphthenate in benzine. R. T.

Hydrates of aluminium fluoride. V. S. Jatlov and A. I. Zelinskaja (J. Gen. Chem. Russ., 1937, **7**, 1787—1790).—The existence of AlF_3,0·5, 3, and $9H_2O$, but not 1 and $3{\cdot}5H_2O$, is confirmed. R. T.

Gallium. V. W. Pugh (J.C.S., 1937, 1959—1962).—The prep. and physical properties of the following *complex gallifluorides* are described: $[M(H_2O)_6][GaF_5,H_2O]$, where M = Mn, Co, Ni, Cu, Zn, and Cd; $Ba_3[GaF_6]_2,H_2O$; $3SrF_2,GaF_3,3H_2O$; $Ag_3[GaF_6],10H_2O$; $Tl_2[GaF_5,H_2O]$. C. R. H.

Rare earths. XLVII. Preparation of the anhydrous iodides of the rare earths. W. A.

TAEBEL and B. S. HOPKINS (Z. anorg. Chem., 1937, **235**, 62—64).—Anhyd. *iodides* of La, Ce, Pr, Nd, Sm, and Yb have been prepared by heating the oxides with NH_4I at 400°, the excess of the latter being removed by sublimation in vac. at 190°. They are green powders, very hygroscopic, and readily sol. in C_5H_5N and EtOH. On exposure to air they form basic salts. F. J. G.

Preparation and crystal structure of the compounds $TlAlF_4$ and Tl_2AlF_5. C. BROSSET (Z. anorg. Chem., 1937, **235**, 139—147).—By the interaction of TlF and AlF_3 in aq. HF the *compounds* $TlAlF_4$ (ρ 6·09) and Tl_2AlF_5 (ρ 5·53) are formed. The compound $Tl_3Al_2F_9$ (A., 1909, ii, 236) could not be obtained and was probably a mixture. $TlAlF_4$ is tetragonal, *a* 3·61, *c* 6·37 A.; space-group D_{4h}^1. Tl_2AlF_5 is rhombic, *a* 10·06, *b* 8·24, *c* 7·46 A., with four mols. in the unit cell; space-group D_2^5. In both structures AlF_6 octahedra are present; in $TlAlF_4$ four, and in Tl_2AlF_5 two, of the F ions are common to two octahedra. F. J. G.

Silicates. VII. Magnesium metasilicate obtained by the thermal decomposition of talc. E. THILO (Ber., 1937, **70**, [*B*], 2373—2381).—Metatalc (I), $MgSiO_3$, obtained by Haraldsen by the ignition of talc, is also obtained from olivine + SiO_2 or from MgO + SiO_2 at 1250° by reaction in the solid state. In presence of LiF as mineralisator, (I) is transformed at 790° into enstatite (II) whilst under these conditions amorphous SiO_2 gives quartz. Conversion of (II) into (I) at 1250° is not observed even after addition of MgO, SiO_2, or (I). The pronounced tendency is for (II) to pass into clinoenstatite (III). The Röntgen diagrams of the products obtained from talc and the molten chlorides of bivalent metals show that only (I) is formed with $MgCl_2$ at about 800° whereas with $CoCl_2$ and $MnCl_2$ a mixture of (I) and (II) possibly containing (III) results. H. W.

Reactions of silicates with sulphur dioxide. T. VON TAKÁTS (Glastech. Ber., 1936, **14**, 103—105; Chem. Zentr., 1936, i, 4345).—Silicates react with SO_2 readily at 300—550°, sulphates being formed in presence of O_2. Failures in Pb-rich glazes may be attributed to the formation of $PbSO_4$. J. S. A.

Chemistry of germanium. E. EINECKE (Chem.-Ztg., 1937, **61**, 989—991, 1011—1014).—A summary and bibliography. J. W. S.

Zirconium and its compounds. E. I. KRETSCH (J. Appl. Chem. Russ., 1937, **10**, 1931—1947).—A review. R. T.

Preparation and properties of bismuth subiodides.—See B., 1938, 102.

Reduction of chromic oxide by hydrogen and solid carbon. W. BAUKLOH and G. HENKE (Z. anorg. Chem., 1937, **234**, 307—310).—With a rapid current of thoroughly dried H_2, Cr_2O_3 is reduced appreciably at 1000° and completely in 6 hr. at 1400°. Admixture of finely-divided Fe much accelerates the reaction, which now begins at 900° and is complete in 5·5 hr. at 1200°. With pure C reduction begins at 1000° and is complete in 8 hr. at 1100°. Fe accelerates the reduction at the lower temp. but not at the higher, apparently owing to combination with C. F. J. G.

Dependence of action of ammonium persulphate on aqueous chromic acid on the way in which it is introduced into the solution. N. D. PODOBED (J. Gen. Chem. Russ., 1937, **7**, 1972—1978).—Reduction of Cr^{VI} to Cr^{III} is observed when cryst. $(NH_4)_2S_2O_8$ is added to acid aq. CrO_3, probably as a result of the reactions $(NH_4)_2S_2O_8 + H_2O \rightarrow H_2O_2$; $Cr_2O_7'' + 7H_2O_2 \rightarrow 2CrO_8'''$; $2CrO_8''' + 12H^{\cdot} \rightarrow 2Cr^{\cdot\cdot\cdot} + 6H_2O + 5O_2$. This reaction does not take place when $(NH_4)_2S_2O_8$ is added as a solution or in presence of $Ag^{\cdot}$. R. T.

Reactions in the solid state between synthetic or mineral ferrous chromite and magnesium oxide or magnesium carbonate. J. A. HEDVALL and V. NY (Z. anorg. Chem., 1937, **235**, 148—152).—The reaction $MgO + FeO,Cr_2O_3 = FeO + MgO,Cr_2O_3$ has been studied. Synthetic FeO,Cr_2O_3 reacts much more rapidly than the mineral, and fine grinding increases the reaction rate. When $MgCO_3$ is used instead of MgO the reaction begins at lower temp. owing to the formation of " nascent " MgO. F. J. G.

Single-shelled malonato-complexes in the dissolved state. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, **235**, 115—119).—By the method of dialysis it has been found that the malonato-complex ions of tervalent metals have the simple formula $[M(C_3H_2O_4)_3]^{3-}$ (where M = V, Cr, Mn, Co, Pr, Nd) whilst those of bivalent metals have the doubled formula $[M_2(C_3H_2O_4)_4]^{-4}$ (where M = Fe, Co, Ni, Cu, Mg, Zn, Cd). $[VO(C_3H_2O_4)_2]^{2-}$, $[UO_2(C_3H_2O_4)_2]^{2-}$, and $[Th(C_3H_2O_4)_4]^{4-}$ have the simple formulæ, as shown. It is suggested that salts of bivalent metals with dicarboxylic acids should be formulated thus : $M\vdots(CO_2{\cdot}R{\cdot}CO_2)_2\vdots M$, and their complex ions thus : $[(RC_2O_4)M\vdots(CO_2{\cdot}R{\cdot}CO_2)_2\vdots M(RC_2O_4)]^{4-}$. F. J. G.

Double-shelled malonato-complexes of various cobaltic and chromic ammines in the dissolved state. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, **235**, 120—123).—By the method of dialysis it has been shown that a large no. of complex ammino-cobaltic or -chromic cations unite in solution with four malonate ions to form double-shelled complex anions. F. J. G.

Double-shelled succinato-complexes of various cobaltic and chromic ammines in the dissolved state. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, **235**, 124—125).—By the method of dialysis it has been shown that a large no. of complex ammino-cobaltic or -chromic cations unite in solution with four succinate ions to form double-shelled complex anions. F. J. G.

Double-shelled citrato-complexes of various cobaltic and chromic ammines in the dissolved state. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, **235**, 126—128).—By the method of dialysis it has been shown that a large no. of complex ammino-cobaltic and -chromic cations unite in solution with four citrate ions to form double-shelled complex anions. F. J. G.

Crystalline molybdenum-blue. V. Auger (Compt. rend., 1937, **205**, 1070—1072).—Cryst. hydrated Mo suboxides have been prepared. Different conditions of prep. are given but the exact constitution of the product is not known. It is possible that there is a reaction between the amorphous material and the molybdic acid resulting in the formation of a complex cryst. compound.
J. A. D.

Exact conditions of formation of the compound between tungstic acid and 8-hydroxyquinoline. S. Halberstadt (Compt. rend., 1937, **205**, 987—989).—$WO_2(C_{10}H_6ON)_2$ is pptd. quantitatively between p_H 3·5 and 3·3. The presence of BO_3''' and PO_4''' does not interfere. E. S. H.

Fluoronitrites and fluoronitrates. G. Beck (Z. anorg. Chem., 1937, **235**, 77—82).—The relationship between mol. vol. and binding energy (A., 1937, I, 464) suggests that NF_3 should combine with basic oxides. By the action of HF on nitrites, nitrates, and perchlorates, the following *compounds* have been obtained: Na_3NF_6 (ρ 2·229); K_2NOF_3 (ρ 2·411) (this gives pptn. reactions similar to those of K_2SO_4); $K_2N_2O_5F_2$ (ρ 2·411) (this is apparently only one of many compounds intermediate between KNO_3 and KNF_6); $2Tl(N_2O_5F),Tl_2(N_2O_4F_4)$; and K_2ClF_7 (or $KClF_6,KF$). In a similar way *K fluorocarbonate* is formed. F. J. G.

Comparative action of potassium iodate and potassium periodate on sodium thiosulphate in a slightly acid medium. É. Carrière and M. Delpla (Compt. rend., 1937, **205**, 1157—1158).—In 0·07N-HCl KIO_4 has a more powerful oxidising action than KIO_3; in 0·2N-HCl the reverse is the case. The degree of oxidation is measured by the quantity of $NaHSO_4$ formed. $[H^{\cdot}]$ and temp. considerably influence the oxidising action of KIO_3, but with KIO_4 these influences are less marked.
A. J. E. W.

Chemistry and electrochemistry of rhenium. V. Complex thiocyanates of rhenium, and rhenium^{V} oxychloride. H. Hölemann (Z. anorg. Chem., 1937, **235**, 1—24).—Various methods for prep. and analysis of the coloured Re thiocyanate compound (A., 1932, 1224) have been studied. The findings of Druce (A., 1935, 593) were not completely confirmed. The substance could not be obtained free from the reducing agent used in its prep., so that analyses lead to no definite conclusions as to the valency of the Re. It gives coloured ppts. with $Ag^{\cdot}$, $Cu^{\cdot}$, $Cu^{\cdot\cdot}$, $Hg^{\cdot}$, $Hg^{\cdot\cdot}$, $Tl^{\cdot}$, and $Pb^{\cdot\cdot}$, and methods for the analysis of the Ag, Cu, Hg, and Tl compounds were worked out. They are all contaminated with excess of the heavy-metal thiocyanate, but the results indicate that the valency of the Re is <6 and probably $=5$. The existence of the compound K_2ReOCl_5 (A., 1934, 1320) has been confirmed; a no. of its reactions have been studied and are contrasted with those of K_2ReCl_6. With thiocyanate, K_2ReOCl_5 gives reactions which are similar to those of perrhenate solutions on reduction in presence of thiocyanate. F. J. G.

Preparation of two lower oxides of rhenium. R. C. Young and J. W. Irvine, jun. (J. Amer. Chem. Soc., 1937, **59**, 2648—2650).—$Re_2O,2H_2O$ and ReO,H_2O (both impure) have been obtained by reduction of $HReO_4$ by Zn and Cd, respectively. The oxides are insol. in HCl or conc. alkali, but sol. in HNO_3 or aq. Br. E. S. H.

Linear corrosion of metals. Selective corrosion of iron by the system water–sulphuric acid–propyl alcohol on three-phase boundaries. L. Gindin and F. Schemjakin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 409—412; cf. A., 1937, I, 319).—The corrosion of Fe, partly covered with paraffin, in H_2O-H_2SO_4-$Pr^{\alpha}OH$ mixtures has been investigated. Concn. ranges which yield linear attack at the air–liquid and liquid–paraffin interfaces, periodic formation of films of corrosion product, and resinification of the $Pr^{\alpha}OH$ are distinguished. J. W. S.

