BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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

NOVEMBER, 1938.

Kramers' absorption law in physical problems. D. H. MENZEL (Nature, 1938, **142**, 433—434).—A criticism (cf. A., 1938, I, 423). An alternative interpretation of the spectrum of H in the discharge tube and in planetary nebulæ, which does not invalidate Kramers' law, is discussed. L. S. T.

After-effect electrons in the photo-effect in a non-self-maintaining hydrogen discharge. H. COSTA and H. RAETHER (Naturwiss., 1938, **26**, 593).—The fraction of the photo-effect due to after-effect electrons under the above conditions considerably exceeds that of other processes. A. J. M.

Band spectrum of helium. F. L. ARNOT (Nature, 1938, **142**, 536).—Recent work (A., 1938, I, 429) shows that the He mols. are formed after interruption of the discharge by the collision of a metastable with a neutral atom (cf. *ibid.*, 485). L. S. T.

Hyperfine structure of boron, yttrium, rhodium, and palladium. D. T. WILLIAMS and L. P. GRANATH (Physical Rev., 1938, [ii], **54**, 338—341).—Data for λλ, transition, and structure are reported for the spectra of B, Y, Rh, and Pd excited in an uncooled Schuler lamp for the range 2500—4000 A., in an attempt to find hyperfine structure. None was discovered that could be interpreted either as isotope shift or as structure due to a nuclear magnetic moment. N. M. B.

New Rydberg series in N_2. R. E. WORLEY and F. A. JENKINS (Physical Rev., 1938, [ii], **54**, 305).—The absorption spectrum of N_2 for 785—850 A. with high dispersion shows a converging series of band heads terminating at ~800 A., and constituting the higher and intermediate members of an electronic series the lower members of which confuse with the complex of bands at longer λλ. The frequencies of the heads closely follow a Rydberg law. The series limit lies at 125,670±2 cm.$^{-1}$, or 15·503 v., which is the first ionisation potential of N_2 computed by Mulliken (cf. A., 1936, 261). The limit of the series is the $^2\Sigma_g^+$ normal state having an internuclear distance 1·11 A. N. M. B.

New band of atmospheric oxygen. H. D. BABCOCK (Physical Rev., 1937, [ii], **51**, 148; cf. A., 1931, 1343).—Approx. 20 lines of the (1, 2) band, 6955—6996 A., with air-paths of approx. 100 km., have been measured. Known spacings of various energy levels in the mol. are shown by the new band. L. S. T.

New terms in the spectrum of Na III. D. H. TOMBOULIAN (Physical Rev., 1938, [ii], **54**, 347—350).—Full data and classifications are tabulated for the range 500—2600 A. of the spectrum excited by an electrodeless discharge, and 30 new levels arising from the $2s^22p^43p$, $2s^22p^43d$, and $2s^22p^44s$ configurations are established. N. M. B.

Presence of sodium in the atmosphere on the basis of interferometry of the *D*-line in the evening and night sky light. R. BERNARD (Z. Physik, 1938, **110**, 291—302; cf. A., 1938, I, 166, 285, 335, 423).—The yellow line of night sky light has λ = 5892·6 A. The Na is of terrestrial origin because the line does not appear in the spectrum of the northern lights. L. G. G.

Hyperfine structure in the resonance lines of Mg I and Mg II. R. A. FISHER (Physical Rev., 1937, [ii], **51**, 381).—Measurements of the structure obtained in the resonance lines 2852 A. of Mg I and 2803 and 2796 A. of Mg II, when an at. beam excited in an electrodeless discharge in A is employed as source, are recorded and discussed. L. S. T.

Arc spectrum of silicon. C. C. KIESS (J. Res. Nat. Bur. Stand., 1938, **21**, 185—205; cf. A., 1934, 231).—Redetermined λλ, wave-nos., intensities, and term combinations for 400 lines at 1565—12,270 A. are tabulated. The fine structure of some diffuse red and infra-red lines has been studied using an arc in N_2 at low pressure. The new and previously known singlet and triplet terms employed in the classifications give $3p^3P_0$ (65,743 cm.$^{-1}$) as the ground state of Si I, corresponding with an ionisation potential of 8·11 v. Observed and predicted lines at >3000 A. correspond in many cases with hitherto unidentified Fraunhofer lines. Data for 7 Si II lines are recorded. A. J. E. W.

Lithium I-like spectrum of phosphorus, P XIII. H. A. ROBINSON (Physical Rev., 1937, [ii], **51**, 381).—The Li I-like isoelectronic sequence has been extended to include P XIII. The second members (2*s*—3*p*) of the principal series lie at 35·137 and 35·098 A., respectively. Other transitions, such as 2*p*—3*d* and possibly 2*p*—2*s*, have been located. The ionisation potential is ~608 e.v. L. S. T.

Four forms of the copper arc in air. A. S. FRY (Physical Rev., 1937, [ii], **51**, 63—64).—The main features of four distinct and reproducible forms which have been identified for the Cu arc in air at 1 atm. are recorded. The controlling gas in the first arc is N, and the gradient in the third and fourth arcs is determined by the presence of Cu vapour furnished by thermal decomp. of the oxides. L. S. T.

Nuclear magnetic moment of copper. S. TOLANSKY and G. O. FORESTER (Proc. Physical Soc., 1938, **50**, 826—833).—The Cu arc resonance lines

λ 3247 and 3274 were obtained sharp and free from reversal effects, the doublet separations being 379 and 405 × 10^{-3} cm.$^{-1}$, respectively. Hyperfine structure interval factors are calc. The mean nuclear magnetic moment is 2·47, and from the ratio of the magnetic moments of the two isotopes the vals. found for ^{63}Cu and ^{65}Cu are 2·43 and 2·54 nuclear magnetons, respectively. N. M. B.

K spectra of arsenic (33), selenium (34), and bromine (35). (MLLE.) M. L. ALLAIS (Compt. rend., 1938, **207**, 450—452).—The KM_{II}–KM_{III} ($\beta_1\beta_3$) doublets of As, Se, and Br have been resolved. Measured λλ of the β_1, β_2, and β_3 lines are recorded. A. J. E. W.

Spectra of Rb III and Sr IV. D. H. TOMBOULIAN (Physical Rev., 1938, [ii], **54**, 350—354).—By applying Shortley's equations (cf. A., 1933, 1226) to the $4s^24p^5(^2P^0)5p$ levels of Rb II, the separation of the ground levels $4s^24p^5\ ^2P^0$ of Rb III has been computed; the observed val. is 7380 cm.$^{-1}$ The $^2P^0$ separation of Sr IV has been predicted from the regular doublet law and identified from the data as 9731 cm.$^{-1}$ On the basis of transitions into the ground doublet, certain $4s^24p^44d$ and $4s^24p^45s$ levels have been located. N. M. B.

Modified scattered spectrum of characteristic molybdenum K radiation at large scattering angle with helium gas as the scattering substance using a curved quartz crystal spectrograph. H. A. KIRKPATRICK and J. W. M. DUMOND (Physical Rev., 1937, [ii], **51**, 147).—The first actual spectrum of Compton shifted radiation to be made with a gaseous scatterer has been obtained; it permits a comparison of the observed breadth and structure of the modified line with the predictions of DuMond's theory for an atom of sufficient simplicity to allow the electron momentum distribution to be calc. L. S. T.

New band systems of diatomic antimony. G. M. ALMY and H. A. SCHULTZ (Physical Rev., 1937, [ii], **51**, 62).—The spectrum of diat. Sb, obtained by heating Sb in N_2 in a graphite tube furnace, shows two new systems, in absorption at 1350—1600° and in thermal emission at 1550—1750°, extending from 4500 to 6000 A. and from 6000 to 7500 A. Both systems involve the ground state, the heat of dissociation of which is ~3·7 v. Consts. for the X, A, and B states are recorded. L. S. T.

Hyperfine structure perturbations in iodine due to nuclear quadrupole moment. S. TOLANSKY (Nature, 1938, **142**, 393).—Seven out of ten interval factors calc. from the hyperfine structure of the spark spectrum of I exhibit perturbation, the interval rule breaking down. The frequency of this indicates that it must arise from the existence of a nuclear quadrupole moment. The interaction energy for each perturbed level necessitates a cubic law to account for the observed vals. L. S. T.

Preliminary lists of terms for the arc and spark spectra of tungsten. D. D. LAUN (J. Res. Nat. Bur. Stand., 1938, **21**, 207—224).—λ and Zeeman effect measurements on ~500 lines at 2100—3100 A. are reported, intensities, wave-nos., and classifications being given. The low ^6D and ^6S terms of W II, with several unidentified metastable terms, are established; the raie ultime is probably at 2204·49 A. 89 new levels for W I have been found, and g vals. for 37 of these levels have been deduced from the Zeeman effect data. A. J. E. W.

Broadening of the wings of the mercury resonance line 2537 A. by increase of the pressure of mercury and of foreign gases. H. A. RÜHMKORF (Ann. Physik, 1938, [v], **33**, 21—51; cf. Kuhn, A., 1937, 1, 272).—Broadening has been investigated at Hg pressures up to 2400 mm., N_2, O_2, and CO_2 to 6 atm., and A at 1 atm. The absorption coeff. in all cases ∝ the no. of Hg atoms and the no. of foreign gas particles. Coupling broadening is not effective except near the centre of the line. Positions of diffuse bands characteristic of the added gas are measured. Optical collision cross-sections are calc. from the variation with foreign gas pressure of the absorption coeff., near the centre of the line. Van der Waals consts. are calc. O. D. S.

Broadening [of spectral lines] due to pressure and electron collision with the high-pressure mercury discharge in relation to the current density. R. ROMPE and P. SCHULZ (Z. Physik, 1938, **110**, 223—232).—The width of the lines 5770 A. ($2^1P_1 - 3^3D_2$) and 10,140 A. ($2^1P_1 - 2^1S_0$) in the high-pressure Hg discharge has been determined in relation to the c.d. The width of 3^3D_2 terms increases linearly with c.d.; 2^1P_1 terms show little variation with c.d. This indicates that broadening of 3^3D_2 terms arises from electron collisions while broadening of 2^1P_1 terms is a pressure effect. H. C. G.

Distribution of light intensity in the luminous arc of the high-pressure discharge in mercury vapour. F. RÖSSLER (Z. Physik, 1938, **110**, 352—359).—The intensity of certain Hg lines and of the continuous spectrum is measured with a monochromator the object focus of which travels across the axis of the discharge tube. For the lines, the max. intensity is in the centre of the tube, falling off to the sides, but with the continuous spectrum the curve has three max., viz., in the centre and at each tube-wall. The lateral max. are attributed to fluorescence. L. G. G.

Action cross-sections for impacts of the second type in excited mercury vapour; hyperfine structure of the 2537 A. mercury resonance line. O. BUHL (Z. Physik, 1938, **110**, 395—396; cf. A., 1938, I, 335).—A correction. H. C. G.

L-Satellites in the atomic number range $73 < Z < 79$. F. K. RICHTMYER, C. H. SHAW, and R. E. SHRADER (Physical Rev., 1937, [ii], **51**, 380).—Preliminary data on the intensities of the satellite group, relative to the parent line $L\alpha_1$, are recorded. L. S. T.

Electron temperature and light excitation in the gas discharge excited by short and ultra-short waves. W. NÖLLER (Z. Physik, 1938, **110**, 320—329).—The discrepancy in vals. obtained by the optical and electrical methods for the electron temp. in the high-frequency discharge in gases is explained mathematically by examination of the excitation function and electron velocity distribution. Comparison of the electron temp. in the He discharge with

short and with ultra-short waves is made from measurements of the relative intensities of spectral lines. H. C. G.

Characteristic quantities in the glow discharge with consideration of the [local] temperature rise. H. FISCHER (Z. Physik, 1938, **110**, 197—213).—The relation of the c.d., cathode voltage drop, and thickness of the dark space to the γ-coeff. and the ionic velocity is discussed theoretically. Gas density at a given point is more important than the pressure and in order to determine it the gas temp. must be known. Experimental work was performed in He at 1—5 mm. pressure. H. C. G.

Method of line reversal. H. J. HÜBNER (Ann. Physik, 1938, [v], **33**, 52—56).—Reversal temp. > the black-body temp. of the reversed radiation can be determined by extrapolation from measurements of the brightness of the reversed line. O. D. S.

Spectrum of the aurora and state of the auroral region. L. VEGARD (Naturwiss., 1938, **26**, 639—644).—A review of work on the variation and explanation of the spectrum of the aurora. A. J. M.

Photographic determination of height and spectra of the great aurora of Jan. 25—26, 1938. C. STÖRMER (Naturwiss., 1938, **26**, 633—638).—Photographs taken at Oslo and 7 other stations are discussed. A. J. M.

Are there metastable molecules in the Lewis-Rayleigh glow? J. KAPLAN (Physical Rev., 1937, [ii], **51**, 143—144).—Evidence that there are no metastable mols. in this glow is presented. L. S. T.

Existence of the bands 2963 and 2977 in night sky spectra. J. KAPLAN (Nature, 1938, **142**, 395).—Laboratory evidence supporting the reality of Gauzit's observation of these bands in the light of the night sky (A., 1935, 3) is presented. L. S. T.

Zeeman and Paschen-Back effects in strong magnetic fields. P. KAPITZA, P. G. STRELKOV, and E. LAURMAN (Proc. Roy. Soc., 1938, **A**, **167**, 1—15).—A method of investigating the effects in fields up to 320,000 gauss is described. The Zeeman splitting $\propto$ the magnetic field and obeys the theoretical predictions previously verified for weaker fields; no displacement of the centre of gravity of the splitting pattern was observed. The Paschen-Back effect was studied on a Be doublet and accurately followed theoretical predictions; its initial stages were also observed on a Zn triplet. G. D. P.

Hyperfine structure of the Zeeman components of the resonance lines of sodium. D. A. JACKSON and H. KUHN (Proc. Roc. Soc., 1938, **A**, **167**, 205—216).—The hyperfine structure was observed by means of absorption in an at. beam, the resolution being obtained by use of a double etalon. In strong fields four components are observed, showing that the nuclear spin is 3/2. The change of spacing of the lines with field strength is in good agreement with theory. Direct determination of the hyperfine structure of the terms $3S_{\frac{1}{2}}$ and $3^2P_{\frac{1}{2}}$ was made from the complete resolution of the line 5896. G. D. P.

Zeeman effect of tellurium. J. B. GREEN and R. A. LORING (Physical Rev., 1937, [ii], **51**, 62).—The Zeeman effect of Te has been investigated at field strengths of approx. 36,000 gauss. The spectrum of Te II was especially well excited, and j- and g-vals. have been assigned in many cases. L. S. T.

Pure Stark effect observed in metallic arcs. J. HURUITI and T. HORI (Nature, 1938, **142**, 535).—Under suitable arcing conditions, the Stark effect for certain lines of Fe, Cu, Ag, Ni, and Al has been observed. A photograph showing this effect in the 2317 and 2321 A. lines of Ag is reproduced. L. S. T.

Electric breakdown in gases. Y. MIYAMOTO (Res. Electrotech. Lab. Tokyo, 1935, No. 380, 111 pp.).—He, Ne, and A do not form negative ions, and the sparking potential of the needle-plate gap with needle positive is > that with it negative. H_2 and N_2 do not form negative ions, but O_2 and Cl_2 do so. Among gases with the same no. of atoms per mol., the lower is the first ionisation potential, the higher is the sparking potential in parallel-plate gaps. CH. ABS. (e)

Disintegration of a monatomic layer of thorium on a tungsten cathode in a mercury discharge. N. MORGULIS and M. BERNADINER (Tech. Phys. U.S.S.R., 1935, **2**, 333—352).—The thermal evaporation theory of cathode disintegration does not explain the existence of a min. crit. ionic energy (V_0) required for disintegration. Experiments were carried out on the disintegration of a monat. Th film on a W filament bombarded by Hg^+ from a gaseous discharge in a tube provided with an auxiliary W cathode. In an ordinary two-electrode discharge the val. of V_0 varies with the temp. of the Th cathode. The variation of V_0 with discharge current with the Th cathode at 1600—1700° K., bombardment taking place with ions from the auxiliary W cathode, was also determined. V_0 decreases with increasing bombarding ion current, finally reaching a limiting val. of 13—18 v. The probability of disintegration increases rapidly with increase of ion energy. An expression connecting the crit. disintegration energy with the neutralising energy of the bombarding ion, its accommodation coeff., the energy of evaporation of the surface atom, and the amount of energy lost at impact with the next atom is derived, and agrees with experiment. A. J. M.

Mechanism of electron emission from coated cathodes. E. MESCHTER (Physical Rev., 1937, [ii], **51**, 377—378). L. S. T.

Secondary-electron emission from nickel, cobalt, and iron as a function of temperature. L. R. G. TRELOAR and D. H. LANDON (Proc. Physical Soc., 1938, **50**, 625—634).—A crit. discussion of evidence tends to discredit the view that magnetic and structural changes in ferromagnetic metals are accompanied by changes in the secondary-electron emission. Measurements of secondary-emission coeffs. for Ni, Co, and Fe at various primary voltages over a temp. range of ~400° show either no change or a slight fall in the coeff. with rising temp., an effect probably due to surface gas. There is no evidence of any discontinuous changes of secondary emission at the transformation points. N. M. B.

Alteration in electron liberation work through activation of oxide cathodes. W. HEINZE and S. WAGENER (Z. Physik, 1938, **110**, 164—188).—The change in work of electron liberation resulting from activation of oxide cathodes has been measured. The increase in emission resulting from activation is due solely to a decrease in the work done. The emission mechanism is discussed and it is concluded that of the inner and outer components of the liberation work, only the inner is affected by activation. H. C. G.

Wall potential of the diffusion column. W. FUNK and R. SEELIGER (Z. Physik, 1938, **110**, 271—276).—Theoretical. L. G. G.

Shenstone effect in bismuth. A. H. WEBER and C. B. BAZZONI (Physical Rev., 1937, [ii], **51**, 378).—Shenstone's experiments (Phil. Mag., 1923, **45**, 918) on the photo-electric sensitivity of Bi have been repeated and extended with two cast Bi plates and a Bi single crystal. The effect reported by Shenstone has been verified. Variations in this sensitivity of Bi when electric currents are passed through the metal directly are due to changes in the amount of gas occluded by the metal. L. S. T.

Quantum absorption probability in the case of the photo-electric effect. A. T. WATERMAN (Physical Rev., 1937, [ii], **51**, 378). L. S. T.

Stopping of fast electrons. A. BRAMLEY (Physical Rev., 1937, [ii], **51**, 387).—Energy losses suffered by electrons are discussed. L. S. T.

Direct proof of the effect of temperature on the conduction electrons of a metal. H. W. B. SKINNER (Nature, 1938, **142**, 432—433).—Photometric curves showing changes in the breadth of the edge of the L_{23} band of Al at 171 A. at 110°, 300°, and 680° K. are reproduced. The change between the lower temp. can be explained by the heat effect on the conduction electrons, but the additional broadening at 680° K. may be due to distortion of the lattice near the m.p. L. S. T.

Scattering and loss of energy of fast electrons and positrons in lead. W. A. FOWLER and (MISS) J. OPPENHEIMER (Physical Rev., 1938, [ii], **54**, 320—324).—A cloud-chamber investigation was made of the scattering and energy loss in a thin Pb lamina of fast electrons and positrons (5—17 Me.v.) produced as secondaries by the γ-radiation from $^7Li + ^1H$. Scattering-angle curves show good agreement for angles $>13°$ with the Mott–Rutherford theory of single scattering, and indicate multiple scattering below 13°. Comparative theoretical and observed energy losses are discussed. N. M. B.

Momentum transfer during ionisation by canal rays. R. KOOPS (Ann. Physik, 1938, [v], **33**, 57—69).—The total ionisation produced in D_2 and in He by H^+ and D^+ particles of velocities from 2000 to 17,500 e.v. has been measured. The total ionisation in D_2 is $>$ in H_2, the abs. difference being const. The energy transfer to the atom on ionisation is $<2 \times 10^{-4}$ of the total energy change on collision. The energy balances for H_2 and for D_2 differ only for collisions of energy <2000 e.v. O. D. S.

Velocity analysis of potassium atoms scattered by a magnesium oxide crystal. V. W. COHEN and A. ELLETT (Physical Rev., 1937, [ii], **51**, 65).—The scattering that results when a beam of neutral K atoms with approx. thermal velocities characteristic of the temp. of the source is directed toward a MgO crystal is adequately described by the cosine law; neither specular reflexion nor any evidence of diffraction is observed. Magnetic analysis of the atoms scattered at right angles to the initial direction shows that the velocity distribution is Maxwellian and characteristic of the temp. of the crystal. The process is probably one of adsorption and re-evaporation, with the adsorbed atoms attaining thermal equilibrium with the crystal surface. L. S. T.

Stern–Gerlach magnetic field as a velocity analyser for atomic beams. A. ELLETT and V. W. COHEN (Physical Rev., 1937, [ii], **51**, 64—65).—The deflexion pattern of a beam of alkali-metal atoms traversing an inhomogeneous magnetic field has been examined in order to determine the constancy of the gradient and the validity of the Maxwell distribution. L. S. T.

Positive ion mobilities in hydrogen by the Townsend deflexion method. A. V. HERSHEY (Physical Rev., 1937, [ii], **51**, 146—147).—The mobility const. found for ions, presumably K^+, of mol. wt. 39 is 13·5 at 0·7 mm. pressure and $X/p = 5$ (X = field strength), in agreement with vals. obtained by Powell and Brata (A., 1932, 1185). At 0·7 mm. pressure and $X/p = 50$, the mobility const. is 30% greater. L. S. T.

Determination of the cross-section of metastable helium atoms with the aid of their "photo-electric" effect. R. DORRESTEIN and J. A. SMIT (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 725—730).—The cross-section (a) of metastable He atoms for collision with normal He atoms has been determined by measurement of the decrease in intensity of a beam of metastable atoms in passing through He at low pressures, this intensity being deduced from their effect in producing electron emission from a metal electrode. Measurements at const. pressure (9×10^{-4} mm.) and with const. electrode distance lead to vals. of a of 21×10^{-16} cm.^{2} and 18×10^{-16} cm.^{2}, respectively. J. W. S.

Atomic masses of hydrogen, helium, carbon, and nitrogen isotopes. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1937, [ii], **51**, 384—385).—The mass separations CH_4–O, H_2–D, and D_3^+–C^{++} give H 1·00815±0·00002, D 2·01478±0·00003, and C 12·00428±0·00017. The doublet separation D_2–He gives He 4·00395±0·00007, and earlier measurements (A., 1937, I, 542) yield ^{13}C 13·0079±0·0002, ^{14}N 14·0076±0·0002, and ^{15}N 15·0050±0·0003. The doublet $^7Li^+$–$^{14}N^{++}$ gives ^7Li 7·01822±0·00014. L. S. T.

Existence of ^3H. R. SHERR, L. G. SMITH, and W. BLEAKNEY (Physical Rev., 1938, [ii], **54**, 388).—Mass-spectroscopic investigation of the fractionated decomp. products of very pure D_2O gave persistent evidence of an unexplained primary mass 5 ion, but no indication of mass 3. The abundance of ^3H in $^1H_2$ must be <1 in 10^{12}. N. M. B.

Atomic masses of beryllium, boron, neon, and argon. E. B. JORDAN and K. T. BAINBRIDGE (Physical Rev., 1937, [ii], **51**, 385).—The mass differences of 12 doublets calc. from mass-spectrographic lines are recorded. These differences and those reported previously (A., 1937, I, 542) give ^{12}C 12·00402±0·00017, ^{10}B 10·01633±0·00013, ^{20}Ne 19·99917±0·00019, ^{11}B 11·01295±0·00013, ^{9}Be 9·01517±0·00016, ^{40}A 39·97580±0·00031, ^{22}Ne 21·99870±0·00040, and ^{21}Ne 21·00013±0·00029 mass units. L. S. T.

Mass-spectrographic measurement of the C^+ band resulting from the dissociation of CO^+. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1937, [ii], **51**, 595).—Using $^2D_2{}^1H$ and trebly-ionised O for comparison masses, a val. of 5·145±0·002 mass units has been obtained for the position of the C^+ band. This agrees with the calc. val., and not with the val. 5·18 reported by Aston. L. S. T.

Isotopic constitution of strontium, barium, bismuth, thallium, and mercury. A. O. NIER (Physical Rev., 1938, [ii], **54**, 275—278).—Using a mass spectrometer of high sensitivity and resolving power (cf. A., 1938, I, 168), no new isotopes were found. Relative abundances were: ^{88}Sr 100, ^{87}Sr 8·50, ^{86}Sr 11·94, ^{84}Sr 0·68; ^{138}Ba 100, ^{137}Ba 15·8, ^{136}Ba 10·9, ^{135}Ba 9·2, ^{134}Ba 3·37, ^{132}Ba 0·136, ^{130}Ba 0·141 (cf. Sampson, A., 1936, 1313). The Tl 203/205 ratio was 0·410±2%. Upper abundance limits of predicted or hypothetical isotopes are given. N. M. B.

Isotopes and analytical standards. M. G. MELLON (J. Chem. Educ., 1938, **15**, 335).—A correction (cf. A., 1938, I, 426). L. S. T.

Are there any naturally radioactive elements still unknown? J. SCHINTLMEISTER (Österr. Chem.-Ztg., 1938, **41**, 315—321).—The curves connecting mass nos. of nuclei emitting α-rays and their disintegration energies are discussed. These form a series of smooth curves from which predictions can be made regarding the α-radioactivity of Ms-Th_2 and Ac. The unknown element 87 must be produced by the α-disintegration of these nuclei, but such radiation has not yet been discovered. It is shown that the final member of the series of β-radiating nuclei obtained by Hahn *et al.* by the addition of neutrons to U (probably eka-Au) cannot be an α-radiator. The radiator of α-rays of range 1·8 cm. is probably an eka-Ti, of which the disintegration product must be a stable eka-Au. A. J. M.

Natural β-radioactivity of lutecium. M. HEYDEN and W. WEFELMEIER (Naturwiss., 1938, **26**, 612).—A counter tube has been constructed for the detection of β-rays of small intensity, and has been used for detecting the radioactivity of Lu. A purified prep. containing 90% Lu_2O_3 was found to have a weak β-activity, somewhat more intense than that of K, but < that of Rb. Tm is inactive, showing that the deviation of its at. wt. from an integral val. is not due to the presence of an isotope of higher mass no. which is β-radioactive. Yb and Ho preps. showed no activity >0·03 that of Lu. A. J. M.

Continuous β-ray spectrum of ^{32}P. W. E. LAMB, jun. (Physical Rev., 1937, [ii], **51**, 145). L. S. T.

Calculations on β-ray spectra. W. G. POLLARD (Physical Rev., 1937, [ii], **51**, 682). L. S. T.

Search for γ-rays from the deuteron–deuteron reaction. A. J. RUHLIG (Physical Rev., 1938, [ii], **54**, 308).—Evidence of the formation of ^3He in an excited state at ~2 Me.v. above the ground state, as shown by a second group of neutrons from the reaction $^2H + {}^2H \rightarrow {}^3He + {}^1n$ (cf. Bonner, A., 1938, I, 339), leads to the expectation of γ-rays due to the transition of ^3He to its normal state. Experiments to detect these γ-rays are described, and results indicate that there is ≯ one γ-ray for every 200 neutrons. Protons of energy >15 Me.v. due to neutrons, probably from the secondary reaction $^3He + {}^2H \rightarrow {}^4He + {}^1n + 17{\cdot}6$ Me.v. due to recoiling ^3H nuclei from the reaction $^2H + {}^2H \rightarrow {}^3H + {}^1H$, are reported. N. M. B.

Observation of ^1H and ^3H ranges from the disintegration of deuterium by deuterons. E. HUDSPETH and T. W. BONNER (Physical Rev., 1938, [ii], **54**, 308—309).—Experiments are described to detect a short-range group of protons from the reaction $^2H + {}^2H \rightarrow {}^3H + {}^1H$ in expectation of an excitation level in ^3H analogous with the 1·89 Me.v. level in ^3He. It is concluded that ^3H is excited to a level 0·4—2·9 Me.v. in <2% of the disintegrations, if at all. Measurements of the range of the ^3H particles produced in the same reaction indicate a need for revision of the range–energy relation for protons. N. M. B.

Bombardment of palladium with deuterons. J. D. KRAUS and J. M. CORK (Physical Rev., 1937, [ii], **51**, 383).—The active isotopes formed when Pd is bombarded with 6·5-Me.v. deuterons have been investigated. Chemical separations show strong activities in the Pd and at least two active Ag isotopes. The Ag activity is not the Fermi activity that would result from the bombardment of Ag itself (22 sec. and 2·3 min.), but has half-life periods of 32 min. and 7·5 days. L. S. T.

Method of studying a statistical theory of an exponential type. Application to radioactivity. M. FERBER (J. Phys. Radium, 1938, [vii], **9**, 337—344).—A new method is developed theoretically for studying statistical series of the exponential type, and has been applied to the automatic registration of α-particles emitted by Po. Fair agreement has been found with experimental data. A possible interpretation of certain anomalies is advanced. W. R. A.

Anomaly in the apparent absorption of slow neutrons by iodine and boron. J. L. MICHIELS (Nature, 1938, **142**, 431—432).—Slow neutrons (Rn + Be + wax) are anomalously absorbed in B and I filters, and when these are used simultaneously, the activity produced in the detector depends on the order in which the filters are placed. An interpretation of the results is given. L. S. T.

Disintegration of boron by slow neutrons. C. O'CEALLAIGH and W. T. DAVIES (Proc. Roy. Soc., 1938, **A**, **167**, 81—98).—The disintegration is studied

in a cloud chamber, the B being spread on a strip of thin Cu foil stretched diametrically across the chamber. Three groups of particles are observed with ranges of 4·25, 7·15, and 8·9 mm. in air at 15° and 760 mm. The first is due to the Li nucleus produced in the reaction $^{10}_{5}B + ^{1}_{0}n \rightarrow ^{7}_{3}Li + ^{4}_{2}He + Q_1$. The two longer-range particles are α-particles with energies deduced from their measured ranges of 2·45 and 3×10^6 e.v. The val. of Q_1 calc. from the equation of reaction is $2{\cdot}99 \times 10^6$ e.v. It is concluded that the 8·9-mm. α-particles correspond with the production of the ^{7}Li nucleus in the ground state, and the 7·15-mm. particles with an excited nucleus. G. D. P.

Absorption of resonance neutrons. H. H. Goldsmith and J. H. Manley (Physical Rev., 1937, [ii], **51**, 382).—Preliminary results obtained from measurements of the absorption of various neutron groups in Cd, Rh, and Ir are reported. L. S. T.

Neutron resonance levels of iridium and rhodium and the comparative overlapping of their resonance regions. R. Jaeckel (Z. Physik, 1937, **110**, 330—333).—The half-life periods of bodies produced by impact of slow neutrons on Ir have been measured by absorption in Rh. H. C. G.

Determination of the mass of the neutron from the nuclear photo-effect in heavy water. G. Stetter and W. Jentschke (Z. Physik, 1938, **110**, 214—222).—From the nuclear process $^{2}_{1}H + h\nu = ^{1}_{1}H + ^{1}_{0}n + E_{kin.}$ (using the hard Th-C'' γ-radiation of 2·62 Me.v.), and the energy of production of ions in H_2 (determined by means of short H-radiation), the binding energy of deuterons is calc. as 2·189±0·022 Me.v. and the mass of the neutron as 1·00895±0·00003. Reasons for discrepancies between these vals. and those of other authors are discussed. L. G. G.

Neutron-yield curves for light elements. L. R. Hafstad and M. A. Tuve (Physical Rev., 1937, [ii], **51**, 376).—These curves have been obtained for several light elements bombarded with deuterons. The abs. no. of neutrons produced in the range 200—1000 kv. has been determined. L. S. T.

Neutron scattering cross-sections of *para*- and *ortho*-hydrogen, and of N_2, O_2, and H_2O. F. G. Brickwedde, J. R. Dunning, H. J. Hoge, and J. H. Manley (Physical Rev., 1938, [ii], **54**, 266—275).—Measurements were made of the transmission of liquid *p*- and *o*-H_2, for the slow neutrons obtained from a Rn–Be source, by scattering in paraffin at room temp. and at liquid air temp. The scattering cross-section σ of liquid H_2 for slow neutrons depended on the velocity of the neutrons and the *o*–*p* composition. The vals. obtained for σ were: *o*-H_2 56×10^{-24}, *p*-H_2 29×10^{-24} for ~300° K. neutrons (paraffin at room temp.); *o*-H_2 79×10^{-24}, *p*-H_2 18×10^{-24} sq. cm. per mol., for ~120° K. neutrons (paraffin cooled with liquid air). It was proved that the interaction between neutrons and protons depends on the relative alignment of their spins, and that the energy of the singlet state of the deuteron, in which the spins of the proton and neutron are antiparallel, is > the energy of these particles when far apart, *i.e.*, the singlet state of the deuteron is virtual (cf. Schwinger, A., 1937, I, 543). Other determinations of σ were: for O 4×10^{-24}, N 13×10^{-24} sq. cm. per atom, and H_2O $91{\cdot}2 \times 10^{-24}$ sq. cm. per mol. for 300° K. neutrons; H_2O 116×10^{-24} for 120° K. neutrons; for the protons in H_2O, $0{\cdot}5[\sigma(H_2O) - \sigma(O)]$, $43{\cdot}6 \times 10^{-24}$ sq. cm. per proton for 300° K. neutrons and 56×10^{-24} for 120° K. neutrons. N. M. B.

Capture cross-sections for 220-ke.v. neutrons. H. von Halban, jun., and L. Kowarski (Nature, 1938, **142**, 392—393).—The capture cross-sections of 20 elements for 220-ke.v. neutrons have been determined by surrounding the source of photo-neutrons (γ-rays of Th-C'' in D_2O) with a cylinder of the element to be investigated. The results show considerable variations even for neighbouring nuclei, the nuclei showing the largest cross-sections being identical with those showing large cross-sections for slow neutron capture, and having mainly odd proton nos. and even neutron nos. L. S. T.

Investigations with rapid neutrons.—I. Artificial neutron source and yield of D + D neutrons. H. Reddemann (Z. Physik, 1938, **110**, 373—388).—A discharge tube for the production of rapid corpuscular rays is described in detail. The yield of neutrons from the D + D reaction and the action cross-section of this reaction in relation to the deuteron energy have been examined over the range 0·1 to 1·0 Me.v. H. C. G.

α-Particle yield from protons on lithium. L. J. Haworth and L. D. P. King (Physical Rev., 1937, [ii], **51**, 59).—The yields of 8-cm. α-particles produced when thin and thick films of metallic Li are bombarded with protons have been determined as a function of proton energies from 20 to 200 kv. The $V^{\frac{3}{2}}$ absorption law is probably invalid at these low energies. L. S. T.

Gamma spectrum of ^{7}Be. H. Maier-Leibnitz (Naturwiss., 1938, **26**, 614).—The energy distribution of photo- and recoil electrons emitted from Pb by irradiation with γ-rays from ^{7}Be has been determined. The curve shows the presence of a single γ-line at 425±20 e.kv. A. J. M.

New radioactive isotope of fluorine. A. H. Snell (Physical Rev., 1937, [ii], **51**, 143).—Bombardment of Ne with 5-Mv. deuterons gives an active product which emits positive electrons and decays with a period of 112±4 min. It behaves chemically like F and must be ^{18}F. The reaction is $^{20}_{10}Ne + ^{2}_{1}D \rightarrow ^{18}_{9}F + ^{4}_{2}He$, and in decaying $^{18}_{9}F$ goes to stable ^{18}O. The positrons have a max. energy of approx. 500 kv. L. S. T.