Relation to metals of sulphur solutions and of a series of organic sulphur compounds in saturated hydrocarbons. Relations to iron of ethyl and butyl mercaptan solutions in *cyclo*hexane. L. G. Gindin, I. I. Torsujev, and V. A. Kazakova (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 413—418).—Fe is unaffected by solutions of EtSH and BuSH in *cyclo*hexane. It is confirmed that the lamp method is satisfactory for determination of S in oils.
J. W. S.

Anhydrous cyanides and cyanamides of iron, cobalt, and nickel. A. Perret (Compt. rend., 1937, **205**, 611—613; cf. A., 1937, I, 257).—The quantities of cyanamide produced by thermal decomp. of $Fe(CN)_2$, and on heating $FeCl_3$, $NiCl_2$, and $CoCl_2$ with NaCN, at 350—550°, have been determined. At. moderate temp. formation of cyanamide is increased by admixture of 20% of reduced Fe, but the thermal stability of the cyanamides shows that the catalysis does not involve formation of FeNCN.
A. J. E. W.

Oxidising properties of pyrites. J. I. Michailenko and A. P. Kreschkov (J. Gen. Chem. Russ., 1937, **7**, 1959—1968).—FeS_2 is regarded as a salt of H_2S_2, which may exhibit oxidising properties with reducing agents (H_2, Fe, Zn, Al, Cu, Fe–P), reducing properties with oxidising agents (O_2, HNO_3, Cl_2, etc.), or may enter into oxidation–reduction reactions.
R. T.

Effect of hydrogen under pressure on steel.—See B., 1938, 63.

Preparation of alkali compounds of ferric anhydride. IV. Basicity of ferrates. Chemical properties. A. D. del Boca (An. Farm. Bioquim., 1935, **6**, 65—69; Chem. Zentr., 1936, i, 4696).—K_2FeO_4 cannot be reduced to K_2FeO_3 by means of cellulose at 50°. No insol. ferrites can be pptd.
J. S. A.

Isolation of cementite by acid attack of ferrous materials, and its physical properties. A. Travers and R. Diebold (Compt. rend., 1937, **205**, 797—799).—Pure white cast Fe, containing 3·4% of C, traces of Mn, and 0·3% of Si, was treated with acid, washed with EtOH, treated with C_2HCl_3, washed with EtOH and Et_2O, and dried in N_2; the product consisted of pure Fe_3C (6·6% C). The carbide prepared by anodic attack has a straw-coloured iridescence, but when AcOH is used it is steel-grey. The Curie point is

210°. The *X*-ray spectrum has been determined. The electrode potential is approx. −0·320 v. in a medium of p_H 2·3, and becomes −0·500 v. with p_H 7·3. Fe_3C is electropositive with respect to Fe, the couple Fe_3C–Fe giving a p.d. of 0·230 v. at 18° in a neutral medium. R. S. B.

Mechanism of the decomposition of pure cementite by acids. A. Travers and R. Diebold (Compt. rend., 1937, **205**, 916—918; cf. A., 1923, ii, 767, and preceding abstract).—The primary reaction in the dissolution of Fe_3C in acids is the attack of Fe, which leaves a residue containing the ethylenic C skeleton; the H liberated replaces Fe, forming unsaturated hydrocarbons, the double linking not being reduced owing to the absence of catalysts. Free C, possessing strong adsorptive properties, is formed, probably owing to preferential oxidation of some of the H formed. A. J. E. W.

Nitrosopentamminocobalt salts. H. Brintzinger and H. Plessing (Z. anorg. Chem., 1937, **235**, 110—114).—By the method of dialysis the cation of the red nitrosopentamminocobalt salts has been found to have the doubled formula $[Co_2(NO)_2(NH_3)_{10}]^{4+}$ or $[Co_2(NO)_2(NH_3)_{10}H_2O]^{4+}$. It is probable, but not certain, that the complex ion contains a mol. of H_2O. The existence in solution of complex anions $[CA_4]^{4-}$ where C is the nitrosopentammine radical and A is SO_4, HPO_4, $HAsO_4$, C_2O_4, $C_3H_2O_4$, or $C_6H_5O_7$ has been detected. Similar experiments with the black isomerides failed owing to their rapid decomp. F. J. G.

Ammines of the Roussin's black salt series. G. Spacu and V. Armeanu (Bul. Soc. Ştiinţe Cluj, 1935, **8**, 299—310; Chem. Zentr., 1936, i, 4696—4697).—The *salts* $[Co(NH_3)_5Cl]R_2$; $[Co\ en_3]R_3,3H_2O$; 1:6-$[Co\ en_2Cl_2]R$; 1:2-$[Co\ en_2(NO_2)_2]R$; $[Co\{Co\ en_2(OH)_2\}_3]R_6$ and enH_2R_2, where R = $[Fe_4S_3(NO)_7]'$, are described. J. S. A.

Hydroxy-compounds of quadrivalent platinum. I. A. A. Grünberg and P. M. Filinov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 23—27).—Oxidation of K_2PtCl_4 with H_2S_2 in slightly alkaline solution, followed by addition of the neutral hydrochloride of the bases, yields ppts. of the *compounds* $(CH_2{\cdot}NH_3)_2[PtCl_4(OH)_2]$ (I) (prisms, sparingly sol. in H_2O, readily sol. in acids and alkalis) and $(NH_3Me)_2[PtCl_4(OH)_2]$ (prisms). With C_5H_5N,HCl, however, the product obtained passes rapidly into *cis*-$[Pt(C_5H_5N)_2Cl_4]$. The mechanism of this change is discussed. On heating alkaline (I) at 100° for about 1 hr. the solution becomes neutral to Me-orange, this being attributed to formation of $(CH_2{\cdot}NH_2)_2H[PtCl_4OH]$. On mixing K_2PtCl_4 oxidised by H_2O_2 with Tl_2SO_4 the *compound* $Tl_2[PtCl_4(OH)_2]$, insol. in HCl but readily sol. in H_2SO_4, is obtained. J. W. S.

Hydroxy-compounds of quadrivalent platinum. II. A. A. Grünberg and F. M. Filinov (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 907—919; cf. preceding abstract).—The compound $[Pt,4NH_3][PtCl_4(OH)_2]$ (I) has been obtained by interaction of $[Pt,4NH_3]Cl_2$ and $(NH_4)_2[PtCl_4(OH)_2]$ in aq. solution and the isomeric $[Pt,4NH_3,(OH)_2][PtCl_4]$ (II) by reaction of $[Pt,4NH_3,(OH)_2]SO_4$ with K_2PtCl_4. With H_2SO_4 (I) yields $[Pt,4NH_3,Cl_2]SO_4$. On addition of H_2SO_4 to (II) isomeric change to (I) occurs, and the $[PtCl_4]''$ and $[Pt,4NH_3]^{\cdot\cdot}$ present during this change unite to form Magnus' salt, which separates. The equilibrium $[Pt,4NH_3][PtCl_6] \rightleftharpoons [Pt,4NH_3,Cl_2][PtCl_4]$ exists in solution. The results indicate that if there are present in solution together ions of the same metal having different co-ordinated groups and different charges tautomeric equilibrium will be established between them, the equilibrium const. being determined by the ratio of the oxidation–reduction potentials of the constituent systems. R. C.

Co-ordination compounds. E. G. Cox (Sci. Progr., 1938, **32**, 463—478).—A review.

Nomenclature of co-ordination compounds. S. Škramovský (Chem. Listy, 1937, **31**, 478—480).—A discussion. R. T.

Quantitative emission spectrum analysis. A. Rivas (Angew. Chem., 1937, **50**, 903—905).—The material (*e.g.*, metal alloy) is dissolved, and a definite amount of the solution, *e.g.* 0·01 c.c., is applied to a C spark electrode. The method is applicable also to arc spectrography. J. S. A.

Determination of sensitivity of drop reactions. N. A. Tananaev and A. N. Romaniuk (J. Appl. Chem. Russ., 1937, **10**, 1624—1627).—The least amount of a no. of cations detectable by known drop reactions is determined. R. T.

Determination of solid content of salt solutions. V. S. Krasnova (J. Gen. Chem. Russ., 1937, **7**, 1979—1981).—Sörensen's method is applicable only to sea-H_2O of a high Cl′ content, such as that of the Polar seas, but gives low results for H_2O of a relatively high $[Mg^{\cdot\cdot}]$, and a low [Cl′], such as that of the Caspian Sea. In such cases Efremov's method is preferred. R. T.

Modified chromatographic technique. H. Flood (Tids. Kjemi, 1937, **17**, 178—179).—Inorg. salt solutions are analysed chromatographically by passing them through a pad of folded filter-papers impregnated with a zeolite. The pad is then unfolded and the sections are "developed" by treatment with suitable reagents for the ions in question. M. H. M. A.

Precision colorimetric determination of p_H. C. Du Rietz [with S. Hähnel] (Svensk Kem. Tidskr., 1937, **49**, 284—298).—The theory of colorimetry with one- and two-colour indicators is discussed in detail, and corrections are worked out for deviations from the Lambert–Beer law. Eleven commercial sulphonephthalein-type p_H indicators have been studied in the Pulfrich photometer and their consts. determined. The effect of impurities in the indicator is discussed. M. H. M. A.

Application of the glass electrode to the measurement of the p_H of slightly buffered and unbuffered solutions. E. G. Edwards and D. P. Evans (J.C.S., 1937, 1938—1942).—Alkaline drift is avoided by using a large vol. of liquid and agitating it with purified air, the small amount of alkali dissolved from the glass causing a negligible change in p_H when dispersed through the liquid. C. R. H.

Acidimetry and alkalimetry with fluorescent indicators. Y. Volmar (Document. sci., 1936, **5**, 33—39; Chem. Zentr., 1936, i, 4332).—The use of fluorescein, acridine, umbelliferone, and quinine is described (cf. A., 1936, 810, 1081). J. S. A.

Mercurous perchlorate as a volumetric reagent for chlorides and bromides. W. Pugh (J.C.S., 1937, 1824—1825).—$HgClO_4$ [prepared by shaking red HgO (22 g.), $HClO_4$ (*d* 1·5; 45 g.), H_2O (50 c.c.), and Hg (30 g.) until free from $Hg^{\cdot\cdot}$, decanting from the Hg, and diluting to 2 l.] can be used for titration of Cl′ and Br′, using bromophenol-blue as adsorption indicator. HNO_3, $HClO_4$, and AcOH have no effect on the results at total acid concn. $\ngtr 0{\cdot}04$N. SO_4'' causes high titres, and should be removed by adding $Pb(NO_3)_2$ to the boiling solution, but $Ag^{\cdot}$ and $Hg^{\cdot}$ are the only cations which interfere. The $HgClO_4$ solutions are fairly stable when kept in the dark. J. W. S.

Analytical chemistry of rhenium. XIII. Determination of chlorine in rhenium compounds. W. Geilmann and G. Lange (Z. anorg. Chem., 1937, **234**, 289—297).—The presence of excess of perrhenate does not interfere with the determination of Cl by pptn. as AgCl, either gravimetrically or volumetrically using Mohr's, Volhard's, or the potentiometric method. Methods available for breaking up the Cl compounds of Re include heating with aq. NaOH and H_2O_2, fusion with NaOH and Na_2O_2, ignition with $CaCO_3$, and reduction in a current of H_2. Of these the first is the most generally applicable. F. J. G.

Mercurimetric determination of chloride in presence of sulphite, thiosulphate, dithionate, sulphide, or nitrite. E. Votoček (Chem. Listy, 1937, **31**, 500—501).—The above ions are oxidised by $KMnO_4$ in acid solution, excess of $KMnO_4$ is removed by $H_2C_2O_4$, and the solution is titrated with standard $Hg(NO_3)_2$ in presence of Na nitroprusside. R. T.

New method of chemical analysis. I. S. Shinkai. **II. Determination of anions.** S. Shinkai and T. Nagata (J. Soc. Chem. Ind. Japan, 1937, **40**, 348B, 349B).—I. In gravimetric analysis the wt. of the ppt., if small in comparison with the vol. of the reacting solutions, can be determined from the vol. and *d* of the sample solution, reagent, and filtrate by means of the formula $m = d_1V_1 + d_2V_2 - d_3V_3$ where m is the wt. of the ppt. and d_1, V_1, d_2, V_2, d_3, V_3 refer to the *d* and vol. of the sample solution, reagent solution, and filtrate, respectively. The method is applied to the determination of Ag.