Radioactivity induced in calcium under deuteron bombardment. H. Walke (Physical Rev., 1937, [ii], **51**, 143).—Bombardment of calcite crystals with 5·5-Mv. deuterons renders them strongly radioactive. Several decay periods have been observed, and chemical analyses indicate that most of the activity is due to Sc isotopes, possibly ^{41}Sc, ^{43}Sc, and ^{44}Sc. L. S. T.

Bombardment of gold with deuterons. J. M. Cork and R. L. Thornton (Physical Rev., 1937, [ii], **51**, 59).—Bombardment of Au with 6—7-Me.v.

deuterons gives a radioactivity associated with a Au and an Ir isotope. The Au emits negative electrons and the Ir both positives and negatives. Probable reactions are $^{197}_{79}Au + ^{2}_{1}H \rightarrow ^{198}_{79}Au + ^{1}_{1}H \rightarrow ^{198}_{80}Hg + ^{1}_{1}H + ^{0}_{-1}e$; and $^{197}_{79}Au + ^{2}_{1}H \rightarrow ^{194}_{77}Ir + ^{1}_{1}H + ^{4}_{2}He$, $^{194}_{77}Ir \rightarrow ^{194}_{78}Pt + ^{0}_{-1}e$ and $^{194}_{76}Os + ^{0}_{+1}e$.
L. S. T.

Induced radioactivity in lead. R. L. THORNTON and J. M. CORK (Physical Rev., 1937, [ii], **51**, 383).—Bombardment of Pb by 2 μ-amp. of deuterons at 6·5 Me.v. for approx. 12 hr. gave no definite indication of Ra-*D*. Active ^{209}Pb with a half-life period of 3·0 hr. and emitting β-particles is produced. Other shorter period activities have been observed but have not yet been resolved chemically. L. S. T.

Scattering of Yukawa particles by protons. O. LAPORTE (Nature, 1938, **142**, 432).—In contrast to electrons, Yukawa particles show a polarisation effect. L. S. T.

Nuclear disintegrations accompanying cosmic-ray showers. A. BRAMLEY (Physical Rev., 1937, [ii], **51**, 385).—A discussion. L. S. T.

Cosmic-ray bursts photographed with a cloud machine controlled by non-collinear counters. G. L. LOCHER (Physical Rev., 1937, [ii], **51**, 386).—The disintegration products of cosmic-ray bursts in paraffin, Al, and Pb have been investigated.
L. S. T.

Radio-transmitted coincidence counter measurements of cosmic-ray intensities in the stratosphere. T. H. JOHNSON (Physical Rev., 1937, [ii], **51**, 385—386).—The method used is described. During an ascent of 55,000 ft., the cosmic-ray intensity passed through a max. equal to approx. 60 times the ground intensity. L. S. T.

Transition effects of cosmic rays in the atmosphere. R. SERBER (Physical Rev., 1938, [ii], **54**, 317—320).—A more exact calculation of the multiplication of the soft component of cosmic rays is made with the help of diffusion equations obtained from the high-energy radiative formulæ of Bethe and Heitler. Comparison of results with vertical counter and ionisation chamber data shows good agreement with observation for the position of the max. of the multiplication curve, and that the penetrating component is largely of secondary origin. N. M. B.

Nature of primary cosmic radiation. T. H. JOHNSON (Physical Rev., 1938, [ii], **54**, 385—387).—A discussion of the known properties and characteristics of cosmic rays leads to a theory tracing the origin of the rays to an unspecified process in stellar atm. N. M. B.

Decrease of intensity of cosmic rays in water to a depth of 440 m. measured with counters and ionisation chamber. J. CLAY, A. VAN GEMERT, and P. H. CLAY (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 694—705).—A plot of log intensity–log depth for cosmic rays in H_2O gives a straight line for depths >50 m. The vals. for 0—10 m. do not lie on this line and those for 10—50 m. also deviate slightly. The energy distribution curve of the hard component of cosmic radiation is deduced. Some irregularities are observed, owing to the excess of secondary rays at >200 m. and particularly at 280—400 m. J. W. S.

Distribution of the intensity of cosmic radiation for different directions around the vertical. J. CLAY, J. T. WIERSMA, and K. H. J. JONKER (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 706—708).—Measurements have been made with double counters in E–W and N–S directions, with and without 30 cm. of Pb between the counters. Without Pb the same val. is obtained in each direction, almost $\propto \cos^2 \alpha$ (α = angle of inclination to the vertical). With the Pb present deviations were observed, but these were eliminated by placing a horizontal layer of 30 cm. of Pb over the counters. The results are discussed with reference to the absorption of cosmic rays by the atm. and by H_2O. The coeff. of decrease of intensity of lateral rays is < that for vertical rays.
J. W. S.

Ray multiplication in showers. H. GEIGER and M. HEYDEN (Z. Physik, 1938, **110**, 310—319).—Using a counter-tube coincidence method, it was found that the no. of coincidences recorded for a shower increased with increasing thickness of Pb, reaching a max. with 3 cm. of Pb and thereafter diminishing. A similar result was obtained with Al. Results are discussed and it is shown that the increase in the no. of coincidences is due to an increase in the no. of rays in a shower. H. C. G.

Cosmic-ray ionisations under various thicknesses of lead shield in northern and equatorial latitudes at different altitudes. R. T. YOUNG, jun., and J. C. STREET (Physical Rev., 1937, [ii], **51**, 386). L. S. T.

Search for exchange phenomena in cosmic rays. (MISS) Z. WASIUTYŃSKA and L. WERTENSTEIN (Nature, 1938, **142**, 475—476).—A search for evidence of proton–neutron exchange phenomena in cosmic rays, using five counters separated by different thicknesses of air and Pb, indicates that if the particles forming the bulk of the penetrating component give rise to any exchange effect, the mean free path in Pb for this effect is ≫30 cm. The relative no. of protons present in cosmic penetrating radiation is very small. L. S. T.

Hard and soft component of cosmic radiation in terms of a common primary background. W. F. G. SWANN (Physical Rev., 1938, [ii], **54**, 307).—Fundamental assumptions on the basis of which expressions have been developed for the intensities of the primaries and secondaries are propounded and applied. N. M. B.

Production of penetrating secondary cosmic-ray particles in the atmosphere. M. SCHEIN and V. C. WILSON (Physical Rev., 1938, [ii], **54**, 304—305).—Hsiung-type experiments (cf. A., 1934, 1285) at high altitudes indicate that above 20,000 ft. penetrating ionising rays (heavy electrons) are produced by non-ionising agents (photons). Results agree with the assumption that the heavy electrons are formed by secondary photons abundant at high altitudes and strongly absorbed by 2 cm. of Pb. At 25,000 ft. the ratios, compared with sea-level, were

3 : 1 for the vertical penetrating component and 12 : 1 for the total vertical radiation. N. M. B.

Absorption of the penetrating component of cosmic radiation. W. M. NIELSEN and K. Z. MORGAN (Physical Rev., 1938, [ii], **54**, 245—248).—Geiger–Müller counter measurements inside and outside a cavern below rock of 60 m. H_2O equiv. depth indicate that the penetrating component is associated with an ionising particle and undergoes a hardening on transmission through large thicknesses of material. There is evidence that the less penetrating radiation is in approx. equilibrium with the penetrating component even at the earth's surface. N. M. B.

Energy distribution analysis of primary cosmic rays. A. H. COMPTON (Physical Rev., 1937, [ii], **51**, 59).—An analysis following Zanstra's method and using new latitude-effect data has been made. Between 9 and 19×10^9 e.v. the energy spectrum appears continuous and indicates an electrical particle origin of most of the cosmic-ray ionisation. L. S. T.

Absorption of corpuscles in the ionosphere. H. D. RATHGEBER (Naturwiss., 1938, **26**, 563).—The assumption that the absorption of ultra-radiation beyond the atm. is due to the presence of free electrons in the ionosphere is examined. The retarding effect calc. on this basis is too small to account for the observed absorption, and the hypothesis also fails to explain the observed variation of intensity. A. J. M.

Quantum theory and relativity. G. WATAGHIN (Nature, 1938, **142**, 393—394).—Theoretical. L. S. T.

Formation of deuterons by proton combination. H. A. BETHE and C. L. CRITCHFIELD (Physical Rev., 1938, [ii], **54**, 248—254).—Mathematical. The probability of the reaction $H + H = D + \epsilon^+$ is calc. The energy evolution due to the reaction is about 2 ergs per g. per sec. at the centre of the sun and is almost sufficient to explain the observed average energy evolution of the sun. N. M. B.

Production of heavy electrons. L. W. NORDHEIM and G. NORDHEIM (Physical Rev., 1938, [ii], **54**, 254—265).—Mathematical. Estimates based on the close analogy of the barytron (heavy electron) theory of nuclear forces to the theory of the electromagnetic field are given for the probabilities of the processes leading to the production of barytrons. The theoretical cross-sections are too small to explain the properties of the hard component of cosmic radiation. The lifetime of barytrons, estimated from radiative β-decay, is $\sim 10^{-8}$ sec. No simple picture of barytron production in terms similar to radiation theory can be given, but the failure indicates only the inapplicability of perturbation calculations. N. M. B.

New experimental evidence for the neutrino. (A) L. WERTENSTEIN. (B) H. R. CRANE and J. HALPERN (Physical Rev., 1938, [ii], **54**, 306—307; cf. A., 1938, I, 383).—(A) The uncertainty in assuming that the relation between the energy of an atom (recoiling ^{38}A) and the ionisation produced by the atom can be used to infer simultaneous emission of an electron and neutrino is emphasised.

(B) A discussion of the objections raised above, and of the problem of ionisation and interpretation of clusters of droplets in a cloud chamber. It is shown that the conclusions were arrived at by a comparison of ^{38}Cl, ^{32}P, and ^{13}N, rather than by an abs. estimate of recoil energy, and that a possible mechanism in addition to ionisation exists for the production of droplets by slowly moving atoms. N. M. B.

Magnetic deflexion of HD molecules. I. ESTERMANN, O. C. SIMPSON, and O. STERN (Physical Rev., 1937, [ii], **51**, 64).—The magnetic deflexion of mol. beams of HD shows that HD differs from H_2 and D_2 by the absence of mols. with zero moment. The weakening by the magnetic field at the position of the undeflected beam is nearly independent of the magnetic moment of the deuteron and of the rotational magnetic moment, but is sensitive to the moment of the proton, more than in the case of H_2. L. S. T.

Sub-elements. F. P. WORLEY (J. New Zealand Inst. Chem., 1938, **3**, 52—53).—A discussion of the possible existence of elements of at. mass <1, possessing nuclei composed of positrons and electrons. Such elements may occur as nuclear disintegration products, in cosmic rays, and among the products of sun-storms which cause terrestrial electromagnetic disturbance. A. J. E. W.

Creation of pairs by nuclear electrons. J. K. KNIPP (Physical Rev., 1937, [ii], **51**, 381—382). L. S. T.

Dimensionless constants of physics. A. E. HAAS (Proc. Nat. Acad. Sci., 1938, **24**, 274—276).—Theoretical. The ratio of the total no. of neutrons to the total no. of protons in the universe is 1 if the results of Eddington and Sitte *et al.* based on wave-mechanics are correct. A. J. M.

Charge on the electron. J. A. BEARDEN (Physical Rev., 1937, [ii], **51**, 378).—A redetermination of the η of air by the rotating-cylinder method gives a val. which, taken with Millikan's oil-drop data, yields for e a val. in agreement with that obtained from X-ray measurements. L. S. T.

Precision determination of h/e from the short wave-length limit of the continuous X-ray spectrum. V. L. BOLLMAN and J. W. M. DU MOND (Physical Rev., 1937, [ii], **51**, 145).—Two precision determinations of the short-λ limit of the continuous X-ray spectrum made in the regions of 10^4 and 2×10^4 v., respectively, give $h/e = 1{\cdot}3767 \times 10^{-17}$. The results confirm the discrepancy in certain physical consts. emphasised by Birge. Accepted vals. of F are suspected. L. S. T.

Measurement of the velocity of light. W. C. ANDERSON (Physical Rev., 1937, [ii], **51**, 596).—A high-frequency method using a relatively short base line gives from 651 measurements a mean val. of 299,764 km. per sec. in a vac. L. S. T.

Matrix element in the Fermi theory of β-decay. L. W. NORDHEIM (Physical Rev., 1937, [ii], **51**, 64).—The way in which the many-body constitutions of the nuclei have to be taken into account in this theory is discussed. L. S. T.

Classical theory of radiating electrons. P. A. M. DIRAC (Proc. Roy. Soc., 1938, **A**, **167**, 148—169).—A self-consistent scheme of equations is deduced which yield all the experimental results about the interaction of electrons and radiation. The physical interpretation of the equations indicates that the interior of the electron is a region of space through which signals can be transmitted with a velocity > that of light. G. D. P.

Loss of energy by fast particles in nuclear collisions. E. J. WILLIAMS (Nature, 1938, **142**, 431).—The energy lost by fast-moving particles in nuclear collisions when traversing matter is estimated to be the same as if the nuclear particles were free and isolated. L. S. T.

Interaction between light nuclei. M. PHILLIPS, L. EISENBUD, and E. U. CONDON (Physical Rev., 1937, [ii], **51**, 382).—The scattering cross-sections for neutrons or protons on ^2_1H, ^3_1H, ^3_2He, and ^4_2He, and for deuterons on deuterons, have been calc. Considerations based on ordinary forces and unsymmetrised wave functions yield elastic scattering cross-sections in approx. agreement with existing experimental data. L. S. T.

Interaction of heavy and light particles at very high energies. L. W. NORDHEIM and G. NORDHEIM (Physical Rev., 1937, [ii], **51**, 379).—Estimation of the probabilities of the emission of electrons and neutrinos by very energetic protons passing through matter, due to Fermi interaction, has been attempted. L. S. T.

Angular distribution of resonance disintegration products. R. D. MYERS (Physical Rev., 1938, [ii], **54**, 361—367).—Mathematical. Formulæ for general coupling and Russell–Saunders coupling are developed, and it is found that the distribution is axially symmetric about the direction of the incident particle and about the equatorial plane. Results are applied to the reactions: $^2D + ^2D \rightarrow ^3H + ^1H$; $^{11}B + ^1H \rightarrow ^8Be + ^4He$; $^7Li + ^1H \rightarrow 2^4He$; $^6Li + ^2H \rightarrow ^7Li + ^1H$. N. M. B.

Static interaction of charged particles. C. D. THOMAS (Physical Rev., 1938, [ii], **54**, 367—370).—Mathematical. N. M. B.

Lower limit for the theoretical energy of the normal state of helium. A. F. STEVENSON and M. F. CRAWFORD (Physical Rev., 1938, [ii], **54**, 375—379; cf. *ibid.*, **53**, 199).—A method of using a modification of Weinstein's lower limit for the energy is applied to the normal state of He, and leads to the lower limit −1·45508 Hylleraas units, with a probable increase to −1·45446, whereas the upper limit found by Hylleraas is −1·45187. The bearing of results on the probable location of the true eigenvalue and the general applicability of the method are discussed. N. M. B.

Theory of magnetically neutral solutions. A new possibility for the determination of magneton values. O. VON AUWERS (Z. Physik, 1938, **110**, 267—270).—The practical results of Salceanu (A., 1938, I, 238) are developed theoretically and it is shown that the method may be employed for the abs. determination of the magneton nos. of solutes. L. G. G.

Rutherford scattering with regard to radiation. W. BRAUNBEK and E. WEINMANN (Z. Physik, 1938, **110**, 360—372).—Mathematical. The formulæ of Mott, Sommerfeld, and Bethe for the action cross-section for nuclear scattering with radiation may be derived from the equation of Bloch and Nordsieck by developing the latter as a potential series of α (Sommerfeld fine structure const.). L. G. G.

Attempt at direct measurement of the magnetic moment of the ^{85}Rb nucleus. S. MILLMAN, I. I. RABI, and J. R. ZACHARIAS (Physical Rev., 1937, [ii], **51**, 379—380).—The val. obtained is ~1·8 nuclear magnetons. L. S. T.

Density of excited levels in heavy nuclei. S. GOUDSMIT (Physical Rev., 1937, [ii], **51**, 64). L. S. T.

Nuclear three-body problem. R. D. PRESENT and W. RARITA (Physical Rev., 1937, [ii], **51**, 382).—Theoretical. L. S. T.

Application of a new limitation in physical theory. H. T. FLINT (Nature, 1938, **142**, 535—536).—The application of a new limitation arising from quantum-relativity relations to an electron moving orbitally in an electrostatic field indicates that the *K*-level cannot exist in atoms with at. nos. >96. L. S. T.

Ultra-violet absorption spectra of some organic substances, examined in the solid state by means of a reflexion method. (MME.) T. GUILMART (Bull. Soc. chim., 1938, [v], **5**, 1209—1218).—A detailed account of work already noted (A., 1938, I, 492). C. R. H.

Ultra-violet band spectra of HgCl, CdCl, and ZnCl. S. D. CORNELL (Physical Rev., 1938, [ii], **54**, 341—346).—The spectra excited in a high-frequency discharge are examined at high dispersion in the range 3200—2000 A. Vibrational analyses of several systems are given, and the electronic configurations involved in the systems are discussed. N. M. B.

Reactions of αβ-unsaturated aldehydes and ketones. II. Absorption spectra of typical compounds and their dihydro-derivatives. R. G. COOKE and A. K. MACBETH (J.C.S., 1938, 1408—1413).—The absorption spectra of phellandral, piperitone, carvone, and cryptone and of their H_2-derivatives have been determined in solutions of EtOH and C_6H_{14}. The saturated ketones show two max. of low intensity; the unsaturated ketones also show two max., one of high intensity in the region 2260—2355 A. (i), and the other of comparatively low intensity in the region 3120—3190 A. (ii). (i) is due to the ethenoid linking influenced by the CO group, whilst (ii) is due to the CO group influenced by the double linking. For phellandral, conjugation of the CHO group and the double linking gives a max. (ii) approx. 10 times that observed in the ketones examined. The spectra of cuminal and cuminic acid agree with recorded data for typical aromatic aldehydes and acids. W. R. A.

Absorption spectra of the halogen acids in the vacuum ultra-violet. W. C. PRICE (Proc. Roy. Soc., 1938, **A**, **167**, 216—227).—A system of new

absorption bands starting at 1762, 1491, and 1331 A., respectively, for HI, HBr, and HCl is described. In the case of HI a Rydberg series of bands was found. Mean ionisation potentials are determined.

G. D. P.

Ultra-violet band system of silicon monoselenide. R. F. BARROW (Nature, 1938, **142**, 434; cf. A., 1938, I, 341).—The ultra-violet band system of SiSe, obtained by means of a 2·5-amp. discharge in a SiO_2 tube containing Al selenide, contains ~30 bands, degraded towards the red, in the region 2914—3671 A., the $0 \rightarrow 0$ band being at 3089·3 A. and comparatively weak. L. S. T.

Ultra-violet band system of silicon monotelluride. R. F. BARROW (Nature, 1938, **142**, 536; cf. preceding abstract).—Details of the band system of SiTe, lying between 3307 and 3831 A. and with its $0 \rightarrow 0$ band at 3496·4 A., are recorded. The system is obtained by passing an a.c. discharge through powdered Al + Te in a SiO_2 tube.

L. S. T.

Absorption spectrum of the permanganate ion in different crystal lattices. J. TELTOW (Z. physikal. Chem., 1938, **B**, **40**, 397—430).—The visible absorption spectrum of MnO_4' ions has been examined at the temp. of liquid H_2 in cryst. solid solution with colourless salts, and in thin layers of pure $KMnO_4$. Crystal-embedded MnO_4' ions show two band systems, (I) and (II), in the green and red regions, I having an intensity $\gg$ that of II. The position, interval, and splitting-up of the bands are independent of the nature of the cations and of the lattice symmetry. The broadening of the lines of I, observed in many salts, is due to the disturbance of electron terms by the environment existing at the abs. zero. The nature of the disturbing influences is indicated. In thin mixed crystals, with the same cations, I shifts towards longer λλ with increasing space-filling of the lattice anions. II shows much more direction-dependence than I. In thin mixed crystals with $NaClO_4$, a wider red band system exists in two directions of vibration, and a band system in the violet which is observed with no other salt. Pure $KMnO_4$ is strongly sensitive to visible light, but no sensitivity has been observed with thin mixed crystals, except KIO_4 and $KHSO_4$ with small amounts of $KMnO_4$. W. R. A.

Study of the constitution of nitric acid from its absorption spectra. R. DALMON (Compt. rend., 1938, **207**, 473—475; cf. A., 1928, 590).—Vals. of the mol. extinction coeff. ε (λ 3180 A.) for aq. HNO_3 (0·8—24·6N.) at 1—2° are recorded. The decrease of ε with increasing concn. is linear at $\not>$10N., but becomes less rapid at higher concns.; ε reaches a min. at 23·6N. (97·2%) and then increases owing to the presence of N_2O_5. Application of Darmois' rule (A., 1934, 24) to the ε–λ curves confirms the existence of an equilibrium between NO_3' and some intermediate form at concns. $\not>$10N.; a second equilibrium, possibly involving the intermediate and homopolar forms, occurs at higher concns. A. J. E. W.

Non-association of photoconductivity with optical absorption in non-conducting crystals. C. ZENER (Physical Rev., 1937, [ii], **51**, 64).—Two new methods indicate that the photoconductivity of electrical insulators is not associated with the long-λ edge of the first absorption band. L. S. T.

Band spectra of BiF, BiCl, SbF, and SbCl. G. D. ROCHESTER (Physical Rev., 1937, [ii], **51**, 146).—Three new systems of bands, degraded towards shorter λλ, have been found in the spectrum of BiF at 3050—3250, 2650—2850, and 2250—2350 A. No new systems have been found in BiCl. The spectrum of SbF has groups of bands in the regions 3600—5200, 2600—2700, and 2200—2430 A. A new system in the region 4000—5500 A. has been found in the spectrum of SbCl. L. S. T.

Spectrum of cadmium fluoride, CdF. R. W. B. PEARSE and A. G. GAYDON (Proc. Physical Soc., 1938, **50**, 711—713).—The spectrum attributed by Asundi (cf. A., 1935, 562) to CdF has been identified with the known spectrum of CaF. Absorption bands incorrectly attributed to $CaBr_2$ and CaI_2 are due to $TlBr_2$, TlI_2, and BiI. N. M. B.

Spectroscopic studies on pinoresinol dimethyl ether, *epi*pinoresinol dimethyl ether, and *epi*-eudesmin. T. KAKU and K. ITTYODA (Keijo J. Med., 1938, **9**, 107—113).—Absorption spectra and curves of the three substances are given; those of the latter two are similar. F. JA.

Absorption spectra and fluorescence of heterocyclic compounds. O. V. FIALKOVSKAJA (J. Phys. Chem. Russ., 1938, **11**, 533—545).—Vapours of C_5H_5N, indole, furan, and thiophen have characteristic band absorption spectra. The spectrum of quinoline vapour is more diffuse. Different specimens of pyrrole give different spectra. Indole vapour fluoresces at room temp., and quinoline vapour above 80°. J. J. B.

Absorption spectra of azo-hydrocarbons and halochromy. T. UÉMURA and Y. INAMURA (Bull. Chem. Soc. Japan, 1938, **13**, 509—516).—Solutions of azo- and diazo-benzene, benzeneazo- and azo-diphenyl, benzeneazo-α-, αα'-azo-, αβ'-azo-, and ββ'-azo-naphthalene in C_6H_6 show an absorption band in the visible region and another in the ultra-violet. The position of the first varies little with the compound, whilst that of the ultra-violet band varies with the size of the azo-radical or the no. of double linkings.

E. S. H.

Absorption spectra of salicylaldehyde–ethylenedi-imine and related compounds. R. TSUCHIDA and T. TSUMAKI (Bull. Chem. Soc. Japan, 1938, **13**, 527—533).—Data for PhCHO–, *o*-OMe·C_6H_4·CHO–salicylaldehyde– (I), and *o*-hydroxyacetophenone–ethylenedi-imine (II) are recorded. In (I) and (II) a band in the near ultra-violet region is ascribed to a H linking between OH and N. The absorption spectrum of (I)–Co is discussed (cf. A., 1938, I, 432) and the steric configuration of the inner complex confirmed.

E. S. H.

Absorption spectra of metal complex salts of 2 : 2'-dipyridyl. II. K. YAMASAKI (Bull. Chem. Soc. Japan, 1938, **13**, 538—542; cf. A., 1937, I, 547).—Spectra of 2 : 2'-dipyridyl in hexane and in H_2O and of $[Mn(dip)_2]Cl_2$ (I), $[Co(dip)_2Cl_2]Cl$ (violet), and

$[Co(dip)_2CO_3]Cl$ in H_2O between 220 and 700 mμ. have been determined. The prep. of (I) is described.
E. S. H.

Spectra of R_1–R_1 systems. Spectra of *l*-ascorbic, hydroxytetronic, reductic, and α-crotonic acid. (A) G. E. CARPÉNI. (B) H. MOHLER. (Helv. Chim. Acta, 1938, **21**, 1031—1036, 1036—1038).—(A) The conclusions of Mohler and Lohr (A., 1938, I, 342) are criticised.
(B) A reply. J. W. S.

Absorption spectrum of visual purple.—See A., 1938, III, 895.

Light absorption and absolute concentration of hydroxyl. L. AVRAMENKO and V. KONDRATEEV (Acta Physicochim. U.R.S.S., 1937, **7**, 567—580).—Abs. absorption coeffs. for 2 lines in the OH band at λ = 3064 A. are calc. by theoretical formulæ from absorption measurements made at different temp. on the mixture 2/3 H_2O + 1/3 O_2. The calc. heat of the reaction $H_2 + 2OH \rightarrow 2H_2O$ is 124 kg.-cal. and equilibrium consts. for the reaction are derived. The data are used to find the concn. of OH radicals in a dil. H_2 flame. J. A. K.

Optical absorption of fused germanium dioxide from 0·185 to 8·5 μ. R. W. SHAW (Physical Rev., 1937, [ii], **51**, 146).—Fused GeO_2 exhibits a uniform transmission from the near ultra-violet to 4·5 μ., except for a sharp absorption at 2·86 μ. The Raman spectrum, excited by the Hg line 3650 A., is a single band. The frequency interval between the band centre and the parent line corresponds with λ 2·88 μ. L. S. T.

Normal modes and frequencies of the sulphur molecule. S. BHAGAVANTAM and T. VENKATARAYUDU (Proc. Indian Acad. Sci., 1938, **8**, **A**, 101—114).—The model of the S_8 mol. is assumed to consist of a puckered octagon made up of two equal squares set at 45°. Expressions are derived for normal νν. Of the 11 normal modes, 4 are single and 7 doubly degenerate; their activity in Raman and infra-red spectra is discussed. W. R. A.

Raman spectrum and specific heat of sulphur. S. BHAGAVANTAM and T. VENKATARAYUDU (Proc. Indian Acad. Sci., 1938, **8**, **A**, 115—118).—The calc. vals. of the 11 normal νν (see preceding abstract) are compared with known infra-red and Raman data and show moderate agreement. Force consts. are derived. The vals. of the sp. heat, deduced from the spectroscopic data, are compared with recorded vals.
W. R. A.

Normal frequencies of phosphorus (P_4). S. BHAGAVANTAM and T. VENKATARAYUDU (Proc. Indian Acad. Sci., 1938, **8**, **A**, 119—123).—Using the method employed for S (see preceding abstract) and assuming the P_4 has tetrahedral symmetry, T_d, the characteristics of its spectrum are deduced from the theory of groups. There should be 3 normal νν, all active in Raman effect but only one in infra-red. The νν comprise one single ν, one doubly and one triply degenerate. Polarisation features are discussed. Calc. vals. of νν agree with observed. Force consts. and the sp. heat at 9° have been evaluated.
W. R. A.

Infra-red spectra. Absorption of the CH_2 group in the region of 3 μ. J. J. FOX and A. E. MARTIN (Proc. Roy. Soc., 1938, **A**, **167**, 257—281).—Seven substances containing CH_2 groups are investigated; in addition to the CH bands found near 3·27 μ. when an aromatic ring is present two or more bands near 3·4 μ. are attributable to the CH_2 groups. An analysis of the data for C_2H_4 leads to an explanation of the bands observed in more complicated mols. When the mol. contains only one CH_2 group two bands are observed which are identified as CH valency vibrations; if the no. of CH_2 groups is increased the no. of bands may increase beyond two. The mass to which the CH_2 group is attached has little effect on the position of the absorption bands, except in cases involving strain of the bonds connecting the CH_2 group to the rest of the mol. The substances examined are: $CH_2Ph{\cdot}OH$, CH_2Ph_2, $(CH_2Ph)_2$, and *cyclo*hexane, in which the CH_2 group is not subject to strain; fluorene, acenaphthene, and dioxan, where the CH_2 groups are attached to the mols. in a manner different from that in the other four compounds. G. D. P.

Infra-red absorption spectrum of methyl alcohol. (MISS) A. BORDEN and E. F. BARKER (J. Chem. Physics, 1938, **6**, 553—563).—The infra-red absorption spectrum from 2·5 to 26 μ. of gaseous MeOH has been examined with a grating spectrometer fitted with a KBr fore prism; it consists of 9 bands, six attributable to fundamental νν of the Me group and corresponding closely with known bands of Me halides, and three to the vibrations within the OH group. The mol. is only slightly asymmetrical. From the fine structure of the parallel band at 1034·18 cm.$^{-1}$ the two major moments of inertia are 35·18 and 33·83 × 10^{-40} g. cm.^{2}, whilst the third, not measurable directly, can be estimated as ~6·8 × 10^{-40} g. cm.^{2} A broad band of low ν (860—880 cm.$^{-1}$) indicates that the OH group does not undergo free rotation, at least in the ground state. There is some evidence of free rotation in states of high excitation. W. R. A.

Infra-red absorption spectra of $CH_3{\cdot}OD$ and $CH_2D{\cdot}OD$. E. F. BARKER and G. BOSSCHIETER (J. Chem. Physics, 1938, **6**, 563—568; cf. preceding abstract).—The spectra from 2·5 to 24 μ. have been measured for gaseous MeOD and $CH_2D{\cdot}OD$. Corresponding νν for the three analogues are compared and shifts are discussed. Comparison of gaseous and liquid samples shows large displacements of the bands arising from OH valency and deformation vibrations. The former cause shifts to longer λλ in the liquid, the latter to shorter λλ. W. R. A.

Rotation of water molecules in non-polar solvents. E. L. KINSEY and J. W. ELLIS (Physical Rev. 1937, [ii], **51**, 381).—Noteworthy features of the infra-red absorption bands of H_2O dissolved in CS_2 are discussed. L. S. T.

CD_4 fundamental bands. H. H. NIELSEN and A. H. NIELSEN (Physical Rev., 1937, [ii], **51**, 62—63).—The two active fundamental vibration–rotation bands ν_3 and ν_4 in the spectrum of CD_4 have been located and their rotational structure studied under

high resolving power. Their centres lie at 2259·0 and 996 cm.$^{-1}$, respectively. The moment of inertia can be computed from $\Sigma\Delta\nu = 3h/8\pi^2A$, where the val. found for A is $1{\cdot}091 \times 10^{-39}$ g.-cm.^{2}, or approx. twice that for CH_4. L. S. T.

Vibration spectra and molecular structure. IV. Infra-red absorption spectra of the double and single molecules of formic acid. L. G. BONNER and R. HOFSTADTER **V. Infra-red studies on light and heavy acetic acids.** R. C. HERMAN and R. HOFSTADTER. **VI. Infra-red absorption spectrum of heavy formic acid.** R. HOFSTADTER (J. Chem. Physics, 1938, **6**, 531—534, 534—540, 540—543).—The infra-red absorption spectrum of HCO_2H vapour has been measured at various temp. up to 140° at which HCO_2H is monomeric. The different spectra are discussed from the viewpoint that H bonding causes dimerisation. A coincidence of C–H and O–H–O νν is suggested and to verify this "heavy" formic acid was prepared by passing D_2S through $(HCO_2)_2Pb$ at 100° and its spectrum taken. The results were not conclusive. Force consts. for C–O and C=O have been calc. and suggest single–double bond resonance for the C–O link but with a resonance energy < that predicted by Pauling and Sherman (A., 1934, 15).

V. The spectra of AcOD and AcOH have been measured from 1 to 15·5 μ. at 24° and 139°, *i.e.*, with, respectively, 9 and 97% of monomeric acid mols. present. For AcOD the band at 2299 cm.$^{-1}$ is very sensitive to temp. changes and is attributed to the D-bonded O–D–O vibration; in the protium compound the analogous band is at 3125 cm.$^{-1}$ The νν of "free" O–H and O–D, 3640 and 2653 cm.$^{-1}$, respectively, diminish and finally disappear as the temp. rises. The monomeride and dimeride spectra of both acids are quite different. For both, the C=O ν is 1737 cm.$^{-1}$ for the dimeride and 1770 cm.$^{-1}$ for the monomeride. Other νν also show appreciable shifts. The dependence of association on temp. has been investigated for AcOD and the heat of dissociation has been evaluated using the fundamental ν of the O–D–O vibration. A similar evaluation for the AcOH was impossible because the O–H–O ν falls in the region of the C–H valency vibrations. The heat of dissociation for AcOD is 15,900 g.-cal. per mole or 7950 g.-cal. per mole per bond. Assuming that the dimeride of AcOH is $CMe\begin{matrix}\diagup O\text{---}(D)H\text{---}O \\ \diagdown O\text{---}H(D)\text{---}O\end{matrix}\diagdown CMe$, and that the O–H(D)–O can be treated as asymmetric linear triat. mols. and that force consts. vary inversely with the cube of the equilibrium distance, the val. 1·07 A. for the shorter O–H(D) distance yields νν 1% different from 3125 and 2299 cm.$^{-1}$ The normal O–H distance is 0·97 A.

VI. The prep. of HCO_2D from D_2S and $(HCO_2)_2Pb$ yielded equal amounts of HCO_2H, HCO_2D, DCO_2H, and DCO_2D. By a simple exchange between HCO_2H and D_2O with subsequent dehydration with anhyd. $CuSO_4$ only HCO_2H and HCO_2D were obtained. Spectra of two samples with $HCO_2D : HCO_2H$ ratios of 8 and 12·4 have been measured at approx. 25° and 145° from 1 to 15·5 μ. Assignments of νν are made. The calc. O–H(D) distance in the dimeric structure which gives best agreement with observed νν is 1·07 A. as for AcOH(D). W. R. A.

Infra-red study of several liquid crystals. R. TASCHEK and D. WILLIAMS (J. Chem. Physics, 1938, **6**, 546—552).—The infra-red absorption spectra of three liquid crystals have been investigated at various temp. over the range 1—11 μ. in the isotropic and anisotropic states. Pronounced changes are exhibited at the m.p. and clearing points. The absorption is greatly influenced by the temp. and the location of max. are shifted. In the mesophase rapid changes in transmission occur which are qualitatively explained by Ornstein's theory. W. R. A.