II. The method is applied to the determination of Cl′, Br′, and SO_4''. C. R. H.

Pycnometric analysis. W. W. Russell (Ind. Eng. Chem. [Anal.], 1937, **9**, 592—597).—A rapid method, in which a purified ppt. is transferred quantitatively to a small pycnometer and weighed in presence of a liquid of known *d*, is described. Analyses involving AgCl, $BaSO_4$, and $Fe(OH)_3$ indicate that the method is accurate. Sources of error in a pycnometric method of analysis and advantages of the present method over orthodox gravimetric methods are discussed. L. S. T.

Determination of iodates. V. J. Anhorn and H. Hunt (Ind. Eng. Chem. [Anal.], 1937, **9**, 591).—A method involving the use of wt. burettes of 1 ml. capacity and the colour of free I as indicator is described for the determination of 0·3 mg. of KIO_3. The method is more accurate and more convenient than the starch indicator method (A., 1931, 325) or the I–CN procedure (A., 1926, 139). L. S. T.

Assay of [pharmacopœial] solution of iodine.—See B., 1938, 102.

Titration of fluorine in aqueous solutions. R. J. Rowley and H. V. Churchill (Ind. Eng. Chem. [Anal.], 1937, **9**, 551—552).—F′ can be accurately titrated with $0{\cdot}1$N-$Th(NO_3)_4$ in aq. instead of in 48% EtOH solution, as recommended in the Willard–Winter method, when the p_H is adjusted to 2·9—3·1 by means of a buffer of $CH_2Cl{\cdot}CO_2H$ half neutralised by NaOH. The end-point is more definite, and larger quantities of F′, up to 50 mg., can be titrated. L. S. T.

Iodometric determination of small amounts of persulphate and bromate present in the same solution. F. Láska (Chem. Listy, 1937, **31**, 404—406).—S_2O_8'' is determined by the method of Zombory (A., 1928, 497), in neutral solution, and BrO_3' by that of Kolthoff (Z. anal. Chem., 1921, **60**, 348), in acid solution. R. T.

Stability of solid sodium thiosulphate. V. K. La Mer and H. M. Tomlinson (Ind. Eng. Chem. [Anal.], 1937, **9**, 588).—Solid $Na_2S_2O_3$ decomposes slowly into S and Na_2SO_3. The deterioration of solutions of freshly recryst. $Na_2S_2O_3$ is no more rapid than that of solutions prepared from crystals not recently recryst. L. S. T.

Determination of sulphur in different forms of combination in medicaments.—See B., 1938, 102.

Determination of sulphur in brown-coal pyrites.—See B., 1938, 11.

Qualitative separations on a micro-scale. III. Analysis of the selenium group of Noyes and Bray. A. A. Benedetti-Pichler and J. R. Rachele (Ind. Eng. Chem. [Anal.], 1937, **9**, 589—591).—The scheme of Noyes and Bray has been adapted, after modification, to the micro-scale, starting with 1 mg. of solid material. With the procedure given 5 µg. of Se, Ge, or As can be detected when accompanied by 500 µg. of the other two elements of the group. A screw clamp for microcones enables pressure digestions to be performed without loss, and a buzzer accelerates the complete pptn. of the $MgNH_4AsO_4,6H_2O$ and the flocculation of the colloidal GeS_2 in the cones. L. S. T.

Determination of ammonia in presence of amino-acids [by Folin's method]. V. P. Hirsjärvi (Suomen Kem., 1937, **10**, **A**, 153—156).—The standard method is modified by freeing the air-stream from CO_2 before drawing it, at 100 l. per hr., through the reaction vessel which is kept at 50°. M. H. M. A.

Determination of nitrates in water in presence of nitrites. G. Gad (Gas- u. Wasserfach, 1938, **81**, 6).—To determine NO_3' by the brucine method

NO_2' must first be destroyed. $CO(NH_2)_2$ is unsuitable for this purpose, results being low even when excess of the reagent is avoided, but NaN_3, $(NH_4)_2SO_4$ and p-$NH_2{\cdot}C_6H_4{\cdot}NO_2$ can be used under the conditions described. A. R. PE.

Detection of nitrate in the presence of nitrite. H. SCHNEIDER (Angew. Chem., 1937, **50**, 906).—NO_2' gives an immediate orange-brown coloration on the addition of conc. $H_2SO_4 + C_6H_6$, but $PhNO_2$ (detected by its odour after evaporation of a drop of the C_6H_6) is formed only in the presence of NO_3'. J. S. A.

Photometric determination of added phosphorus in oils.—See B., 1938, 52.

Analysis of crude phosphorus and sludges containing phosphorus.—See B., 1938, 52.

Arsenious oxide in the standardisation of solutions of potassium permanganate. H. A. BRIGHT (Ind. Eng. Chem. [Anal.], 1937, **9**, 577—578).—Standardisation of 0·1N-$KMnO_4$ solutions against As_2O_3 using KI or KIO_3 as catalyst (A., 1926, 581), and against $Na_2C_2O_4$ as in Fowler and Bright's procedure (A., 1936, 304), gave vals. which agreed to 1 in 3000, showing As_2O_3 to be a suitable primary standard. L. S. T.

Determination of silicon in aluminium.—See B., 1938, 69.

Microgasometric analysis with the dilatometer. Determination of the carbonate radical. B. L. CLARKE and H. W. HERMANCE (Ind. Eng. Chem. [Anal.], 1937, **9**, 597—598).—The CO_2 is liberated by heating a few mg. of the carbonate with fused $K_2S_2O_7$ in a micro-retort and its vol. measured by means of an attached Hg-thread dilatometer. Results obtained with cerussite are recorded. L. S. T.

Rapid method for accurate determination of helium (neon) in gas mixtures. E. SCHRÖER (Z. anal. Chem., 1937, **111**, 161—168).—Apparatus is described for the determination of He or Ne by a modification of the Paneth–Peters method, SiO_2 gel being used as adsorbent. J. S. A.

Determination of potassium by the Shohl–Bennett method. E. R. HARTZLER (J. Biol. Chem., 1938, **122**, 19—20).—Refinements in technique are described whereby 0·04 mg. of K can be determined. P. G. M.

Choice of indicator in determining the alkalinity of ashes.—See B., 1938, 51.

Electrometric determination of silver. H. ROBINSON and H. HUGG (Ind. Eng. Chem. [Anal.], 1937, **9**, 565—566).—The Ag, as nitrate, is titrated with KI using a Au electrode and a C electrode, saturated with HNO_3, connected to a microammeter. The first excess of KI generates sufficient current through oxidation by the HNO_3–C electrode to be read directly on the ammeter, neither amplifier nor balancing circuit being required. Pb, Cu, Cd, Ni, Co, and Zn in concns. up to 55% do not interfere, and suspended metastannic acid, traces of Sb, Al, and colloidal Au have no effect. When Fe is present a balancing circuit must be used. Pd must be absent. SO_4'' renders the end-point uncertain, and the C electrode must then be saturated with 0·1N-$Ce(SO_4)_2$. The method is accurate up to 50°. L. S. T.

Determination of radium, mesothorium I, and radiothorium in sealed preparations. G. V. GORSCHKOV and V. N. IONOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 15—18).—Mixtures can be analysed by measurement of the effects of their γ-radiations in expelling neutrons from D_2O (giving the Ra-Th content) and from Be (yielding the content of Ra-Th + Ra). Combination of the results with the total γ-ray activity yields the meso-Th I content. J. W. S.

Separation of magnesium as oxalate by precipitation in concentrated acetic acid solution. P. J. ELVING and E. R. CALEY (Ind. Eng. Chem. [Anal.], 1937, **9**, 558—562).—Details for the determination in 85% AcOH are given. The ppt. can be converted into and weighed as oxide or sulphate, or the oxalate can be determined volumetrically. The alkalis can be determined in the filtrate after the separation of Mg by this method, but double pptns. of the oxalate are required for accurate results in certain cases. Large amounts of Na, as from a carbonate fusion, cannot be separated conveniently. NH_4 salts in excessive amounts must be removed, preferably by means of HNO_3 and $HClO_4$. Heavy metals and alkaline earths must be absent. Applications of the method to the Mg in limestone and dolomite are described. L. S. T.

Analytical application of 2 : 2′-dipyridyl. C. FERRARI (Annali Chim. Appl., 1937, **27**, 479—482).—Mg, Be, Al, or Ti can be determined in aq. solution in presence of Fe^{III} salts by reduction of $Fe^{\cdot\cdot\cdot}$ to $Fe^{\cdot\cdot}$ and addition of 2 : 2′-dipyridyl, which forms $[Fe\,dipy_3]^{\cdot\cdot}$ (I). Excessive amounts of Fe are removed as the perchlorate of (I). F. O. H.

p_H studies of milk of magnesia with the glass electrode.—See B., 1938, 101.

Modification of the palmitate determination of magnesia in water.—See B., 1938, 111.

(A) Micro-separation of zinc with 8-hydroxyquinoline in acetic acid. (B) Volumetric micro-determination of zinc in an alkaline medium. C. CIMERMAN and P. WENGER (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 98—101; cf. A., 1936, 1352).—(A) Complete separation from $NH_4^{\cdot}$, $K^{\cdot}$, $Na^{\cdot}$, $Li^{\cdot}$, and $Mg^{\cdot\cdot}$ can be effected by suitable adjustment of the vol. of solution and the concns. of NaOAc and AcOH present; the appropriate quantities are specified.

(B) Tartaric acid and excess of NaOH are added to the $Zn^{\cdot\cdot}$ solution; a slight excess of a 1% EtOH solution of 8-hydroxyquinoline is added in the cold. After 15 min. the liquid is heated, and after 45 min. the ppt. is collected and treated as in the AcOH method. A. J. E. W.

Spectrographic determination of impurities in cadmium.—See B., 1938, 66.

Determination of traces of heavy metals in mineral waters.—See B., 1938, 111.

Determination of lead by the sulphite method. J. HANUŠ and V. HOVORKA (Chem. Listy, 1937, **31**, 489—500).—A litre of H_2O at 100° dissolves approx. 2 mg. of $PbSO_3$. In determining Pb as $PbSO_3$, pptd. by $Na_2S_2O_5$ from neutral solution, this loss is compensated by adsorption of ions from the solution. Should the latter contain NH_4OAc, the ppt. should be dried at ≯90°, whilst when it contains only Cl', NO_3', or tartrate a temp. of 115° may be applied. The method serves for determination of 0·0009—0·75 g. of Pb in sol. and insol. salts. R. T.

Separation of lead from antimony. V. Hovorka (Chem. Listy, 1937, **31**, 501—507).—2 g. of NH_4 tartrate are added to the ammoniacal solution containing ≯0·2 g. each of Sb and Pb, and Pb is pptd. as $PbSO_3$ from the boiling solution by means of $Na_2S_2O_5$. R. T.

$[Fe(CN)_6]'''$–$Pb_2[Fe(CN)_6]$ electrode as an indicator in the potentiometric titration of lead. A. B. Schachkeldian (J. Appl. Chem. Russ., 1937, **10**, 1706—1710).—The solubility coeff. of $Pb_2[Fe(CN)_6]$ (I) is 5×10^{-16}. Electro-titration of Pb^{II} by Na phosphate is effected with a Pt in $K_3Fe(CN)_6$–(I) electrode, for ≮0·005M-Pb^{II}. R. T.

Separation of lead from arsenic. V. Hovorka (Chem. Listy, 1937, **31**, 414—419).—$PbHAsO_4$ is converted by heating at 100° with aq. $Na_2S_2O_5$ into $PbSO_3$ containing ≯ traces of As. R. T.

Use of potassium ferrocyanide for potentiometric determination of copper. F. K. Fischer (J. Appl. Chem. Russ., 1937, **10**, 1687—1692).—Cu^{II} solutions are electro-titrated with $K_4Fe(CN)_6$, using a Pt electrode. $Ag^{\cdot}$ can be titrated in the same solution, with a Ag electrode. R. T.