Vibrational spectrum and thermodynamical properties of nickel carbonyl. B. L. CRAWFORD, jun., and P. C. CROSS (J. Chem. Physics, 1938, **6**, 525—530).—The infra-red absorption spectra of liquid $Ni(CO)_4$ from 1 to 8 μ. and of $Ni(CO)_4$ vapour from 1 to 23 μ. have been measured. The results, which agree satisfactorily with those of Bailey and Gordon (A., 1938, I, 295), have been analysed in conjunction with the Raman data of Duncan and Murray (A., 1934, 1289) and indicate a tetrahedral, T_d, structure, although they do not completely exclude a square configuration (D_{4h}). Normal coordinates, selection rules, and spectroscopic characteristics for each structure have been derived by the method of group theory. Calc. νν of fundamentals, first overtones, and binary combination tones are tabulated and compared with observed infra-red data. The assignments which account for the Raman spectrum are given. Force consts. have been evaluated; that for C–O stretching is $15{\cdot}89 \times 10^5$ dynes per cm., which is intermediate between the vals. for C=O and C≡O. Interat. distances derived from force consts. agree with observed vals. By statistical mechanics the virtual entropy, the free energy function, and C_v have been determined at six temp. in the range 298—500° K. W. R. A.

Effect of temperature of uranin solutions on the fluorescence decay time. W. CRAM (Physical Rev., 1937, [ii], **51**, 62).—The fluorescence decay times of eight different uranin (I) solutions have been measured over the range 0—70°. For low concns. (1×10^{-4} g. per c.c.) in H_2O or EtOH this time decreases 25% with a rise in temp. from 0° to 30°. An increase in concn. of (I) tends to weaken this effect, and at a concn. of 6×10^{-3} g. per c.c. it disappears. An increase in η also lowers the temp. effect. Glycerol solutions show no temp. effect. L. S. T.

Selective extinction of continuous fluorescence spectra. N. PRILESHAEVA (Acta Physicochim. U.R.S.S., 1937, **7**, 149—162).—Max. extinction of the continuous fluorescence of PhMe, PhEt, PhOH, and NH_2Ph by N_2 and CO occurs at the frequencies corresponding with the vibration levels of the latter gases. With H_2 max. extinction occurs at 2800 A., corresponding with the dissociation of H_2 into atoms. With CO_2 and H_2O two max. occur, probably corresponding with the energy of activation of the unimol. decomp. of these mols. No selective extinction was observed with O_2 and NH_3. Selective extinction is

attributed to a kind of Raman effect through collisions of the second kind. J. W. S.

Sensitised fluorescence of aniline and benzene vapours. N. PRILESHAEVA and A. KLIMOVA (Acta Physicochim. U.R.S.S., 1937, **7**, 163—170).—Sensitised fluorescence produced by processes of the type $A + B^* \rightarrow A^* + B$ is attributed to intersection of the potential curves of the two states of the system, and it is concluded that under suitable conditions the reverse reaction should occur, giving anti-Stokes sensitised fluorescence. This is confirmed by observation for the systems NH_2Ph–indigotin and NH_2Ph–C_6H_6. J. W. S.

Resolution and interpretation of the luminescent spectra of some solids at low temperatures. J. EWLES (Proc. Roy. Soc., 1938, **A**, **167**, 34—52).—Ultra-violet bands excited by cathode-ray bombardment of CaO and SrO show frequency differences close to the vibrational frequencies of the crystal lattices. The optically excited spectra of pure CaO and of CaO activated with Bi are similar to those excited by cathode rays. The bands in the visible region are not resolved and are independent of the nature of added impurities. It is suggested that the luminescent spectra of the alkaline-earth oxides and sulphides are to be regarded as electron vibration bands associated with the crystal lattice, and a possible mechanism for short-duration phosphorescence is discussed. The compounds examined are CaO, BaO, BaS, $BaCO_3$, ZnO, ZnS, MgO, and Zn silicate, activated with different impurities. G. D. P.

Adsorption in preparative phosphorescence chemistry. Zinc sulphide system. E. TIEDE and W. SCHIKORE (Z. Elektrochem., 1938, **44**, 586).—The influence of traces of Cu and Fe on the phosphorescence of ZnS is described. C. R. H.

Hexaco-ordination in telluric acid, and in molybdates and tungstates in solution. J. GUPTA (Indian J. Physics, 1938, **12**, 223—232).—The Raman spectra of telluric acid and several molybdates and tungstates have been re-examined in the cryst. state and in aq. solutions of definite p_H. Further theoretical and experimental evidence is produced in support of the author's previous conclusion (A., 1937, I, 598) that normal MoO_4^{--} and WO_4^{--} ions exist like H_2TeO_4 as dihydrated octahedral units. The extra lines recorded by the other workers, *e.g.*, Venkateswaran (A., 1938, I, 228), are not due to the normal ions. T. H. G.

Raman effect. LXXXVII. Esters of arsenious, phosphorous, and orthocarbonic acids. A. W. REITZ and R. SABATHY (Z. physikal. Chem., 1938, **B**, **41**, 151—162).—Raman measurements of the Me and Et esters and polarisation measurements of HCO_2Me and anisole are recorded. The data are discussed in connexion with the CH frequency of the OMe group in various types of compounds. C. R. H.

Raman spectra of solutions of mercuric cyanide in ammonia and pyridine. M. V. VOLKENSTEIN (Acta Physicochim. U.R.S.S., 1937, **7**, 315—316).—In the Raman spectra of solutions of $Hg(CN)_2$ in liquid NH_3 and in C_5H_5N the NC–Hg–CN and CN frequencies are greatly reduced. This is attributed to a decrease in the strength of the linkages through complex formation. J. W. S.

Raman effect in binary mixtures with liquid sulphur dioxide. M. V. VOLKENSTEIN (Acta Physicochim. U.R.S.S., 1937, **7**, 313—314).—Binary mixtures of CCl_4 and $CHCl_3$ with liquid SO_2 show only additivity of Raman spectra. Mixtures of SO_2 (4 mol.) and BCl_3 (1 mol.) show additivity initially, but gradually develop the νν of $SOCl_2$. In mixtures of SO_2 (3 mol.) and Me_2O (2 mol.) the 920 cm.$^{-1}$ frequency of Me–O–Me is diminished, whilst the three νν of Me are raised. These changes are attributed to orientation effects of the dipoles. J. W. S.

Spectra of light scattered by the crystals of acetic acid, bromoform, and *cyclo*hexane. A. I. SIDOROVA (Acta Physicochim. U.R.S.S., 1937, **7**, 193—200).—The Raman spectrum of solid $CHBr_3$ contains a broad line corresponding with ν 32—52 cm.$^{-1}$, whilst that of solid AcOH contains νν 49 and 119 cm.$^{-1}$ These νν correspond with the "wings" observed in the Raman spectra of the liquids. There are no low-ν lines in the Raman spectrum of cryst. C_6H_{12} and no wings observable in that of the liquid. The Raman spectrum of AcOH contains a series of νν in the range 900—1750 cm.$^{-1}$ which are not observed for the liquid. J. W. S.

Raman spectra of acrylic acid and of methyl and ethyl methacrylates at various degrees of polymerisation. D. MONNIER, B. SUSZ, and E. BRINER (Helv. Chim. Acta, 1938, **21**, 1349—1355; cf. A., 1938, I, 61).—νν and intensities are recorded for $CH_2{:}CH{\cdot}CO_2H$, monomeric and polymerised $CH_2{:}CH{\cdot}CO_2Me$, and monomeric, polymerised, and partly polymerised $CH_2{:}CH{\cdot}CO_2Et$. The intensity of the C:C frequency decreases and that of the CH_3 frequency increases progressively with increasing degree of polymerisation. This supports the view that polymerisation is due to breaking of C:C linkings and chain formation. J. W. S.

Raman spectrum of diphenyl. S. K. MUKERJI and S. A. AZIZ (Indian J. Physics, 1938, **12**, 271—282).—The Raman spectrum of molten Ph_2 has been studied by carefully cutting out the continuous background with suitable filters, thereby revealing certain new faint lines. The ground frequencies of C_6H_6 are also observed with Ph_2; the characteristic frequency due to the internuclear C–C bond is 1283 cm.$^{-1}$ T. H. G.

Raman spectra of compounds with three benzene rings [*o*- and *m*-diphenylbenzene]. S. K. MUKERJI (Nature, 1938, **142**, 477).—33 new lines for *o*- and 27 for *m*-$C_6H_4Ph_2$ in the molten state are recorded. L. S. T.

Raman spectra of some organic dicyclic compounds. B. D. SAKSENA (Proc. Indian Acad. Sci., 1938, **8**, **A**, 73—100).—Raman displacements and depolarisation factors have been measured for $C_{10}H_8$, deca- and tetra-hydronaphthalene (I), indene, and *trans*-β-decalone in the liquid states and, except for the last compound, compared with existing infra-red and Raman data. By means of the theory of groups the spectroscopic characteristics of possible

mol. models have been determined and examined in the light of the experimental vals. $C_{10}H_8$ has a structure possessing a centre of symmetry; (I) is puckered. The Raman spectrum of solid *trans*-decahydro-β-naphthol has also been measured. W. R. A.

Raman effect and problems of constitution. XII. Condensed dicyclic hydrocarbons resembling naphthalene. K. W. F. KOHLRAUSCH and R. SEKA (Ber., 1938, **71**, [*B*], 1551—1562).—The Raman spectra of *o*-C_6H_4MeEt, indane (I), indene (II), 1 : 2 : 3 : 4-tetrahydronaphthalene (III), Δ^1- (IV) and Δ^2-dihydronaphthalene, and *o*-$C_6H_4Me{\cdot}CH{:}CH{\cdot}CO_2Et$ are recorded. Transition from mono- to *o*-di-derivatives of C_6H_6 causes typical spectral changes. It is possible therefore to speak of an "*ortho* spectrum" of C_6H_6 derivatives and the relationship of the lines to the vibration forms has been partly determined. According to their spectra (I) and (III) in which the side-chains are closed to a saturated ring are regarded as *ortho*-derivatives. They differ little from one another in the main lines although (I) is of similar symmetry to *o*-xylene whereas (III) is less symmetrical probably due to a non-planar character of the mol. Introduction of a double linking into the closed side-chain makes the relationships less certain; it appears, however, that (II) and (IV) like (I) and (III) have mols. of "benzenoid type." The transition to $C_{10}H_8$ is accompanied by such increase of symmetry that nothing can be achieved by qual. comparison. With such closely related, similar and almost compensated systems as are presented by the two halves of the $C_{10}H_8$ chain it is unwise to select certain lines and to assign them to oscillations of definite portions of this chain. The difficulties of a strict analysis of the spectrum are discussed. H. W.

Raman effect and problems of constitution. XIII. Condensed heterodicyclic systems resembling naphthalene. K. W. F. KOHLRAUSCH and R. SEKA (Ber., 1938, **71**, [*B*], 1563—1570).—The spectra of coumaran, coumarone, benzoxazole, anthranil, indole, 2-methylindole, indazole, benztriazole, benzthiazole, and thionaphthen are recorded and discussed. Qualitatively they show nearly all the phenomena characteristic of *o*-substituted benzenes; in this respect the spectra are so similar amongst themselves that a common factor in their structure must be assumed. On the other hand the dicyclic compounds are not *o*-derivatives so that deviations occur. In these deviations the spectra of the heterocyclic compounds are individual and distinct from one another so that certain finer structural differentiations exist within a common structural frame. These differences are ascribed to changes in the mechanism of union since the spectra of chains (C_3H_8–Me_2O–$NHMe_2$; piperazine–piperidine–*cyclo*hexane–pentamethylene oxide–dioxan–morpholine; $C_{10}H_8$–quinoline–*iso*quinoline; C_6H_6–C_5H_5N) are qualitatively of a precisely similar type. On the other hand these spectral differences occur mainly in the frequency region 1200—1600 cm.$^{-1}$ where among unsaturated compounds are found the high chain frequencies essentially dependent on the system of double linkings. H. W.

Raman spectrum and fluorescence of dioxan. H. W. HUNTER (J. Chem. Physics, 1938, **6**, 544—545).—The Raman spectrum of dioxan, excited by the 3126 and 3132 A. Hg lines, consists of 11 νν. When dioxan in a quartz tube is illuminated by a quartz Hg arc a strong continuous band appears in the visible with max. at 5800 and 4500 A. This fluorescence is not exhibited by dioxan in a glass tube and must therefore be caused by λλ <2900 A. At 12° the fluorescence extends from 3400 A. throughout the visible; its intensity diminishes rapidly as temp. increases. Irradiation for three days gave the same fluorescence as exhibited by a fresh sample. Dioxan does not lose its transparency on continued exposure to ultra-violet light. W. R. A.

Raman effect. LXXXVI. Ethyl derivatives. J. WAGNER (Z. physikal. Chem., 1938, **B**, **40**, 439—449).—Et derivatives are considered as valency force systems constituting an asymmetrical three-mass model, $Me{\cdot}CH_2{\cdot}X$. Raman data for 8 compounds are analysed. The theory holds for the chain νν only when the at. mass of X is <36. Force consts. are < and interat. distances are > for corresponding Me compounds. W. R. A.

Intensity of the [Raman] lines of the benzene ring in monosubstituted derivatives. E. VITALE (Nuovo Cim., 1936, **13**, 284—289; Chem. Zentr., 1936, ii, 3899).—The Raman lines of C_6H_6, NH_2Ph, PhOH, $PhNO_2$, and PhMe are similarly placed but the following differences in intensity (variation with the electric moment) are noted: ν = 607 cm.$^{-1}$, PhOH >, PhMe and NH_2Ph <, C_6H_6; 1170 cm.$^{-1}$, PhMe and $PhNO_2$ >, PhOH and NH_2Ph <, C_6H_6; 1585 cm.$^{-1}$, all > C_6H_6; 3005 cm.$^{-1}$, PhOH and $PhNO_2$ >, PhMe and NH_2Ph <, C_6H_6. A. H. C.

Contact p.d. between different faces of silver single crystals. H. E. FARNSWORTH (Physical Rev., 1937, [ii], **51**, 378).—After outgassing at < visible red heat for 160 hr. the (111) face of one Ag single crystal is positive by approx. 0·4 v. with respect to the (100) face of another. The true val. is probably > 0·4 v. L. S. T.

Electronic conduction due to 4*f* electrons in some tervalent rare-earth compounds. K. GHOSH and B. GHOSH (Indian J. Physics, 1938, **12**, 259—270).—Using fine powders compressed in the shape of solid rings and placed between coaxial cylindrical electrodes, the conductivities of the fluorides of La, Ce, Pr, and Nd have been determined. By deducting the conductivity of LaF_3 from each the contribution due to the extra 4*f* electrons in the other metals can be found. Using a formula similar to that of Wilson, it is found that the vals. of the energy difference between the top of the completely filled band and the bottom of the completely empty band agree roughly with results from magnetic and spectroscopic data. T. H. G.

Contact potentials. B. GYSAE and S. WAGENER (Z. Physik, 1938, **110**, 145—163).—The contact p.d. between two bodies is resolved into its component parts which are defined by equations. The true contact potential is defined and a method described for its measurement in the case of Ta and W. H. C. G.

Dielectric properties of some organic substances. G. R. PARANJPE and D. J. DAVAR (Indian J. Physics, 1938, **12**, 283—288).—d, n_D, and dielectric const. (at 7500 kc.) have been determined at 30° for oleic acid, linoleic acid, triolein, triricinolein, and tristearin in C_6H_6 solution. The polarisations and electric moments have been calc. from the Debye equation, using the method of least squares. The electric moments, which have been explained in terms of the chemical constitution and structure of the substances, are 1·009, 1·208, 3·158, 4·117, and 2·844 D., respectively. T. H. G.

Variation with field strength of the dielectric constant of *p*-azoxyanisole. W. MAIER (Ann. Physik, 1938, [v], **33**, 210—225).—A method for the measurement of dielectric consts. at const. frequency and with varying amplitude of the measuring field is described. ϵ of *p*-azoxyanisole has been measured at 651,000 Hz, temp. from 119° to 145°, and field strengths from 37 to 330 v. per cm. ϵ of the anisotropic phase is 5·4 at 290 v. per cm. The dipole moment is 2·3 D. O. D. S.

Viscosity dispersion of the dielectric constants of organic liquids. E. PLÖTZE (Ann. Physik, 1938, [v], **33**, 226—242; cf. A., 1938, I, 436). O. D. S.

Dielectric constants and dipole moments of dimethyl citraconate and dimethyl mesaconate and their ozonides; heat of ozonisation of these esters. E. BRINER, D. FRANK, and E. PERROTTET (Helv. Chim. Acta, 1938, **21**, 1312—1317).—The following vals. of ϵ have been obtained at 20°: Me_2 citraconate (I) 8·71, Me_2 mesaconate (II) 7·15, Me_2 citraconate ozonide (III) 10·52, Me_2 mesaconate ozonide (IV) 8·77. Measurements on dil. solutions in C_6H_6 yield the following vals. of μ (in D.): (I) 2·68, (II) 2·06, (III) 2·8, (IV) 2·5. From the heats of combustion of the esters and of their ozonides the heats of ozonisation are (I) 110·8 and (II) 131·3, kg.-cal. per mol., respectively. The differences in properties for the *cis*- and *trans*-isomerides are in accord with previous results (A., 1937, I, 65). J. W. S.

Rotation of dipoles in solution. P. GIRARD and P. ABADIE (Physikal. Z., 1938, **39**, 691—692).—The dispersion and absorption curves for PrOH in C_6H_{14} have been determined up to 40 vol.-% PrOH. Comparison of these curves with those of pure PrOH shows the effect of the non-polar mols. of the solvent on the rotation of the PrOH dipoles in an alternating field. The effect is similar to the retarding action of a considerable increase in viscosity. The dispersion curve is displaced towards longer λ and there is also a difference in the slope of the curve. The retardation of the PrOH dipoles varies with the nature of the solvent. A. J. M.

Chemical war materials. X. Theoretical bases of the interpretation of molecular structure from dipole moments. H. MOHLER and C. T. ZAHN. **XI. Dipole moments and molecular structure. Interpretation of the experimental data.** C. T. ZAHN and H. MOHLER (Helv. Chim. Acta, 1938, **21**, 1276—1283, 1284—1296).—X. Factors inhibiting free rotation in simple mols. are classified and their effects on the dipole moments of these mols. are discussed.

XI. From the dipole moments of various eye, nose, and throat irritants and of lung and skin poisons (A., 1938, I, 388) the probable spatial arrangements of these mols. are deduced and are correlated with their physical and chemical properties. J. W. S.

Dielectric polarisation. XXIII. Dipole moments of some aliphatic and aromatic aldehydes and of anthrone. D. I. COOMBER and J. R. PARTINGTON (J.C.S., 1938, 1444—1452).—The dipole moments of several aldehydes in C_6H_6 solution have been determined. MeCHO has a val. of 2·49 D. and EtCHO, 2·54 D.; the moments of the higher members attain a practically const. val. (2·57). These results are discussed with reference to the series effect. The moments of PhCHO and its derivatives indicate an angle of 55° between the axis of the ring and the C=O direction. The effect of interaction moments in *p*-substituted compounds is deduced from a comparison with the corresponding acid chlorides and the results obtained indicate an angle of 125° between the axes of the rings in $COPh_2$. The CHO groups in p-$C_6H_4(CHO)_2$ exhibit completely free rotation. W. R. A.

Electric polarisations of some metallic acetylacetonates. A. E. FINN, G. C. HAMPSON, and L. E. SUTTON (J.C.S., 1938, 1254—1263).—Dipole measurements have been made on Be acetylacetonate in a variety of solvents, and between 298° and 415° K. in decalin, and on several metallic acetylacetonates in C_6H_6 solution. The data obtained in non-polar solvents show a large difference (approx. 45% $_EP_2$) between the mol. total polarisation P_2 and the mol. electron polarisation $_EP_2$ of the solute, which has second-order dependence on the solvent, and falls into one of three groups of rough ratio 2 : 3 : 4 as the compound contains 2, 3, or 4 chelate groups. The results may be due to (i) a transitory electric moment arising from slow bending within the mol. caused by thermal bombardment (cf. Hampson, A., 1934, 1157), or (ii) to atom polarisation, in which the field induces considerable moments by causing inter-nuclear movements. (i) is not probable, as calculations show that the frequency of bending would be too high for the mol. to orient while bent. W. R. A.

Electric moments of *p*-benzoquinone and related compounds. D. L. HAMMICK, G. C. HAMPSON, and G. I. JENKINS (J.C.S., 1938, 1263—1268; cf. preceding abstract).—*p*-Benzoquinone (I), its symmetrical Me_2 and Cl_2-derivatives, and 2 : 2 : 4 : 4-tetramethyl*cyclo*butane-1 : 3-dione, with geometrically symmetrical mols. the electric moments of which should be zero, are definitely polar, with an approx. const. difference between their total and electron polarisations. A mechanical model of the structure of (I) shows that polarisation by bending is possible, but cannot be the primary cause. This is confirmed by calculation of the frequency of bending, which does not agree with the infra-red absorption v. The polarisation discrepancies are therfore high atom polarisations or solvent effects. W. R. A.

Electric polarisations of the vapours of some substances having anomalous dipole moments,

and their bearing on the theory of atom polarisation. I. E. Coop and L. E. Sutton (J.C.S., 1938, 1269—1286; cf. preceding abstract).—The electric polarisations of various acetylacetonates, symmetrical diketones, symmetrical $(NO_2)_2$- and $(CN)_2$-compounds, and tetrahalides in the vapour state have been measured over various ranges of temp. The polarisations are temp.-independent, and comparison with results obtained in solution (*loc. cit.*) shows that the anomalous moments are not due to solvent effects. The compounds studied are non-polar in their unperturbed configurations, and can become polar only as a result of bending or twisting. The observed facts are therefore due either to slow thermal bending or to atom polarisation, P_A. Calculation of the vibration frequencies, however, eliminates the former. Extending the theory of P_A, a relation is obtained between P_A, force const. of bending, and bond moment for a mol., which has been tested quantitatively with success for a no. of compounds; the series of $HgPh_2$ compounds proves an exception. The polarisations of the diketones studied are explained by the hypothesis that each C=O bond bends relatively to the rest of the mol. and perpendicular to the plane of the double bond. W. R. A.

Electrical moments of dioximes. M. Milone (Congr. int. Quim. pura apl., 1934, **9**, II, 191—196, 196—198; Chem. Zentr., 1936, ii, 3659).—The moment of symmetrical αβ-dioximes is > that of the asymmetrical next higher homologues indicating the *amphi*-configuration. Glyoxime and its Me, Me_2, Me Et, Me Pr, and Me *n*-octyl derivatives were examined. β- (*amphi*-)forms of higher moment of α- and β-phenyl, -tolyl, -phenylmethyl, and α-, β-, and γ-diphenyl-glyoximes are also described. A. H. C.

Optical activity of serum-proteins.—See A., 1938, III, 872.

Theory of absorption in ionised gases. I. Opacity in stellar material. II. Optical properties of liquid metals. B. Majumdar (Indian J. Physics, 1938, **12**, 233—248).—Mathematical. A quantum theory has been deduced in which the energy taken up from the electrical field of the incident radiation by the electrons is transformed by collision with the ions into random motion of the electrons and ions. The theory is then used to calculate the opacity coeffs. of stellar material; it is in fair agreement with observed results when applied to the optical properties of liquid metals. T. H. G.

Constitution of potassium thiocyanate. Refractometric investigation. G. Spacu and E. Popper (Z. physikal. Chem., 1938, **182**, 389—392).—The measured val. of the mol. refraction of KCNS is 19·849, in accord with the val. calc. for K·S·C⋮N (20·817) rather than with that calc. for K·N⋮C·S (22·146). J. W. S.

Double refraction of anisotropic liquids. W. Kast (Ann. Physik, 1938, [v], **33**, 185—191; cf. A., 1934, 478).—Theoretical. The anisotropic melt and the crystal of *p*-azoxyanisole have equal mol. refractions and show the same dispersion of the double refraction between 589 and 546 mμ. The degree of orientation in the melt between 119° and 133° is calc. O. D. S.

Dispersion theory. C. Schaefer (Ann. Physik, 1938, [v], **33**, 243—248).—Classical theory leads to a dispersion formula of the same type as that derived from wave mechanics. O. D. S.

Determination of molecular dispersion with the Abbe refractometer. H. Waldmann (Helv. Chim. Acta, 1938, **21**, 1053—1065).—For normally dispersing org. and inorg. compounds the dispersion curve shows a definite regularity within the λ region between the H_α and H_β lines. From the relationship $(n_D - n_C)/(n_F - n_C) = 0{\cdot}286$ it is possible to deduce the vals. of n_F and n_C from measurements of n_D made with an Abbe refractometer and the appropriate mean dispersion $(n_F - n_C)$. It is therefore possible to calculate the mol. dispersion from measurements made on an Abbe refractometer. J. W. S.

Magnetic rotatory power of hydrofluoric acid. R. de Mallemann and F. Suhner (Compt. rend., 1938, **207**, 494—495).—The mol. rotatory power of aq. HF $= 1{\cdot}30 \times 10^{-5}$ (λ 578 mμ.), showing that the rotation of F' is very small and of the same order as that of $H^{\cdot}$. The rotation of fluorides is consequently only slightly > that of the cation involved. The at. rotation of F is probably negative. A. J. E. W.

Magnetic rotatory power of imperfect complexes. F. Gallais (J. Chim. phys., 1938, **35**, 249—261; cf. A., 1938, I, 498).—Anomalies observed in the Faraday effect are interpreted in relation to the constitution of the complexes. The formation of co-ordination linkings in a mol. is not always accompanied by exaltation of the Faraday effect. Applications to the study of dissolved complexes and the prep. of solutions with a high Verdet const. are discussed. E. S. H.

Graphical representation of the energy states of a diatomic molecule on the basis of band spectroscopic data. R. Schmid and L. Gerö (Ann. Physik, 1938, [v], **33**, 70—88). O. D. S.

Indeterminacy and electron spin. R. T. Cox and F. E. Myers (Nature, 1938, **142**, 394).—Quantum indeterminacy would prevent observation of the difference in potential energy between two free electrons in magnetised Fe with magnetic axes parallel and anti-parallel, respectively, to the direction of magnetisation. L. S. T.

Deformation of molecules in a condensed phase and the "hydrogen bond." E. Bauer and M. Magat (J. Phys. Radium, 1938, [vii], **9**, 319—330).—A theory developed from the electrostatic action of neighbouring mols. is described; it explains the characteristics of the OH bond in different substances. The postulated existence of a homopolar "H bond" is considered unnecessary. W. R. A.

Significance of subsidiary valency forces for the elastic properties of high-molecular substances. W. Kuhn (Angew. Chem., 1938, **51**, 640—647).—In the consideration of the elastic properties of high-mol. substances the rapidly changing configuration of the free mol. taking place without the breaking of principal valencies is important. The

changes of configuration of a thread mol. suspended in a solution are considered. The elastic properties of rubber and the effect of temp. on them are discussed, and the significance of subsidiary valency forces for the occurrence or non-occurrence of this type of elasticity is considered. The crystallisation on stretching of many high-mol. substances which have rubber-like elasticity is also considered, as well as the elastic after-effect. A. J. M.

Structure of acids derived from metal halides. A. GLAZUNOV (Chem. Listy, 1938, **32**, 289—292).—A discussion. R. T.

Structure of substances with enediol-α-ketonic function. G. E. CARPÉNI (J. Chim. phys., 1938, **35**, 233—248).—Mol. structure and the influence of cyclisation and substitution on total acid function are discussed in the light of published data on dissociation consts. E. S. H.

Stability of formic acid dimeride.—See A., 1938, II, 390.

Nucleus formation under the influence of electrical charges. G. TOHMFOR and M. VOLMER (Ann. Physik, 1938, [v], **33**, 109—131).—Theoretical. The formation of drops in the Wilson chamber and at the electrodes of an electrolytic cell is discussed. O. D. S.

Reciprocal influence of carbon atom linkages. T. FÖRSTER (Z. Elektrochem., 1938, **44**, 620).—A brief commentary on the application of Raman spectra to the analysis of mol. structure. C. R. H.

Duration of energy exchange between gas molecules and solid surfaces. W. HUNSMANN (Z. Elektrochem., 1938, **44**, 606—610).—The derivation of the relation $\alpha = \tau/(\tau + \beta)$, where α, τ, and β are respectively the accommodation coeff., the adsorption time, and the induction period, permits the calculation of an abs. val. for β from known vals. of α and τ. Data have been obtained for the adsorption on SiO_2 and NiO of C_2H_6, C_2H_4, N_2O, and SF_6. The vals. of α for SiO_2 and NiO are of the same order, but the val. of β for NiO is 50—100 times the val. for SiO_2. The data gree with Herzfeld's theory that the exchange of energy of vibration occurs relatively quickly only if there is resonance between mol. and lattice frequencies. SiO_2, with a higher frequency than NiO, is more likely to have such resonance. C. R. H.

Frequency of vibration of molecules in liquids and its relation to viscosity. D. B. MACLEOD (Proc. Physical Soc., 1938, **50**, 788—800).—An expression is found for the variation with temp. of the average frequency of vibration of a mol. in a liquid. The abs. frequency is calc. approx. and is used in Andrade's expression for η of a liquid at the m.p. to obtain an expression for the variation of η with temp. Results as given by this expression and by a relation found by Andrade are tabulated and compared for liquid Ga, K, Na, Sn, Br, and Hg at various temp. Data for sp. vol., free space, abs. η, and temp. variation of η are tabulated and compared with experiment, and the calc. internal pressures of Sn, Ga, Hg, Na, K, and Br are given. N. M. B.

Molecular models of dielectrics. L. HARTSHORN (Proc. Physical Soc., 1938, **50**, 852—855).—Structural features of complex org. compounds are illustrated by models assembled cheaply and simply from coloured wooden balls of various sizes connected by pegs fitting into holes. White balls in hexagon formation represent aromatic C atoms forming C_6H_6 rings, black balls link the hexagons and represent CH_2 groups, and spotted balls represent OH groups. Soluble resin (Novolak), heat-hardened resin (Bakelite), polystyrene, and chlorinated rubber are shown. N. M. B.

New thermodynamic calculation of the degree of dissociation. K. H. RIEWE (Z. Physik, 1938, **110**, 393—394).—Theoretical. L. G. G.

Physical significance of crystallographic ionic radii. H. JENSEN, G. MEYER-GOSSLER, and H. ROHDE (Z. Physik, 1938, **110**, 277—290).—Ionic radii in different types of lattice are discussed from the quantum-mechanical viewpoint. H. C. G.

Quantum theory of the polarisibility of atoms and ions in inhomogeneous electric fields. H. HELLMANN and S. J. PSCHEJETZKI (Acta Physicochim. U.R.S.S., 1937, **7**, 621—645).—A crit. discussion of the present theoretical methods for extrapolating the ordinary polarisibility of atoms with completely filled outer shells in order to obtain the effective polarisibility in the inhomogeneous field of a point charge. A new approximation method is developed and applied in detail to HCl and H_2O. J. A. K.

Probability of annihilation of positrons without emission of radiation. H. S. W. MASSEY and E. H. S. BURHOP (Proc. Roy. Soc., 1938, **A**, **167**, 53—61).—The process considered is a collision of a positron with an at. electron with mutual annihilation, but the energy liberated, instead of being radiated, is used to eject another electron from the atom. The calculation is carried out for a *K*-electron of a Pb atom, and it is concluded that about one positron in 10,000 would be annihilated by a radiationless process. It is considered that the process should be observable in a cloud chamber. G. D. P.

Calculation of intermolecular forces and energies. M. L. HUGGINS (Physical Rev., 1937, [ii], **51**, 379).—The resultant force between two mols. is considered as the sum of interpenetration repulsions, attractions of the London "dispersion" type, forces between dipoles, and valency or exchange forces. L. S. T.

Critique of the quantum theory of metallic conduction. E. WEBER (Physical Rev., 1937, [ii], **51**, 378).—Shortcomings of the quantum theory are pointed out. A new theory of electric conduction is proposed. L. S. T.

Faraday effect in the *X*-ray region. H. T. CLARK and K. LARK-HOROVITZ (Physical Rev., 1937, [ii], **51**, 61). L. S. T.

***X*-Ray analysis of crystal structure.** G. SELÉNYI (Tech. Kurir, 1938, **9**, 65—66).—A review. E. P.

Determination of crystal structure from *X*-ray data. M. AVRAMI (Physical Rev., 1938, [ii],

54, 300—303).—Mathematical. Structure-factor formulæ are replaced by an approximating system leading to equations from which the co-ordinates of at. positions or interat. distances are found. Results are illustrated with reference to the KH_2PO_4 crystal. N. M. B.

X-Ray diffraction of substances under high pressures. R. B. JACOBS (Physical Rev., 1938, [ii], 54, 325—331).—An apparatus described for X-ray diffraction work on specimens under pressures up to 5000 atm. uses He as compressive medium and contains the complete camera and specimen within the compression chamber, the X-rays being incident through a Be window in the chamber wall. Results are given for the transition AgI(II)–AgI(III). The crystal structure of AgI(II) is cubic NaCl type. The vol. change in transition is > when measured by over-all methods, and an explanation is given. Some results on Cd and RbCl are reported. N. M. B.

Effect of a direct electric field on Laue diffraction photograms. A. NĚMEJCOVÁ and J. BROŽ (Physical Rev., 1938, [ii], 54, 379—384).—Investigations on Laue photograms of SiO_2, mica, and gypsum crystals show that the intensity of the Laue reflexions is increased and the central spot is made narrower. If the field is applied to the crystals through Al coatings, deposited by evaporation on both surfaces of the crystals, the narrowing of the central spot increases only up to a certain field intensity, and a time influence is observed, *i.e.*, if the field is applied for a longer time or if sufficiently aged Al coatings are used the difference in the central spot with and without the field disappeared. The narrowing is caused by alternations provoked in the crystal lattice by the field. Explanations of results are discussed. N. M. B.

Scattering of X-rays at beryllium at small angles. K. ALEXOPOULOS and S. PERISTERAKIS (Physikal. Z., 1938, 39, 688—690).—The scattering of X-rays at Be in the range $(\sin \theta/2)/\lambda = 0{\cdot}013$—$0{\cdot}054$ has been investigated. The scattering curve agrees with that of Scharwächter (A., 1937, I, 224), but shows deviations from the theoretical curve in the expected direction at very small angles. A. J. M.

Simplified derivation of the Laue particle size equation. B. E. WARREN (Z. Krist., 1938, 99, 448—452; cf. Laue, *ibid.*, 1926, 64, 115).—Mathematical. The results agree in essentials with other forms (Scherrer, Bragg). I. McA.

Test of the cellular method of obtaining lattice functions. W. SHOCKLEY (Physical Rev., 1937, [ii], 51, 379). L. S. T.

Crystallisation of polymorphous substances from the vapour phase. II. S. E. MADIGAN and K. LARK-HOROVITZ (Physical Rev., 1937, [ii], 51, 61; cf. A., 1935, 151).—An X-ray method for the quant. determination of the constitution of polymorphous mixtures has been applied to the deposition of ZnS from the vapour phase. The amount deposited in the cubic or hexagonal form depends on conditions of temp. and pressure. At a high rate of evaporation and in presence of inert gases the unstable form is always deposited. At a slow rate in a vac. most of the nuclei seem to form at the gas–solid interface. Single crystals of Zn blende split in a vac. immediately before deposition show that crystal growth starts from different centres distributed at random over the surface. L. S. T.

Structure of molten salts. E. P. MILLER and K. LARK-HOROVITZ (Physical Rev., 1937, [ii], 51, 61; cf. A., 1937, I, 553).—Different methods have been worked out for the evaluation of the distribution function as determined by the X-ray scattering curve. When applied to the determination of the no. of atoms around any atom in molten KCl and LiCl the results indicate that for the next neighbours the co-ordination found in the solid is maintained for the liquid, but that the distribution of the second next neighbours is already disturbed. L. S. T.