Colorimetric determination of copper. J. Šebor (Chem. Listy, 1937, **31**, 419—420).—The most sensitive method is that involving the use of 1 : 2-diaminoanthraquinonesulphonic acid. The methods involving use of aq. NH_3, $K_4Fe(CN)_6$, alone or with citric acid, or of Na_2S can be applied only over a narrow range of concns. R. T.

Application of sodium nitroprusside to determination of copper, cadmium, cobalt, and nickel. O. Tomíček and J. Kubík (Chem. Listy, 1937, **31**, 471—478).—The solubilities of some nitroprussides in H_2O at 20° are : Cd 3, Co 2, and Ni and Cu $0·6 \times 10^{-4}$ g.-mol. per litre. To determine Cu and Ni, excess of 0·05M-$Na_2Fe(CN)_5NO$ (I) is added to 10 ml. of approx. 0·05M-Cu^{II} or -Ni in dil. H_2SO_4, the vol. is made up to 50 c.c. after 12 hr. (final $[H_2SO_4] = 0·05$M), the solution is centrifuged, and an aliquot part of the centrifugate is electro-titrated with 0·1N-$AgNO_3$, to determine excess of (I) used. Co is determined similarly, without adding H_2SO_4. In the case of Cd 10—15 ml. of EtOH are added in place of H_2SO_4, and the solution is filtered instead of being centrifuged. R. T.

Dithizone processes in chemical analysis. H. Fischer (Angew. Chem., 1937, **50**, 919—932).—The subjects discussed include the absorption curve of dithizone (I) and its oxidation product, sources of error and their avoidance, the detection and determination of Cu, Ag, Au, Zn, Cd, Hg, In, Tl, Pb, Bi, Sn, Mn, Fe, Co, Ni, Pd, and Pt, and the application of the use of (I) in various fields. L. S. T.

Zinc sulphide as a reagent for fractional detection of mercury, copper, and cadmium. M. Schtschigol (J. Appl. Chem. Russ., 1937, **10**, 1644—1645).—An equal vol. of 10% KI is added to the solution, followed by 20% NaOH + Na_2CO_3 to a strongly alkaline reaction, and the solution is boiled and filtered, and the filtrate heated with ZnS; a black ppt. of HgS forms. The ppt. is boiled with $(NH_4)_2SO_4$ in aq. NH_3, the solution is filtered, and the filtrate is warmed with ZnS; a brown ppt. indicates Cu. A second portion of filtrate is decolorised with KCN, and ZnS is added; a yellow ppt. indicates CdS. R. T.

Electrometric titration of mercurous salts in presence of mercuric salts. E. Michalski (Rocz. Chem., 1937, **17**, 578—584).—Electrotitration of Hg^I in presence of Hg^{II} is effected by adding the solution from a burette to standard I in KI solution, until a zero galvanometer reading is obtained. NH_4, Ca, Mg, Ni, Co, Mn^{II}, Zn, Cr^{III}, Al, Ag, Pb, and Bi do not interfere. R. T.

Volumetric determination of aluminium by means of pyrogallol. A. V. Pavlinova (J. Appl. Chem. Russ., 1937, **10**, 1718—1720).—Pptn. of $Al(OH)_3$ is not prevented by glycerol, mannitol, glucose, or sucrose; pyrogallol (I) (1 mol. per $Al^{\cdot\cdot\cdot}$) prevents pptn., and liberates an equiv. amount of acid from Al salts, according to the reaction $Al^{\cdot\cdot\cdot} + C_6H_3(OH)_3 \rightarrow 3H^{\cdot} + C_6H_3O_3Al$. Al may be determined by titrating the free acid formed after addition of 3% aq. (I). R. T.

Detection of related elements in drops in presence of one another. II. Microchemical detection of aluminium and beryllium with ammonium molybdate. G. Kramer (Z. anal. Chem., 1937, **111**, 169—176).—Al and Be are pptd. in characteristic habit as molybdates by means of $(NH_4)_2MoO_4$ in ≯0·2N-HNO_3 solution, and may be so detected simultaneously. J. S. A.

Photometric methods in the analysis of light metals.—See B., 1938, 70.

Photoelectric determination of manganese and chromium in steels.—See B., 1938, 65.

Principles and applications of absolute colorimetry. XVI. Absolute colorimetric determination of iron. A. Thiel and E. van Hengel (Ber., 1937, **70**, [*B*], 2491—2497).—The method of Thiel and Peter (A., 1936, 44) for the determination of Fe by sulphosalicylic acid (I) is modified in accordance with Alten *et al.* (A., 1934, 49) by the addition of citrate. The suggestion of these authors that $Fe^{\cdot\cdot}$ gives a red coloration with (I) could not be confirmed and no correction is necessary on this account in the actual determination. $Fe^{\cdot\cdot\cdot}$ can be accurately determined by the green colour developed with 7-iodo-8-hydroxyquinoline-5-sulphonic acid in solution which is just distinctly acidic to Me-orange. $Fe^{\cdot\cdot}$ is without action. Strong acids should be partly neutralised by NH_3. Other probable foreign cations do not interfere but tartrates, citrates, and similar anions have a harmful influence on the depth of colour. Light filters SF_9 or SF_{10} are used and a compensating solution is unnecessary. $Fe^{\cdot\cdot}$ in presence of $Fe^{\cdot\cdot\cdot}$ is determined by measurement of the latter and, after oxidation, of total $Fe^{\cdot\cdot\cdot}$. The simplest and most sensitive reagent for $Fe^{\cdot\cdot}$ is 2 : 2′-dipyridyl, which gives a persistent, intense red colour in almost neutral solution. Foreign cations, except $Mn^{\cdot\cdot}$, do not interfere beyond necessitating the use of a larger amount of reagent. $Zn^{\cdot\cdot}$ causes a turbidity or gives a white ppt. Org. OH-acids are without effect. I in high concn., CNS, and a few infrequent anions give ppts. or changes in colour. Light filter SF_5 is used. $Fe^{\cdot\cdot\cdot}$ can be determined directly after reduction by $Na_2S_2O_4$. H. W.

Determination of small amounts of iron by means of quinaldinic acid. G. A. Butenko and B. A. Veller (J. Appl. Chem. Russ., 1937, **10**, 1662—1673).—1 g. of substance, containing $\not>$5% Al, is freed from SiO_2, the residue is dissolved, and made up to a vol. of 250—500 ml. 25—50 ml. of the solution are diluted to 70 ml., made neutral with aq. NH_3 (metanil-yellow), 3 ml. of 5% NH_2OH,HCl, 6 ml. of 1·13% Na quinaldate, 2 ml. of 10% KCN, and H_2O to 100 ml. are added, and the coloration is compared with that given by a standard solution. Should a ppt. of $Al(OH)_3$ form after addition of KCN, a further 2 ml. of 10% KCN are added, and the solution is filtered. Should Ti hydroxide separate after addition of aq. NH_3, 4 ml. of N-HCl are added, and the amount of KCN is raised to 6 ml. In presence of PO_4''' 3·5 ml. of N-HCl and 4 ml. of KCN are taken. R. T.

Histochemical detection of organic iron. C. Ferrari (Annali Chim. Appl., 1937, **27**, 487—489).—Aq. $K_4Fe(CN)_6$ does not react with NH_4HS in the dark, whilst after exposure to light the photolytic products give a ppt. of FeS. F. O. H.

Analytical application of sulphinic and seleninic acids. F. Feigl (Österr. Chem.-Ztg., 1937, **40**, 535).—Priority is claimed (cf. Dubsky *et al.*, A., 1937, I, 532). Arylsulphinic acids are suitable precipitants for Fe and quadrivalent metals. J. S. A.

Determination of potassium ferrocyanide from the point of view of the rules of residues and of replacement. N. A. Tananaev and P. F. Vereschnia (J. Appl. Chem. Russ., 1937, **10**, 1628—1643).—Pure $K_4Fe(CN)_6$ is obtained by pptn. with EtOH from aq. solution. It can be determined as K_2CO_3 (fusion with $H_2C_2O_4$), with a mean error of −0·2% (time >1 hr.), as $K_3Fe(CN)_6$ (oxidation with Br, followed by iodometric titration; mean error −0·15%; time 25 min.), or argentometrically (excess of standard $AgNO_3$ is added, the solution is filtered, and Ag is titrated in the filtrate; mean error ±0·10%; time 27 min.). $K_4Fe(CN)_6$ may serve for standardisation of $KMnO_4$, $Na_2S_2O_3$, $AgNO_3$, NH_4CNS, and acids. R. T.

Determination of iron in pharmaceutical preparations by means of ceric sulphate.—See B., 1938, 102.

Micro-determination of cobalt with anthranilic acid. P. Wenger, C. Cimerman, and A. Corbaz (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 96—98; cf. A., 1933, 924).—$Co^{\cdot\cdot}$ is pptd. as $Co(C_7H_6O_2N)_2$ in neutral or very slightly acid solution with 2% Na anthranilate (I) solution (p_H 6); the ppt. is washed with (I) solution and EtOH, dried at 120—130°, and weighed. A. J. E. W.

Electrolytic determination of nickel without the use of platinum electrodes. L. I. Favorski and G. V. Zotov (J. Appl. Chem. Russ., 1937, **10**, 1700—1705).—Ni can be determined by the Fresenius–Bergmann method, using a Ni cathode and a passivated Fe anode. R. T.

Assay of nickel in ores.—See B., 1938, 66.

Colour test for chromates and dichromates. B. K. Nandi (Current Sci., 1937, **6**, 156—157).—CrO_4'' and Cr_2O_7'' in presence of $H_2C_2O_4$ at p_H <6·5 give a transient purple colour with 8-(α-methyl-δ-diethylaminobutyl)amino-6-methoxyquinoline (plasmoquin) (I). The colour is due to partial oxidation of (I) to a semi-quinone type compound. The test is sensitive at dilutions up to 1 in 10^5. Complex acids of Mo and W give a blue colour with (I) in alkaline solution. A. J. E. W.

Titrimetric determination of alkali dichromates in neutral solution. G. Tsatsa (Praktika, 1935, **10**, 235—238; Chem. Zentr., 1936, i, 4187).—$BaCrO_4$ is pptd. by adding $BaCl_2 + NaOAc$. The AcOH liberated may then be titrated with 0·1N-KOH. The accuracy of the method makes it usable for standardising alkalis. J. S. A.

Retention of alkalis by metallic hydroxides of the chromium group. P. N. Raikov (Z. anal. Chem., 1937, **111**, 179—183).—Treatment of an aq. suspension of $Cr(OH)_3$, washed free from NH_4 salts, with CO_2 liberates NH_3. It is considered that NH_3 is bound chemically to two anhydrohydroxides, the acid strength of which is comparable with that of CO_2. $Fe(OH)_3$ and $MnO(OH)_2$, but not $Al(OH)_3$, behave similarly. J. S. A.

Determination of chromium in chromite.—See B., 1938, 67.

Colorimetric determination of zirconium. V. A. Nazarenko (J. Appl. Chem. Russ., 1937, **10**, 1696—1699).—5 ml. of 4N-HCl are added to the solution, which is evaporated down to 0·5 ml., 5 ml. of 2N-HCl and excess of 1% $p\text{-}NMe_2\cdot C_6H_4\cdot N{:}N\cdot C_6H_4\cdot AsO(OH)_2$ in 5% HCl in EtOH (1 ml. per 0·1 g. Zr, + 1 ml. excess) are added, and the solution is filtered after 2 hr. The residue is washed successively with 0·08N-HCl in EtOH and with 60% EtOH, dissolved in 2N-KOH, the solution is diluted to 50—250 ml. with 2N-KOH, and the coloration is compared with that given by standard Zr solution. Ti, Th, Ce, Fe, and U do not interfere. R. T.

Determination of zirconium in ferrozirconium. R. Chandelle (Bull. Soc. chim. Belg., 1937, **46**, 423—427).—Finely powdered alloy (0·3 g.) containing no Ti is fused with Na_2O_2 (4—5 g.) in a Ni crucible for 10—15 min., the cold mass extracted with H_2O (300—400 ml.), and filtered. The ppt., containing Zr, Fe, Ni, and SiO_2, is dissolved in 5N-HCl, SiO_2 removed by usual method, and $FeCl_3$ by extraction with Et_2O. From 250 ml. of 0·5N-HCl solution containing 0·03 g. of Zr, 1 g. of Na_2MeAsO_3 ppts. the Zr quantitatively. The ppt. is ignited to ZrO_2 (A., 1937, I, 634). K. S.