Dependence of diffuse scattering of X-rays from quartz on the crystal orientation. II. E. S. FOSTER, jun., G. E. M. JAUNCEY, and W. A. BRUCE (Physical Rev., 1937, [ii], 51, 61).—The coherent part of X-rays diffusely scattered from a crystal $\propto (1-\epsilon)^{-2M}$, where M, the Debye–Waller temp. factor, is a measure of the mean square displacement of the atoms. The structure of quartz as determined by X-ray analysis is very complicated, and a no. of rules concerning the symmetry of the diffuse scattering from an X-cut crystal has been established. L. S. T.

New type of mixed halogen–oxygen lattice. L. G. SILLÉN (Naturwiss., 1938, 26, 612—613).—Bi_2O_3 dissolves readily in molten LiCl, and when excess of the latter is removed by H_2O, $LiBi_3O_4Cl$, which crystallises in colourless, tetragonal plates, remains. The Laue, rotation, and powder diagrams of this substance indicate that it has a new type of mixed halogen–O lattice. $LiBi_3O_4Br_2$ and $LiBi_3O_4I_2$ have similar lattices. A. J. M.

Theory of orientation separation of ionic crystals. I. N. STRANSKI and L. KRASTANOV (Monatsh., 1938, 72, 76; cf. A., 1938, I, 299).—A correction. J. W. S.

Orientation of liquid crystals by heat conduction. D. O. HOLLAND and G. W. STEWART (Physical Rev., 1937, [ii], 51, 62; cf. A., 1936, 670).—Former results concerning a definite effect on the orientation of liquid cryst. *p*-azoxyanisole by heat conduction have been checked by the photographic densities of the X-ray halo with different vertical alterations in temp. gradients. The new results favour the view that orientation is produced by heat conduction. L. S. T.

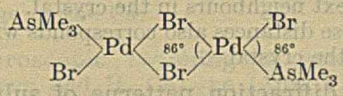
Geometric derivation from lattice dimensions of the range of action of ions in crystal structures. A. PITSCHUGIN (Z. Krist., 1938, 99, 251—263).—Ionic domains are defined in terms of null potential loci, and need not be spherical. Radii of those for 61 elements are found by analysis of certain cubic crystal types. In comparison with standard data (Pauling, Goldschmidt, Rinne) the new vals. show a smaller difference between at. and ionic radii, whilst cationic are usually > anionic radii. I. McA.

Crystalline configurations of electrolytic lead deposited from nitrate solutions. S. YAMAMORI

and S. YOSHIMOTO (Mem. Coll. Sci. Kyoto, 1938, **A**, **21**, 75—84).—*X*-Ray Laue diffraction patterns indicate that the Pb micro-crystals tend to be deposited fibrously, with one of the [211] axes in common. The direction of max. growth does not always coincide with the direction of the fibrous axis. In most cases there are two growths of micro-crystals incompletely rotating around the same common [211] axis.

N. M. B.

Crystal structure of certain bridged palladium compounds. A. F. WELLS (Proc. Roy. Soc. 1938, **A**. **167**, 169—189).—The structures of the compound $(AsMe_3)_2Pd_2Cl_4$ and its Br analogue have been determined. Crystals of the tetrachloride from EtOH and dioxan and of the tetrabromide from dioxan are all isomorphous. The mol. is planar, with the configuration:



The distance Pd—Br is 2·45, Pd—As 2·50 A. The mols. are packed into the tetragonal cell in such a way as to produce tunnels in the crystals which may remain empty or may take up solvent with a small change of cell size and reorientation of the mol. G. D. P.

Structure of aromatic compounds. IV. Space-group and atomic arrangements in phloroglucinol dihydrate. K. BANERJEE and R. AHMAD (Indian J. Physics, 1938, **12**, 249—258).—The cell dimensions are *a* 6·80, *b* 8·103, *c* 13·70 A. From oscillation photographs about *a* and *b* the space-group is *Pnnm*. $d = 1·394$ g./c.c.; 4 mols. per cell. Measurements of magnetic susceptibilities by BHATTACHARJEE (unpublished) lead to the conclusion that the mols. lie nearly parallel to the {103} planes and the mol. arrangement suggested is in accordance with this and the space-group. T. H. G.

***X*-Ray investigation of atomic vibrations in magnesium between 86° and 293° K.** G. W. BRINDLEY and P. RIDLEY (Proc. Physical Soc., 1938, **50**, 757—766).—Measurements of the intensities of *X*-ray reflexions from Mg powder, and abs. vals. of the intensity ratio I_{86}/I_{293} obtained from comparative measurements on Mg–Al powders, are reported. A discussion of results in relation to theoretical work on the effect of lattice vibrations in hexagonal metals on the intensities of *X*-ray reflexions shows that in Mg the lattice vibrations are almost isotropic, but that the mean at. displacements in the basal plane are ~3% > those parallel to the *c* axis. Calc. vals. are given and are also expressed in terms of characteristic temp. of 339° and 327° parallel and perpendicular, respectively, to the *c* axis. These results for Mg and for other hexagonal metals point to a correlation between the departure of the axial ratio from the ideal val. 1·633 and the asymmetry of the lattice vibrations.

N. M. B.

Scattering of *X*-rays in liquids, in particular triacylamines. R. N. BAPAT (Z. Physik, 1938, **110**, 389—392).—A no. of tri-*n*- and -*iso*-amines (C_{2-5}), and mono- and di-*iso*amylamine, have been examined by a method to be published. The larger variation in *d* is not explicable, and the conclusions reached in the previous work do not apply.

L. G. G.

Test of alternative structures proposed for cellulose. S. T. GROSS and G. L. CLARK (Z. Krist., 1938, **99**, 357—366).—Using a modified Sauter camera, transmission, rotation, and Sauter *X*-radiograms have been made for variously oriented cellulose structures (tunicin, bacterial cellulose, and *Valonia ventricosa*). Comparison with the patterns expected from the Meyer–Mark (A., 1937, I, 502) and Sauter (A., 1937, I, 226) cells favours the former. I. McA.

Crystal structure of the trimethylstibine dihalides, Me_3SbX_2. A. F. WELLS (Z. Krist., 1938, **99**, 367—377).—The isomorphous $SbMe_3X_2$ (X = Cl, Br, and I) have 2 mols. per hexagonal cell with *a* 7·27, 7·38, and 7·53, *c* 8·44, 8·90, and 9·59 A., respectively; space-group $C\bar{6}2c$—D^4_{3h}; ρ –, 2·58, and 2·97. Complete at. parameters and interdistances, determined by Fourier and other methods from oscillation and Weissenberg *X*-radiograms (visual intensities), give a triangle of 3 Me with the central coplanar Sb bisecting the perpendicular X–X. X is equidistant from 6 Me. Sb—X and X—X distances indicate, in accord with physical and chemical properties, a form intermediate to the ionic $X'(SbMe_3)^{\cdot\cdot}X'$ and the mol. with 5-covalent Sb.

I. McA.

Law of twinning and regular intergrowth of most densely packed spheres. G. MENZER (Z. Krist., 1938, **99**, 378—409; cf. Schaacke, A., 1938, I, 234, 350).—Crystallo-geometrical. With a view of application to the submicroscopic twinning in metal foil, a mathematical treatment of twinning in the three cubic space-lattices is developed in terms of a common cube-shaped superlattice. Cases specially considered include the densest (cubic and hexagonal) packings of spheres, and lattice faults in the contact range of the twins. I. McA.

Structure of thin nickel and silver layers. G. MENZER (Z. Krist., 1938, **99**, 410—443; cf. preceding abstract).—Results of Brück (A., 1936, 784) and of Cochrane (*ibid.*, 1327) for the electron diffraction of metal films show, in addition to the normal pattern, two types of "irrational points." The first type has been interpreted by Laue (A., 1937, I, 351). Theory developed shows the second type to be due to submicroscopic twinning about (111) planes. I. McA.

Induced and spontaneous change of molecular arrangement in stretched rubber. P. A. THIESSEN and W. WITTSTADT (Z. physikal. Chem., 1938, **B**, **41**, 33—58).—The mol. arrangement in stretched rubber is investigated by methods of double refraction and *X*-rays. It is a function of temp., extension, and velocity and duration of preliminary stretching. The results indicate that in stretched rubber a "Mehrstoff-system" exists, in which crystals and melts exist within a wide temp. range in pressure-dependent equilibrium. The intrinsic and characteristic properties of rubber may be deduced from these considerations. W. R. A.

Crystal structure and molecular structure of bromotricyanomethane. W. FENSCH and G.

WAGNER (Z. physikal. Chem., 1938, **B**, **41**, 1—14).—*X*-Ray measurements by the rotating-crystal method indicate, for $CBr(CN)_3$, a rhombic elementary 8 mol. cell: J_{100} 6·05 A.; J_{010} 11·33 A.; J_{001} 17·17 A.; $d = 1·8$; mol. wt., 169·94. The space-group is V_h^{11} and the symmetry is V_h. The 8 Br lie in one plane with the parameters x 0·197, y 0·229, z 0·181; the probable symmetry of the residual $C(CN)_3$ is C_s. On the basis of these results a structure for $CBr(CN)_3$ is proposed and discussed. W. R. A.

Preparation and crystal structure of some alkali aluminium fluorides of the type $TlAlF_4$. C. BROSSET (Z. anorg. Chem., 1938, **239**, 301—304).—$KAlF_4$, NH_4AlF_4, and $RbAlF_4$ are isomorphous with $TlAlF_4$, and have a 3·550, c 6·139 A., a 3·615, c 6·261 A., and a 3·587, c 6·346 A., respectively. An improved method for the prep. of the K salt is described; the *Rb* salt is apparently new. F. J. G.

Metallic amides and metallic nitrides. V. Crystal structures of Cu_3N, GaN, and InN. R. JUZA and H. HAHN (Z. anorg. Chem., 1938, **239**, 282—287).—Cu_3N is cubic with a 3·807 A., one mol. in the unit cell, space-group O_h^1. GaN and InN are hexagonal, wurtzite lattice, space-group C_{6v}^4 with a 3·180, c 5·166 A., and a 3·533, c 5·693 A., respectively. At. positions are given. F. J. G.

***X*-Ray investigations of organo-metallic compounds. I. Silicon, tin, and lead tetraphenyl.** G. GIACOMELLO (Gazzetta, 1938, **68**, 422—428).—From *X*-ray measurements the following vals. of the distance between the central atom and a C are calc. for $SiPh_4$, $SnPh_4$, and $PbPh_4$, respectively: 1·88, 2·07—2·08, 2·39 A. These agree well with the vals. calc. from Pauling's at. radii. O. J. W.

New form of resorcinol. I. Structure determination by *X*-rays. II. Thermodynamic properties in relation to structure. J. M. ROBERTSON and A. R. UBBELOHDE (Proc. Roy. Soc., 1938, **A**, **167**, 122—135, 136—147).—I. At about 74° α-$C_6H_4(OH)_2$ transforms into a denser modification (β) the structure of which has been determined. It is orthorhombic, the unit cell containing 4 mols., $d_{calc.}$ 1·327. The analysis shows that the C_6 ring is apparently a regular hexagon but that the OH are displaced from the symmetrical positions and that one at least is not in the plane of the ring.

II. The unusual fact of the existence of the denser modification at high temp. is discussed in the light of the crystal structure. The open α-structure is maintained by OH bonds; transition to the denser β-structure is accompanied by distortion of these bonds and of the mol. The prep. of the two forms is described and the heat of transition is determined. The temp. of transition of $C_6H_4(OH)_2$ is about 2° < that of $C_6H_4(OD)_2$. The vol. changes from liquid to solid are investigated and some preliminary work on the change from tetragonal to cubic pentaerythritol is described. G. D. P.

Diffraction of *X*-rays in organic glasses. T. M. K. NEDUNGADI (Proc. Indian Acad. Sci., 1938, **8**, **A**, 65—72).—The *X*-ray diffraction of glycerol, salol, and $COPh_2$ has been examined in the liquid (I) and glassy (II) states. The change from (I) to (II) is accompanied by a large decrease in the scattering at small angles, a definite sharpening of the haloes, and a widening of the haloes. The first two effects are explained on the basis of the large decrease in the compressibility of the substances in passing from (I) to (II), whilst the third effect is attributed to the decrease of the intermol. distance which results from the closer packing of the mols. in (II). W. R. A.

Structure of glassy selenium. K. LARK-HOROVITZ and E. P. MILLER (Physical Rev., 1937, [ii], **51**, 380).—The diffraction pattern obtained with thin rods of glassy Se has three bands, the $\lambda/2 \sin \theta$ of which are equal to 3·42, 1·73, and 1·13, in agreement with vals. obtained for liquid Se (A., 1937, I, 119). The three sharp peaks found in the distribution curve correspond with distances of 2·32, (3·46, 3·69), and 4·34 A. for next neighbours in the crystal. The no. of atoms at these distances also corresponds with the no. of atoms in the crystal. L. S. T.

Electron diffraction patterns of sulphur and selenium molecules. J. D. HOWE and K. LARK-HOROVITZ (Physical Rev., 1937, [ii], **51**, 380).—The diffraction of electrons from S and Se vapour at low temp. has been investigated. The pattern for S differs from that described previously (*ibid.*, 1936, **49**, 199) and cannot be interpreted on the basis of a diat. mol.; a puckered ring S_8 structure adequately describes the results. The pattern for Se is similar to that obtained for S, and a structure like that for S, but corresponding with Se_6, is preferred. L. S. T.

Temperature variation of electron diffraction patterns of some organic films. K. TANAKA (Mem. Coll. Sci. Kyoto, 1938, **A**, **21**, 85—88).—Diffraction pattern photographs show that with rise of temp. the parallel arrangement of the mols. is gradually destroyed and finally becomes haphazard. The transition temp., as shown for grease, vaseline, and two paraffins, varies for different substances and for different film thicknesses. Temp.–η curves show a smooth fall with rise of temp. and no discontinuity at the transition temp. N. M. B.

Diffraction of electrons by cellulose nitrate. V. A. KARGIN, V. KARPOV, and Z. PINSKER (Acta Physicochim. U.R.S.S., 1937, **7**, 646—647).—Four diffraction rings were observed when a beam of fast electrons was passed through a thin film of cellulose trinitrate. The results agreed with those found by *X*-rays and were characteristic of the trinitrate. The lines in the electron photographs were no sharper than those obtained with *X*-rays. This broadening of the lines is due to crystal imperfections, and it is suggested that the structure is not strictly regular, but there are statistical variations in the disposition of glucose chains. J. A. K.

Estimation of interatomic distances in AX_3 and AX_4 halides from electron diffraction measurements. O. HASSEL and A. SANDBO (Z. physikal. Chem., 1938, **B**, **41**, 75—85).—From electron diffraction measurements, the interat. distances and the valency angles in AX_3 and AX_4 halides have been estimated. The difference between the vals. obtained and those calc. from the Pauling–Huggins

radii are large for Si compounds. AsX_3 has a valency angle > SbX_3. The valency angle for each of the elements studied increases with increasing at. wt. of the halogen. W. R. A.

Structure of electrically polished copper surfaces. K. H. Moore (Ann. Physik, 1938, [v], **33**, 133—137; cf. A., 1937, I, 19).—The structure of electrolytically polished Cu surfaces has been investigated by electron diffraction. The surface consists of plates of Cu_2O. At a dodecahedron surface the plates are oriented with their cube edges parallel to the cube edges of the Cu. At a cubic surface the plates are not uniformly oriented. The most frequent orientation is with the octahedral plane of the Cu_2O parallel to the cube plane of the Cu in such a way that a surface diagonal of the Cu_2O is approx. parallel to a cube edge of the Cu. O. D. S.

Submicroscopic twinning of some metals. F. Kirchner and H. Cramer (Ann. Physik, 1938, [v], **33**, 138—142; cf. A., 1938, I, 17).—A max. intensity of the irregular interference points in the electron diffraction patterns of oriented Cu films is observed at a film thickness of about 20 mμ. Irregular interference points have been observed in the pattern of a natural Cu crystal. The irregular interference points are due to repeated twinning at the octahedral plane and are characteristic of face-centred crystals. With increasing thickness of the film the primary orientation is reinforced. O. D. S.

Diffraction of electrons by oxide-coated cathodes. J. A. Darbyshire (Proc. Physical Soc., 1938, **50**, 635—641).—Electron diffraction methods were used to examine Ni cathodes coated with a solid-solution paste of $BaCO_3$–$SrCO_3$, and arrangements were made to fire off getter pellets at suitable stages of the activation. After activation by heat-treatment to give good emission, the cathodes gave patterns of SrO alone when no getter had been fired off, and patterns of MgO and SrO when the getter pellet (Ba–Mg alloy) had been fired. Cathodes consisting of $BaCO_3$ alone before activation gave patterns of BaO after activation, whereas $SrCO_3$ cathodes gave SrO patterns. N. M. B.

Electron-optical investigation of the penetration of slow electrons (0 to 200 volt) through metal foils. Penetration of slow electrons (0 to 200 volt) through metal foils. H. Katz (Ann. Physik, 1938, [v], **33**, 160—168, 169—184; cf. A., 1938, I, 109).—I. Electron-microscopic investigations show that chemically prepared Ag foils about 1000 A. thick are transparent to slow electrons over the whole surface. With 10-v. electrons images can be formed of objects behind the foil, showing that the electrons penetrate the foil without change in direction. The transparency of the films is increased by electron bombardment.

II. Measurements have been made of the transparency of chemical Ag foils for electrons up to 200 v. At velocities >30 v. the transmitted electrons consist of two groups with velocities, respectively, equal to and < the primary velocity. A max. in the transparency with respect to electrons of unchanged velocity is observed at a velocity which is the lower the greater is the transparency of the film. O. D. S.

Domain theory of ferromagnetics under stress. III. Reversible susceptibility. W. F. Brown, jun. (Physical Rev., 1938, [ii], **54**, 279—287; cf. A., 1938, I, 301).—The statistical theory previously developed is extended to give formulæ for the magnetisation curve and other properties of an ideal reversible specimen and is applied to actual specimens. This leads to the formula for the reversible susceptibility of Ni and Fe proposed and verified by Gans but not hitherto deduced. By taking into account the anisotropy of the domains, satisfactory expressions for Co are found. N. M. B.

Magnetic viscosity in iron. C. W. Heaps (Physical Rev., 1938, [ii], **54**, 288—293).—Magnetic viscosity (change of induction after the magnetising field has ceased to vary) measured in a bar of commercial Fe, with elimination of switch sparking complications, depends on previous magnetic states. This indicates that reversible domains can retain their lagging propensity while the magnetic force is varying over a considerable range. The viscous effect depends on the magnitude of the previous induction for vals. of the latter ≯60 gauss. There is evidence that the movement of the boundaries of saturated domains is subject to time-lag. N. M. B.

Optical properties of the alkali metals. R. W. Wood and C. Lukens (Physical Rev., 1938, [ii], **54**, 332—337; cf. A., 1933, 1096).—The physical processes responsible for the unique optical properties of Ag, in contrast to those of the alkali metals, are discussed on the basis of the zone theory of electron distribution in crystals. Photographs of the spectra of the discharge of a condenser through a capillary tube after reflexion from alkali metal films condensed at liquid-air temp. showed no renewal of reflecting power in the remote ultra-violet to 500 A. N. M. B.

Crystalline nickel sulphate α-hexahydrate. (A) Optical activity. N. Underwood, F. G. Slack, and E. B. Nelson. **(B) Magneto-optical activity.** F. G. Slack, R. T. Lageman, and N. Underwood (Physical Rev., 1938, [ii], **54**, 355—357, 358—360).—(A) Visual and photographic measurements of the optical activity in the region 4200—6500 A. were made. Both right- and left-hand crystals are found and the rotatory dispersion curves show anomalous rotatory dispersion. Using Drude's equation the observed anomaly is predicted as due to absorption bands at 3954 and 7187 A., respectively; the presence of these is shown by transmission data for the crystal, in agreement with absorption data for solutions.

(B) The dispersion of the Verdet const. was measured over the visible range of the spectrum, and the temp. effect was investigated over a small temp. range. The magnetic rotatory dispersion curve may be fitted by a single-term electronic dispersion equation as suggested by Drude, and calculation indicates an active absorption band at 964 A. The Verdet const. is inversely ∝ abs. temp. in the range measured. N. M. B.

Molecular rotation of the modifications of hydrogen in the solid state. K. SCHÄFER (Naturwiss., 1938, **26**, 563—564).—Theoretical. The effect of a potential field in the crystal on the energy levels of the rotational states $l = 0$ and $l = 1$ is calc. on the basis of quantum mechanics. A. J. M.

Variation of the elastic constants of crystalline sodium with temperature between 80° and 210° K. S. L. QUIMBY and S. SIEGEL (Physical Rev., 1938, [ii], **54**, 293—299).—Methods are described for growing Na single-crystal rods 4·7 mm. by 10 cm., for handling them in an atm. of He, and for measuring the principal elastic moduli at low temp. Vals. of the adiabatic and isothermal moduli and consts. are tabulated at 10° intervals for 80—210° K. The Debye characteristic temp., calc. from the elastic consts. at 80° K., is 164° K. N. M. B.

Explanation of the connexion between modulus of elasticity and damping for ferromagnetic substances. M. KORNETZKI (Wiss. Veröff. Siemens-Werken, 1938, **17**, 48—62).—It is shown that the relationship between extension and strain for a ferromagnetic substance behaves like the magnetisation with respect to magnetic field strength. For small strains the modulus of elasticity decreases linearly with increasing strain. The log decrement increases linearly with the strain. A relationship between the decrease in the modulus of elasticity and the increase in damping is put forward. A. J. M.

The α–β transformation of quartz. H. E. VON STEINWEHR (Z. Krist., 1938, **99**, 292—313).—A full account of work already reported (A., 1937, I, 402). I. McA.

Changes of resistance of pure metals in a magnetic field. M. KOHLER (Naturwiss., 1938, **26**, 630; cf. A., 1938, I, 302).—A relationship between the effects of temp. and field strength on the variation of resistance of pure metals in a magnetic field can be derived theoretically on the basis of the assumption that a definite collision time can be assigned to electrons dependent on temp. and purity of the metal. Data obtained for the resistance change of W at 1·57—20·4° K. with variation of magnetic field strength by de Haas *et al.* (A., 1938, I, 349) give a linear relationship between log ρ/ρ_0 and log H/ρ_0. A. J. M.

Superconductivity of thin films of mercury. E. T. S. APPLEYARD and A. D. MISENER (Nature, 1938, **142**, 474).—Hg films deposited at 64° K. and annealed at 90° K. are practically uniform and coherent when >400 A. thick. Their resistivity approaches closely that of the bulk metal. In agreement with Shalnikov's results for annealed Pb and Sn (A., 1938, I, 452), their transition temp. in zero magnetic field (4·14° K.) approximates to that of the bulk metal, and the films show high magnetic threshold fields. When the field is applied parallel to the plane of the film, resistance is completely restored over a considerable range of magnetic field; the first onset of resistance is sharp. The dependence of this onset field on temp. is shown graphically for films 392, 1034, and 9120 A. thick. The field changes by a factor >15 on passing from the thinnest to the thickest film. L. S. T.

Atomistic explanation of superconductivity. U. DEHLINGER (Naturwiss., 1938, **26**, 593—594).—The sudden change in sp. heat at the onset of superconductivity can be explained by assuming that below the threshold temp. there is an increasingly regular distribution of the spin of the valency electrons as the temp. decreases. This explains the observed magnetic effect, especially the effect of a field on the transition temp., the Meissner–Ochsenfeld effect, and the paramagnetic effect on switching off the field. The hypothesis is further developed to explain the disappearance of electrical resistance. A. J. M.

Magnetic properties of anhydrous nickel chloride and the laws of variation of paramagnetism. P. LAURENT (J. Phys. Radium, 1938, [vii], **9**, 331—336).—The magnetisation of sublimed anhyd. $NiCl_2$ has been accurately determined between 15° and 450°. The coeff. of magnetisation, plotted as a function of the temp., can show one of two forms depending on the previous thermal treatment of the sample. It may consist of two straight lines, a high-temp. line characterised by a moment of 17·2 magnetons and a low-temp. line of 16·4 magnetons, meeting near 250°, or the straight line at low temp. may continue as a curve above 250°. The curved region, which corresponds with a metastable state of $NiCl_2$, is attributed to the existence of several moments. W. R. A.

λ Transition point of the magnetic susceptibility of manganous oxide, MnO. H. BIZETTE, C. F. SQUIRE, and B. TSAÏ (Compt. rend., 1938, **207**, 449—450; cf. A., 1934, 14).—Data for χ at 10—300° K. are recorded. Above the transition point (T_λ^0 = 117° K.) the variation of χ with T is normal, χ being independent of H. The paramagnetism is due to spin; Curie const. 4·40, Curie point −610° K., p_B 5·95. Below T_λ^0, χ decreases rapidly with decreasing temp., and increases with H, probably owing to exchange forces which restrict the spin (cf. Bitter, A., 1938, I, 438). A. J. E. W.

Principal paramagnetic susceptibilities of potassium ferricyanide at low temperatures. L. C. JACKSON (Proc. Physical Soc., 1938, **50**, 707—710).—Measurements previously reported (cf. A., 1933, 766) were repeated and extended to 14·2° K. Two of the principal susceptibilities are approx. equal over the range 290—14° K., but that along the third principal axis is considerably smaller. The anisotropy is almost 400% at 14° K. and is still increasing as the temp. falls. A brief comparison with Howard's theory (cf. A., 1936, 148) is made. N. M. B.

Paramagnetism of the ferromagnetic elements. W. SUCKSMITH and R. R. PEARCE (Proc. Roy. Soc., 1938, **A**, **167**, 189—204).—The method consists in measuring the force on a specimen placed in an inhomogeneous magnetic field. The apparatus allows the determination to be carried out in a controlled atm. or in vac. at temp. up to 1500°. Accurate vals. of the susceptibilities of Fe, Co, and Ni are obtained, whence the magneton nos. are deduced. Existing theory is inadequate to explain the experimental results. G. D. P.

Entropy and magnetic susceptibility of paramagnetic salts below 1° K. M. H. HEBB and E. M. PURCELL (Physical Rev., 1937, [ii], **51**, 384).—Results of other investigations on the production of very low temp. by the adiabatic demagnetisation method are discussed. L. S. T.

Magnetism and molecular constitution of some chromium compounds. S. S. BHATNAGAR, B. PRAKASH, and A. HAMID (J.C.S., 1938, 1428—1434).—The susceptibilities of various Cr compounds have been determined, using a modified form of Gouy's balance, and are compared with calc. vals. CrO_2 contains Cr^{IV}; $AgCrO_4$ and the C_5H_5N salt of perchromic acid contain Cr^{VI}. The constitution of a complex Cr sulphate has been confirmed, and more satisfactory constitutions are suggested for triamminochromium tetroxide, and the C_5H_5N and quinoline salts of tetrachlorohydroxychromic acid. The three isomerides of dichloroaquotriamminochromic chloride have also been examined. W. R. A.

Magnetism, a modern aid to the organic chemist. E. MÜLLER (Angew. Chem., 1938, **51**, 657—663).—Published work is reviewed. E. S. H.

Absorption measurements of ultrasonic waves in aqueous solutions. W. BUSS (Ann. Physik, 1938, [v], **33**, 143—159).—Investigation by optical interferometry of the sound field in H_2O does not lead to the possibility of measurement of the sound intensity. The absorption of ultrasonic waves of frequencies from 2100 to 6500 kHz. in aq. solutions of sucrose, glycerol, $MgSO_4$, Na_2SO_4, NaCl, and NH_4Cl has been determined by measurement of the sound pressure by means of a variable condenser with one light, moving plate. Vals. are not in agreement with the absorption formula of Stokes and Kirchhoff and differ from those of Claeys *et al.* (A., 1937, I, 122). O. D. S.

Refractive indices of liquid helium I and helium II. H. E. JOHNS and J. O. WILHELM (Canad. J. Res., 1938, **16**, **A**, 131—132).—The vals. for He I are 1·0206±0·0012 at 4·2° K. and 1·0269±0·0004 at 2·26° K., and for He II 1·0269±0·0004 at 2·18° K., all obtained for λ 5461 A. There is no measurable difference between the vals. for He I and II at temp. at which they have the same *d*, and it follows that they have the same mol. refractivity. C. R. H.

Relation between b.p. and refractivity. M. M. SAMIGIN (J. Phys. Chem. Russ., 1938, **11**, 325—330).—Empirical relations are found between b.p. and [*R*] or *n* of series of homologues. J. J. B.

Specific heat of nickel from 100° to 600°. C. SYKES and H. WILKINSON (Proc. Physical Soc., 1938, **50**, 834—851).—Full data are tabulated and plotted for the determination of the sp. heat–temp. curves for four different types of Ni, and the effects of method of manufacture, heat-treatment, and chemical composition were investigated. All available data are reviewed, and an attempt is made to evaluate the most probable C_p–T curve for Ni in the range 100—600°. N. M. B.

Heat capacity at constant volume of the system ethylene near the critical temperature and pressure. D. B. PALL, J. W. BROUGHTON, and O. MAASS (Canad. J. Res., 1938, **16**, **B**, 230—241).—The heat capacity in the immediate neighbourhood of the crit. temp. is a function of the previous thermal treatment of the system. It is shown that a large amount of mol. interaction exists in the crit. region both in the condensed phase and, to a smaller extent, in the vapour phase. C. R. H.

Measurements of the kinetic and calorific properties of gaseous helium at the temperature of liquid helium. A. VAN ITTERBECK (J. Phys. Radium, 1938, [vii], **9**, 313—318).—The methods used for the determination of sp. heat and η of He at the temp. of liquid He are described; the results obtained agree with the existing theory of gases at low temp. The measurements agree with the Uehling theory (A., 1935, 157) and indicate the validity, at low pressures, of Maxwell's law for the distribution of velocities of the mols. W. R. A.

Specific heats of organic vapours. P. FUGASSI and C. E. RUDY, jun. (Ind. Eng. Chem., 1938, **30**, 1029—1030).—The Einstein functions in Bennewitz and Rossner's sp. heat equation (A., 1938, I, 303) are expressed as function of T of the form $\Gamma_0 + \Gamma_1 T + \Gamma_2 T^2$, enabling C_p for an org. vapour to be expressed as an explicit function of T of the usual type. Vals. of Γ_0, Γ_1, and Γ_2 are deduced from the structural formula. Calc. vals. of C_p for C_6H_6 are in agreement with experiment. A. J. E. W.

New thermodynamical conception of entropy. E. HEGELMANN (Wärme, 1938, **61**, 579—585, 599—605, 615—620).—Mathematical. R. B. C.

Calorimetric measurements at the transition from the anisotropic to the isotropic liquid phase. C. KREUTZER (Ann. Physik, 1938, [v], **33**, 192—209).—The sp. heats of *p*-azoxyanisole, *p*-azoxyphenetole, and *p*-azoxyanisole–phenetole in the isotropic and anisotropic states and the corresponding heats of transition have been measured by a differential method. The sp. heat in the anisotropic phase is in all cases > in the isotropic phase. O. D. S.

Evaporation coefficient of water. H. MACHE (Z. Physik, 1938, **110**, 189—196; cf. A., 1937, I, 607).—The magnitude of the coeff. is affected by traces of solutes derived from the glass vessel, and dissolved gases. A new method is described which obviates this by measuring the rate of expansion of vapour bubbles from a cylindrical boiling nucleus suspended below the surface of superheated H_2O. L. G. G.

M.p. of high-purity silicon. M. L. V. GAYLER (Nature, 1938, **142**, 478).—The m.p. of 99·93% Si (Al 0·02, Fe 0·02, Ca 0·02, insol. 0·01%) is 1415°±2° (cf. A., 1938, I, 21). L. S. T.

Empirical relationship between m.p. and number of carbon atoms for higher normal paraffins. C. D. NENITZESCU, S. TITEICA, and I. IRIMESCU (Naturwiss., 1938, **26**, 629).—The m.p. (°C.) and no. (*n*) of C atoms in the higher normal paraffins (C_{25}—C_{70}) are connected by the relationship m.p. $= 32 - 0{\cdot}56n + 15{\cdot}84(n - 19{\cdot}7)^{\frac{1}{2}}$. The m.p. of all normal paraffins from C_{25} to C_{80} are calc. A. J. M.

II ⇌ III change in solid hydrogen sulphide, H_2S and D_2S, under a pressure of 250 kg. per sq. cm. K. CLUSIUS and K. WEIGAND (Z. Elektrochem., 1938, **44**, 674—679).—The vol. difference for the two modifications, $V_{II} - V_{III}$, is $0{\cdot}22 \pm 0{\cdot}08$ and $0{\cdot}18 \pm 0{\cdot}08$ c.c. per mol. for H_2S and D_2S, respectively. Hysteresis increases with pressure and possibly affects the transformation mechanism, theories of which are discussed. C. R. H.

Complexity of phosphorus pentoxide. II. A. SMITS, J. A. A. KETELAAR, and J. L. MEYERING (Z. physikal. Chem., 1938, **B**, **41**, 87—97).—The v.p. of metastable liquid P_2O_5 between 260° and 360° is 4—17 mm. Hg higher when determined with SiO_2 than with glass apparatus. When the liquid volatilises there is a disturbance of equilibrium to form the stable solid modification, and the observed v.p. is < the true v.p. Glass is five times as active catalytically as SiO_2 with respect to this liquid–solid transition. By means of an indirect method the true v.p. of the liquid form has been calc. V.d. determinations indicate that the vapour of both forms is bimol. but a small amount of association to a quadrimol. state occurs with the vapour of the liquid form. C. R. H.

Complexity of aluminium chloride. A. SMITS and J. L. MEYERING (Z. physikal. Chem., 1938, **B**, **41**, 98—111).—V.p. data for the solid and liquid, respectively, satisfy the equations $\log p = -6000/T + 15{\cdot}115$, and $\log p = -2070/T + 6{\cdot}678$, where p = pressure in cm. From the data the following have been calc.: sublimation temp. at 1 atm., 180·2°; metastable b.p. of the liquid, 159°; mol. heat of sublimation, 27·4 kg.-cal.; mol. heat of evaporation, 9·5 kg.-cal.; mol. heat of fusion, 17·9 kg.-cal.; mol. sublimation entropy, 60; evaporation entropy, 22. No evidence of a second modification has been obtained. V.d. determinations indicate that the gas is Al_2Cl_6. Dissociation data agree with those of Fischer and Rahlfs (A., 1932, 565). The solid phase consists of at least two pseudo-components, and after sublimation a less volatile residue remains and an abnormally low v.p. is observed. Rapid condensation of vapour yields a sublimate which, for a time, exhibits a high v.p. A possible structure of the pseudo-components based on the cryst. structure of $AlCl_3$ is suggested. C. R. H.

Thermal diffusivity of nickel. C. STARR (Physical Rev., 1937, [ii], **51**, 376—377).—The thermal diffusivity of Ni (>99·98%, ρ 8·79 g. per cm.³) after annealing in H_2 at 870° is 0·15885 cm.² per sec. (±0·06%) at 25°. The corresponding thermal conductivity is 0·618 w. per cm. per degree. L. S. T.

Dependence of the coefficient of thermal conductivity of gases and vapours on the pressure. N. VARGAFTIK (Tech. Phys. U.S.S.R., 1937, **4**, 341—360).—Using the hot-wire method, measurements have been made of the thermal conductivity of N_2 up to 90 atm. and of steam up to 30 atm. The coeff. of thermal conductivity, λ, increases with increase of pressure. The val. of λ for steam increases with temp. and the val. of the const. K in the expression $\lambda = KC_v\eta$ also increases with temp. K also decreases with increase in pressure. C. R. H.