Determination of thorium by means of (A) phenylarsinic acid, (B) ammonium molybdate. L. E. Kaufman (J. Appl. Chem. Russ., 1937, **10**, 1648—1650, 1693—1695).—(A) The method of Rice *et al.* (A., 1926, 593) has no advantages over other methods, and is more laborious. Separation of Th from Ce depends on difference in solubility of the phenylarsinates in HCl, and not in AcOH, as proposed by Rice.

(B) Metzger's method (A., 1913, ii, 157) gives trustworthy results if pptn. is effected in 4·5—5% AcOH, instead of 6—6·6% AcOH as specified by Metzger. R. T.

Determination of vanadium, nickel, and molybdenum in sea-water. T. Ernst and H. Hörmann (Nachr. Ges. Wiss. Göttingen, 1936, [ii], **1**, 205—208; Chem. Zentr., 1936, i, 4344).—V, Ni, and Mo are conc. on pure $Fe(OH)_3$ as carrier, and determined spectrographically. Mean contents are V_2O_3 0·5, NiO 0·1, and MoO_3 1 × 10^{-6} g. per l. J. S. A.

(A) Acidimetric determination of vanadium in quinquevalent vanadium compounds by means of hydroxy-compounds. (B) Volumetric determination of vanadium by means of hydroxy-compounds. V. K. Zolotuchin (J. Appl. Chem. Russ., 1937, **10**, 1651—1655, 1656—1661).—(A) V^V is determined by the method previously described (*ibid.*, 1933, **6**, 1676), after reduction to V^{IV} by means of $H_2C_2O_4$, tartaric acid, or Mg.

(B) V^{IV} salts liberate equiv. amounts of inorg. acid from solutions of Na K tartrate (I), or of mannitol, glycerol, or sucrose. The [V^{IV}] in solutions is determined by titration of the acid liberated with (I); the results differ from those obtained by $KMnO_4$ titration by ±0·6%. R. T.

Colorimetric determination of bismuth. T. Yamamoto (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 1312—1317).—Dil. aq. Na_2S is added to a slightly acid solution of the sample in presence of gum arabic or polyvinyl alcohol. The solution is made slightly alkaline with NH_3, diluted to a standard vol., and the colour matched against a standard. The accuracy is ±3%. E. S. H.

Precision mercury thermometers in fused quartz. H. Moreau (Compt. rend., 1937, **205**, 967—969).—Preliminary observations show that such thermometers retain a remarkably const. zero during use. E. S. H.

Differences in gas thermometer data. V. Jacyna (Bull. Acad. Polonaise, 1937, **A**, 98—108).—The corrections applied to gas thermometric measurements at const. vol. and pressure are discussed theoretically. The three relationships $\Delta t_v \lesseqgtr \Delta t_p$. are possible and in the case of He are experimentally observed over the temp. range 4—3000° K. K. S.

Lag in the indication of thermometers. F. Lieneweg (Wiss. Veröff. Siemens-Werken, 1937, **16**, 112—126).—The calculation of the lag in indication of thermometers of different materials, and when placed in different media, is considered. A. J. M.

Measurement of flame temperatures. G. Ribaud (Compt. rend., 1937, **205**, 901—902).—A modification of the Kurlbaum method, in which two images of a source of variable intensity are matched photometrically, is described; the light producing one of these images is passed through the flame under test. When matching occurs, the flame temp. = the temp. of the source. Using a spectrometer, temp. of non-luminous flames can be measured by the Féry method. A. J. E. W.

Radiation thermopiles. A. H. Pfund (Rev. Sci. Instr., 1937, [ii], **8**, 417—418).—A technique for making junctions between Bi–Sb and Bi–Sn alloys without the use of solder is outlined. F. J. L.

Semi-micro-colorimeter for measuring heat capacities at low temperatures. D. R. Stull (J. Amer. Chem. Soc., 1937, **59**, 2726—2733).—The apparatus is designed for the determination of sp. heats and heats of transition and fusion of 5—6-c.c. samples of org. compounds over the temp. range 100—320° K. Data for the sp. heats of PhMe, CCl_4, PhF, PhCl, PhBr, PhI, *n*-hexane, β- and γ-methylpentane, and βγ- and ββ-dimethylbutane at 90—320° K. are recorded. ββ-Dimethylbutane undergoes a transition in the solid state at 127·11° K. E. S. H.

Radioelectric thermostat. A. L. Delaunois (Arch. Int. Pharmacodyn., 1937, **57**, 64—66). D. T. B.

Method of obtaining spectra of metals. H. Muraour and A. Michel-Lévy (Compt. rend., 1937, **205**, 1054—1055).—A modification of a previous method of obtaining the spectra of metals is described (cf. A., 1937, I, 568). The metal is now used in the form of a thin sheet 0·02 mm. thick and is pulverised by means of an explosion wave in A. J. A. D.

Device for improving the observation of lines in spectrograms. G. Bolla (Nuovo Cim., 1937, **14**, 257—261).—A plane-parallel glass plate, which is made to oscillate with a suitable frequency and in a suitable direction, inserted between the spectrogram plate and the objective of a microscope comparator produces a sharpening of the spectral lines and overcomes the effects due to the granular nature of the photographic plate. O. J. W.

Curved quartz crystal *X*-ray spectrograph and a determination of the grating constant of quartz. B. B. Watson (Rev. Sci. Instr., 1937, [ii], **8**, 480—485).—The construction of a small experimental spectrograph of the curved-crystal type is described. The improvement of the spectra obtained when quartz is used in place of mica or gypsum is discussed. The grating const. *d* for the basal planes of quartz is 5·393±0·002 A. L. S. T.

Focussing method for *X*-ray powder spectroscopy. L. K. Frevel (Rev. Sci. Instr., 1937, [ii], **8**, 475—477).—A convergent Soller type slit, adaptable to a camera of arbitrary radius, selects pencils of *X*-rays that emanate from a broad focal spot and impinge on any selected point on the equator of the cylindrical camera. The powder is mounted on the camera wall in the form of a thin sheet that intercepts the wedge of *X*-radiation. All *X*-rays diffracted at the same Bragg angle are thus brought to a focus at the equator of the camera. L. S. T.

Focussing of X-rays with a crystal of variable curvature. V. Dolejšek and M. Tayerle (Compt. rend., 1937, **205**, 605—607).—The use of a rotating crystal of mechanically varied curvature, giving sharp focussing over a wide λ range, is discussed. A. J. E. W.

Adjustment of a crystal for oscillation X-ray photographs. O. P. Hendershot (Rev. Sci. Instr., 1937, [ii], **8**, 436—438).—A systematic method for setting a single crystal, so that a zone axis coincides with the axis of rotation, by means of an oscillation X-ray photograph is outlined. F. J. L.

Simple X-ray tube with low energy consumption. Studies on the wide-angle method. B. Hess (Z. Krist., 1937, **97**, 197—207).—Design, scope, and performance are described of an inexpensive 3-w. gas tube with a Cu foil (10 μ.) anode and hemispherical cathode. In single crystal analysis, planes are reflected on the plate by the conical beam as hyperbolæ. Simple analytical technique is developed and exemplified with gypsum. I. McA.

Application of the spectroscope to quantitative analysis. (Simplified spectrocolorimeter.) K. A. Snesarev and F. M. Schemjakin (J. Gen. Chem. Russ., 1937, **7**, 1811—1818).—The concn. of coloured salts is determined spectrophotometrically, using apparatus of simple construction. R. T.

Objective colorimeter for the measurement of small colorations and turbidities. H. Dreyer (Ann. Physik, 1937, [v], **30**, 650—664).—Apparatus for photo-electric colorimetry with accuracy 0·3—0·5% for aq. solutions containing 0·1 to 0·5 g. of methylene-blue per cu. m. is described. O. D. S.

Apparatus for the subjective study of colour mixtures. V. H. Pavlović (Compt. rend., 1937, **205**, 791—792; cf. *ibid.*, **204**, 1635).—A stroboscopic method of colour mixture is described. R. S. B.

Orthostereoscopic photomicrography and some applications. L. C. Martin and T. R. Wilkins (J. Opt. Soc. Amer., 1937, **27**, 340—349).—Apparatus for the stereoscopic photomicrography of tracks of α-rays and other high-energy at. particles is described. The conditions for obtaining a natural perspective from photographs made with a compound microscope system are discussed. The position of the stops is also considered. The theory is verified experimentally with both low- and high-power systems. A. J. M.

Photomicrography in chemistry. Photomicrographic reproduction of microchemical crystal precipitations. S. Oehlinger (Phot. u. Forsch., 1936, **5**, 161—167; Chem. Zentr., 1936, i, 4331).—The utilisation of standard photographic apparatus is outlined. J. S. A.

Refractive indices at low temperatures. A. V. Grosse (J. Amer. Chem. Soc., 1937, **59**, 2739—2741).—Procedure for determining n with the Abbé refractometer at temp. down to $-50°$ is described. Data are recorded for several org. compounds at low temp. E. S. H.

Application of the fluorescence microscope in analytical chemistry. M. Servigne (Ann. Chim. Analyt., 1937, [iii], **19**, 313—319).—The advantages of microscopical fluorescence analysis for microchemical work are indicated. J. S. A.

Precision, all-purpose microcamera. L. C. Graton and E. B. Dane, jun. (J. Opt. Soc. Amer., 1937, **27**, 355—376).—A new type, high-precision instrument, for photography with transmitted or reflected light, is described. A motor-driven fine focussing mechanism is 100 times slower than on standard instruments. 1 scale division = 100 A. Results indicate that true depth of focus is $<$, and resolution $>$, that allowed by current theory. A revision of microscopical theory is suggested since lenses surpass their theoretical limits. N. M. B.

Light counter with positive wall potential. H. Pupke (Z. tech. Physik, 1937, **18**, 326—332).—The light-sensitivity of counter tubes with positive wall potential is not const. O. D. S.

Water vapour in the construction of more sensitive photo-electric cells of alkali metals. J. Kunz, J. T. Tykociner, and L. P. Garner (J. Opt. Soc. Amer., 1937, **27**, 354). A. J. M.

High-vacuum multiplate camera. D. A. Richards and R. A. M. Bound (J. Sci. Instr., 1937, **14**, 402—406).—The apparatus described enables several exposures to be made in an electron diffraction camera or a cathode-ray oscillograph without breaking the vac. in order to remove the photographic plates. L. S. T.

Glass-enclosed metallic reference electrode. O. J. Stewart and W. L. Carruth (Ind. Eng. Chem. [Anal.], 1937, **9**, 581—582).—A Hg-filled glass electrode suitable as a reference electrode in oxidation–reduction potentiometric titrations on a semi-microscale is described. L. S. T.

Asbestos–potassium chloride bridge and a simple calomel electrode. C. E. ZoBell and S. C. Rittenberg (Science, 1937, **86**, 502). L. S. T.

Remote p_H recorder with glass electrode. Anon. (Paper Trade J., 1937, **105**, TAPPI Sect., 332).—The model described is fitted with an automatic sampler, the frequency of sampling being variable at will. The recorder may be 500 ft. from the electrodes, and is very simple in design. The chart is a flat sheet, and the recording pen operates in such a way that back-lash and other mechanical errors are avoided. Processing valves may be made to operate by the instrument, thus permitting automatic control of p_H. H. A. H.

Electrode for electrometric measurement of p_H. P. Nylén (Z. Elektrochem., 1937, **43**, 921—923).—Cf. A., 1937, I, 49. J. W. S.

Hot-cathode demountable X-ray tube and vapour trap. P. M. Harris (Rev. Sci. Instr., 1937, [ii], **8**, 478—480). L. S. T.

Arrangement for investigation of fluorescent materials for cathode-ray tubes. M. von Ard-

ENNE (Angew. Chem., 1937, **50**, 905—906).—An apparatus for the spectrophotometry of fluorescence phenomena is described. J. S. A.

Application of electron lens to cloud chamber photography. W. T. DAVIES and C. O'CEALLAIGH (Proc. Camb. Phil. Soc., 1937, **33**, 540—548).—The magnetic lens electron focussing system of Busch (Arch. Elektrotech., 1927, **18**, 583) has been adapted to focus high-energy electrons from radioactive sources as they enter the cloud chamber. The dispersion is greatest for particles of lowest energy and these may be removed from the beam by means of stops. The γ-radiation from the source is adequately screened and the stray field within the chamber is negligible. Sources of the order of 10 millicuries must be employed. J. A. D.

Cloud chamber for nuclear disintegration studies. H. R. CRANE (Rev. Sci. Instr., 1937, [ii], **8**, 440—444).—The construction of a purely automatic cloud chamber adapted to the study of of the high-energy electrons produced in artificial disintegration experiments is described. F. J. L.

Apparatus for low-voltage nuclear research. L. J. HAWORTH, L. D. P. KING, C. T. ZAHN, and N. P. HEYDENBURG (Rev. Sci. Instr., 1937, [ii], **8**, 486—493).—The apparatus described gives steady, well-focussed proton beams of 12, 40, and 60 μA. up to energies slightly $>$ 300 kv., and up to 150 and 100 kv., respectively. L. S. T.

Simple electrodialyser. D. B. ROXBURGH and M. H. POWER (Ind. Eng. Chem. [Anal.], 1937, **9**, 578).—With the apparatus described a dialysed Na_2SO_4 solution of protein could be electrodialysed in 6—8 hr. at 220 v. to the point at which the sp. conductivity was $\sim 1 \times 10^{-5}$. L. S. T.

A.c. method of measuring resistance. D. SHOENBERG (Proc. Camb. Phil. Soc., 1937, **33**, 577—582).—The experimental arrangement previously described (cf. A., 1938, I, 19) is used to measure the sp. resistance of high-conductivity metals and to test for superconductivity. The specimen need not be altered from the form in which it is available. Pure specimens of Os, Ge, Mo, and La were examined at liquid He temp. La was superconducting at 4·2 K. At 2·3 K. it was still superconducting at 1500 gauss (cf. Mendelssohn and Daunt, A., 1937, I, 229). No new superconductors were found. J. A. D.

Battery-operated Geiger–Müller counter for the location of lost radium. R. B. TAFT (Rev. Sci. Instr., 1937, [ii], **8**, 508).—The portable instrument described will detect 20 mg. of Ra approx. 135 ft. away when no obstructions intervene. L. S. T.

Evaluation of counter tube measurements. J. MEIXNER (Ann. Physik, 1937, [v], **30**, 665—682).—Theoretical. O. D. S.

"Scale of two" high-speed counter using hard vacuum triodes. W. B. LEWIS (Proc. Camb. Phil. Soc., 1937, **33**, 549—558).—A high-speed recording counter operating on the "scale of two" principle (Wynn-Williams, A., 1932, 671) employs thyratrons only in the output stage. Two triodes are arranged in a symmetrical circuit which is triggered alternately from one stable state to the other by the applied impulses acting through two Cu_2O rectifiers and an inductance. The counter will operate at 20,000 impulses per sec. provided that the recording meter operates in $<$ 0·01 sec. J. A. D.

Determination of dipole moments of solutions. H. MOHLER (Helv. Chim. Acta, 1937, **20**, 1447—1457).—Apparatus and procedure for measuring dipole moments in hexane solutions are described. F. L. U.

Method for magnetic spectrograph calculations. F. T. ROGERS, jun. (Rev. Sci. Instr., 1937, [ii], **8**, 432—436).—A general method for calculating the kinetic energies of charged particles from magnetic spectrograph data, when the magnetic fields used are not uniform, is presented. F. J. L.

Automatic pipette, and a convenient siphon. K. NOWAK (Przemysł Chem., 1937, **21**, 238—239).—Apparatus is described. R. T.

Use of Haldane apparatus for analysis of gases containing ether.—See A., III, 162.

Portable apparatus for precise gas analysis.—See B., 1938, 14.

Dilatometer for high temperatures. S. PYK, B. STÅLHANE, and T. WESTBERG (Jernkont. Ann., 1935, **119**, 401—411; Chem. Zentr., 1936, i, 4184).—An instrument suitable for use with ceramics and metals is described. H. N. R.

High-vacuum leak. W. BOGG (J. Sci. Instr., 1937, **14**, 412—413).—The new design obviates damage by overscrewing to the needle or the orifice that it closes. L. S. T.

Measuring and making visible air currents. U. SCHMIESCHEK (Z. tech. Physik, 1936, **17**, 98—100; Chem. Zentr., 1936, i, 4185).—The production of flocculent smokes from polymerised MeCHO, and their application to the photographic study of air currents, are discussed. J. S. A.

Apparatus for measurement of viscosity coefficients at low temperatures. M. MAKOWIECKA (Acta phys. polon., **2**, 371—374; Chem. Zentr., 1936, i, 4184).—A capillary viscosimeter adapted to liquid air cooling is described. η is determined for fluorocyclene. H. N. R.

Simple Knudsen gauge. A. L. HUGHES (Rev. Sci. Instr., 1937, [ii], **8**, 409—412).—A simple Knudsen pressure gauge consists of a heater (Pt foil) parallel to a piece of Al foil; the deflexion of the Al foil, $\propto$ to the no. of excited gas mols. bombarding it, *i.e.*, to the gas pressure, is measured by means of a microscope. The sensitivity can be varied by altering the temp. of the heater. The upper limit of pressure is 0·01 mm. F. J. L.

Simplified hydrogen liquefier. J. E. AHLBERG, I. ESTERMANN, and W. O. LUNDBERG (Rev. Sci. Instr., 1937, [ii], **8**, 422—426).—A small H_2 liquefier with an efficiency of 16%, using a twisted tube heat interchanger, is described. F. J. L.

Sedimentation equilibrium of sucrose in the simplest opaque air-driven spinning tops as

ultracentrifuges. J. W. McBain and C. Alvarez-Tostado (J. Amer. Chem. Soc., 1937, **59**, 2489—2494).—Two methods for measuring sedimentation equilibrium in a mechanically immobilised liquid are described. In the first, the liquid is immobilised by means of insol. fibres of soap curd; sedimentation takes place in the interstices, and successive portions of the curd are finally removed for analysis. The second method, which is universally applicable to solutions or monodisperse particles, makes use of a simple, opaque, two-piece steel rotor, where the contents are directly accessible for chemical, physical, or biological analysis. E. S. H.

Quantity heads for the air-driven ultracentrifuge. R. W. G. Wyckoff and J. B. Lagsdin (Rev. Sci. Instr., 1937, [ii], **8**, 427—429).—The design and explosion limits of quantity heads capable of centrifuging 100—150 c.c. of liquid in fields of 200,000 to 300,000 *g* are given. The optimum tube angle is 25°. F. J. L.

Evaporation of quartz in silver. H. W. Edwards (Rev. Sci. Instr., 1937, [ii], **8**, 451—452).—The heater element for the evaporation of quartz on to Ag mirrors is a small Ta V-shaped trough. The temp. of the heater is 1900°, and the reflecting power of the resulting mirror is about 1—2% $<$ that of the freshly deposited Ag. F. J. L.

Deposit of films of uniform thickness for interferometer mirrors. R. A. Fisher and J. R. Platt (Rev. Sci. Instr., 1937, [ii], **8**, 505—507).—The uniformity of evaporated films is discussed, and an apparatus for producing metal films of uniform thickness by evaporation in a vac. is described. L. S. T.

Determination of compressibilities of gases and vapours. K. L. Ramaswamy (Current Sci., 1937, **6**, 214).—Compressibilities can be obtained by determining the pressures corresponding with known vals. of *n*, referred to a gas such as CH_4 for which vals. of *n* for various pressures are known. L. S. T.

Charcoal trap for oil vapours. P. A. Anderson (Rev. Sci. Instr., 1937, [ii], **8**, 493—495).—The C mass acts as its own heater as in a granular C resistance furnace. The preliminary baking period for outgassing is much reduced in comparison with C traps heated externally. L. S. T.

Lubrication of taps with phosphoric acids. D. L. Chapman and L. A. Moignard (J.C.S., 1937, 1936—1938).—A new tap, of Hg-sealed type, and the prep. of the lubricant from fused HPO_3 are described. C. R. H.

Technique of preparing collodion membranes. H. Lodenkamper (Zentr. Bakt. Par., 1937, I, **139**, 214—224). L. D. G.

Shaking machine. H. Kühne and A. Bellmann (Chem.-Ztg., 1937, **61**, 994).—The usual form of laboratory shaker (150—360 motions per min.) is mounted, with its motor, on a platform which is subjected to a rocking motion of much lower frequency (2—4 motions per min.). The machine is claimed to be particularly suitable for use with very viscous liquids. J. W. S.

Apparatus for demonstrating the type, water/oil or oil/water, of emulsions. W. J. Pullar (Pharm. J., 1938, **140**, 7).—A procedure similar to that of Bhatnagar (J.C.S., 1920, **117**, 542) is described. The apparatus measures the conductivity of the continuous phase and the increase which occurs when the emulsion changes from oil-in-water to water-in-oil type. W. McC.

Distilling apparatus. J. Erdös and B. Molnár (Tech. Kurir, 1937, **8**, 96).—A combined apparatus for refluxing and distilling is described. E. P.

Ball packings for laboratory rectifying columns. A. R. Glasgow, jun., and S. T. Schicktanz (J. Res. Nat. Bur. Stand., 1937, **19**, 593—603).—The relationships between the efficiency (η), liquid hold-up (v), ball diameter (d), and total surface area (a) have been investigated for fractionating columns packed with glass balls ($d = 2{\cdot}95$ and $3{\cdot}80$ mm.), Pb balls ($d = 2{\cdot}05$ and $4{\cdot}05$ mm.), and Cu balls ($d = 4{\cdot}00$ mm.). For a column of diameter 2·6 cm. packed with such balls the thermal conductivity of the balls is without effect, and, approx., $\eta \propto a/d^2$ and $v \propto a$. J. W. S.

Molecular distillation.—See B., 1938, 2, 3.

Distillation apparatus.—See B., 1938, 3.

M.p. determination. F. Grégoire (Bull. Sci. pharmacol., 1935, **42**, 655—657; Chem. Zentr., 1936, i, 4764).—A method suitable for determining the temp. of initial and of final melting for materials of indefinite m.p. is described. H. N. R.

Apparatus for f.p. determinations. D. Quiggle, C. O. Tongberg, and E. M. Fry (Ind. Eng. Chem. [Anal.], 1937, **9**, 579—581).—The apparatus described is suitable for determining the purity of substances, particularly those freezing at low temp. Results for $CH_2Pr^{\beta}Bu^{\gamma}$ alone and containing 0·9 mol. % of n-C_7H_{16} are given in illustration. L. S. T.

Logarithmic titration graph. E. J. Schorn (Pharm. J., 1938, **140**, 7).—In volumetric determinations depending on neutralisation of ionic charges the p_H is plotted against the $\log_{10}$ of the no. of drops of solution added before and after the end-point is attained. Two parallel straight lines which meet the *y*-axis are obtained, the distance between the lines representing the p_H change which occurs between the addition of one drop before and one drop after the end-point is reached. The graphs illustrate many points in the theory of the determinations. W. McC.

Significance and function of the history of chemistry. E. Pietsch (Angew. Chem., 1937, **50**, 939—948).—A lecture. L. S. T.

Geochemistry.

Coefficients of absorption and the mean temperature of the atmospheric ozone. G. Déjardin, A. Arnulf, and D. Cavassilas (Compt. rend., 1937, **205**, 809—811).—The thickness of the O_3 layer in the atm., reduced to normal temp. and pressure, has been determined as 0·290 cm. ±5% from measurements of absorption in the region 3135—3326 A., and the no. of mols. per c.c. under normal conditions as $2·90 \times 10^{19}$. The absorption coeff. of atm. O_3 has been compared with that of laboratory O_3. The mean temp. of atm. O_3 is −35°. R. S. B.