Heat-conduction in a medium having thermal properties depending on the temperature. M. R. HOPKINS (Proc. Physical Soc., 1938, **50**, 703—706).—Mathematical. Typical standard calculations are modified to allow for the variation with temp. of the thermal properties of the medium. N. M. B.

Application of the viscosity formulæ of E. Andrade and S. Chaikin to fused salts. A. A. LEONTIEVA (J. Phys. Chem. Russ., 1938, **11**, 310—316).—The equations of Andrade (cf. A., 1934, 356) and Chaikin (cf. A., 1937, I, 125) satisfy many viscosity data of borates, phosphates, etc. J. J. B.

Structure viscosity in softening vitreous selenium. E. JENCKEL (Kolloid-Z., 1938, **84**, 266—268).—Structure viscosity is observed and can be expressed by Philippoff's equation (A., 1935, 692). E. S. H.

Effect of temperature on the internal viscosity of non-polar gases. A. W. MÜLLER (Wiss. Veröff. Siemens-Werken, 1938, **17**, 33—37).—It is shown that at the same reduced temp. (T_r) the reduced internal viscosity (η_r) for all non-polar gases is the same, and an expression connecting T_r with η_r is given. A. J. M.

Internal friction of metallic crystals. T. A. READ (Physical Rev., 1938, [ii], **54**, 389).—The observed longitudinal decrements of single crystals of Cu, Pb, and Sn are < those of the polycryst. form, indicating that the internal friction is less in the single crystals. The effect of internal strain is discussed. N. M. B.

Transfer effect in liquid helium II. J. G. DAUNT and K. MENDELSSOHN (Nature, 1938, **142**, 475; cf. A., 1938, I, 397, 511).—The rate of transfer of liquid He II on glass depends only on temp. and is practically independent of the difference in height between two levels. Hence the rate of transfer is a characteristic quantity depending only on the thermal state of liquid He II. The rate of transfer on polished Cu, but not on drawn Cu wire, is the same as that on glass. The He film in which transfer takes place is approx. 5×10^{-6} cm. and appears not to change in order of magnitude between 2·1° and 1·5° K. Above the λ point it is $\not>10^{-7}$ cm. thick. The heat transport can be accounted for by actual flow of He along the surface in the direction towards higher temp. L. S. T.

Emanation methods. I. Thermal behaviour of alkaline-earth carbonates. II. Possibility of determining diffusion constants and particle size from emanation properties. K. E. ZIMENS (Z. Elektrochem., 1938, **44**, 590—594).—I. Examples are given of the application of emanation methods (cf. A., 1937, I, 403, 605).

II. A preliminary account of the derivation of a formula connecting emanation properties with diffusion consts. and particle size. C. R. H.

Diffusion of water of crystallisation. H. KRAFT (Z. Physik, 1938, **110**, 303—309).—Diffusion of H_2O of crystallisation is measured by suspending various crystals in an atm. of D_2O approx. = v.p. of H_2O at the crystal surface. The crystal is transferred to a vac., the total H_2O and D_2O pumped into a

discharge tube, and the intensity difference between the H_a and D_a lines measured. The diffusion coeff. is very small and approx. = coeff. of self-diffusion of metals as found by Hevesy. From the temp. coeff. of the diffusion velocity, the activation energy is 6000 g.-cal. per mol. L. G. G.

Isotherms and isobars of the nitrogen–carbon monoxide system. N. TOROCHESHNIKOV (Tech. Phys. U.S.S.R., 1937, **4**, 365—369).—Isothermal and isobaric data are tabulated and an equation is derived from which data for the equilibrium in the N_2–CO system can be calc. C. R. H.

Viscosity of ideal mixtures. A. BATSCHINSKI (J. Phys. Chem. Russ., 1938, **11**, 597—598).—Comments on a paper by Lutschinski (A., 1937, I, 295). J. J. B.

Physico-chemical investigation of the system $POCl_3$–SO_2Cl_2. III. Density, viscosity, and b.p. G. P. LUTSCHINSKI and A. I. LICHATSCHEVA (J. Phys. Chem. Russ., 1938, **11**, 317—320; cf. A., 1937, I, 296).—*d* and η are measured between 15° and 35°. The b.p. and the composition of the co-existing phases are measured at the ordinary pressure. J. J. B.

Viscosity and density of aqueous solutions of mercuric chloride at 35°. S. PRASAD, A. S. CHAKRAVARTI, and B. PRASAD (J. Indian Chem. Soc., 1938, **15**, 301—304).—The *d* of 0·001534—0·2652M solutions of $HgCl_2$ at 35° is 0·9941 + 0·228*c* (*c* in mol. per l.). Viscosity of 0·001534—0·1M solutions is $\eta/\eta_0 = 1 + 0·125c$, but at higher concn. increases more rapidly. The linear variation of η in dil. solution indicates its resemblance to a non-electrolyte, the coeff. of $\sqrt{c}$ in Jones and Dole's equation being zero. F. R. G.

Diffusion in a centrifugal field of force. II. W. J. ARCHIBALD (Physical Rev., 1938, [ii], **54**, 371—374; cf. A., 1938, I, 352).—The general equation for the settling of particles and mols. in a liquid suspension or ideal solution is solved for the case of a cell with radial sides and two bounding cylindrical ends. A set of curves showing the concn. at all points in the cell for different vals. of the time is given. N. M. B.

Diffusion in non-ideal media.—See A., 1938, III, 948.

Apparent molecular volumes and hydration of acids and bases. A. I. KASMIN (J. Phys. Chem. Russ., 1938, **11**, 585—596).—The degree of hydration is calc. from the vol. contraction associated with mixing H_2O with strong acids or alkalis. J. J. B.

Fluorescence, absorption spectra, and electrical conductivity of fluorescein, rhodamine, and acriflavin in aqueous solution. I. C. GHOSH and S. B. SENGUPTA (Z. physikal. Chem., 1938, **B**, **41**, 117—141).—The dependence on concn. of the absorption spectra of solutions of K fluorescein and of the chlorides of rhodamine B and acriflavin, and the dependence of the fluorescence of these compounds on cell thickness, λ of incident light, and concn., have been investigated. Fluorescence is independent of the concn. at large dilutions, but in more conc. solutions it ceases on account of the formation of larger micelles which do not fluoresce. This behaviour corresponds with a fall in equiv. conductivity at high concns. C. R. H.

Optical behaviour of dissolved ions and its significance in the structure of electrolytic solutions. VII. Extinction of fluorescence and solvation. G. KORTÜM (Z. physikal. Chem., 1938, **B**, **40**, 431—438).—Measurements have been made on the extinction of fluorescence of eosin anions in very dil. aq. solution by different inorg. and org. compounds. The results confirm those obtained from optical measurements in electrolytic solutions (A., 1938, I, 23). W. R. A.

Refractometric investigation of the system sodium molybdate and mannitol in aqueous solution. G. SPACU and E. POPPER (Z. physikal. Chem., 1938, **B**, **41**, 112—116).—The *n* at 22° of solutions of Na_2MoO_4 and of mannitol and of various mixtures of equimol. solutions of the two are recorded. The data for the mixtures indicate the existence of $Na_2[MoO_4(C_6H_{14}O_6)_2]$. C. R. H.

Titanium–tartaric acid complexes. V. CAGLIOTI (Congr. int. Quim. pura apl., 1934, **9**, IV, 537—547; Chem. Zentr., 1936, ii, 3532).—The change in [α] of aq. tartaric acid with $Ti(OH)_4$ indicates a complex, acid : Ti = 3 : 2, of which the dissociation is > that of the acid alone. The max. [α] varies with $TiCl_4$ (1 : 1, 2 : 1) and $Ti(SO_4)_2$ (5 : 1) according to the concn., an effect ascribed to free acid; *e.g.*, [α] of the $Ti(OH)_4$ complex is decreased 47%, that of tartaric acid only 5%, by HCl. A. H. C.

Valency and covalency of ruthenium in the blue chloride solution. L. W. N. GODWARD and W. WARDLAW (J.C.S., 1938, 1422—1424).—By the interaction of the blue solution resulting from the reduction of $RuCl_3$ solution with certain amines the following *compounds* have been isolated: $(C_5H_6N)_2RuCl_4$, $(NMe_3H)_2HRuCl_5$, $dipyH_2RuCl_4$, and enH_2RuCl_4. The metal is bivalent in these compounds, which have zero magnetic moment, as expected theoretically. O. J. W.

Interaction of atoms in alloys. W. SHOCKLEY (J. Chem. Physics, 1938, **6**, 523—525; cf. A., 1938, I, 305).—Extension to the interactions between atoms which are not nearest neighbours in the lattice does not bring Bethe's theory of superlattices (A., 1935, 1193) into better agreement with experiment, as it predicts, contrary to experiment, that many properties of binary alloys are symmetrical between the two constituents. The theory also disagrees with certain fundamental features of the interactions of atoms in alloys. W. R. A.

Dependence of diffusion velocity in metals on the crystallographic orientation (anisotropic diffusion). V. BUGAKOV and N. BRESHNEVA (Tech. Phys. U.S.S.R., 1935, **2**, 435—443).—Hg diffuses into single crystals of Cd and Zn at rates depending on the direction of diffusion. The rate is highest for directions parallel and lowest for directions perpendicular to the base plane of the crystal. With rise in temp. the influence of direction becomes less marked. Similar results have been obtained for the diffusion of Cu into Zn. C. R. H.

Atomic vibrations of a zinc–copper alloy. M. L. FULLER (Physical Rev., 1938, [ii], **54**, 388—389).—The change in crystal lattice dimensions accompanying variation of composition of the ϵ and η phases in Cu–Zn alloys is in experimental analogy with the variation of at. vibrations with axial ratio as reported by Howard (cf. A., 1938, I, 448). N. M. B.

X-Ray study of silver–zinc alloys rich in silver above the β-transformation temperature. E. A. OWEN and I. G. EDMUNDS (J. Inst. Metals, 1938, **62**, Advance copy, 163—176).—The various phase boundaries in alloys with 50—80% Ag have been determined by X-ray examination of alloys annealed for several days at the appropriate temp. and then quenched. The α–($\alpha+\beta$) boundary joins the points 76·8% Ag, 710° and 71·2% Ag, 270°, the ($\alpha+\beta$)–β boundary the points 71·2% Ag, 710° and 65·9% Ag, 270°, the β–($\beta+\gamma$) boundary the points 61·6% Ag, 667° and 61·4% Ag, 289°, and the ($\beta+\gamma$)–γ boundary the points 53% Ag, 667° and 51·4% Ag, 289°. A. R. P.

Alloys of magnesium with gallium, indium, and thallium. W. HAUCKE (Naturwiss., 1938, **26**, 577—578).—The intermediate phases occurring in the Mg–Ga, Mg–In, and Mg–Tl systems have been examined by X-ray methods. In the Mg–Ga system there are at least four intermediate phases. Mg_5Ga_2 crystallises in the rhombic space-centred system (*a* 13·72, *b* 7·0, *c* 6·02 A.; 28 atoms in unit cell). Mg_2Ga has a hexagonal structure (*a* 7·85, *c* 6·94 A.; 18 atoms in unit cell). MgGa and a phase with higher [Ga] show complex Debye–Scherrer diagrams. Four intermediate phases were found in the Mg–In system. Mg_5In_2 and Mg_2In have the same structures as Mg_5Ga_2 and Mg_2Ga, respectively. MgIn crystallises in the tetragonal space-centred system (*a* 3·24, *c* 4·35 A.; 2 atoms in unit cell). $MgIn_3$ is cubic. In the Mg–Tl system the existence of the three phases Mg_5Tl_2, Mg_2Tl, and MgTl was confirmed. Mg_5Tl_2 and Mg_2Tl have structures similar to those of Mg_5Ga_2 and Mg_2Ga, respectively. A. J. M.

Constitution of the magnesium-rich alloys in the systems aluminium–magnesium, gallium–magnesium, indium–magnesium, and thallium–magnesium. W. HUME-ROTHERY and G. V. RAYNOR (J. Inst. Metals, 1938, **63**, Advance copy, 203—228).—The Al–Mg eutectic lies at 437·2°, 30 at.-% Al, the solubility of Al in Mg is 11·5—11·6 at.-% at the eutectic temp., and the solidus is almost linear down to the eutectic horizontal. Mg and Ga form a eutectic at 422·7°, 19·1 at.-% Ga and 3·14 at.-% Ga is sol. in Mg at this temp. but <0·2 at.-% at 20°. Mg dissolves 19·4 at.-% In between the peritectic temp. (483·8°) and 327°; the solubility then decreases rapidly to about 14 at.-% at 200°. The solubility of Tl in Mg is 15·4 at.-% at 405° and decreases almost linearly to 7·3 at.-% at 200°; the eutectic is at 405·3°, 25 at.-% Tl. A. R. P.

Factors affecting the liquidus, solidus, and solid solubility curves in some alloys of magnesium. W. HUME-ROTHERY and G. V. RAYNOR (J. Inst. Metals, 1938, **63**, Advance copy, 229—245).—Theoretical. The general principles underlying the solubility relations in alloys of Al, Ga, In, and Tl with Mg are discussed and the differences between Mg and Zn and Cd as solute metals are shown to be satisfactorily accounted for by modern electronic theories. The high solubilities of In and Tl, the low solubility of Ga, and the strong temp.-dependence of the solubility of Al in Mg are readily explained by the size-factor theory. A. R. P.

Physico-chemical properties of cadmium–tin alloys. V. P. SCHISCHOKIN, A. S. ANDREEV, and F. F. BUKIN (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 65—99).—Hardness and conductivity data are recorded for the alloys at 20—190°. The solid solutions are of monat. Cd in Sn. R. T.

System aluminium–magnesium. F. LAVES and K. MOELLER (Z. Metallk., 1938, **30**, 232—235).—X-Ray examination shows that there are four intermediate phases: δ', δ, γ, and β. The δ-phases (49—57% Mg) has an α-Mn structure, the δ'-phase (46% Mg) a distorted α-Mn structure, and decomposes below 300° into $\beta+\gamma$. The β- and γ-phases have complex structures giving numerous lines in the X-ray diagrams; the structure of β resembles that of Cu_4Cd_3. On heating above 390° γ decomposes into $\beta+\delta'$. A. R. P.

Ageing of Al–$MgZn_2$ alloys. P. L. SALDAU and M. I. ZAMOTORIN (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 27—36).—Ageing is most marked in alloys containing 6—14% of $MgZn_2$, and proceeds almost to completion in 120 hr. at 15° or in 20 hr. at 100°. R. T.

Constitution of lead-rich alloys of lead and cadmium. E. C. ROLLASON and V. B. HYSEL (J. Inst. Metals, 1938, **63**, Advance copy, 187—196).—The system up to 20% Cd was examined by thermal, micrographic, and resistivity methods. The eutectic is placed at 17·5% Cd, 248°; the solubility of Cd in Pb is 3·3% at this temp., 0·8% at 150°, and 0·3% at 20°. Thermodynamic analysis of the Pb end of the system indicates that both the liquid and solid solutions consist of monat. mols. of Cd in monat. mols. of Pb; the molal heat of fusion of Pb is calc. as 5·80 g.-cal. per g. A. R. P.

Atomic increase in the resistance of dilute lead alloys between 273° and 14° K. A. EUCKEN and H. SCHÜRENBERG (Ann. Physik, 1938, [v], **33**, 1—20).—Measurements have been made of the increase in the resistance of Pb by the presence of Mg, Ag, Cd, In, Sn, Sb, Hg, Tl, and Bi in solid solution. The at. increase ξ (= increase due to addition of 1 at.-%) is the greater the greater is the separation in the periodic system between the dissolved metal and Pb (cf. Norbury, Trans. Faraday Soc., 1921, **16**, 570). ξ is approx. $\propto \log D_x/D_{Pb}$, where D_x is the diffusion coeff. of the metal in Pb and D_{Pb} is the self-diffusion coeff. of Pb. At low temp. deviations from Mathiessen's rule were observed which increased with increasing ξ. Upper limits for the solubilities of Cd, Sb, and Mg in Pb at room temp., 0·65, 0·13, and 0·5 at.-%, respectively, were observed. O. D. S.

Manganese–copper alloys. N. I. KORENEV (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 47—63).—Workable alloys containing 48—75% Mn are obtained by reheating at 750—800°, or containing 75—95% Mn

at 800—1100°. At 800° the limit of solubility is 49·27% Mn. The mechanical properties of the alloys are adversely affected by presence of Al, Fe, or Si. An abrupt change in conductivity is found as the Mn content exceeds 50%. R. T.

Anomalous change in the electric resistance of iron–silicon alloys with a longitudinal magnetic field at various temperatures. Y. SHIRAKAWA (Nature, 1938, **142**, 395).—Data for Fe–Si alloys (1·66 and 9·43% Si) from −195° to 820° are tabulated. Resistance decreases with the longitudinal magnetic field at temp. other than those in the neighbourhood of the Curie point. L. S. T.

X-Ray investigation of heat-treated magnetic iron–nickel–aluminium alloys. L. VERESTSCHJAGIN and G. KURDJUMOV (Tech. Phys. U.S.S.R., 1935, **2**, 431—434).—The alloys have a regular at. arrangement in a cubic body-centred lattice. Reactions in solid solution, which take place before the separation of the γ-phase, govern coercivity changes. C. R. H.

Nickel–aluminium compound. A hardener for steel. F. B. FOLEY (Metal Progr., 1936, **29**, 53—56).—A Ni–Al compound (composition not given) is sol. in austenite but not in α-Fe. After a transformation has occurred in α-Fe the Ni–Al compound is pptd. Max. pptn.-hardness is obtained at 565°. CH. ABS. (*e*)

γ to α transformation in iron alloyed with palladium. R. HULTGREN and C. A. ZAPFFE (Nature, 1938, **142**, 395—396).—*X*-Ray examination of the Fe–Pd system reveals an intermediate stage in the decomp. of the γ-form which resembles martensite in several respects. Under quenching conditions, the decomp. of the γ-phase occurs in at least two steps, (i) the atoms rearrange themselves into a body-centred form, and (ii) Pd is pptd. out in a face-centred Pd-rich phase. L. S. T.

Micro-structure and hardness of iridium–bismuth alloys. Certain processes taking place during melting. P. S. BELONOGOV (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 37—46).—Ir–Bi alloys are formed by heating the metals for 4—6 hr. at 1450°. The compounds IrBi, m.p. 1420°, and Ir_2Bi, m.p. 1440°, and their solid solutions with Ir, are described. Alloys containing >5% Ir are highly resistant to the action of strong acids (HNO_3, HCl, aqua regia) at high temp. R. T.

Stability of silica hydrates of definite composition. R. SPYCHALSKI (Z. anorg. Chem., 1938, **239**, 317—320).—The hydrates of SiO_2 (A., 1930, 720) have been isolated by controlled isothermal dehydration, and are quite stable. Their solubilities in H_2O at 18—22° range from approx. 3×10^{-4} mols. per l. for $SiO_2,2{\cdot}5H_2O$ to approx. 2×10^{-3} mols. per l. for $SiO_2,0{\cdot}5H_2O$. F. J. G.

Solubility of quartz or flint after the action of water or soda solutions under pressure. J. A. HEDVALL and O. WEILER (Z. anorg. Chem., 1938, **293**, 295—300).—The % of "sol. SiO_2" formed when finely-divided quartz or flint is heated in an autoclave with aq. Na_2CO_3 increases with temp., [Na_2CO_3], and with the degree of subdivision. The attack by H_2O is very slight but is appreciable after several hr. with very finely-divided material at 188°. F. J. G.

Solubility properties of series of salts with common anion. W. D. TREADWELL and A. AMMANN (Helv. Chim. Acta, 1938, **21**, 1249—1265).—Solubility relations in various groups of salts are compared and discussed with reference to the ionic radii, lattice energies, and the normal potential of the cations. J. W. S.

Solubility of bone salt.—See A., 1938, III, 920.

Quantitative investigations of amino-acids and peptides. IV. Solubilities of the amino-acids in water–ethyl alcohol mixtures. M. S. DUNN and F. J. ROSS (J. Biol. Chem., 1938, 309—332; cf. A., 1934, 139).—The solubilities of *dl*-alanine, *dl*-aspartic acid, *d*-glutamic acid (I), glycine, *dl*-leucine, *dl*-norleucine, *dl*-serine, and *dl*-valine (II) in 25%, 50%, 75%, and 95% aq. EtOH have been determined at 0°, 25°, 45°, and 65°. The solubilities in pure EtOH have also been measured for (I) at 25° and 40° and for (II) at 0°. The results are correlated with previous data and abnormal variations of solubility with temp. and [EtOH] are discussed with reference to the probable activity coeff. of the solutes. J. W. S.

Thin layers of tin and other metals. V. Corrosion of tin by dilute organic acids. J. A. N. B. K. VAN HEYNINGEN and D. A. WAS (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 717—724; cf. B., 1938, 393).—Corrosion of Sn by aq. citric acid (5×10^{-5} to 0·1M), lactic acid (5×10^{-4} to 0·1M), $EtCO_2H$ (0·1M), and BzOH (0·1M) has been studied by the optical method. The corrosion velocity decreases with time until a stationary state is reached. It is concluded that intermediate products are formed on the metal surface, and that these dissolve into the liquid with formation of complex ions. J. W. S.

Adsorption of gases from the lowest to the highest pressures. A. VON ANTROPOFF and L. SCHAEBEN (Z. Elektrochem., 1938, **44**, 586—587).—The equation for relative adsorption previously derived (cf. A., 1936, 1063) is presented in a more convenient form. C. R. H.

Theoretical and practical investigation of the adsorption velocity of gases on porous substances. E. WICKE (Z. Elektrochem., 1938, **44**, 587—590).—An equation for the adsorption and desorption velocity is derived and successfully applied to data for the adsorption of CO_2 on and its desorption from medicinal charcoal and SiO_2 gel. The theory assumes that the adsorbent consists of spheroidal aggregates, and it is emphasised that since SiO_2 gel has a different structure from C, the formula in this case can only be approx. C. R. H.

Relative effect of inhibitants on adsorption and on catalytic activity. I. E. B. MAXTED and C. H. MOON (J.C.S., 1938, 1228—1233).—Measurements of the effect of poisoning by H_2S on the adsorption of H_2 by Pt at 18° show a general parallel with the effect of increasing amounts of H_2S on the catalytic activity of the Pt for the hydrogenation of crotonic acid at 40°. A better correlation results if the fall in the velocity of adsorption due to the action of H_2S,

rather than the total adsorption, is compared. At a H_2 pressure of 0·06 mm. the rate of adsorption is not greatly changed by the poison, although the latter may have reduced the catalytic activity to 20% of its initial val. The velocity of adsorption is controlled in this case by the H_2 pressure. H. J. E.

Adsorption of deuterium on some promoted molybdenum oxides. J. H. HUDSON and G. OGDEN (Nature, 1938, **142**, 476—477).—Pronounced van der Waals adsorption occurs at 77° K. on surfaces of Zn–, Ni–, and Co–Mo oxides, D_2 being adsorbed more than H_2. The low-temp. heats of adsorption for D_2 are ~600 g.-cal. < those for H_2 in each case. At 218° (region of activated adsorption) the rate of adsorption of D_2 is < that of H_2 for all three adsorbents. With the Zn– and Co–Mo oxides, the adsorption of D_2 is < that of H_2 at <300°, and > that of H_2 at >300°. With the Ni–Mo oxide, the activated adsorption of D_2 never exceeded that of H_2. On Zn–, Co–, and Ni–Mo oxides, the high-temp. heats of adsorption for H_2 are 21,400, 31,400, and 21,600 g.-cal., respectively, and for D_2, 30,100, 34,200, and 31,125 g.-cal., respectively. Differences in activation energy also occur. L. S. T.

Gas absorption of thin metallic layers; explanation of the anomaly of the optical constants. M. KINDINGER and K. KOLLER (Z. Physik, 1938, **110**, 237—250).—Calculations based on the dispersion equation are in agreement with the observed relation between optical consts. and thickness and age of the layer. Large quantities of gas are absorbed which increase the no. of free electrons in the metal. The influence of gas absorption is greatest at long λλ and moderate layer thicknesses (5—30 mμ.) and least in the ultra-violet and for very thick or very thin films of metal. Measurement of the air equiv. of Au layers for α-rays leads to the no. of absorbed gas atoms and measurements on the transparency for light (λ = 436 mμ.) are in agreement with theoretical vals. calc. from optical consts. of massive Au. L. G. G.

Orientation of molecules in the surface layer of an adsorbent and gas adsorption. II. B. A. TALMUD and D. L. TALMUD (J. Phys. Chem. Russ., 1938, **11**, 345—351).—Palmitic acid (I) prepared by coagulation of its emulsions adsorbs ~0·6 mol. of NH_3 per mol.; when prepared by a continuous skimming off of its unimol. films or by pptn. of a 2% solution of NH_4 palmitate by 0·1N-HCl, it takes up 1—1·3 mol. of NH_3. Accumulated monolayers of a mixture of 33% of (I) and 67% of paraffin wax take up 20 mols. of NH_3. Almost the whole amount adsorbed is given off on evacuating. After desorption the adsorptive capacity is strongly lowered. NMe_3 is adsorbed like NH_3. J. J. B.

Adsorption of oxygen at the surface of molten silver. A GERASSIMOFF (Z. Elektrochem., 1938, **44**, 709—716).—O is adsorbed in at. form and the heat of adsorption, 5·2 kg.-cal., agrees fairly well with the heat of formation of Ag_2O. C. R. H.

Sorption of oxygen by several metal chromites. J. C. W. FRAZER and L. HEARD (J. Physical Chem., 1938, **42**, 855—862; cf. A., 1936, 283).—The temp. at which $CuCr_2O_4$, $ZnCr_2O_4$, $CoCr_2O_4$, $NiCr_2O_4$, and $BeCr_2O_4$ catalysts begin to cause conversion of CO into CO_2, and the temp. at which this conversion is complete, have been determined. The sorption of O_2 by the catalysts has been studied as a function of time and temp. over these temp. ranges, and the heats of activation of the processes are calc. With $BeCr_2O_4$ consistent results were not obtained, as alternate oxidation and reduction tended to increase the sorption; the same treatment lowered the temp. at which oxidation of CO began, but raised the temp. at which complete conversion occurred. J. W. S.

Physical and chemical phenomena during the contact of gases with noble-metal surfaces and especially with thin layers. M. AUWÄRTER and K. RUTHARDT (Z. Elektrochem., 1938, **44**, 579—585).—Variations with temp. in the electrical conductivity, κ, of thin layers of Pt, Pd, Rh, and Ir, on which gas is adsorbed, have been investigated. κ decreases slightly with rise in temp. until a temp. is attained characteristic of each gas, when κ suddenly and rapidly decreases. This change is attributed to the formation, on the metal surface, of a compound of metal and gas which, by preventing further interaction, is of the nature of a passive layer. C. R. H.

Carbonising conditions and carbon reactivity. See B., 1938, 1117.

Formation and properties of activated carbon. —See B., 1938, 1117.

Lubricating effect of adsorption layers. II. N. I. KOLESNIKOVA (J. Phys. Chem. Russ., 1938, **11**, 321—324; cf. A., 1935, 697).—The static friction between metal spheres and plates was measured. The surfaces were lubricated by a hydrocarbon oil with additions of stearic acid (I). For the couple steel–Al the friction does not depend on the concn. of the (I). For other metals it shows a min. at approx. 0·1—0·2% of (I). The dynamic friction at high velocities is not affected by addition of fatty acids. J. J. B.

Detection of adsorption of colloidal graphite in oil sols by metal surfaces. F. PAVELKA and A. WISCHIN (Kolloid-Z., 1938, **84**, 334—339).—Surface tension tests show that the adsorption of graphite by an Fe surface is much less in oil sols than in hydrosols and occurs relatively slowly. Adsorption is increased greatly by diluting the oil with petroleum (1 : 1). The controlling factors are probably the high viscosity of the oil and the high degree of solvation of the graphite particles. E. S. H.

Ion concentration and ion exchange at the boundary protoplasm–solution.—See A., 1938, III, 948.

Optical sensitisation of silver salts. III. Adsorption of pigments by silver bromide. A. I. RABINOVITSCH and S. V. NATANSON (J. Phys. Chem. Russ., 1938, **11**, 434—450; cf. A., 1936, 1215).—The adsorption by AgBr of Bismarck-brown, methylene-blue, malachite-green, and phenosafranine, which desensitise AgBr, is normal, whilst the adsorption isotherms of the sensitisers pyronine G, phloxine, eosin, and erythrosin show a plateau at medium concns.

Diffusion measurements show that the dyes used are molecularly dissolved, so that the abnormal adsorption cannot be due to micelles. The adsorption equilibrium is reached within a few min. The amount adsorbed is independent of temp. between 0° and 40°. J. J. B.

Influence of adsorbed layers on the rate of evaporation of water. N. I. GLASOV (J. Phys. Chem. Russ., 1938, **11**, 484—491).—Evaporation of H_2O from flat dishes in an air current is reduced by surface films as follows: $C_{16}H_{33}\cdot OH > C_8H_{17}\cdot OH > C_{15}H_{31}\cdot CO_2H$ and $C_{25}H_{51}\cdot CO_2H >$ saponin. Only liquid films are effective. They reduce the convection under the surface. J. J. B.

Monolayers of isomeric unsaturated compounds. J. MARSDEN and E. K. RIDEAL (J.C.S., 1938, 1163—1171).—Measurements of the force-area characteristics made in a Langmuir trough with monolayers of oleyl alcohol, and oleic, petroselic, and erucic acids, and their respective *trans*-isomerides, are recorded. The *trans*-structures can form close-packed films by interlocking, this being impossible with the bent *cis*-forms. In mixed films the *trans*-unsaturated chains can pack with saturated chains, but the *cis*-forms cause expansion. In support of these observations, the oxidation rate of films of the *trans*-isomerides by 0·005% $KMnO_4$ + 0·01N-H_2SO_4 is shown to be very susceptible to compression. The *cis*-$(OH)_2$-acid is formed almost exclusively on oxidation at interfaces. The *trans*-$(OH)_2$-acids form solid films, an effect which suggests that there is H bonding between adjacent mols. H. J. E.

Protein monolayers. Films of oxidised cytochrome-*C*.—See A., 1938, III, 949.

Linear phenomena. IV. Linear adsorption by two-dimensional colloids. P. F. POCHIL, T. I. ZILBERMAN, and D. L. TALMUD (J. Phys. Chem. Russ., 1938, **11**, 519—525).—The spreading pressure of a dil. two-dimensional solution of myristic acid on aq. $BaCl_2$ gradually decreases owing to formation of two-dimensional colloid particles of Ba myristate. The pressure of a mixture of this colloid with a gaseous film of $([CH_2]_7\cdot CO_2Me)_2$ is < the sum of the single pressures, indicating adsorption of the ester by the colloid. An average particle of the colloid contains 1000 mols. J. J. B.

Constitution of higher polymerides and structure of thin films. G. NATTA (Congr. int. Quim. pura apl., 1934, **9**, IV, 208—214; Chem. Zentr., 1936, ii, 3283).—Electron diffraction methods reveal uni- or bi-mol. films of fatty material on polyvinyl acetate preps. (cf. A., 1935, 687). A. H. C.

Labile organic molecules and interfacial phenomena. G. SEMERANO (Z. Elektrochem., 1938, **44**, 598—602).—A survey of recent work on the reactivity of the unstable acids $CH\cdot CO_2H$, $CH_2\cdot CO_2H$, etc., which are formed at Hg–H_2O and C–H_2O interfaces by the depolymerisation of certain acids, *e.g.*, fumaric, maleic, succinic. C. R. H.

Spreading of electrolyte solutions on filter-paper. II. K. PROSAD and B. N. GHOSH (Kolloid-Z., 1938, **84**, 275—283; cf. A., 1937, I, 301).—Tests on the spreading of aq. H_2SO_4, HCl, and H_3PO_4 on filter-paper coloured with Me-orange show that two diffusion rings (corresponding with H_2O and acid, respectively) are formed with dil. solutions, but only one ring with conc. solutions. The amount of acid adsorbed by filter-paper in the inner ring has been determined; with HCl and H_3PO_4 the amount increases with increasing concn., but with H_2SO_4 the adsorption is independent of concn. The velocities of spreading of the above acids and of aq. NaCl and Na_2SO_4 have been measured and are discussed particularly in relation to adsorption. E. S. H.

Structure of surface films of oxides. I. Inactivation of pyrophoric iron aërosols by surface films of oxides. A. WINKEL and R. HAUL (Z. Elektrochem., 1938, **44**, 611—619).—*X*-Ray and electron diffraction analysis show that inactivation is brought about by a film of Fe_3O_4 approx. 10 A. thick. The data are discussed with reference to other methods of inactivation. C. R. H.

Constant characterising volatile materials in very dilute solution. S. WEHRLI (Helv. Chim. Acta, 1938, **21**, 1384—1391).—When aq. solutions of alcohols (≯0·3%) are distilled in an inverted flask with the vapour outlet pointing vertically downwards the alcohol content of the distillate at any instant is given by $-dx = dv.kx/(Q - v)$, where Q is the total amount of initial material, v the amount already distilled, x the amount of alcohol in the residual liquid, and k is a const. The val. of k increases regularly with increasing no. of C atoms in the alcohol mol. J. W. S.

Historical root of colloid science. WO. OSTWALD (Kolloid-Z., 1938, **84**, 258—265).—A lecture. E. S. H.

Smokeless zone around heated platinum ribbon. S. MIYAKE (Rep. Aeronaut. Inst. Tokyo Univ., 1935, No. 123, 85—106).—The breadth (B) of the smokeless zone around an electrically heated vertical Pt ribbon is given by $B = C\theta a/p$, where θ is the temp. difference between the wire and the ambient air, p is the gas pressure, and C and a are consts. For stable smokes (*e.g.*, TiO_2, P_2O_5) the val. of B is approx. independent of the smoke. Larger vals. were obtained for H_2SO_4 and NaCl smokes, due to evaporation of the particles. The val. of B is unaffected by radiation from the hot body, or by electric or magnetic fields. The smokeless zone arises from air convection and the Magnus effect. CH. ABS. (*e*)

Determination of average particle size of a colloidal solution of a metal by measuring the absorption of light for two monochromatic wavelengths. M. F. KAZANSKI (J. Phys. Chem. Russ., 1938, **11**, 546—554).—The particle size calc. according to Mie's theory from measurements made with a Ag sol agrees with that found by direct counting. J. J. B.

Light-scattering in solutions of large molecules. W. LOTMAR (Helv. Chim. Acta, 1938, **21**, 953—984; cf. A., 1938, I, 397).—An improved form of apparatus for determination of the degree of depolarisation of scattered light is described. Measurements are recorded for a no. of colloidal

solutions and are compared with corresponding data for solutions of smaller mols. J. W. S.

Theory of ultra-filtration of colloidal solutions. M. TEMKIN (J. Phys. Chem. Russ., 1938, **11**, 296—299).—A Donnan equilibrium between sol and ultra-filtrate is assumed (cf. A., 1936, 1461), and the concn. of both calc. for different stages of the ultra-filtration. J. J. B.

Colour and nature of solutions of sodium in liquid ammonia. F. KRÜGER (Ann. Physik, 1938, [v], **33**, 265—284).—Vals. of the absorption coeff. of solutions of Na in liquid NH_3 calc. by the theory of Mie for colloidal solutions are in approx. agreement with those measured by Gibson and Argo (A., 1918, ii, 417). Ultramicroscopic and filtration experiments support the conclusion that the solutions are colloidal. The lifetime of the solutions can be increased by the addition of protective colloids. O. D. S.