Concentration of D_2O in natural ice. IV. E. Baroni and A. Fink (Monatsh., 1937, **71**, 128—130; cf. A., 1935, 953; 1936, 183, 699).—The $[D_2O]$ in freshly fallen snow, initially 40% $<$ in ordinary H_2O, increases during periods of snowfall, and may become 15% $>$ in ordinary H_2O. This is attributed to fractional pptn. It is concluded that the $[D_2O]$ in atm. H_2O is 25% $<$ in ordinary H_2O (cf. A., 1937, I, 203). J. W. S.

Composition of (A) sea ice, (B) the ice of the Caspian Sea. V. S. Krasnova (J. Gen. Chem. Russ., 1937, **7**, 1742—1746, 1747—1748).—Analytical data are recorded for White Sea and Caspian Sea ice. The salt content is highest in the lowest layers of ice, but is considerably $<$ in the underlying H_2O. R. T.

Oxidation–reduction potential in sea-water. L. H. N. Cooper (J. Marine Biol. Assoc., 1937, **22**, 167—176).—Vals. for the standard O_2 electrode potential at various temp. and for the activity of O_2, OH′, and H_2O in sea-H_2O are calc. The theoretical oxidation–reduction potential of sea-H_2O due to a reversible O_2 system is calc. as 0·7—0·8 v. Vals. for the oxidation–reduction potential of sea-H_2O [by W. R. G. Atkins] and irreversible potentials calc. from Hoar's (1931) results with a Pt electrode show that the oxidation–reduction potential in sea-H_2O is determined by an irreversible O_2 system. The val. at p_H 8·15 was about 0·43 v. The O_2 system in sea-H_2O can never function strictly reversibly. The biologically effective potential may be anywhere between 0·43 and 0·75 v. A. D. H.

Colloidal ferric hydroxide in sea-water. H. W. Harvey (J. Marine Biol. Assoc., 1937, **22**, 221—225).—Colloidal $Fe(OH)_3$ flocculates in sea-H_2O, the rate increasing with the concn. Protection is afforded by emulsoids such as gum arabic, starch, albumin, and agar. Since 1 mol. of emulsoid protects many mols. of $Fe(OH)_3$ the phenomenon cannot be explained by the shell theory of protection. In the sea it is probable that $Fe(OH)_3$ is also adsorbed on protective emulsoids. In view of the possibility that such compounds may be important in the sea the properties of Fe humates are briefly described. The particles of $Fe(OH)_3$ sol at p_H about 7·4 are positively charged, but adsorption on gum arabic, albumin, or agar caused change in polarity. A. D. H.

Ratio of nitrogen to phosphorus in the sea. L. H. N. Cooper (J. Marine Biol. Assoc., 1937, **22**, 177—182).—It is confirmed that the ratio of NO_3-N to PO_4-P does not vary greatly in sea-H_2O and (as mg.-atoms) is usually about 20. In plankton the N : P ratio is more variable but averages 16·3. The hydrographical importance of the ratio is discussed with particular reference to the English Channel, the Mediterranean, and the South Atlantic. A. D. H.

Nitrogen cycle in the sea. L. H. N. Cooper (J. Marine Biol. Assoc., 1937, **22**, 183—204).—A review. Methylamines and $CO(NH_2)_2$ must be set free in sea-H_2O in considerable quantities as excretory products of animals. The former will be included when NH_3 is determined by distillation. The conditions in sea-H_2O favour the decomp. of $CO(NH_2)_2$ into NH_4CNO, which is hydrolysed to NH_3 and CO_2. A purely chemical mechanism is probably sufficient to account for the hydrolysis of $CO(NH_2)_2$ although bacterial enzymes probably assist. NH_2-acids may be present. They may be of val. to phytoplankton organisms as accessory nutrient substances. The mechanism by which they are assimilated probably differs from that for inorg. N because they must be mainly in the form of zwitterions. N-fixing bacteria are present in the sea and N-fixation by electric discharge also occurs. The production of NH_3 from NH_2-acids and methylamines is probably bacterial. NH_3 is utilised by diatoms, probably as $NH_4^{\cdot}$. NH_3 in the sea is oxidised to NO_2'; evidence is adduced for the intermediate formation of hyponitrite. From the surface to about 1 m. depth photochemical oxidation takes place, colloidal SiO_2 possibly being important as a photosensitiser. Chemical oxidation may occur at the surface and may be accelerated by the presence of air bubbles just below the surface. Near the bottom the oxidation is probably bacterial. The mechanism of oxidation of NH_3 in mid-water is unknown. NO_2' is oxidised to NO_3' in the sea; near the bottom bacterial oxidation occurs but in mid-water the mechanism is unknown. Reduction of NO_3' to NO_2' can take place in aërated sea-H_2O even in the absence of denitrifying bacteria, which are known to occur in the sea. The thermodynamic efficiency of the oxidation of glucose by NO_2' and by O_2 is similar. Bacteria may obtain energy both from oxidation of NO_2' to NO_3' and from reduction of NO_3' to NO_2' in presence of org. substances. Photochemical reduction of NO_3' is not possible in the sea. A. D. H.

Origin of calcium hydrogen carbonate contained in the waters of the Versoix (Geneva canton). J. P. Buffle (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 77—80; cf. A., 1935, 600).—The presence of $Ca(HCO_3)_2$ is due to the infiltration of surface H_2O containing H_2CO_3, which causes dissolution of $CaCO_3$ in the river bed. A. J. E. W.

[Mineral] water of S. Genesio (Turin). F. Biglietti (Annali Chim. Appl., 1937, **27**, 457—472).—Data for chemical composition, physico-chemical consts., and nature of the dissolved gases are tabulated. F. O. H.

Physico-chemical characteristics of regions of salt domes in Stalingrad region and Kal-

mückia. V. I. Nikolaev, O. K. Janateva, and V. D. Poljakov (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 857—869).—Determination of $K^{\cdot}$ and Br' in the H_2O of springs in the Kalmückian steppes has indicated the presence of deposits of K and Br salts. Analysis of salts extracted from materials from bore-holes in the region of a supposed salt-dome in the Stalingrad region has shown that with increasing depth the concns. of K, Br, and B_2O_3 increase from vals. characteristic of deposits from the Caspian Sea to vals. characteristic of deposits from the Permian Sea. R. C.

Boron content of sea-water and of marine organisms. I. Igelsrud, T. G. Thompson, and B. M. G. Zwicker (Amer. J. Sci., 1937, [v], **35**, 47—63).—B, as sol. borate, has been determined in numerous samples of sea-H_2O from the coastal waters of the north-east Pacific Ocean, and the B–chlorinity ratios calc. The vals. vary from 0·125 to 0·485 mg.-atom of B per kg. of H_2O, and approx. $\propto$ the chlorinity of the H_2O. The average B–chlorinity ratio (mg. atoms of B per g. of halide) is 0·0223. The presence of complex B compounds may account for the discrepancy between the vals. reported in the literature for B in sea-H_2O. Five species of marine algæ gave 4·2 to 14·9 mg.-atoms of B per kg. of dried material or 15·1 to 50·3 mg.-atoms per kg. of ash. No accumulation of B beyond that observed in terrestrial plants growing in good soils low in B was observed in the species of marine plants examined. 20·8 and 80·0 mg.-atoms of B per kg. were found in the marine animal shells of *Conus* and *Cyprea*, and 173 mg.-atoms per kg. in a sample of *Hydrocorallina*, indicating that B may occur generally in calcareous and sedimentary structures of oceanic origin, probably as Mg or Ca borates. L. S. T.

Thermal water in Bukovička Banja. S. Miholić (Bull. Soc. Chim. Yougoslav., 1937, **8**, 83—96).—Analyses are given. F. L. U.

Recent changes in the water of Laguna de Bay and their effect on the lake fauna. S. M. Cendaña and A. M. Mane (Philippine Agric., 1937, **26**, 327—340).—Changes following the influx of sea-H_2O into the lake are recorded. A. G. P.

Hydrochemistry of the Gulf of Karabugaz. V. P. Ilinski, G. S. Klebanov, and J. B. Blumberg (Trudi Solianoi Lab., 1936, No. 5, 9—47).—Complete redissolution of the $Na_2SO_4,10H_2O$ deposits does not take place during the summer months. Part of the Mg is pptd. as $MgCO_3$ by $Ca(HCO_3)_2$ present in Caspian Sea H_2O entering the Gulf. The d of the H_2O has risen from 1·136 in 1897 to 1·174 in 1932; the H_2O will be saturated with respect to NaCl in 40—50 years, at the present rate of concn. R. T.

Reduction of sulphates in Caspian Sea water. A. D. Pelsch (Trudi Solianoi Lab., 1936, No. 5, 81—108).—The max. concn. of H_2S tolerated by *Microspira æstuarii*, van Delden, varies according to the p_H, inasmuch as HS' is far less toxic than is H_2S; concns. of >2400 mg. per l. of H_2S are tolerated at p_H 9 (98% dissociation of H_2S), and may be achieved by the action of *Microspira* on sulphates. R. T.

The red lake near Witzenhausen: recent and fossil weathering of felspar-basalt. E. Blanck and R. Themlitz (Chem. Erde, 1937, **11**, 375—407).—The H_2O in an abandoned quarry in basalt with adjoining Bunter sandstone is deep red, and contains colloidal SiO_2, Al_2O_3, and Fe_2O_3. Analyses are given of the fresh and weathered rocks and of bauxitic products of Tertiary age. L. J. S.

Chlorides in chemical weathering and hydrogen-ion concentration in geology. M. Storz (Chem. Erde, 1937, **11**, 408—419).—Limestones on the Dalmatian coast show cavernous weathering due to the action of NaCl on $CaCO_3$ with the formation of Na_2CO_3 and $CaCl_2$. Sea-H_2O standing in rock pools shows a max. p_H value of 8·8—9·0. In artificial sea-H_2O p_H was raised from 6·5 to 8·8 by the addition of $CaCO_3$. L. J. S.

Composition of the mud of the brine of the Karabugaz Gulf. L. S. Selivanov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **16**, 455—458).—From analyses of the mud and the associated brine, an attempt is made to deduce the hydro-chemistry of the Gulf. C. R. H.

(A) **Dynamics,** (B) **energetics, of the desulphatation process.** A. D. Pelsch (Trudi Solianoi Lab., 1937, No. 14, 5—43, 45—81).—(A) *Vibrio æstuarii* has been identified in the sludge from the Strait of Karabugaz. Its growth is inhibited by limiting concns. of undissociated H_2S, the val. of which depends on the p_H and salt content of the medium.

(B) The mechanism of the microbiological reduction of H_2SO_4 to H_2S is discussed from the thermodynamical point of view, and it is shown that free H_2 is not involved, but that a no. of unknown H donators effect reduction through the stages $H_2SO_4 \rightarrow H_2SO_3 \rightarrow (H_2SO_2) \rightarrow (H_2SO) \rightarrow H_2S$. *Vibrio desulfuricans*, *V. æstuarii*, and *V. thermodesulfuricans* are able to effect only those stages involving diminution of free energy of the system, whilst *V. rubentschickii* can also produce changes leading to increase in free energy (oxido-reduction of glucose). R. T.

(A) **Formation of sludge in Lake Moinak.** J. V. Pervolf. (B) **Micro-zonal analysis of sludge deposits.** J. V. Pervolf and A. I. Proschkina-Lavrenko. (C) **Hydrobiological conditions of sludge formation.** J. V. Pervolf (Trudi Solianoi Lab., 1937, No. 14, 83—96, 97—104, 105—119).—(A) Biological conditions are described.

(B) Methods of microscopical examination of mud profiles are described.

(C) Algæ develop in salt lake H_2O of a salt content corresponding with $d < 1{\cdot}14$, and can enter into the composition of the sludge on condition of periodic overlaying with inorg. detritus. R. T.

Slime of Brazilian mangrove swamps. F. W. Freise (Chem. Erde, 1937, **11**, 333—355).—Mechanical and chemical analyses are given, and alterations in the material are considered. L. J. S.