Ferromagnetic colloid for studying magnetic structures. W. C. ELMORE (Physical Rev., 1938, [ii], **54**, 309—310).—The prep. and advantages of a colloidal magnetite are described. N. M. B.

Peptisation of aluminium hydroxide by ammonia in presence of boric acid. F. PAVELKA (Kolloid-Z., 1938, **84**, 303—311).—H_3BO_3 is adsorbed by the ppt. in accordance with the Freundlich equation. Peptisation, which under certain conditions is reversible, occurs at a definite temp. which depends on the $H_3BO_3 : Al(OH)_3$ ratio; this effect is reduced by mannitol, but not by MeOH, $(CH_2{\cdot}OH)_2$, or glycerol. The ppt. is considered to have a foam structure. E. S. H.

Structure of iron hydroxide sols. V. A. KARGIN and V. V. KISELEVA (J. Phys. Chem. Russ., 1938, **11**, 461—466).—Absorption spectra of $Fe(OH)_3$ sols are almost unaffected by addition of $K_4Fe(CN)_6$ or KCNS; consequently the sols do not contain $Fe^{\cdots}$. It is concluded that they are stabilised by HCl. J. J. B.

Exchange adsorption of ions by colloidal iron oxide. V. A. KARGIN and G. V. KLIMOVITZKAJA (J. Phys. Chem. Russ., 1938, **11**, 467—472).—The amounts of SO_4'' adsorbed and of Cl′ liberated during the coagulation of $Fe(OH)_3$ sol by Na_2SO_4 and by H_2SO_4–Na_2SO_4 and Na_2SO_4–NaOH mixtures were measured. J. J. B.

Irregular series in mercuric sulphide sols. I. Winssinger's mercuric sulphide sol. N. SATA and Y. NIWASE (Kolloid-Z., 1938, **84**, 314—319).—The degree of peptisation of HgS ppts. by H_2S depends on the purity of HgS and on the relative amounts of solid phase and H_2S. Irregular series is exhibited in coagulation by $AgNO_3$ when the sol contains Cl′. E. S. H.

High-frequency conductivity of colloidal electrolytes. IV. Change from molecular disperse to colloid state in soap-like sols. G. SCHMID and E. C. LARSEN (Z. Elektrochem., 1938, **44**, 651—658; cf. A., 1938, I, 78).—The chemical and electrostatic theories of McBain and Lottermoser and of Hartley and Pauli, respectively, are discussed. High-frequency conductivity data for solutions of Na dodecyl sulphate, cetylpyridinium chloride, Na oleate, and Ca and K arabate support the electrostatic and contradict the chemical theory. C. R. H.

Comparative electrochemical investigations on highly purified lyophilic sols. VI. Electrochemistry of algic acid sol. W. PAULI and L. STERNBACH (Kolloid-Z., 1938, **84**, 291—303; cf. A., 1937, I, 410).—Electrochemical and viscosimetric measurements have been carried out on the acid and neutralised sols, purified by electrodialysis and electrodecantation. Evidence of the existence of a hydrated form, containing chains of $C_6H_{10}O_7$, is reported; the acid equiv., determined conductometrically, is 194. The influence of dilution on dissociation of the acid has been investigated. The neutralised sols have higher η than the acid sols. E. S. H.

Influence of electrolytes on the viscosity of cellulose nitrate. S. A. GLIKMAN (J. Phys. Chem. Russ., 1938, **11**, 512—518).—A review. J. J. B.

Complex systems of biocolloids. I. Survey and classification according to colloid-chemical and electrochemical points of view. II. Specific factors of importance to the intensity of the complex relations, and their significance in particular with regard to the formation of the tricomplex systems. H. G. B. DE JONG (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 776—787, 788—799).—I. Colloid systems in which complex relations occur, owing to simultaneous electrical attraction and repulsion as a result of solvatation, are surveyed. According as the complex relations exist between zwitterions or multipolar ions mutually, cations and anions, or simultaneously between zwitterions, cations, and anions these systems are classified as unicomplex, dicomplex, and tricomplex systems, respectively. The relationships of these classes with analogous crystalloid systems and their limit cases (NH_2-acid crystals, NaCl crystals, and crystals of the double compounds of NH_2-acids with NaCl) are discussed.

II. Factors determining the intensity of the complex relations between colloidal anions and colloidal cations are discussed. These relations become the stronger the lower is the equiv. wt. of the colloid. The effects of ionic characteristics on charge reversal in such systems (A., 1938, I, 457) are discussed. The theoretical deduction that tricomplex flocculation will occur between a small inorg. cation and a sulphate colloid of high surface charge is confirmed by the occurrence of such flocculation in systems containing isoelectric gelatin or egg-lecithin, with Na carragheen and $CaCl_2$ or LiCl. J. W. S.

Origin of ferromagnetic gels and allied phenomena. T. KATSURAI and K. YAMASAKI (Kolloid-Z., 1938, **84**, 311—314).—Ferromagnetic gels are obtained by grinding $Na_2SO_4,10H_2O$, $MgSO_4,7H_2O$, $MnSO_4,5H_2O$, $NiSO_4,7H_2O$, $CoSO_4,7H_2O$, $ZnSO_4,7H_2O$, $CuSO_4,5H_2O$, $CdSO_4,8/3H_2O$, $HgSO_4$, or $UO_2SO_4,3H_2O$ with $FeCl_3,6H_2O$ (mol. ratio 2 : 1). On heating in an autoclave at 180° the gels separate into a liquid and a solid phase; the solid phase is insol. in H_2O and does not resemble magnetite or hæmatite. Magnetic properties of magnetite ppts. formed by reaction in aq. solutions are described. The change of colour

occurring when aq. $Fe^{\cdot\cdot}$ and $Fe^{\cdot\cdot\cdot}$ salts are mixed has been measured photometrically and is discussed. E. S. H.

Thixotropic gelation of thorium molybdate gels. M. PRASAD, S. M. MEHTA, and (MISS) H. RATHNAMMA (J. Indian Chem. Soc., 1938, **15**, 365—376).—The η of Th molybdate gels, which are thixotropic, has been measured by Scarpa's method during gel formation from mixtures of $Th(NO_3)_4$, K_2MoO_4, and HCl. The η–time curves are not continuous but show well-marked changes of direction, a phenomenon not previously observed during gel formation. Increase in concn. of $Th(NO_3)_4$, K_2MoO_4, or HCl increases the first max. η. Addition of electrolytes and/or non-electrolytes does not alter the nature of the curves. The first max. becomes less and the rest of the curve smoother with rise of temp. F. H.

Gel formation in proteins. W. KOPACZEWSKI (Protoplasma, 1937, **29**, 180—193).—Gel formation can be induced in a no. of protein hydrosols by treatment with acids, bases (including org. bases), salts, or surface-active substances, such as bile salts. Both cations and anions are effective, and the effect of two or more substances is additive. In the case of bases the change can be reversed by heating, stirring, or dialysis. Standard anti-coagulants accelerate the action of acids, bases, or salts. Gel formation is not a chemical process, but a change in the equilibrium between different degrees of hydration. M. A. B.

Mechanism of deformation of fibrous substances. VI. Double refraction of Herman's cellulose hydrate gel. O. KRATKY and P. PLATZEK (Kolloid-Z., 1938, **84**, 268—275; cf. A., 1938, I, 515).—The double refraction and dimensional changes of fibres in H_2O, EtOH, and glycerol have been measured. The sp. double refraction is deduced and the results are discussed in relation to Wiener's theory. E. S. H.

Mechanism of coagulation of cellulose ester sols. S. A. GLIKMAN (J. Phys. Chem. Russ., 1938, **11**, 492—511).—If a solution of cellulose benzoate (I) in EtOH+C_6H_6 is pptd. by EtOH or light petroleum, or a solution of cellulose nitrate (II) in $COMe_2$ by H_2O or C_6H_{14}, the amount of coagulating liquid required increases with rise of temp. The similar behaviour of H_2O and C_6H_{14} etc. shows that the polarity of the coagulant is irrelevant. Addition of small amounts of EtOH to a solution of (I) in C_6H_6 causes a contraction, and that of large amounts an expansion, but the coagulation point is not observable. The η of (I) in C_6H_6 is reduced by EtOH; there is no change of η at the coagulation point. The η of (II) in $COMe_2$ is increased by light petroleum. The effect of Et_2O on the η of (II) in EtOH is complicated. Addition of H_2O causes expansion in solutions of (II) in $COMe_2$. J. J. B.

Influence of organic non-electrolytes on oleate and phosphatide coacervates. I. H. G. B. DE JONG and G. G. P. SAUBERT. **II. Influence of different alcohols.** H. G. B. DE JONG, H. L. BOOY, and G. G. P. SAUBERT (Protoplasma, 1937, **28**, 498—515, 543—561).—I. Hydrocarbons with b.p. above 150° decrease the vol. and increase the d of oleate coacervates as shown by changes observed under the microscope. The effect decreases with increasing b.p. The hydrocarbon mols. probably act as cohesion intermediaries between the hydrocarbon chains of the oleate ions as a result of a van der Waals attraction. On this assumption the effect should increase with increasing mol. size; the fact that the reverse occurs is attributed to decreasing H_2O-solubility.

II. The influence of *n*- and *iso*-alcohols varies with the length of the C chain. With the lower members a decrease in d of the coacervate occurs; with the higher members an increase. Probably the decrease in d is due to the OH group and depends on its hydrophilic properties, whilst the increase in d is due to the cohesive action of the hydrocarbon chain. The result produced by any given alcohol depends on which of these effects predominates. The nearer is the OH group to the middle of the mol. the greater is its effect. The effect of alcohols is, in general, greater on phosphatide than on oleate coacervates. With phosphatides the thickening produced by MeOH, EtOH, and PrOH shows a max. at the point of reversal of charge. M. A. B.

Solubility of casein in salts of certain organic acids and its fractionation by means of these acids. R. H. MCKEE and S. P. GOULD (J. Agric. Res., 1938, **57**, 125—143).—The solubility of acid-pptd. casein in aq. Na cymenesulphonate, $PhSO_3Na$, and KCNS of varying concns. is recorded. Vals. increase with temp. The sulphonate solutions at p_H 4·6 separate casein into at least two fractions differing in composition and properties, notably % P and capacity to absorb CH_2O. A. G. P.

Cataphoresis of a spherical particle. S. KOMAGATA (Res. Electrotech. Lab. Tokyo, 1935, No. 387, 35 pp.).—A general equation for cataphoresis of a spherical particle, taking into account deformation of the ionic atm., is derived. The deformation effect tends to decrease the cataphoretic velocity. CH. ABS. (e)

Determination of purity of cerebroside and sphingomyelin by a colloid-chemical method.—See A., 1938, III, 843.

Streaming potential and surface conductivity. A. J. RUTGERS, E. VERLENDE, and M. MOORKENS (Proc. K. Akad. Wetensch. Amsterdam, 1938, **41**, 763—775).—The abnormal variation of the electrokinetic potential with concn. observed for KCl solutions is attributed to surface conductivity effects. Formulæ permitting the separation and evaluation of each of these effects are derived, and confirmed by measurements on dil. aq. KCl and $BaCl_2$. J. W. S.

Diffusion of vapours of organic solvents across cellulose ester films. A. PAKSCHVER and E. MANKASCH (J. Phys. Chem. Russ., 1938, **11**, 400—409).—Diffusion of H_2O, $COMe_2$, EtOH, Et_2O, and $(CH_2Cl)_2$ vapours across films of cellulose nitrate, acetate, and benzoate was measured. The diffusion coeff. D rises with increasing thickness of the film, presumably owing to stationary air layers on both sides of the film. If the film does not swell in the vapour diffusing D remains const.; in the opposite case D mostly decreases in the course of an experiment. There is no obvious relation between D and the magnitude of the swelling, which was also measured.

The solvent from which the film was prepared is irrelevant. J. J. B.

Two aspects of the second law of thermodynamics in systems at a non-uniform temperature. R. DEFAY (Bull. Acad. roy. Belg., 1938, [v], **24**, 474—487, 534—544).—Mathematical. W. R. A.

Partial molar volumes [$\bar{v}$] of strong electrolytes at high pressures. I. R. KRITSCHEVSKI (J. Phys. Chem. Russ., 1938, **11**, 305—309).—The thermodynamical equation $\bar{v} = \delta\bar{F}/\delta p$ is used, $\bar{F}$ being the partial molar free energy and p the pressure. $\bar{F}$ consists partly of the electrostatic energy of ions which depends on the dielectric const. (ϵ) of the solvent. Thus the equation $\bar{v} = a-(b/\epsilon^2)(\delta\epsilon/\delta p)$ is derived (a and b are consts.). This equation agrees with experiments of Adams (cf. A., 1932, 810) and Gibson (cf. A., 1937, I, 513). From the val. of b the mean radius of NaCl is calc. to be 0·9 A. J. J. B.

Exchange forces and electrostatic forces between ions in solution. R. W. GURNEY (J. Chem. Physics, 1938, **6**, 499—505).—The mechanism of ionic dissociation of mols. in solution has been investigated by the methods of statistical mechanics. W. R. A.

Acids and bases. G. N. LEWIS (J. Franklin Inst., 1938, **226**, 293—313).—A lecture.

Chemical constitution and the dissociation constants of monocarboxylic acids. X. Saturated aliphatic acids. J. F. J. DIPPY (J.C.S., 1938, 1222—1227; cf. A., 1938, I, 250).—The thermodynamic dissociation consts. of n-acids ($PrCO_2H$—$C_8H_{17}\cdot CO_2H$) and of $Pr^{\beta}CO_2H$, $CHEt_2\cdot CO_2H$, $Bu^{\beta}CO_2H$, and $Bu^{\gamma}CO_2H$ have been determined. Vals. for the n-acids (excluding $PrCO_2H$) fall as the series is ascended. *sec.*-$BuCO_2H$, $CHEt_2\cdot CO_2H$, and $Bu^{\beta}CO_2H$ are comparable with $PrCO_2H$ in possessing abnormally high strengths. $PrCO_2H$ does not differ from $EtCO_2H$ in strength, despite the marked fall in $Bu^{\gamma}CO_2H$. This observation is related to the anomalous order found in the p-alkylbenzoic acids. H. J. E.

Electrostatic influence of substituents on the dissociation constants of organic acids. I. J. G. KIRKWOOD and F. H. WESTHEIMER. **II.** F. H. WESTHEIMER and J. G. KIRKWOOD (J. Chem. Physics, 1938, **6**, 506—512, 513—517).—I. Mathematical. An extension of Bjerrum's theory of the influence of substituents on dissociation consts. (A., 1923, i, 1059), treating the mols. and ions in which the charges are embedded as cavities of low dielectric const., leads to better results, especially for short-chain dicarboxylic acids. It also permits a satisfactory treatment of the influence of dipolar substituents on dissociation consts.

II. The theory is extended to acids ellipsoidal in shape. W. R. A.

Free energy of the producer-gas reaction, and the "zero-point" entropy of graphite. F. D. ROSSINI (J. Chem. Physics, 1938, **6**, 569).—Using new thermodynamical data for the reactions $C_{(graphite)} + O_{2(G)} = CO_{2(G)}$, $CO_{(G)} + \frac{1}{2}O_{2(G)} = CO_{2(G)}$, and $C_{(graphite)} + \frac{1}{2}O_{2(G)} = CO_{(G)}$, the following new thermodynamical vals. for the producer-gas reaction $C_{(graphite)} + CO_{2(G)} = 2CO_{(G)}$, (I), have been calc.: $\Delta H^0_{298\cdot16} = 41{,}240 \pm 58$ g.-cal., $\Delta G^0_{298\cdot16} = 28{,}663 \pm 59$ g.-cal., $\Delta H^0_0 = 39{,}587 \pm 58$ g.-cal. By combination of this val. of ΔH^0_0 with the appropriate vals. of $(G^0 - H^0_0)/T$, the equilibrium consts. of reaction (I) have been calc. at various temp. The vals. obtained agree with recorded experimental vals., and indicate the non-existence of a "zero-point" entropy for graphite. W. R. A.

Equilibrium between chlorine and bromine and metallic halide melts. H. SCHÜTZA (Z. anorg. Chem., 1938, **239**, 245—256; cf. A., 1936, 681).—The equilibria metallic bromide + $Cl_2 \rightleftharpoons$ chloride + Br_2 have been investigated for Pb at 500°, Na at 800°, Ag at 500° and 800°, and Cd at 600°. The equilibrium consts. (activities being introduced where necessary) agree with those found indirectly. The equilibrium const. for $2BrCl \rightleftharpoons Br_2 + Cl_2$ is 0·140 at 800°. F. J. G.

Double decomposition in absence of solvents. XXXIV. Reversible mutual system of potassium and lead chlorides and sulphates. XXXV. Singular irreversible mutual system, of a transitional nature, of silver and cadmium chlorides and sulphates. O. S. DOMBROVSKAJA. **XXXVII. Irreversible mutual system of potassium and sodium nitrates and iodides.** F. I. VASENIN and A. G. BERGMAN. **XXXVIII. Irreversible mutual system of potassium and thallium chlorides and sulphates.** O. S. DOMBROVSKAJA. **XXXIX. Irreversible mutual system of potassium and sodium chlorides and fluorides.** V. D. POLJAKOV. **XL. Density isotherms of the irreversible mutual system of sodium and potassium chlorides and fluorides.** E. N. VARASOVA, N. P. LUSHNAJA, E. I. LUKJANOVA, and A. G. BERGMAN. **XLI. Complex irreversible system of potassium, sodium, and magnesium sulphates and chlorides.** A. G. BERGMAN and N. M. SELIVANOVA. **XLII. Irreversible mutual system of silver and thallium nitrates and sulphates.** P. T. SOKOLOV. **XLIII. Irreversible mutual system, of transitional type to singular systems, of sodium and potassium fluorides and iodides.** A. G. BERGMAN and F. P. PLATONOV. **XLIV. Complex mutual system of sodium, potassium, and thallium nitrates and chlorides.** R. N. NIANKOVSKAJA. **XLV. Irreversible mutual systems of sodium and potassium fluorides and sulphates.** S. MUKIMOV. **XLVI. Mutual system of sodium and potassium fluorides, chlorides, and iodides.** G. I. NAGORNIJ (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 135—150, 151—167, 169—187, 189—199, 201—212, 213—224, 225—235, 237—251, 253—266, 267—274, 275—290, 291—325).—XXXIV. The fusion diagrams of the system $K_2SO_4 + PbCl_2 \rightleftharpoons PbSO_4 + 2KCl$, and of its constituent binary systems, are given. The compounds $KCl,PbCl_2$, $KCl,2PbCl_2$, $K_2SO_4,PbSO_4$, and $K_2SO_4,2PbSO_4$ are confirmed.

XXXV. The fusion diagrams of the system $Ag_2SO_4 + CdCl_2 \rightarrow CdSO_4 + 2AgCl$, and of the constituent binary systems, are given. Compounds are not formed.

XXXVII. The fusion diagrams of the system $KNO_3 + NaI \rightleftharpoons NaNO_3 + KI$ and of its constituent

systems are given. The compounds $NaNO_3$,NaI and KNO_3,KI are suggested.

XXXVIII. The fusion diagrams of the system $K_2SO_4 + 2TlCl \rightleftharpoons Tl_2SO_4 + 2KCl$, and of the constituent binary systems, are given. Compound formation is not observed.

XXXIX. The fusion diagrams of the system $NaF + KCl \rightleftharpoons KF + NaCl$, and of the constituent binary systems, are given. Compounds are not formed.

XL. The *d*-composition curves of the system $NaF + KCl \rightleftharpoons KF + NaCl$, at 650°, 700°, 750°, and 800°, are given.

XLI. The fusion diagram of the system NaCl–KCl–$MgSO_4$ is given.

XLII. The fusion diagrams of the systems $TlNO_3$–Tl_2SO_4, $AgNO_3$–Ag_2SO_4, and $2AgNO_3 + Tl_2SO_4 \rightarrow 2TlNO_3 + Ag_2SO_4$ are given.

XLIII. The fusion diagram of the system $NaI + KF \rightarrow NaF + KI$ is given.

XLIV. The fusion diagram of the system KNO_3–$NaNO_3$–TlCl is given.

XLV. The fusion diagram of the system $2KF + Na_2SO_4 \rightarrow K_2SO_4 + 2NaF$ is given. The compounds Na_2SO_4,NaF and K_2SO_4,KF are suggested.

XLVI. Fusion diagrams are given for the system $NaI + NaCl + KF \rightarrow KI + KCl + NaF$. R. T.

Equilibria in binary systems containing phenylenediamines. N. A. Pushin and M. Dezelic (Monatsh., 1938, **72**, 65—75).—The m.p. diagrams are recorded for 11 binary systems containing *o*-, *m*-, or *p*-$C_6H_4(NH_2)_2$ and BzOH, CHPh:CH·CO_2H, salol, thymol, and menthol. BzOH and CHPh:CH·CO_2H form equimol. *compounds* with all three isomerides, but only those with *p*-$C_6H_4(NH_2)_2$ have congruent m.p. There also exists *compounds* 2BzOH,*o*-$C_6H_4(NH_2)_2$ with congruent m.p. and 2BzOH,*m*-$C_6H_4(NH_2)_2$ and 2CHPh:CH·CO_2H,*o*-$C_6H_4(NH_2)_2$ with incongruent m.p. No compounds are produced in the binary systems of salol with *o*-, *m*-, and *p*-$C_6H_4(NH_2)_2$ or in the systems thymol–*o*-$C_6H_4(NH_2)_2$, menthol–*p*-$C_6H_4(NH_2)_2$, and *o*-$C_6H_4(NH_2)_2$–*p*-$C_6H_4(NH_2)_2$. J. W. S.

Relationship of beryllium to the vitriol-forming group and to the alkaline-earth metals. III. Double-sulphate formation between sodium and beryllium sulphates in comparison with the vitriols. II. [Polytherms of the ternary system $BeSO_4$–Na_2SO_4–H_2O between 0° and 100°.] W. Schröder [with H. Hompesch and P. Mirbach] (Z. anorg. Chem., 1938, **239**, 225—239; cf. A., 1938, I, 517).—The 75°, 86°, and 99·5° isothermals show the existence of a *Be-vanthoffite*, $BeSO_4,3Na_2SO_4$, which was not detected in the earlier experiments because although stable at lower temp. (>42°) it is not formed except in presence of nuclei. Corr. 50° and 60° isothermals are given. F. J. G.

Micro-disperse type of solid solutions in the system $NiCl_2$–NH_4Cl–H_2O. N. S. Kurnakov and V. S. Egorov (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 101—134).—The solid phases at 0°, 25°, and 50° are $NiCl_2$,2, 4, and $6H_2O$, $NiCl_2,NH_4Cl,6H_2O$, and micro-disperse crystals of $NiCl_2,NH_4Cl,2H_2O$ (I) in NH_4Cl, or of NH_4Cl in (I). R. T.

Methods for the graphical representation of quaternary systems involving reciprocal salt pairs, making possible the extrapolation of tie-lines. J. E. Ricci and C. M. Loucks (J. Chem. Educ., 1938, **15**, 329—333).—A new method in which the system is plotted in an irregular pyramid in terms of equivs. of the components per 100 g. of mixture is described and compared with a similar method due to Schreinemakers (cf. A., 1908, ii, 571, 935). Shortcomings of the usual methods are discussed. L. S. T.

Representation of diagrams of quinary aqueous mutual systems of six salts as projections of a four-dimensional pyramid. V. P. Radischtschev (Ann. Sect. Anal. Physico-Chim., 1938, **11**, 5—25).—Geometrical methods are described. R. T.

Heat of formation of gaseous hydrogen bromide. W. A. Roth and E. Börger (Z. anorg. Chem., 1938, **239**, 327—328).—The reaction Ag + HBr (aq.) = $0·5H_2$ + AgBr occurs slowly at room temp. and is slightly exothermic. The heat of formation of gaseous HBr is therefore slightly <3·7 kg.-cal. per g.-mol. F. J. G.

Methods for determining heats of formation of oxides of strongly-reducing elements. W. A. Roth, E. Börger, and H. Siemonsen (Z. anorg. Chem., 1938, **239**, 321—326).—The sources of error inherent in various methods are discussed. In the direct method the use of Cellophane as auxiliary substance is advantageous. In this way the vals. for BeO and ZrO_2 are found to be 147·3 and 258·3 kg.-cal. per g.-mol., respectively, at 20°. F. J. G.

Heat of combustion of mono- and poly-styrene. W. von Luschinsky (Z. physikal. Chem., 1938, **182**, 384—388).—The heat of combustion of polystyrene (prepared by heating monostyrene at 180° for 6 hr.) is < that of styrene. The polystyrene produced can be separated into fractions with different heats of combustion. The results are discussed with reference to the energy changes involved in the polymerisation process. J. W. S.

Heat of dissolution of calcium and magnesium oxides and hydroxides. K. Taylor and L. S. Wells (J. Res. Nat. Bur. Stand., 1938, **21**, 133—149).—Data for the heat of dissolution ($-\Delta H_s$) of MgO in HCl show that the heat evolved decreases as the temp. at which the MgO is prepared is raised. This effect is shown by a decreasing rate of dissolution and by sedimentation experiments to be due to an increase of particle size with increasing ignition temp. No change of cryst. form occurs. The heat of hydration ($-\Delta H_h$) [$MgO \rightarrow Mg(OH)_2$ (I)] is similarly dependent on the properties of the MgO and (I). Vals. of ΔH_s for (I), CaO, and $Ca(OH)_2$ in HCl, and measured and calc. vals. of ΔH_h for CaO, are recorded. A. J. E. W.

Isotope action in the heat of dilution of highly concentrated electrolyte solutions and of water–dioxan mixtures at 25°. W. Birnthaler and E. Lange (Z. Elektrochem., 1938, **44**, 679—693).—The heats of dilution of solutions of LiCl and LiBr in H_2O and D_2O have been determined, and the data

compared with similar data for other solutions and with other properties of LiCl and LiBr solutions. Similar data for H_2O–dioxan and D_2O–dioxan mixtures have also been obtained. The data are represented graphically and are discussed theoretically at length. C. R. H.

Coupling of ionic transference at multiple electrodes. K. NAGEL (Z. Elektrochem., 1938, **44**, 637—639).—Theoretical. C. R. H.

Direct measurement of the electrolytic migration velocity in metallic solutions. K. SCHWARZ (Z. Elektrochem., 1938, **44**, 648—651).—A glass capillary, filled with Hg, dips into a vessel containing Hg, and a Pt wire is fused into the closed top of the capillary. When a current is passed through the Hg, there is a rise in temp. in the capillary. If the Hg in the vessel is replaced by an amalgam, the dissolved metal will, under the influence of the current, migrate up the capillary. Since the conductivity of the amalgam will differ from that of the pure Hg, the temp. in the capillary where there is amalgam will differ from that part where there is still pure Hg. By means of a thermoelement the point in the capillary where there is a temp. change can be ascertained, and its rate of movement measured. C. R. H.

Adsorption potentials and ageing liquids. G. EHRENSVÄRD and L. G. SILLÉN (Nature, 1938, **142**, 396—397).—Mainly a reply to criticism (A., 1938, I, 451). Freshly-distilled org. liquids show a marked difference in e.m.f. from those which have been kept in a glass bottle. The ageing process, which may be due to mol. re-association, is soon completed. L. S. T.

Galvanic cells with formation of alloys. V. A. PLOTNIKOV and D. P. ZOSIMOVITSCH (Compt. rend. Acad. Sci. U.R.S.S., 1938, **20**, 31—34; cf. A., 1934, 1178; 1935, 1080; B., 1936, 842; A., 1937, I, 189; 1938, I, 143; *et al.*).—A review, with special reference to the authors' published work. I. McA.

Kinetics of the electrode process at an ammonia gas electrode. A. S. FOMENKO (J. Phys. Chem. Russ., 1938, **11**, 578—584).—The potential change $\Delta\pi$ of platinised Pt in aq. NH_4NO_3 saturated with NH_3 is connected with the c.d. I of the polarising current by the equation $\Delta\pi = a - b \log I$, a and b being consts. Between 0° and 30° b rises from 0·034 to 0·039; its val. suggests that $NH_3 + 3OH' \rightarrow N + 3H_2O + 3\ominus$ is the slowest reaction at the electrode. J. J. B.

Mechanism of occurrence of potential drop on platinum in silver salt solutions. A. OBRUTSCHEVA (J. Phys. Chem. Russ., 1938, **11**, 473—483).—In $AgNO_3$ and Ag_2SO_4 solutions bright and platinised Pt electrodes assume the potentials of a Ag electrode since some Ag is deposited on Pt. This Ag originates from $Ag_2^{\cdot}$ ions. Their concn. may be estimated if the charge necessary to produce a definite shift of the Pt potentials is compared with the amount of $AgNO_3$ solution producing the same shift. 1N-$AgNO_3$ contains approx. 10^{-5}N-$Ag_2^{\cdot}$, and after heating with Ag up to 10^{-4}N. A simple adsorption of $Ag^{\cdot}$ on Pt does not affect its potential. J. J. B.

Polarographic studies with dropping mercury cathode. LXXIV. Electronegativity rule of the reduction potentials of organic compounds. M. SHIKATA and I. TACHI (Coll. Czech. Chem. Comm., 1938, **10**, 368—379).—Electrolytic reduction potentials recorded in the authors' earlier papers are summarised and it is shown that the reducibility of substituted aromatic ketones, azo- and NO_2-compounds increases with the electro-negativity of the substituents. F. R. G.

Electrolyte streaming at cathodes. I. Mercury and gallium dropping cathodes. H. J. ANTWEILER (Z. Elektrochem., 1938, **44**, 663).—Electrolyte streaming is due to the effect of a potential gradient, caused by reductions in c.d., on the electrical double layer on the drops of Hg or Ga. C. R. H.

Streaming phenomena at mercury cathodes. M. VON STACKELBERG, H. J. ANTWEILER, and L. KIESELBACH (Z. Elektrochem., 1938, **44**, 663—674).—Theoretical. Explanations of streaming anomalies at cathodes are reviewed, and experiments illustrating the phenomena are described. C. R. H.

Electrochemical polarisation. Reaction of the hydrogen electrode with oxidising agents, and determination of p_H in their presence. A. E. LORCH (Trans. Electrochem. Soc., 1938, **74**, Preprint 23, 349—356).—On polarising the H_2 electrode b O″ the rate of reaction depends primarily on the rate of diffusion (convection). For metallic electrodes of similar dimensions and surface characteristics the rate of diffusion is approx. const. J. W. C.

Mechanism of overvoltage. M. LOSCHKAREV and O. ESSIN (J. Phys. Chem. Russ., 1938, **11**, 410—419).—It is shown that different mechanisms of overvoltage may lead to identical expressions, and that the relation between c.d. and overvoltage alone is insufficient for determining this mechanism. J. J. B.

Overvoltage of hydrogen and solvents. I. I. S. NOVOSELSKI (J. Phys. Chem. Russ., 1938, **11**, 369—375).—The overvoltage of H_2 on Hg was measured in H_2O, MeOH, EtOH, and Et_2O. Tafel's equation holds for all the solvents. J. J. B.

Significance of the electrical properties of an insulating material. G. PFESTORF (Kunstharze, 1938, **8**, 218—223, 257—258, 260).—Various electrical terms are explained: dielectric const., power factor, dielectric loss factor, power loss, a.c. and d.c. resistance, dipole moment, dielectric angle of loss, surface resistance. F. McK.

Nature of the upper limit of inflammability of oxygen–hydrogen mixtures. M. V. POLJAKOV and I. E. NEIMARK (J. Phys. Chem. Russ., 1938, **11**, 555—568; cf. A., 1937, I, 251).—The upper pressure limit of inflammability of a $2H_2 + O_2$ mixture gradually disappears if the part of the quartz vessel which is filled with Pt wire is increased; the total length of the wire is irrelevant. The rate of the slow oxidation below the lower inflammability limit at 440° is increased by filling with wire such part of the vessel that the upper pressure limit would disappear, but it decreases if a larger part of the vessel

is obstructed by a Pt wire. The results are interpreted on the assumption that chain reactions can originate on the Pt surface, but this surface also breaks the chains originating in the space. Above the upper pressure limit the reaction occurs on the surface only. J. J. B.

Carbon monoxide–oxygen flame. IV. Influence of moisture on the intensity of the visible luminosity of the flame. E. KONDRATEEVA and V. KONDRATEEV (J. Phys. Chem. Russ., 1938, **11**, 331—337).—In presence of H_2O vapour [*e.g.*, 1 mm. (Hg) of H_2O for 30 mm. CO and 30 mm. O_2] CO is oxidised more completely but the luminosity of the flame is lowered. This decrease of the luminosity is too great for interpretation as due to extinction of luminescence; it reveals the reaction $CO + H_2O = CO_2 + H_2$. J. J. B.

Theory of the Bunsen flame. A. PREDVODITELEV (Tech. Phys. U.S.S.R., 1935, **2**, 364—368).—The application of the laws of hydrodynamics to the theory of the Bunsen flame by Michelson is criticised. It is assumed that the stable inner cone of the Bunsen flame is produced only when the velocity of flow at a given point in free space is equal to the normal velocity of the flame. A. J. M.

Primary decomposition of ethane, and the reaction between ethane and nitric oxide. T. J. GRAY, M. W. TRAVERS, and F. T. WHITE (Proc. Roy. Soc., 1938, **A**, **167**, 15—24).—The thermal decomp. of C_2H_6 and of C_2H_6–NO mixtures has been studied by the method of detailed analysis. The reduction of the rate of primary decomp. by the presence of NO is confirmed. A rapid reaction takes place between C_2H_6 and NO without increase of vol.; the product of this reaction was not isolated, but it appears to react with C_2H_6 to produce C_2H_4. The facts are not explicable on the theory of free radicals and an alternative explanation is proposed. G. D. P.

Two-stage auto-ignition of hydrocarbons and "knock." G. P. KANE (Proc. Roy. Soc., 1938, **A**, **167**, 62—80).—In the temp. range 270—400° ignition occurs by a two-stage process preceded by an induction lag t_1 before the formation of a cool flame and a second lag t_2 before the ignition of the cool flame products. An optical recording manometer, by means of which the two intervals t_1 and t_2 can be measured to an accuracy of 0·01 sec. at pressures up to 15 atm., is described. With C_3H_8 t_2 decreases more rapidly than t_1 with increasing initial pressure, and at a crit. pressure (~8 atm.) the two-stage is replaced by a single-stage process. With C_3H_6 the induction lags are much greater and no crit. pressure is observed. The kinetics of the process and the bearing of the results on the problem of knock in internal-combustion engines are discussed. G. D. P.

Projection of flame in gaseous mixtures and the phenomenon of knock in explosion engines.—See B., 1938, 1120.

Oxidation of chloroacetylene and bromoacetylene. L. A. BASHFORD, H. J. EMELÉUS, and H. V. A. BRISCOE (J.C.S., 1938, 1358—1364).—V.p. data are recorded for CH:CCl from −68·0° to −35·9° and for CH:CBr from −58·7° to −1·2°. The b.p. are −29·6° and 4·7°, and the latent heats 89 and 58 g.-cal. per g., respectively. The kinetics of the reactions between the vapours and O_2 have been studied. They have the characteristics of branching-chain reactions. Possible mechanisms are discussed. F. J. G.

Kinetics of the formation of a quaternary salt from gaseous constituents. A. GLADISCHEV and J. K. SIRKIN (J. Phys. Chem. Russ., 1938, **11**, 425—433).—The reaction $NEt_3 + MeI \rightarrow NMeEt_3I$ was followed by measuring the fall in pressure. It is heterogeneous and seems to occur on the salt surface rather than on that of glass. Its rate up to 50 mm. $\propto$ [NEt_3] and [MeI] and between 20° and 60° decreases with rise in temp. The apparent heat of activation is −1450 g.-cal. The rate of reaction is increased by vapour of $H_2O > MeOH > C_6H_6 > COMe_2$; this increase is <100%. J. J. B.

Autoxidation of quinol and of the mono-, di-, and tri-methylquinols.—See A., 1938, II, 441.

Period of induction in the interaction of potassium bromate and hypophosphorous acid. B. N. SEN (Coll. Czech. Chem. Comm., 1938, **10**, 321—329).—The formation of Br from $KBrO_3$ and H_3PO_2 is preceded by a period of induction which, when the concn. of one reactant is kept const., varies for 0·0007—0·0039M-$KBrO_3$ and 0·0075—0·0461M-H_3PO_2 inversely as the concn. of the other. The period is decreased by increase of temp. from 30° to 55°, by MeOH, EtOH, $Pr^{\beta}OH$, HCl, KBr, colloidal S, markedly decreased by $Na_2S_2O_3$, NH_4CNS, and $Na_2S_4O_6$, increased by $Pr^{\alpha}OH$, glycerol, Cl', NO_3', SO_4'', citrate, tartrate, H_2SO_4, and ovalbumin. Addition of glass wool does not affect the induction period; hence the reaction is homogeneous. F. R. G.

Kinetics of unimolecular decomposition in solution. J. K. SIRKIN and M. A. GUBAREVA (J. Phys. Chem. Russ., 1938, **11**, 285—295).—The reactions $NPhMe_2 + CH_2PhI \rightleftharpoons CH_2Ph{\cdot}NPhMe_2I$ are measured in 0·005N alcoholic solution. Between 50° and 60° the equilibrium const. is $1{\cdot}2 \times 10^{-6}e^{13,700/RT}$, the velocity coeff. of the unimol. reaction is $6{\cdot}4 \times 10^{11}e^{-24,900/RT}$, and that of the bimol. reaction is $7{\cdot}7 \times 10^{5}e^{-11,200/RT}$. The results are discussed from the point of view of the transition state theory. J. J. B.

Acid and alkali hydrolysis of acetamide and acetonitrile in heavy water. O. REITZ (Z. Elektrochem., 1938, **44**, 693—695).—In 0·1N-acid the hydrolysis of NH_2Ac is 50% quicker in D_2O than in H_2O, but with increasing acid concn. the difference diminishes until in 3—4N-acid it is 15% slower in D_2O than in H_2O. In the alkaline hydrolysis of NH_2Ac and MeCN the difference between the rates in D_2O and H_2O is less than the difference for acid hydrolysis. In the latter there is a D–H exchange in the Me group. In the alkaline hydrolysis of MeCN, D–H exchange occurs quicker than the hydrolysis, but in the alkaline hydrolysis of NH_2Ac the D–H exchange is slower than the hydrolysis. C. R. H.

Effect of temperature variation on the benzoin reaction.—See A., 1938, II, 444.

Theory of tarnishing processes. III. C. WAGNER and K. GRÜNEWALD (Z. physikal. Chem., 1938, B, **40**, 455—475; cf. A., 1936, 792).—The speed of oxidation, v, of Zn to ZnO is independent of the O_2 pressure, whilst those of Cu to Cu_2O and Ni to NiO increase with increasing O_2 pressures. These facts are explained on the basis of diffusion gradient considerations within the oxide phases. For thicker Cu_2O layers v is determined by the diffusion of the $Cu^{\cdot}$ ion and electron within the Cu_2O phase, and the observed v agrees with the val. calc. from electrical conductivity and $Cu^{\cdot}$ transport no. in the Cu_2O phase. For thinner Cu_2O layers, however, v is largely determined by the speed of phase boundary reactions. A graphical method for determining the speed of phase reactions and diffusion processes is outlined. W. R. A.

Formation of water films at solid-gas interfaces and their influence on metal dissolution. F. TÖDT (Z. Elektrochem., 1938, **44**, 578—579).—The initial velocity of corrosion of Fe by a H_2O film is reduced, within a few sec., to a val. approx. 0·01 of the original val. C. R. H.

Verification of the law of combustion of parallel layers of colloidal powders.—See B., 1938, 1235.

Conditions for initiation and propagation of detonation in solid explosives.—See B., 1938, 1235.

Determination of spontaneous ignition points [of solid and liquid fuels].—See B., 1938, 1120.

Kinetics of oxidation of naphthenic oils by oxygen.—See B., 1938, 1121.

Oxidation of phosphorus vapour and hydrogen phosphide with oxygen in presence of nitric acid.—See B., 1938, 1156.

Catalytic oxidation of iodides by persulphates. VI. Mechanism of the effect of organic catalysts. P. V. AFANASIEV (J. Phys. Chem. Russ., 1938, **11**, 376—383).—It is suggested that S_2O_8'' oxidises the semiquinonoid form (I) of the catalyst to its holoquinonoid form (II) which oxidises I′ to I_2. The reactions between S_2O_8'' and (I) and between (II) and I′ are quicker than that between S_2O_8'' and I′ because (I) and (II) are positively charged [in the case of a diamine (I) is a uni- and (II) is a bi-valent cation] and meet the anions S_2O_8'' and I′ much more often than these meet together. This suggestion explains many of the results obtained (cf. A., 1938, I, 464). It is also applicable to many enzymic reactions. J. J. B.

Influence of alkyl groups on reaction velocities in solution. II. Base-catalysed prototropy of phenyl alkyl ketones. D. P. EVANS and J. J. GORDON. **III. Alkaline hydrolysis of saturated aliphatic esters.** D. P. EVANS J. J. GORDON, and H. B. WATSON (J.C.S., 1938, 1434—1439, 1439—1444; cf. A., 1936, 941).—II. The velocities of the acetate-catalysed bromination of the series of ketones $CH_2R{\cdot}COPh$ (R = H, Me, Pr^{α}, Pr^{β}) and of $COPhPr^{\beta}$, and also of the acid-catalysed bromination of $COPhBu^{\alpha}$, have been studied, and the effects of the substituents on the vals. of P and E in the equation $k = PZe^{-E/RT}$ are discussed.

III. The velocities of alkaline hydrolysis of the series of esters RCO_2Et (R varying from Me to C_7H_{15}) have been studied and the effects of the substituents on the vals. of P and E in the above equation are discussed. F. J. G.

Organic catalysts of the Wurtz reaction. D. L. TALMUD (J. Phys. Chem. Russ., 1938, **11**, 526—532).—The yield of NaI in the reaction between $Bu^{\alpha}I$ and Na in Et_2O is increased many times by CPh_2O, $(CPh_2{:}{:})_2$, and $(CMePh{:}N)_2$. The rate of the reaction rises on addition of CPh_2O and reaches a const. val. when $[CPh_2O] : [Bu^{\alpha}I] = \sim 0{\cdot}005$. Only those substances show a catalytic activity which add two Na to one double bond; the additive product, *e.g.*, $CPh_2Na{\cdot}ONa$, is the real catalyst. J. J. B.

Catalytic activity of charcoal in the reaction between bromine and hydrogen. B. BRUNS and O. ZARUBINA (J. Phys. Chem. Russ., 1938, **11**, 300—304).—A mixture of H_2 and Br vapours was passed through a layer of charcoal and was then analysed. The rate of reaction $\propto [H_2]$. It increases with the temp. (120—190°); the "activation energy" is 30 kg.-cal. The C was prepared by heating sucrose-C in CO_2 at 850°. Its catalytic activity first rose and then declined with increasing time of heating. A max. in its adsorptive capacity towards Br was reached after a shorter time of heating than the max. of its catalytic activity. J. J. B.

Kinetics of the catalytic synthesis of ammonia. M. T. RUSOV and V. A. ROITER (J. Phys. Chem. Russ., 1938, **11**, 390—399).—The rate of NH_3 formation in presence of an industrial catalyst at 450° $\propto [H_2][N_2]^{0{\cdot}5}p^{-0{\cdot}25}$, p being the total pressure. The factor $p^{-0{\cdot}25}$ is due to an inhibition by adsorbed NH_3; when p is >10 atm. the adsorption of NH_3 becomes practically independent of p, and the factor $p^{-0{\cdot}25}$ disappears. The adsorption of NH_3 by the working catalyst can be estimated by a rapid cooling of the catalyst and analysis of the gases occluded in it. The rate of formation is max. at $[N_2] : [H_2] = 1 : 2$. The activation energy between 400° and 475° is 9 kg.-cal. J. J. B.

Rôle of sorption of nitrogen in the synthesis of ammonia in the presence of industrial iron catalysts. S. S. GAUCHMAN and V. A. ROITER (J. Phys. Chem. Russ., 1938, **11**, 569—577).—The rate of sorption of H_2 and of N_2 was measured between −184° and 450°. Two types of activated sorption of H_2 and at least one type of activated sorption of N_2 were observed. At 375° the rate of NH_3 formation is of the same order of magnitude as that of the N_2 sorption, but the activation energy of the NH_3 synthesis is $<$ that of the N_2 sorption. J. J. B.

Active oxides and reactions of solid substances. CXIII. States of mixed catalysts as determined by mixture relations and thermal pretreatment, illustrated by the system zinc oxide–ferric oxide. G. F. HÜTTIG (Z. Elektrochem., 1938, **44**, 571—577).—A lecture (cf. A., 1938, I, 410). C. R. H.

Decomposition of citric acid by ferric iron.—See A., 1938, II, 428.

Application of catalysis in industry.—See B., 1938, 1109.

Chromium-vanadium catalyst with a high velocity coefficient.—See B., 1938, 1156.

Reaction mechanism of a graphite electrode with a reversing direct current. V. SIHVONEN (Z. Elektrochem., 1938, **44**, 659—662).—Earlier work by the author on electrolysis with graphite electrodes is described, together with additional experiments on the electrolysis of H_2SO_4, NaOH, and Na_2SO_4, in some of which CH_2O and $CH_2(OMe)_2$ have been detected. A possible mechanism is suggested. C. R. H.

Electrolysis of mixtures of nitrates with salts of methylethylacetic acid.—See A., 1938, II, 428.

Ammonia in the electrodeposition of brass.—See B., 1938, 1176.

Electrodeposition of aluminium from aluminium bromide solutions.—See B., 1938, 1176.

Electrolysis of alkali chlorides with the aid of mercury cathodes.—See B., 1938, 1180.

Photochemical investigations in the Schumann ultra-violet. VI. Mechanism of the photochemical hydrogen-oxygen reaction compared with the thermal hydrogen-ozone reaction. W. GROTH and P. HARTECK (Z. Elektrochem., 1938, **44**, 621—627).—H_2–O_2 mixtures containing 0·3—8·0% of O_2 yield O_3, H_2O, and HO_2 when subjected to light of λλ 1470 and 1295 A. The mechanism of the reaction is discussed and the conclusion is reached that activated O_3 mols., instead of decomp. into O_2 and O, attack H_2 mols. forming H_2O and HO_2. The theory is supported by data for the thermal H_2–O_3 reaction. C. R. H.

Photochemical studies. XXVII. Effect of radiation on mixtures of nitrogen dioxide and nitrous oxide and its relationship to the photochemical decomposition of nitrous oxide. F. C. HENRIQUES, jun., A. B. F. DUNCAN, and W. A. NOYES, jun. (J. Chem. Physics, 1938, **6**, 518—522).—The photochemical decomp. of N_2O has been investigated to test the validity of the postulated theory of one primary process (*a*) $N_2O + h\nu = N_2 + O$ and two secondary processes (*b*) $N_2O + O = 2NO$ and (*c*) $O + O\ (+M) = O_2\ (+M)$. O atoms are obtained from the photochemical decomp. of NO_2 by ultraviolet radiation and these do not combine with N_2O, showing that (*b*) is unlikely. The results favour the alternative explanation of two primary processes (*a*) and (*d*) $N_2O + h\nu = NO + N$ and a subsequent secondary reaction (*e*) $N + N_2O = NO + N_2$. W. R. A.

Photochemistry of carbon monoxide. P. HARTECK, W. GROTH, and K. FALTINGS (Z. Elektrochem., 1938, **44**, 621).—Light of λ 1295 A. decomposes CO quantitatively into CO_2 and C_3O_2. The val. of the heat of dissociation lies between 193 and 219 kg.-cal. H_2–CO mixtures containing <1% O_2 give H_2O and HO_2, but if CO be absent, no HO_2 is formed. C. R. H.

Photochemical reactions between iron pentacarbonyl and ammonia. F. P. FEDOROV and D. L. TALMUD (J. Phys. Chem. Russ., 1938, **11**, 352—355).—$Fe(CO)_5$ and NH_3 in the vapour phase in visible light give a small amount of $CO(NH_2)_2$ and other (unidentified) products. J. J. B.

Spectral investigation of the energetics of the Herschel effect. J. N. GOROCHOVSKI and S. A. SCHESTAKOV (J. Phys. Chem. Russ., 1938, **11**, 356—368).—A photographic plate is irradiated by white light. A part of it is developed and shows the density of blackening D_0. Another part absorbs E_λ ergs of light having the wave-length λ, and is then developed; its density is $D_0 - \Delta D$. $A_\lambda = \Delta D/E_\lambda$ is the sp. intensity of the Herschel effect. It is small at λ <600 mμ. and >900 mμ. and shows a max. between λ = 700 and 800 mμ. The higher is D_0 the shorter is λ of the threshold and of the max.; at λ <650 mμ. the secondary irradiation intensifies or weakens the primary image according to whether D_0 is small or large. The λ of the max. is increased by sensitising the plates; desensitising the plates by large additions of KBr shifts the max. to λ <620 mμ. The results are explained on the assumption that the Herschel effect is due to destruction of colloid Ag particles by light. J. J. B.

"Critical quantum number" in photography. III. Stratified specimen of a polydisperse emulsion. S. P. SCHUVALOV (J. Phys. Chem. Russ., 1938, **11**, 384—389).—The relation between the no. of developable nuclei in a photographic plate and their total no. and the no. of photons spent in irradiating the plate is calc. J. J. B.

Photochemical equivalent in optical sensitising. S. E. SHEPPARD, R. H. LAMBERT, and R. D. WALKER (Nature, 1938, **142**, 478—479).—A continuation of former experiments (A., 1938, I, 151) shows that both with erythrosin, an acid dye, and with polymethine basic dyes, vals. for the photochemical equiv. approximate to unity, *i.e.*, for each quantum of light adsorbed per mol. of dye one atom of Ag is produced, at least, in the initial high-efficiency region of the adsorption. Scheibe's hypothesis (A., *ibid.*, 90) is unnecessary, and for the region studied is incorrect. L. S. T.

Photochemical polymerisation of methyl acrylate vapour. H. W. MELVILLE (Proc. Roy. Soc., 1938, **A**, **167**, 99—121).—The reaction is studied in the temp. range 20—150° at pressures up to 60 mm.; at λλ <2537 A. the mol. dissociates to H and propiolic ester. The temp. coeff. of polymerisation is negative. The effect of O_2 and butadiene as inhibitors of the reaction is investigated in some detail, and the results are used to measure the energy of activation of the propagation reaction. The behaviour of Me acrylate is compared with that of Me methacrylate previously studied (A., 1938, I, 261). G. D. P.

Photodichroism of cyanine. S. NIKITINE (Compt. rend., 1938, **207**, 462—464).—Measurements of the dichroism of collodion films containing cyanine after bleaching by insolation are described and discussed. The results are in agreement with the author's theory (A., 1938, I, 318, 528). A. J. E. W.

Photochemistry of reversible redox processes. II. Photochemical equilibrium of the type $A + BH_2 \underset{h\nu_B}{\overset{h\nu_A}{\rightleftharpoons}} AH_2 + B$, with A and B as photo-

active components in the visible spectrum. G. HOLST (Z. physikal. Chem., 1938, **182**, 321—340).—The action of light of various λλ in the visible region on the redox equilibrium between methylene-blue (I) and NHPh·NH·SO_3H has been investigated. The equilibrium depends principally on the relative absorptions of the H-acceptors (I) and NPh:N·SO_3H (II). The mol. extinction coeff. of (I) in the red and yellow region is ≫ that of (II) in the blue and violet region. The double absorption band of (I) in the red region is attributable to equilibrium between single and double mols., the equilibrium const. $[A]^2/[A_2]$ being about 10^{-4}. Quantum yields of both the forward and back reactions have been determined under various conditions. J. W. S.

Photochemical decomposition of *l*-ascorbic acid.—See A., 1938, II, 391.

Formaldehyde formation in the photo-oxidation of organic compounds.—See A., 1938, II, 430.

Polymerisation of acetylene by slow electrons. G. GLOCKLER and F. W. MARTIN (Trans. Electrochem. Soc., Preprints, 1938, **74**, 239—253).—The polymerisation of C_2H_2 by 40—90-e.v. electrons has been studied in a flow system by following the pressure change with a Pirani gauge. The determination of the no. of mols. reacting per ion-pair (M/N) is rendered difficult by the occurrence of secondary electrons, which cannot be allowed for accurately in the current measurements. The estimated max. val. of M/N is 8. A yellow solid polymeride (cuprene ?) has been isolated. A. J. E. W.

Influence of atomic hydrogen on the synthesis of ammonia by impact of positive ions. A. GELBERT and I. MOTSCHAN (J. Phys. Chem. Russ., 1938, **11**, 338—344).—$Na^{\cdot}$, $K^{\cdot}$, and $Cs^{\cdot}$ induce NH_3 formation only when their velocities exceed a threshold val. At higher velocities the rate of the NH_3 formation is almost independent of the field applied, although the ionic current increases with increasing voltage so that the NH_3 yield per ion decreases with increasing voltage. If a source of H atoms (a hot W wire) is present, the yield is high (0·15—0·3) and almost independent of the voltage. Probably the reaction between N and H atoms takes place on the walls of the vessel. J. J. B.

Precipitation stimuli. N. P. SMIRNOV (Utschen. Zap. Univ. Kazan, 1937, **97**, No. 8, 3—14, 15—32; cf. A., 1935, 1328).—A mathematical treatment of the co-pptn. of salts with a common ion is given. J. J. B.

Exchange of acetic acid and acetate with heavy water. L. D. C. BOK and K. H. GEIB (Z. Elektrochem., 1938, **44**, 695; cf. A., 1938, II, 169). C. R. H.

Inhibition of the ammoniacal silver oxide precipitation in presence of small amounts of ammonium nitrate. T. MILLNER (Z. anal. Chem., 1938, **114**, 26—30).—The prevention, by small amounts of NH_4NO_3 or HNO_3, of the pptn. of Ag_2O from aq. $AgNO_3$ by aq. NH_3 can be satisfactorily explained by a consideration of the equilibrium conditions in the reactions (Reychler, A., 1904, ii, 403) $AgNO_3 + 2NH_4OH = Ag(NH_3)_2NO_3 + 2H_2O$ and $Ag(NH_3)_2NO_3 + AgNO_3 + 2H_2O \rightleftharpoons 2AgOH + 2NH_4NO_3$. L. S. T.

Magnesium carbonate trihydrate, basic carbonate, new double compounds of magnesium carbonate, and basic magnesium sulphate. J. D'ANS and G. GLOSS (Kali, 1938, **32**, 155—158).—Methods for the prep. of magnesite; basic carbonates with $MgO : CO_2 : H_2O = 1 : 0{\cdot}68—0{\cdot}85 : 2$; $Mg(OH)_2,4MgCO_3,7H_2O$ as spherical, doubly-refracting crystals; $MgCl_2,MgCO_3,7H_2O$, hygroscopic crystals, n_α 1·49, n_β 1·47, n_γ 1·46, stable between −12° and 25°; $2MgCO_3,MgCl_2,6H_2O$ (very hygroscopic); $MgBr_2,2MgCO_3,6H_2O$; $MgBr_2,MgCO_3,7H_2O$ (very unstable); and possibly $MgI_2,MgCO_3,7H_2O$; $Rb_2CO_3,MgCO_3,4H_2O$; $MgSO_4,3Mg(OH)_2,6H_2O$; and $MgSO_4,5Mg(OH)_2,8H_2O$ are described. Double carbonates with Cs, and compounds of $MgCO_3$ with $Mg(NO_3)_2$ or $MgSO_4$, were not obtained (cf. A., 1936, 689). By boiling an aq. suspension while air is passing, $MgCO_3,3H_2O$ is quickly converted into a basic carbonate which is gradually changed into $Mg(OH)_2$. L. S. T.

Mixed crystal formation with tricalcium silicate and tricalcium aluminate. W. JANDER and J. WUHRER (Zement, 1938, **27**, 377—379).—*X*-Ray powder diagrams of the products of heating $2CaO,SiO_2 + CaCO_3 + Al_2O_3$ (24 hr. at 1400°) and $3CaO,SiO_2 + 3CaO,Al_2O_3$ (20 hr. at 1350°) indicate that 6—7% of aluminate dissolves in the silicate without alteration of the lattice const. This may be explained by assuming that 10 Al replaces 3Ca + 6Si in the mixed crystals. G. H. C.

Organic derivatives of scandium and of yttrium.—See A., 1938, II, 435.

Reaction of phosphoric anhydride with nitrogen dioxide and with nitric oxide. E. M. STODDART (J.C.S., 1938, 1459—1461).—When P_2O_5 is heated with NO_2 the *compound* $P_2O_5,2NO$ is formed with liberation of O_2. It is also formed by direct union of P_2O_5 and NO. The observations of Smith (A., 1928, 953) were incorrectly interpreted; no compound P_2O_5,xNO_2 is formed, and his conclusions as to the effect of intensive drying on the system NO_2–NO–O_2 are invalid. F. J. G.

Demonstration of the influence of acidity on the reactions of intermediate products formed in the reduction of chromic acid. R. LANG (Mikrochim. Acta, 1938, **3**, 113—115).—The formation of intermediate unstable valency states of Cr during the reduction of CrO_4'' is demonstrated by the fact that, unlike CrO_4'' and $Cr^{\cdot\cdot\cdot}$ solutions, a solution of CrO_4'' to which AsO_2' has been added causes oxidation of "ferroine" [*o*-phenanthroline–Fe^{II}] in 2N-H_2SO_4 and a reducing effect on "ferriine" in 0·3N-acid. The reversal of the process is attributed to variation of the energetics of the reaction with acidity. J. W. S.

Preparation of violet chrome alum. R. A. CRESPI GHERZI (Rev. Fac. Cien. Quím. La Plata, 1936, **11**, 17—19).—Formation of the green isomeride is prevented by saturating a cooled solution of $K_2Cr_2O_7$ in H_2SO_4 with SO_2 until the violet colour appears. F. R. G.

Chromium diguanides, phenyldiguanides, and bisdiguanides.—See A., 1938, II, 435.

Chrome-tanning liquors.—See B., 1938, 1203.

Concentration of chlorine isotopes by centrifuging. J. W. BEAMS and A. V. MASKET (Physical Rev., 1937, [ii], **51**, 384).—CCl_4 has been separated into light, medium, and heavy fractions in an air-driven centrifuge. Vals. of ρ of the fractions are in approx. agreement with theory. L. S. T.

Complex compounds of iron sulphate and sulphite-cellulose extract.—See B., 1938, 1203.

Atmospheric corrosion of iron.—See B., 1938, 1167.

Corrosion of steel.—See B., 1938, 1169.

Corrosion of iron and lead in soils.—See B., 1938, 1206.

Compounds of hexamethylenetetramine with simple and double salts of cobalticyanic acid and the nature of residual affinity.—See A., 1938, II, 434.

Preparation of pure platinum. N. COLLARI and A. BATTAGLIA (Annali Chim. Appl., 1938, **28**, 310—318).—$(NH_4)_2PtCl_6$ is reduced by H_2 at 800° and the finely-divided Pt washed free from Fe etc. with conc. HCl; this process having been thrice repeated, the Pt is dissolved in HNO_3–HCl and electrolytically (1·2 v., 0·05 amp. per sq. cm.) separated in 0·4% H_2SO_4 at 60° (Ir remains in solution). The Pt is finally recovered by dissolution in HNO_3–HCl, conversion into $(NH_4)_2PtCl_6$, etc. The Pt is fused on CaO with the O_2–H_2 flame and the purity is determined spectrographically. F. O. H.

Ammines. IX. Diaquo-, hydroxoaquo-, and acidohydroxo-diammines of bivalent platinum. H. J. S. KING (J.C.S., 1938, 1338—1346).—cis- and trans-*Dipicratodiamminoplatinum*, *cis*-$[Pt(NH_3)_2(C_6H_2O_7N_3)_2],4H_2O$ and *trans*-$[Pt(NH_3)_2(C_6H_2O_7N_3)_2],3H_2O$, are described. *cis*- and *trans*-Sulphatodiamminoplatinum exist respectively as *monohydrate* and *dihydrate* (cf. Cleve, K. Svensk Vet. Akad. Handl., 1872, **10**, No. 9). Measurements of Λ and p_H show that these and the nitratodiammines exist in aq. solution as diaquodiammino-salts, and that these are in equilibrium with hydroxo-salts. The diaquo-salts could not be isolated but the following *hydroxo-salts* have been obtained: *cis*-$[Pt(NH_3)_2(NO_3)(OH)]$; *trans*-$[Pt(NH_3)_2(NO_3)(OH)],0{\cdot}5H_2O$; *cis*- and *trans*-$[Pt(NH_3)_2(C_6H_2O_7N_3)(OH)]$; *cis*- and *trans*-$[\{Pt(NH_3)_2(OH)\}_2SO_4],2H_2O$ (I); *cis*- and *trans*-$[Pt(NH_3)_2(OH)_2]$. The dichloro- and dinitro-diammines are not aquotised in solution, but the *chloro*- and *nitro-hydroxodiammines*, *cis*-$[Pt(NH_3)_2(OH)Cl],0{\cdot}5H_2O$ and *cis*-$[Pt(NH_3)_2(OH)(NO_2)]$, have been obtained from *cis*-(I) and $BaCl_2$ or $Ba(NO_2)_2$. F. J. G.

Determination of p_H of soil.—See B., 1938, 1207.

Potentiometric titration of sodium salts of fatty acids. P. EKWALL (Kolloid-Z., 1938, **84**, 284—291).—The p_H of soap solutions can be determined by the H_2 or quinhydrone electrode. The solutions can be titrated potentiometrically with HCl with the aid of the quinhydrone or glass electrodes. The results of conductometric and potentiometric titration methods are compared. A nephelometric method, indicating the separation of free fatty acid, is reported, and some results are compared with conductometric titrations. E. S. H.

Chlorometry; Pontius' method. RIZARD (J. Pharm. Chim., 1938, [viii], **28**, 208—216).—Determination of Cl by $NaHCO_3$–KI is discussed. The reaction is held to proceed by way of ICl or by formation of NaOI. R. S. C.

Hypohalogenites in volumetric analysis. I. Hypobromite. O. TOMÍČEK and M. JAŠEK. **II. Hypochlorite and hypobromite.** O. TOMÍČEK and P. FILIPOVIČ (Coll. Czech. Chem. Comm., 1938, **10**, 353—367, 340—352).—I. At the optimum concn. of 0·1N-NaOBr and 0·5N-NaOH solutions kept in a cool, dark place, the titre changes irregularly, and is best determined by AsO_3''' or Tl in excess of NaOH. The end-point must be determined potentiometrically. Determination of I′, S_2O_3'', SO_3'', and CNS′ gives high results.

II. Accurate determination of I′, S_2O_3'', and CNS′ titrated with hypobromite is possible according to the method of Kolthoff and Stenger (A., 1935, 595) using $Ca(OCl)_2$ and KBr. Accurate vals. are obtainable, and the solution kept in the dark or in brown bottles is much more stable than that of NaOBr. F. R. G.

Volumetric determination of fluoride and silicofluoride ions. W. GEFFCKEN and H. HAMANN (Z. anal. Chem., 1938, **114**, 15—21).—F′ and SiF_6'' are determined with an accuracy of ~1% by acidifying the solution with a known excess of HCl and titrating with KOH and K_2SiO_3 using suitable indicators. The method is based on the reaction $6F' + SiO_2 + 2H_2O \rightleftharpoons SiF_6'' + 4OH'$. L. S. T.

Determination of fluorine in foods.—See B., 1938, 1226.

Hydrogen-reduction method for determination of oxygen in steel.—See B., 1938, 1170.

Determination of oxygen in alloy steels.—See B., 1938, 1170.

Characteristic light phenomenon for the detection of sulphur compounds. E. SCHRÖER (Z. physikal. Chem., 1938, **B**, **40**, 450—454).—The production of a characteristic blue colouring in the heart of a H_2 flame by S or gaseous S compounds is explained as the process of re-combination of the H atom with the S_2 mol., the excitation energy of which is equal to the heat of recombination of the H atom in resonance. W. R. A.

Determination of sulphur in alloys.—See B., 1938, 1173.

Determination of forms of sulphur in insoluble residues from hydrogenated coal.—See B., 1938, 1117.

Assay of sulphur ointments.—See B., 1938, 1228.

[Determination of hydrogen sulphide and carbon disulphide in air from viscose factories.]—See B., 1938, 1236.

Micro-determination of sulphate.—See A., 1938, III, 972.

Conductometric analysis of mixed sulphuric and butylsulphuric acids.—See B., 1938, 1132.

Electrometric determination of free sodium hyposulphite in reduced indigo preparations.—See B., 1938, 1136.

Use of persulphate in the determination of nitrogen without distillation. K. STEINITZ (Mikrochim. Acta, 1938, **3**, 110—112).—In the Rappaport method (cf. A., 1938, III, 462) only 0·1 g. of $Ti(OH)_4$ is used per 100 c.c. of digesting solution. The material containing 0·02—0·35 × 10^{-3} g. of N is heated with 2 c.c. of this solution until a brown colour appears. H_2O is added and then 0·1 g. of $K_2S_2O_8$. Digestion is continued until the solution is colourless and white vapours appear. After cooling, 2—3 c.c. of H_2O are added. If no yellow colour appears $\not>0·3 \times 10^{-3}$ g. of $K_2S_2O_8$ remains. The solution is again heated until H_2SO_4 fumes are evolved, cooled, neutralised, and titrated as in the Rappaport method. J. W. S.

Determination of water-soluble nitrogen in cyanamide.—See B., 1938, 1155.

Direct determination of ammonia in water.—See B., 1938, 1241.

Determination of ortho-, pyro-, and meta-phosphoric acids by colorimetric p_H titrations. A. B. GERBER and F. T. MILES (Ind. Eng. Chem. [Anal.], 1938, **10**, 519—524).—The acid containing 73—88% P_2O_5 is diluted in such a manner as to avoid hydration; equal portions of the diluted solution are titrated with NaOH, one to p_H 4·4 (bromocresol-green), and the other to p_H 8·8 (thymol-blue or oleo-red B) in presence of added $NaNO_3$ or NaCl. Aq. $AgNO_3$ is added in excess to either solution to form the normal Ag salts and the resultant acid is titrated (Me-red) with NaOH. From the data obtained the proportions of H_3PO_4, HPO_3, and $H_4P_2O_7$ are calc. L. S. T.

Spectro-photometric determination of ortho-phosphate and sodium ions. A. LECLÈRE (J. Pharm. Chim., 1938, [viii], **28**, 152—158).—The fluid containing <0·5 mg. of P_2O_5 with a NaOAc–aq. AcOH mixture (2 c.c.) and 4% U acetate (2 c.c.) at 100° in 5 min. affords a ppt. which when suitably washed and dissolved in dil. HCl affords with $K_4Fe(CN)_6$ in 20 min. a brown colour which is measured spectro-photometrically. 5 mg. of P_2O_5 per l. can be detected. A strongly acid solution of a Na salt with excess of the reagent (details given) affords at room temp. a ppt. which when washed and treated as above affords a colour applicable to spectro-photometric determination. J. L. D.

Determination of phosphoric acid in soil and fertilisers.—See B., 1938, 1206, 1207.

Determination of arsenic in brewing materials and wine.—See B., 1938, 1216, 1217.

Determination of arsenic, antimony, and tin in lead-, tin-, and copper-base alloys.—See B., 1938, 1171.

Evaluation of commercial arsenious oxide by titration with iodine.—See B., 1938, 1155.

Determination of boron in steel by special organic reagents.—See B., 1938, 1170.

Determination of boric acid in food products.—See B., 1938, 1226.

Determination of silica in quartzites by evaporation with hydrofluoric acid. T. KVIST (Z. anal. Chem., 1938, **114**, 21—26; cf. A., 1937, I, 45).—In routine determinations of SiO_2 in quartzites evaporation with HF in presence of H_2SO_4 does not give correct vals., but one evaporation with HF alone gives a result that is apparently correct. Repeated evaporations in order to reach const. wt. give results that are too high. L. S. T.

Determination of carbon monoxide and oxygen in industrial gases.—See B., 1938, 1156.

Detection of hydrogen cyanide [in air].—See B., 1938, 1236.

Determination of potash in fertilisers.—See B., 1938, 1207.

Colorimetric determination of sodium as uranyl manganese sodium acetate. W. C. WOELFEL (J. Biol. Chem., 1938, **125**, 219—227).—The reagent is prepared from solutions of (*a*) $UO_2(OAc)_2,2H_2O$ (80 g.), 30% AcOH (46 ml.), and H_2O (to make 520 g.), and (*b*) $Mn(OAc)_2,4H_2O$ (245 g.), 30% AcOH (23 ml.), and H_2O (to make 520 g.). (*a*) and (*b*) are mixed while hot, cooled to room temp., and one third of their vol. of 95% EtOH is added. After 24 hr., 0·2 g. of pptd. $NaMn(UO_2)_3(OAc)_9,6H_2O$ (I) is added to saturate the solution, which is filtered immediately before use. The sample (1 ml. containing 0·1—0·5 × 10^{-3} g. of $Na^{\cdot}$) is treated with 8 ml. of this reagent, the solution centrifuged, and the ppt. is washed with a saturated solution of (I) in glacial AcOH. The ppt. is finally treated with 10 ml. of KIO_4 reagent (KIO_4 5 g., 85% H_3PO_4 100 ml., H_2O 800 ml.), the colour developed being compared with standards. The application of this method to the colorimetric determination of Na in urine and blood serum is discussed. J. W. S.

Sensitive [test for] detection of lithium. O. PROČKE and R. UZEL (Mikrochim. Acta, 1938, **3**, 105—107).—The reagent used is prepared by dissolving 2 g. of KIO_4 in 10 c.c. of 2N-KOH, diluting to 50 c.c., treating with 3 c.c. of 10% aq. $FeCl_3,6H_2O$, and diluting again to 100 c.c. This solution is stable. In the test a drop of neutral solution under test is treated with a drop of reagent. In presence of >5 μg. of Li an immediate ppt. is formed. If no ppt. is formed the mixture is heated for 1—2 min. in boiling H_2O, when a yellowish ppt. or cloudiness is obtained in presence of >0·25 μg. The test is unaffected by presence of K, Rb, and Cs, but NH_4 salts should be removed. The test is more sensitive in presence of $Na^{\cdot}$, and by saturating the test solution with NaCl about 0·05 μg. of Li can be detected. J. W. S.

Soap-solution method for determining hardness of water.—See B., 1938, 1241.

Micro-determination of calcium in water.—See B., 1938, 1241.