Geochemistry of lithium. H. W. Strock (Nachr. Ges. wiss. Göttingen, 1936, [ii], **1**, 171—204; Chem. Zentr., 1936, i, 4409—4410).—Li is determined spectrographically, using the 6708 A. line and adding

NaCl to enhance the sensitivity. Analyses of igneous rocks and their differentiation products, zeolites, meteorites, sedimentary rocks, plant ashes, and coals show a mean Li content of 0·014% in igneous rocks. Granites show 100-fold enrichment as compared with Mg-rich rocks, ten-fold as compared with gabbros. Li is progressively enriched in the darker coloured constituents on increasing differentiation, but does not run parallel to other univalent metals, *e.g.*, Na. Li replaces Mg isomorphously in pyroxenes and hornblendes, but the Li_2O : MgO ratio is fairly const. in sedimentary clays. J. S. A.

Optical and spectrographic examination of beryls, especially at high temperatures. R. Böse (Neues Jahrb. Min., 1936, **A**, **70**, Beil.-Bd., 467—570; Chem. Zentr., 1936, i, 4701—4702).—Measurements of *n*, *d*, dispersion, double refraction, and dispersion of double refraction are recorded for beryls from various sources up to 1150°, and the variations in optical properties correlated with increase in *d*. Beryls of low *d* free from inclusions may be heated to 1000°; those of high *d* with inclusions are destroyed above 700°. Li, Na, K, Cs, Ca, Mg, Ga, Sc, Ti, V, Mn, Cr, Fe, Ni, Sn, Cu, and Ag were detected spectroscopically. Emeralds from Katharinenburg have a very high V content, with considerable amounts of Ti and Sc. CO_2, H_2, and H_2O are evolved from beryls on heating at 1200°; He was detected in only one case. The deposit volatilised off in vac. contained Fe, Mn, Ni, Cu, Ag, Ga, Ti, Ce, Na, Mg, and Zn. The deposit from Leydsdorp emerald contained no Cr, which is considered to be combined differently from the other metals; a part of the Fe in aquamarine is similarly differentiated. J. S. A.

Volcanic rocks of Ság Mt., Hungary. L. Jugovics and A. Marchet (Tsch. Min. Petr. Mitt., 1937, **49**, 369—414).—Petrographical descriptions and chemical analyses are given of basalt and dolerite, showing that these rocks belong to the "Atlantic series." L. J. S.

Emerald and associated minerals in the Habach valley, Salzburg. H. Leitmeier (Tsch. Min. Petr. Mitt., 1937, **49**, 245—368).—Emerald occurs in biotite-schist at the junction of gneiss and amphibolite. Analysis, SiO_2 63·54, Al_2O_3 17·25, Cr_2O_3 0·12, Fe_2O_3 0·71, BeO 13·07, MgO 0·84, CaO 0·78, Na_2O 1·42, K_2O 0·14, H_2O 2·97 = 100·84, *d* 2·749, does not correspond with the usually accepted formula $Be_3Al_2Si_6O_{18}$. Variations in *d* and *n* are compared with the data for emerald from other localities. The associated minerals and rocks are described and their origin is discussed. The occurrence is similar to that in the Urals. L. J. S.

Analysis of granite from Montorfano and of granite and tourmaline from Alzo [Italy]. P. Gallitelli (Atti R. Accad. Lincei, 1937, [vi], **26**, 103—106).—Analytical data are tabulated. The granites contain SiO_2 and Al_2O_3 69·52, 70·62, and 15·45, 15·66%, respectively, whilst the tourmaline contains B_2O_3 8·82%. F. O. H.

Textural groups of Wisconsin till and their distribution in Illinois. H. Wascher and E. Winters (Amer. J. Sci., 1937, [v], **35**, 14—21).—Mechanical analyses showing the range in composition of the four textural groups proposed are given. L. S. T.

Density and structure of zircon. II. M. von Stackelberg and K. Chudoba (Z. Krist., 1937, **97**, 252—262; cf. A., 1937, I, 382).—Density and *X*-ray analyses with heat-treatment show that very light zircons, ρ 3·972, 3·945, are oxide decomp. products of $ZrSiO_4$, the SiO_2 being amorphous, the ZrO_2 amorphous or microcryst. On heating these at 1450°, $ZrSiO_4$ is re-formed as a single crystal or fibre structure; above 1000° ρ increases but is $\leqslant$ the normal 4·7. Discussion of further data of the authors and others on zircons of intermediate ρ reveals difficulties in correlating mechanical, optical, thermal, and *X*-ray results. I. McA.

New form of titanite. H. Meixner (Z. Krist., 1937, **97**, 332—335).—Cryst. features are described. I. McA.

Morphology of apophyllite. J. D. H. Donnay (Bull. Acad. roy. Belg., 1937, [v], **23**, 749—761).—The structure of apophyllite accords with the generalised Bravais law (A., 1937, I, 171). It shows zonal series of the simple primary, double primary, and double secondary types. J. W. S.

Crystallographic investigation of borates of Inder deposit. G. B. Boki (Bull. Acad. Sci. U.R.S.S., 1937, Sér. Chim., 871—883).—The crystallographic characteristics and consts. of ulexite, colemanite, inyoite, pandermite, hydroboracite, ascharite, and inderite ($2MgO,3B_2O_3,15H_2O$) are recorded. R. C.

Polymorphic transitions in leucite. J. Wyart (Compt. rend., 1937, **205**, 1077—1079).—Leucite (cf. A., 1937, I, 17) is pseudo-cubic at ordinary temp., being built up of tetragonal crystallites regularly arranged. On heating, the spacings (001) and (100) become more nearly equal, and coincide at 625°. The mineral is then true cubic, but will return to the pseudo-cubic form on cooling. The transition is gradual and continuous, heat being absorbed during heating from 575° to 625° just before the transition. Heat is evolved as the structure returns to normal on cooling. J. A. D.

Anomalies of structure and composition of phosphates of the Paris Basin. L. Cayeux (Compt. rend., 1937, **205**, 1021—1023).—The origin of the minerals has been investigated. Intermediate strata of foreign minerals were observed and the concns. were apparently originally submarine. J. A. D.

Origin of gold in the borders of Guinea and Sudan, and in the ancient Haute-Volta. J. Sagatsky and R. Goloubinow (Compt. rend., 1937, **205**, 925—927). A. J. E. W.

Submarine (halmyrolytic) alteration-skin of Baltic pebbles. K. Hummel (Chem. Erde, 1937, **11**, 356—367).—Pebbles of various rocks dredged from the Baltic show an outer alteration zone a few mm. in thickness. Analyses of the fresh and altered rock show no essential difference from terrestrial weathering. L. J. S.

Presence and distribution of boron in the strata of the potassium salt deposits of Alsace. G. Bertrand (Bull. Soc. chim., 1938, [v], **5**, 69—72).—The layers of clay separating the saline layers contain from 50 to 500 mg. of B per kg. With the exception of the parts nearest to these layers of clay, the saline layers contain only 1 or 2 mg. per kg. F. J. G.

Classification of the natural silicates. I, II. C. K. Swartz (Amer. Min., 1937, **22**, 1073—1086, 1161—1174).—I. The classification proposed is based on the four ways in which the SiO_4 tetrahedra can combine through their solid angles. The five fundamental types may combine further to form complex types. The relationship of this classification to earlier classifications is discussed.

II. Compositions as determined by *X*-ray analysis are tabulated according to the proposed classification. L. S. T.

Unit cell and space-group of cubanite. M. J. Buerger (Amer. Min., 1937, **22**, 1117—1120; cf. A., 1936, 585).—A Weissenberg study of cubanite from Sudbury gives *a* 6·43, *b* 11·04, *c* 6·19 A., with 4 $CuFe_2S_3$ per cell; space-group *Pna* or *Pcmn*. The chemical analysis indicates an excess of Fe over that required by $CuFe_2S_3$. This is balanced by a deficit of Cu. L. S. T.

Riebeckite in quartz veins from the Michipicoten district, Ontario. J. E. Hawley (Amer. Min., 1937, **22**, 1099—1103).—The occurrence of fibrous riebeckite in quartz veins and in granitic and basic volcanic wall rocks in this area is described. L. S. T.

Origin of Pelvoux granite. P. Bellair (Compt. rend., 1938, **206**, 189—190). A. J. E. W.

Selective incrustation of minerals. C. Frondel (Amer. Min., 1937, **22**, 1104—1116).—Examples of selective incrustation are described and tabulated, and the origin of the selectivity is discussed. Crystallisation of one mineral on another is closely connected with adsorption at the crystal–solution interface. Chemical reaction between a solution or a sol and the surface of the incrusted crystal may also effect selectivity. Minerals that are identical or nearly so in crystal structure, *e.g.*, members of the calcite group, the felspars, and sphalerite-tetrahedrite-chalcopyrite, have a marked tendency to incrust each other in preference to other species. L. S. T.

Origin of montmorillonite. W. H. Tomlinson and A. E. Meier (Amer. Min., 1937, **22**, 1124—1127). L. S. T.

Coloration of minerals. A. E. Fersman (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 201—204).—The deepening of the colour of a crystal when ions of one of its elements, but in a different state of valency or ionisation, enter the lattice is attributed to the indefinite state of the valency electrons on the boundary between the two ions. The phenomenon is observed in minerals containing $Fe^{II} + Fe^{III}$, $Mn^{II} + Mn^{III}$, $Co^{II} + Co^{III}$, $U^{IV} + U^{V}$, and $V^{IV} + V^{V}$, which in some cases are black. Various pigments, *e.g.*, W-blue ($WO_3 + WO_2$), are of this type, and even Prussian-blue and Turnbull's blue can be placed in the same class. J. W. S.

Nature of the zircon deposit of Mount Ampanobe, Madagascar. A. Lacroix (Compt. rend., 1937, **205**, 1333—1336).—The geology of the region and the origin of the zircon deposit are discussed. A. J. E. W.

Pencatite from the Organ mountains, New Mexico. W. F. Hunt and G. T. Faust (Amer. Min., 1937, **22**, 1151).—The results of a petrological and chemical examination of a dedolomitised rock are recorded. L. S. T.

Missouri glauconite. V. T. Allen (Amer. Min., 1937, **22**, 1180—1183).—The TiO_2 contents of four glauconites (analyses given) are discussed in relation to their possible origin from biotite. L. S. T.

New locality for autunite. E. S. C. Smith and E. O. E. Maslowski (Amer. Min., 1937, **22**, 1184).—An occurrence associated with dark smoky quartz at Hooper's Ledge, Maine, is recorded. L. S. T.

New occurrence of millerite [at West Pittston, Pennsylvania]. M. A. Northup (Amer. Min., 1937, **22**, 1184—1185). L. S. T.

Identification of transparent gem stones by their density and colour. K. Chudoba (Deut. Goldschmiede-Ztg., 1936, **39**, 90—91; Chem. Zentr., 1936, i, 4189).—Tables are given. J. S. A.

Can graphite be present in Late-Glacial clays? II. A. Salminen (Suomen Kem., 1937, **10**, **B**, 30).—The org. matter in two Finnish Late-Glacial clays is almost completely burnt at 700°, and C therefore cannot be present as graphite, in confirmation of previous work (*ibid.*, 5). M. H. M. A.

Genesis of colloidal metals in salt soils. Gedroitsite, a new mineral. I. N. Antipov-Karataiev and I. D. Sedlecki (Compt. rend. Acad. Sci. U.R.S.S., 1937, **17**, 251—254).—In order to ascertain the conditions resulting in the formation of colloidal minerals having a high alkali content, experiments on artificial mineral production were made. A gelatinous ppt. formed by mixing pure liquid glass dissolved in NaOH with $NaAlO_3$ was dried, and after 3 years was shown, by the Debye–Scherrer *X*-ray powder method, to have developed a complex cryst. structure. The substance is unchanged when heated to 1020°, and is regarded as a new mineral of high alkali content not removable by H_2O. N. M. B.

Geological basis of the search for oil in Great Britain. G. M. Lees and P. T. Cox (Quart. J. Geol. Soc., 1937, **93**, 156—194).—Results obtained in recent drillings are also described. L. S. T.

Coal in glacio-fluvial deposits in Ohio. K. Ver Steeg (Science, 1937, **86**, 285—286).—The widespread occurrence of waterworn fragments of coal in sand and silt deposits near Conotton Creek, Ohio, is described. L. S. T.

Coal measures of Bristol and Somerset. L. R. Moore and A. E. Trueman (Quart. J. Geol. Soc., 1937, **93**, 195—240). L. S. T.