Determination of calcium and magnesium [in water and soils] by soap titration.—See B., 1938, 1241.

Determination of magnesium and manganese in fertilisers.—See B., 1938, 1208.

Palmitate determination of magnesia in water.—See B., 1938, 1241.

Determination of magnesia and lime in cooking salt.—See B., 1938, 1154.

Determination of small quantities of magnesia in limestone and [sugar] defecation slime.—See B., 1938, 1155.

Determination of metals in foods.—See B., 1938, 1226.

Determination of zinc in light aluminium alloys containing lead, copper, antimony, tin, iron, manganese, and magnesium.—See B., 1938, 1174.

Precipitation of cadmium as sulphide and its separation from zinc. C. Zöllner (Z. anal. Chem., 1938, **114**, 8—15).—$Cd^{\cdot\cdot}$ is pptd. quantitatively by H_2S, in a form easy to filter, from solutions containing 15 c.c. of conc. H_2SO_4 per 100 c.c. Cl' must be absent. Quant. separation from $Zn^{\cdot\cdot}$ in different proportions is effected by a single pptn. in the same [H_2SO_4]. L. S. T.

Determination of lead [in spray residue].—See B., 1938, 1226.

Determination of lead in drinking water.—See B., 1938, 1241.

Potassium tungsten enneachloride as a reducing agent. R. Uzel and R. Přibil (Coll. Czech. Chem. Comm., 1938, **10**, 330—339).—$K_3W_2Cl_9$ can be used in an atm. of CO_2 to replace $TiCl_3$ in the reductometric determination of Cu, Fe, Cr, Ce, MnO_4', or BrO_3', the end-point being measured potentiometrically or by the ink-blue colour of W^V. F. R. G.

Accuracy of the dithizone mixed colour titration. H. Grubitsch and J. Sinigoj (Z. anal. Chem., 1938, **114**, 30—38).—The errors involved in the determination of Cu and Zn by means of the dithizone mixed colour titration method have been investigated. The error is large in the green and reddish-violet colour regions, but is a min. in the greyish mixed colour region, where the ratio colour change : added metal ion is a max. Comparative titrations to this mixed colour involve the min. errors, which are $\pm 1{\cdot}5\%$ for Cu and $\pm 2{\cdot}5\%$ for Zn. L. S. T.

Microchemical detection and determination of mercury. N. D. Costeanu (Mikrochim. Acta, 1938, **3**, 136—140).—Filter-paper is soaked with the solution under test and dried. A drop of aq. HI is then applied and the colour produced compared with standard stains produced on papers soaked in solutions of $Hg^{\cdot\cdot}$ and $Hg_2^{\cdot\cdot}$ of known concn. J. W. S.

Internal electrolysis. IV. Determination of small quantities of mercury in presence of copper and zinc. J. G. Fife (Analyst, 1938, **63**, 650—651; cf. A., I., 1937, 631).—Using apparatus described previously (A., 1936, 1479) with anodes of Cu wire, cathodes of Pt, anolyte of $CuSO_4$ = 5 g. Cu and 2 ml. of 96% aq. H_2SO_4 per 100 ml., and catholyte of 300 ml. approx. containing the Hg as $Hg(NO_3)_2$, $CuSO_4$, $ZnSO_4$, and 6 ml. of 96% aq. H_2SO_4, the electrolysis is carried out at 60° for 30—40 min. 0·7—7 mg. of Hg may be so determined. HNO_3 and nitrates may be substituted for H_2SO_4 and sulphates. E. C. S.

Dimethylamino- and diethylamino-phenyliminocamphor. Reagents for mercury. M. Singh (J. Indian Chem. Soc., 1938, **15**, 402).—Dimethylaminophenyliminocamphor in EtOH gives a deep scarlet colour with $Hg^{\cdot\cdot}$ salts and no colour with Pb, Cu, Ni, Co, Fe, Ca, Ba, Cd, Mn, and Mg salts. Bi and Ag salts give a faint pink colour and a slight, white ppt. The Et_2 compound gives with $Hg^{\cdot}$ and $Hg^{\cdot\cdot}$ a deep violet colour which disappears on passing O_2 into the solution, the colour reappearing on adding more reagent. Both reagents may be used on filter-paper for spot tests, the colour obtained with $Hg^{\cdot\cdot}$ disappearing and that with $Hg^{\cdot}$ becoming black on exposure to NH_3 vapour. The sensitivity in each case is 1 in 50,000. F. H.

Microchemical detection of europium in mixtures of rare earths. G. Beck (Mikrochim. Acta, 1938, **3**, 141—143).—In common with the lower valency states of Ti, Sn, V, Nb, Mo, W, U, and Re, $Eu^{\cdot\cdot}$ salts reduce cacotheline (I) to a violet dye. No other rare-earth metals give this reaction, and Eu can be detected in a solution containing these metals by reducing it with Zn and HCl in presence of (I). The limit of sensitivity of the test is 3 μg. per c.c. J. W. S.

Determination of aluminium in certain non-ferrous materials by use of ammonium aurintricarboxylate.—See B., 1938, 1176.

Determination of aluminium in cast iron.—See B., 1938, 1167.

Rapid determination of manganese in stainless steel.—See B., 1938, 1169.

Direct determination of iron in malt beverages.—See B., 1938, 1216.

Electrolytic analysis of nickel bronzes and light aluminium alloys.—See B., 1938, 1176.

Determination of nickel and boric acid in nickel-plating solutions.—See B., 1938, 1175.

Microchemical detection by means of redox action with chromic acid and a reducing agent. R. Lang (Mikrochim. Acta, 1938, **3**, 116—125).—Procedures are described for the microchemical detection of CrO_4'' with "ferriine" and H_2TeO_4, H_2TeO_4 with "ferriine" and $K_2Cr_2O_7$, CrO_4'' and TeO_4'' by induced oxidation of Br', and of CrO_4'', Mn, Ce, and V with $NHPh_2$. All the tests are based on the effects produced by unstable valency states of Cr. J. W. S.

Determination of chromium by alkaline mercuric oxide. P. Raychaudhury (J. Indian Chem. Soc., 1938, **15**, 317—320).—Cr^{III} salts, when boiled with HgO freshly pptd. from $HgCl_2$ and excess of NaOH, are quantitatively oxidised to Na_2CrO_4 in which the Cr is determined iodometrically. F. R. G.

Determination of small quantities of antimony in tartar emetic spray residues.—See B., 1938, 1210.

Rapid analysis of type metals.—See B., 1938, 1171.

Sensitive catalytic test for niobium and tantalum. A. S. KOMAROVSKI and M. J. SCHAPIRO (Mikrochim. Acta, 1938, **3**, 144—146).—The fact that the presence of substances capable of forming peracids causes reaction between S_2O_3'' and H_2O_2 to yield SO_4'' instead of S_4O_6'' (A., 1931, 1133) is applied to the detection of Nb and Ta. The reagent solution is freshly prepared from equal parts of 1% aq. $Na_2S_2O_3,5H_2O$, 25% aq. $BaCl_2$, 0·1N-AcOH, and 0·7% H_2O_2, and is mixed with an equal vol. of the solution under test, the opalescence produced being compared with that in a similar blank test. The method is capable of detecting 0·2 μg. of Nb or 0·4 μg. of Ta in 4 c.c. of solution. J. W. S.

Analysis of dental gold alloys.—See B., 1938, 1171.

Determination of gold and silver in cyanide [leach] solutions.—See B., 1938, 1172.

Thyratron-controlled thermostat. J. M. STURTEVANT (Rev. Sci. Instr., 1938, **9**, 276—279).—A modified form of the regulator described by Benedict (cf. A., 1937, I, 534) employs a resistance thermometer and phase-shifting thyratron circuit and gives continuous control accurate to ±0·003°. N. M. B.

Improved method of heat input control in glass fractionating columns. G. H. MOREY (Ind. Eng. Chem. [Anal.], 1938, **10**, 531—532).—The 12-l. Pyrex flask, suitably protected and insulated by asbestos, is heated electrically by three circuits of nichrome wire wound around the outside. L. S. T.

Application of the direct-fusion furnace to the helium method of determining the geologic ages of rocks. R. D. EVANS and C. GOODMAN (Physical Rev., 1937, [ii], **51**, 595).—With minor modifications, the furnace described previously (A., 1935, 723) can be used to release He from the boiling rocks at 2000°. L. S. T.

Apparatus for the determination of the variation of the coefficient of thermometric conductivity of disperse bodies. A. KURTENER and A. CHUDNOVSKI (Tech. Phys. U.S.S.R., 1937, **4**, 377—379).—The apparatus used previously is described. C. R. H.

Universal apparatus for micro-analytical purposes. F. HECHT (Mikrochim. Acta, 1938, **3**, 129—132).—An electrically-heated apparatus, suitable for drying micro-apparatus in a stream of dust-free air and for rapid evaporation of liquids, is described. The equipment can also be modified to enable these operations to be performed in vac. J. W. S.

Variable-angle liquid-prism spectrometer. T. V. STARKEY (J. Sci. Instr., 1938, **15**, 290—292).—An auto-collimating type instrument and its use in measuring n for liquids are described. N. M. B.

Permanence of absorption weakeners of antimony. G. O. LANGSTROTH and D. R. MCRAE (Rev. Sci. Instr., 1938, **9**, 282).—Sb films deposited on a quartz or glass surface at the exit of a heated tube through which a mixture of H_2 and SbH_3 is passed retain their transmission characteristics approx. const. for at least a year. N. M. B.

Use of an uncalibrated stepped wedge in quantitative spectrum analysis. L. ALIFANOVA and S. RAJSKI (Tech. Phys. U.S.S.R., 1937, **4**, 361—364).—Calibration of the wedge is not only unnecessary but also undesirable as it may introduce errors. C. R. H.

High-temperature Debye–Scherrer camera, and its application to the study of the lattice spacing of silver. W. HUME-ROTHERY and P. W. REYNOLDS (Proc. Roy. Soc., 1938, **A**, **167**, 25—34).—A camera for recording X-ray powder diffraction patterns of specimens maintained at temp. $\not>1000°$ is described. The parameter of the Ag lattice has been measured between 20° and 943° and the results are expressed in the form of an empirical equation. G. D. P.

Chemical analysis by X-ray diffraction. Classification and use of X-ray diffraction patterns. J. D. HANAWALT, H. W. RINN, and L. K. FREVEL (Ind. Eng. Chem. [Anal.], 1938, **10**, 457—512; cf. A., 1936, 1084).—Powder diffraction data for 1000 chemical substances are tabulated, and a scheme of classification which makes possible a routine use of the Hull method of X-ray analysis (A., 1919, ii, 470) is given. A survey of the apparatus required, the technique of obtaining and the method of interpreting the patterns, and the applications of X-ray diffraction is also given. L. S. T.

Precision powder camera for photographs at at high temperatures, and apparatus for measuring X-radiograms. F. SCHOSSBERGER (Z. Krist., 1938, **99**, 341; cf. A., 1938, I, 276).—Acknowledgment of the Seemann camera. I. McA.

Recording apparatus for the measurement of integrated intensities of X-ray reflexions. O. B. JACKSON and A. GOETZ (Physical Rev., 1937, [ii], **51**, 142). L. S. T.

X-Ray tube for crystal analysis and stress measurements. J. E. DE GRAAF and W. J. OOSTERKAMP (J. Sci. Instr., 1938, **15**, 293—303).—A high-output tube with earthed anode is described, and the factors determining the development of a tube for crystal analysis (brightness of the focal spot, its shape and load distribution, and the purity of the spectrum) are discussed. General expressions for the temp. of the focal spot and the temp. gradient at the cooled wall are deduced. N. M. B.

Microphotometer for analysing X-ray diffraction patterns of raw cotton fibre.—See B., 1938, 1139.

Use of the Lovibond tintometer in colorimetric analysis.—See B., 1938, 1169.

Simplified conductivity bridge assembly. G. M. EVANS (J. Chem. Educ., 1938, **15**, 389—391). L. S. T.

Method of mounting conductivity and potentiometer setups. P. E. HATFIELD and A. STRICKLER (J. Chem. Educ., 1938, **15**, 380—382). L. S. T.

New polarograph and its application. A. SCHMIDT (Z. Elektrochem., 1938, **44**, 699—708).—The construction and application of the instrument are described. C. R. H.

Electrode support for electrometric titrations. M. E. STANSBY (Ind. Eng. Chem. [Anal.], 1938, **10**, 529). L. S. T.

Electrolytic resistors for direct-current applications in measuring temperatures. D. N. CRAIG (J. Res. Nat. Bur. Stand., 1938, **21**, 225—233).—The resistors consist of glass capillaries filled with a solution of CuCl in HCl and EtOH, with Cu electrodes. They have a high temp. coeff. and high stability, and are suitable for use in meteorographs to measure temp. of −75° to 30°, to within 1°. A. J. E. W.

General theory of the double-focussing mass spectrograph. R. HERZOG and V. HAUK (Ann. Physik, 1938, [v], **33**, 89—106). O. D. S.

Application of electron test beams for micromanipulation. M. VON ARDENNE (Naturwiss., 1938, **26**, 562).—The use of a sharp convergent electron test-beam in connexion with the electron ultra-microscope is discussed. A. J. M.

Pulse chopper of the Geiger–Müller counter. M. KOZODAEV and G. LATISCHEV (Compt. rend. Acad. Sci. U.R.S.S., 1938, **20**, 21—23; cf. Getting, A., 1938, I, 160).—Factors affecting the time resolving power (τ) of counters are reviewed. A multivibrator system is designed for coincidence circuit; it uses resistances of ~1 MΩ, has flat characteristics (air- or A-filled tube), and τ, 3×10^{-4} sec., is the natural circuit period independent of counter processes. 1% of omissions occur at 10^3 pulses per min. I. McA.

Tube circuit for the Geiger–Müller counter. M. KOZODAEV (Compt. rend. Acad. Sci. U.R.S.S., 1938, **20**, 25—26).—It is shown why the circuit described, akin to that of Neher and Pickering (A., 1938, I, 277), fails, with lowered resistance, to reduce the pulse duration of the counter (cf. preceding abstract). I. McA.

Limiting sensitivity of an alternating-current method of measuring small magnetic moments. E. A. JOHNSON (Rev. Sci. Instr., 1938, **9**, 263—266).—The moment of small magnetic dipoles is measured by rotating the dipole inside a fixed coil and measuring the voltage induced in the coil by means of an a.c. amplifier. The limiting sensitivity is calc., and moments of 3×10^{-7}—8×10^{-8} c.g.s. unit can be detected. The method has been applied to the measurement of the polarisation in sedimentary deposits. N. M. B.

Laboratory apparatus for mixing small quantities of gas in a gas stream at constant ratio. A. VAN DER LINDEN (Chem. Weekblad, 1938, **35**, 664).—The main gas stream is measured by a gas-meter and passes through a constricted tube. By an arrangement of two respirators placed respectively in front of and behind the constriction, the second aspirator containing the gas to be added in small amount, the difference in pressure caused by the restriction is used to force the second gas into the main gas stream. Const. ratios of 0·1—1% can be maintained. Arrangements are made for filling the gas aspirator should it become empty. S. C.

Apparatus for examining firedamp and mine gases.—See B., 1938, 1118.

Portable instrument for analysis of hydrogen cyanide–air mixtures.—See B., 1938, 1154.

Silver membranes. H. J. READ and M. KILPATRICK (Trans. Electrochem. Soc., 1938, **74**, Preprint, 255—277; cf. A., 1933, 565; 1935, 931).—Apparatus and technique for the prep. of Ag membranes by distillation of Zn from sheets of a Ag–Zn alloy, and for the measurement of the permeability of the membranes to gases (k), are described. The effect of the alloy composition and of the time and temp. of distillation on ρ and k for the membrane are determined. Photomicrograms of typical membranes are given, the effect of reheating being illustrated. Vals. of the mean pore radius and no. of pores per unit area are calc. A. J. E. W.

Pyknometer. J. WESTBERG (Z. Spiritusind., 1938, **61**, 286—287).—In the described instrument, which is suitable for volatile liquids and those having low η, the thermometer (0—25°) is fused through the side of the bulb. A marked capillary neck to the bulb is surmounted by an expansion chamber closed with a ground stopper. A special funnel is provided for filling, and a capillary tube for drying. I. A. P.

Hydrogen sulphide generator. C. W. BENNETT (J. Chem. Educ., 1938, **15**, 377—379). L. S. T.

Lecture apparatus for [the collection of] gases. E. T. HOPPE (J. Chem. Educ., 1938, **15**, 369). L. S. T.

High-speed multi-jet oil diffusion pumps of metal construction. C. M. VAN ATTA and L. C. VAN ATTA (Physical Rev., 1937, [ii], **51**, 377). L. S. T.

Production of metal single crystals between 20 and 0·2 μ. J. RINEHART and A. GOETZ (Physical Rev., 1937, [ii], **51**, 147).—The liquid metal is sprayed by the application of gas at 100—150 atm. at a temp > the m.p. The resulting metal dust crystallises while hovering in an oil fog, and the particles are separated by sedimentation and centrifuging in order to obtain suspensions of crystals of equal size, which are then oriented crystallographically parallel. L. S. T.

Production of very thin beryllium flakes for a polonium–beryllium neutron source. T. R. FOLSOM (Physical Rev., 1937, [ii], **51**, 375).—A technique for producing very thin flakes of Be by a vac.-evaporation process, and the use of these flakes to produce an intense Po–Be neutron source conc. in a small vol., are described. L. S. T.

Rapid method for drying solid synthetic products. H. V. ALLISON (J. Chem. Educ., 1938, **15**, 379).—The arrangement described replaces the use of porous plates or an oven. 75—100 g. of wet material can be dried in 30—45 min. at room temp. L. S. T.

Use of isotopes in chemical investigation. K. H. GEIB (Angew. Chem., 1938, **51**, 622—626).—A review dealing with the use of radioactive indicators

(natural and artificial), and with the application of D for determining the course of reactions. Exchange experiments with isotopes other than D are also reviewed. A. J. M.

Determination of particle size and mol. wts. by centrifuges. P. VON MUTZENBECHER (Angew. Chem., 1938, **51**, 633—640).—A review dealing with the theory and technique of sedimentation analysis. A. J. M.

Electrostatic method of measuring elastic constants. D. BANCROFT and R. B. JACOBS (Rev. Sci. Instr., 1938, **9**, 279—281).—The method described employs a sensitive electrostatic pick-up for ascertaining the condition of resonance. Measurements of Young's modulus and the rigidity plotted for various temp. for a C-steel rod are accurate to 0·1%. N. M. B.

Greaseless stopcock. L. S. ECHOLS, jun. (Ind. Eng. Chem. [Anal.], 1938, **10**, 527).—A modified Hg-sealed stopcock, positive in action, insensitive to changes in temp., and eliminating hysteresis effects and loss of gas vol., is described. L. S. T.

Simplified portable McLeod gauge. E. W. FLOSDORF (Ind. Eng. Chem. [Anal.], 1938, **10**, 534). L. S. T.

Continuous extractor using hot solvent. T. R. P. GIBB, jun. (Ind. Eng. Chem. [Anal.], 1938, **10**, 547).—The continuous, automatic apparatus, which can be attached to any flask, employs solvents at the b.p.; since channeling and filter clogging are avoided, it is suitable for the extraction of adhesive, semi-solid tars, or gelatinous substances. The flow of solvent varies from 20 to 50 c.c. per min. Quantities of material much larger than usual can be dealt with. L. S. T.

Elimination of surface tension effects in specific gravity measurements. C. H. M. ROBERTS (Ind. Eng. Chem. [Anal.], 1938, **10**, 518—519).—A small drop of 1% aq. Na lauryl sulphate is added to the surface of the aq. solution after immersion of the plummet in order to ensure complete and reproducible wetting of the wire. Diffusion of the added substance into the solution is thus minimised; its effect on the *d* is negligible. L. S. T.

Compact self-regulating valve. L. WILLIAMS and A. H. W. BUSBY (Ind. Eng. Chem. [Anal.], 1938, **10**, 512).—The valve described maintains the rate of flow of gas into a vac. const. to within 10% for a variation in pressure from 28 to 2 in. of Hg. By a reverse arrangement of the needle, the valve can be adapted to the control of gas flow from a pressure source. L. S. T.

Surface tensiometer. H. N. HOLMES (Science, 1938, **88**, 223—224).—A modified Lloyds-Scarth (*ibid.*, 1926, **64**, 253) tensiometer is described. L. S. T.

Distillation apparatus. J. ERDÖS and B. MOLNÁR (J. Pharm. Chim., 1938, [viii], **28**, 216—219).—A compact apparatus avoiding exposure of the vapour to air is described. R. S. C.

Laboratory columns packed with silicon carbide. H. J. HALL and G. B. BACHMAN (Ind. Eng. Chem. [Anal.], 1938, **10**, 548—549; cf. B., 1936, 306).—Distillation columns packed with 3—6-mesh SiC compare favourably in efficiency with recently-developed packed columns, and can be used for most distillations of org. and inorg. substances. After use, efficiency is easily restored by refluxing with a suitable solvent or by boiling with HNO_3 or CrO_3 cleaning mixture. Test data for a mixture of C_6H_6 and $C_2H_4Cl_2$ are recorded, and the results of a comparison with metal packings are given. For the distillation of unstable halides or corrosive S compounds, SiC is advantageous. L. S. T.

"Twin tubes" for experiments with free radicals. L. ANSCHÜTZ (Ber., 1938, **71**, [*B*], 1902).—The apparatus consists essentially of two Schlenk tubes joined by a lateral tube. It is useful for the separation of a metallic ketyl solution from excess of metal, for the determination of the suitability of the experimental conditions for the prep. of unknown radicals, and for lecture experiments. H. W.

Geochemistry.

Determination of the meteorological conditions of the atmosphere by the use of radio-sounding balloons. H. A. THOMAS (Proc. Roy. Soc., 1938, **A**, **167**, 227—250).—The radio-transmitter, barometer, and thermometer units are described and the results of typical ascents are analysed. G. D. P.

Chemical composition of the rainfall in Holland. K. W. H. LEEFLANG (Chem. Weekblad, 1938, **35**, 658—664).—Analyses of the rainfall for colour, κ, solids, reducing power ($KMnO_4$), Cl, HNO_2, HNO_3, SO_4'', HCO_3', SiO_2, NH_4, albuminoid NH_3, CaO, MgO, alkali metals (Na), hardness, and carbonate hardness, in different seasons from 1933 to 1937, and at different distances from the coast, are recorded and discussed. S. C.

[Chemical and physico-chemical data for the air and thermal waters of] the Giusti grotto of Monsummano [Pistoia, Italy]. C. PORLEZZA and M. TRAMONTANO-GUERRITORE (Annali Chim. Appl., 1938, **28**, 281—289). F. O. H.

Metamorphism of ocean salt deposits. H. BORCHERT (Kali, 1938, **32**, 132—135, 143—146, 169—172).—A discussion, with especial reference to metamorphism by intrusive waters and to Jänecke's views. L. S. T.

Liberation of helium from [Travancore] monazite by heating. P. R. SUBBARAMAN and K. R. KRISHNASWAMI (Current Sci, 1938, **7**, 54—55).—40- and 80-mesh samples yielded 0·850 and 0·903 c.c. per g., respectively. For complete liberation of He in 4 hr. samples must be heated at 1000—1100°. L. S. T.

Internal structure of the earth; genesis of continents and oceans. A. DAUVILLIER (Compt.

rend., 1938, **207**, 452—454).—The internal composition and structure of the earth are discussed on analogy with meteorites. The surface structure is probably produced by similar processes to that of the moon, with which it is compared. H_2O in oceans is formed by reduction of ferrous metal oxides by H_2 during the cooling period. A. J. E. W.

Magnetic properties of the rocks constituting the earth's crust. I. Y. Katô (Sci. Rep. Tôhoku, 1938, [i], **27**, 91—100).—The effect of temp. on the magnetisation of lava in a weak field has been investigated by a method which is described. The susceptibility, which is dependent only on the amount of magnetite in the sample, reaches a max. at 200—250° and becomes zero at 625°. W. R. A.

Microscopical examination of non-opaque minerals. D. A. P. Wilson and V. L. Bosazza (J. Chem. Met. Soc. S. Africa, 1938, **38**, 539—543).—Grains of mineral concentrates are mixed with bakelite powder and briquetted by heating in a mould. Sections are then cut and examined in transmitted light. L. S. T.

Microscopical and chemical analyses of the Cambrian phosphorites from Sandomierz. W. Wawryk (Rocz. Pols. Tow. Geol. Krakow, 1932, **8**, 266—272).—Siliceous phosphate nodules are found in conglomerate. The amorphous and cryptocryst. phosphates consist of fluorapatite and F-free phosphorite. Ch. Abs. (*e*)

Solubility of quartz. C. S. Fox (Rec. Geol. Survey India, 1936, **69**, 423—425; Chem. Zentr., 1936, ii, 2323).—Attack of specimens of quartzite is attributed to some form of mollusc. A. J. E. W.

Size and specific gravity of seashore sand. Y. Ikeda, M. Aramata, and K. Yoneta (Mem. Fac. Eng. Hokkaido, 1938, **4**, 239—254).—Sp. gr., apparent sp. gr., porosity, and average diameter are tabulated for 206 seashore sands from Honsyu, Hokkaidô, and Karahuto. Frequency curves of these properties are plotted. L. S. T.

Origin of the Quebec phlogopite-apatite deposits. K. K. Landes (Amer. Min., 1938, **23**, 359—390; cf. A., 1938, I, 281).—The general geology, the deposits, the 21 minerals present and their paragenesis are described. Previous theories of the origin of the deposits are criticised and a new theory is advanced. L. S. T.

Petrographic and chemical study of the dacites of Draica, Hunedoara. V. Ianovici (Ann. Sci. Univ. Jassy, 1938, **24**, II, 303—313).—Constituent minerals are described and two chemical analyses are given. L. S. T.

Metalliferous deposits of Tulghes. VII. Huian outcrop. A. Chelarescu (Ann. Sci. Univ. Jassy, 1938, **24**, II, 346—372; cf. *ibid.*, 1937, **23**, II, 316).—Rocks and minerals adjoining the deposit are described, together with the constituents of the ore, which are magnetite (I), pyrite, chalcopyrite, hæmatite (II), limonite, and maghémite [(II) produced by alteration of (I)]. L. S. T.

Römerite. C. W. Wolfe (Amer. Min., 1938, **23**, 468).—A correction (cf. A., 1937, I, 431). L. S. T.

Sedimentary copper, vanadium-uranium, and silver in south western United States. F. R. Koeberlin (Econ. Geol., 1938, **33**, 458—461).—A discussion concerning the origin of these deposits (cf. A., 1938, I, 218). L. S. T.

Talc deposits of N. Carolina. B. C. Moneymaker (Econ. Geol., 1938, **33**, 461—463; cf. A., 1938, I, 281).—The talc and the pseudodiorite of southwestern N. Carolina and the contiguous parts of Georgia were probably formed by hot solutions of magmatic origin. L. S. T.

Tungsten mineralisation at Oreana, Nevada. P. F. Kerr (Econ. Geol., 1938, **33**, 390—427).—Rock types of the area, the minerals of the pegmatites, the sequence of mineralisation, and the origin of the Oreana deposit are discussed. This deposit is unique among American W deposits in that the scheelite mineralisation is considered to be pegmatitic. Beryl, oligoclase, albite, phlogopite, fluorite, quartz, and scheelite (I) are the chief minerals. The two forms of (I) deposition are complex pegmatite dykes cutting metadiorite, and lens-like masses along a limestone-metadiorite contact. The pegmatitic minerals appear to have been produced by hydrothermal solutions originating below and working upward through limestone to the metadiorite. (I) appears to have been produced within a comparatively narrow range of conditions accompanying the formation of alkali felspar and phlogopite mica. L. S. T.

Petrologic results of a study of the minerals from the Tertiary volcanic rocks of the San Juan region, Colorado. E. S. Larsen, J. Irving, F. A. Gonyer, and E. S. Larsen 3rd. (Amer. Min., 1938, **23**, 417—429; cf. A., 1938, I, 483).—Orthoclase and related alkaline felspars are not abundant in the lavas of the San Juan region, except in the groundmass. Three chemical analyses of sanidine phenocrysts from these lavas, the alkali and CaO contents of these phenocrysts and of the rocks in which they occur, and the optical properties of the sanidines are tabulated. Various relationships are represented graphically, and the crystallisation curve of albite and orthoclase in the rocks of the San Juan mountains is given. Minor accessories, such as magnetite, ilmenite, fluorapatite, zircon, sphene, etc., are discussed. A summary of the whole investigation is included. L. S. T.

Garnet crystals in cavities in metamorphosed Triassic conglomerate in York County, Pennsylvania. G. W. Stose and J. J. Glass (Amer. Min., 1938, **23**, 430—435).—The physical and optical properties of large, well-formed crystals of andradite garnet discovered in this locality are described. L. S. T.

Composition and occurrence of garnets. W. I. Wright (Amer. Min., 1938, **23**, 436—449).—Published analyses have been surveyed in order to determine which particular garnet is characteristic of each rock type. 223 analyses are expressed in percentages of spessartite (I), grossularite (II), pyrope, almandite (III), and andradite (IV). Triangular diagrams for occurrence of different varieties of garnet in eight different rock types, *e.g.*, granites, eclogites, calcareous

rocks, etc., are given. The results show the remarkable constancy of one variety of garnet in each rock type. (I) and (III) constitute 85—90% of the mols. of garnets from pegmatites and granites, and (II) and (IV) represent >90% of the garnet mols. in calcareous contact rocks. New chemical analyses of two garnets from biotite schists from Amisk Lake, N. Saskatchewan, and from Alaska are recorded. L. S. T.

Orthopyroxenes of the Bushveld type. H. H. HESS and A. H. PHILLIPS (Amer. Min., 1938, **23**, 450—456).—Two chemical analyses of bronzite and one of bronzitite, and the anomalous optical properties of such pyroxenes, are recorded and discussed. Orthopyroxenes from plutonic igneous rocks average 2·15% of CaO, whilst those from volcanic rocks average 2·28% of CaO, corresponding with ~9% of the diopside mol. and indicating that this represents the solubility of this mol. in Mg-rich orthopyroxenes at high temp. L. S. T.

[Metamorphic rocks of] Adelie Land, [Antartica]. D. STEWART, jun. (Amer. Min., 1938, **23**, 464—467).—The mineralogical compositions of eleven of these rocks are tabulated. L. S. T.

Geology of the Caribou stock, in the Front Range, Colorado. W. SMITH (Amer. J. Sci., 1938, [v], **36**, 161—196). L. S. T.

Geochemistry and mineralogy of Polar regions. A. E. FERSMAN (Compt. rend. Acad. Sci. U.R.S.S., 1938, **19**, 619—623).—Conditions characterised by low reaction rates and liquid [H_2O] are illustrated in a review of typical minerals and geological features. I. McA.

Pegmatites at Tinton, South Dakota. F. L. HESS and B. BRYAN, jun. (U.S. Bur. Mines, Rept. Invest., 1938, No. 3404, 1—19).—A preliminary report on these pegmatites, which have yielded small amounts of Sn ore. Large bodies of felspar (analysis is given of necronite—a fetid microcline) and quartz-spodumene-rock (averaging 2% Li_2O) are available. Amblygonite, mica, and some columbite are also present. L. J. S.

Analysis of a red earth and bitumen content of an argillite from Bustranje (S. Serbia). K. SCHOKLITSCH (Zentr. Min., 1936, **A**, 171—174; Chem. Zentr., 1936, ii, 1140).—The red earth contained SiO_2 45·48, TiO_2 1·30, Al_2O_3 20·33, Fe_2O_3 10·62, FeO 0·40, MnO 0·0002, MgO 2·42, CaO 0·005, Na_2O 0·11, K_2O 5·21, H_2O+ 8·47, H_2O- 5·97, S 0·20%. The argillite contained 1·3% of bitumen. H. J. E.

Plumbocalcite from Tsumeb, and tarnowitzite. W. SIEGL (Z. Krist., 1938, **99**, 95—121).—The $CaCO_3$: $PbCO_3$ ratio and mode of association in these minerals (I, II) has been studied by chemical, density, and *X*-ray analyses, confirmed by crystallographic and optical measurements. Neither is homogeneous. (I) has the dimensions and structure of calcite, cerussite and calcite (Zn, Mg, <1%) forming anomalous mixed crystals; the outer shell has a high fine-grained $PbCO_3$ content. The outer region of (II) is a member of the isomorphous aragonite–cerussite series ($PbCO_3$ ~3%) with rhombic cell elements *a* 4·97, *b* 8·015, *c* 5·79 A., ~1% > those of aragonite; excess of cerussite is neither free nor isomorphously associated. Cryst. co-orientation is discussed. I. McA.

Mineralogical nature of aluminium hydroxide in French W. African bauxites. J. DE LAPPARENT and R. HOCART (Compt. rend., 1938, **207**, 202—203).—The deposits are described. H. J. E.

Highly persistent fluorescence in natural calcites. M. DÉRIBÉRÉ (Compt. rend., 1938, **207**, 222—223).—A discussion of the colour and persistence of the fluorescence exhibited by various abnormal specimens. H. J. E.

Formation of bituminous sediments. K. KREJCI-GRAF (Schr. Gebiet Brennstoff-Geol., 1935, Pt. 10, 71—94; Chem. Zentr., 1936, ii, 2832).—Org. sea deposits usually form coals; sapropelites form bituminous coals or coal-oil shales, but with chalk bitumens and asphalts appear. No regular connexion between sea and mineral oil deposits can be traced, a more specialised nature being assumed for the latter. A. H. C.

Vegetable material as the origin of mineral oil. A. TREIBS (Schr. Gebiet Brennstoff-Geol., 1935, Pt. 10, 121—148; Chem. Zentr., 1936, ii, 2831).—It is concluded that plants play a part in the formation of bitumens and mineral oils (temp. $\not>200°$). Hæmin and chlorophyll (I) derivatives are stable only in H_2O as they decay in air. Non-fatty substances, carbohydrates, and proteins may also therefore be precursors of mineral oil but must contain (I) or its degradation products. A. H. C.

Origin of mineral oil. K. KREJCI-GRAF (Kali, 1936, **30**, 51—108, 25 pp.; Chem. Zentr., 1936, ii, 2476).—Available deposits are not dependent on the nature of accompanying rock and an examination of existing silt deposits points to decaying deposits as the origin of mineral oils. Org. material is deposited in O_2-free H_2O with clay etc. and by drying and decomp. (*e.g.*, by freezing) may be converted into peat. The possibility of an origin as coal is excluded by the presence in oils of porphyrins and characteristic metals. Marine rather than fresh-H_2O deposits are held to account for the greater part of mineral oil. Org. material is adsorbed, H or complexes rich in H split off by bacterial action, and residual bitumen is hydrogenated to paraffins. Oxygenation yields naphthenes and heavy oils, asphalt, ozokerite, graphite, etc. A. H. C.

Origin of petroleum. E. BERL (Amer. Inst. Min. Met. Eng., Tech. Paper 920; Petrol. Tech., 1938, **1**, No. 2, 18 pp.).—The theory is developed that petroleum has been formed from plant carbohydrates which were first converted into asphalt-like "proto-products" under the influence of high pressures and moderate temp. in an alkaline medium, and were subsequently hydrogenated and cracked. Experimental evidence supporting this hypothesis is described (cf. A., 1933, 929; 1937, I, 430). A. B. M.

Oil-field geology. V. BILIBIN (Azer. Neft Choz., 1935, No. 7—8, 53—56).—A geological discussion of the Zuikha oil fields. CH. ABS. (*e*)