BRITISH CHEMICAL ABSTRACTS

A.—PURE CHEMISTRY

NOVEMBER, 1935.

General, Physical, and Inorganic Chemistry.

Absorption spectrum of hydrogen. I. Heat of dissociation of H_2 molecule determined from rotational structure at long-wave limit of absorption continuum at 850 Å. H. BEUTLER (Z. physikal. Chem., 1935, B, 29, 315—327).—Measurement of the absorption of 2-metre layers of p-H_2 and $(\frac{3}{4}o\text{-}+\frac{1}{4}p\text{-})H_2$ under pressures up to ~ 0.05 mm. in the vac. spectrograph has shown for H_2 mols. in the rotational levels $K''=0$, 1, 2 $E''_{\text{rot}} + h\nu = D_0 + (1^2S - 2^2S) - H$, where the last term represents the energy of excitation of the H atom and E''_{rot} is the rotational energy of the absorbing mol., $h\nu$ the light energy required to cause dissociation into $H+H^*$, and D_0 the heat of dissociation. The absorption edge observed by Dieke and Hopfield at 849·43 Å. (A., 1927, 89) is ascribed to H_2 mols. rotating with $K''=3$. The val. $102\cdot72\pm0\cdot02$ kg.-cal. is calc. for D_0 for the ground state of p-H_2 (cf. this vol., 135, 555). R. C.

Triplet band formula for the general intermediate case, and its application to the $B^3\pi$, $C^3\pi$ terms of N_2. A. BUDÓ (Z. Physik, 1935, 96, 219—229). A. B. D. C.

Stark effect in molecular spectra of nitrogen, carbon monoxide, and hydrogen. W. RAVE (Z. Physik, 1935, 96, 276—277).—A correction of a rotation term diagram (cf. this vol., 675). A. B. D. C.

Absorption spectrum of solid oxygen. I. A. PRICHOTKO, M. RUHEMANN, and A. FEDERITENKO (Physikal. Z., Sovietunion, 1935, 7, 410—431).—The absorption spectrum of each of the three modifications of solid O_2 has been studied in the visible, and those of the α- and γ-modifications in the near ultra-violet. Results resemble those for liquid O_2 and compressed gaseous O_2, except that with α and β structural elements appear in addition to the continuous absorption exhibited by γ and by liquid O_2. In α there is a characteristic frequency interval of 1400 cm.$^{-1}$ No conclusions could be reached regarding differences in crystal structure nor whether the bands were due to O_2 or O_4 mols. W. R. A.

Effect of a magnetic field on the polarisation of impact radiation. W. H. McCORKLE (Physical Rev., 1935, [ii], 48, 532—535).—Na D line radiation excited by electrons moving parallel to a magnetic field of $\not< 300$ gauss shows about 16% polarisation. In fields 300—0 the polarisation decreases to zero. The variation indicates that the $3^2P_{3/2}$ level is a hyperfine multiplet which undergoes a Paschen–Back effect (cf. Larrick, A., 1934, 1279). N. M. B.

Spark spectrum of chlorine (Cl II). K. MURAKAWA (Z. Physik, 1935, 96, 117—118). A. B. D. C.

Spectra of argon in the extreme ultra-violet. J. C. BOYCE (Physical Rev., 1935, [ii], 48, 396—402). —Term tables of A II, III, IV are revised or extended through new $\lambda\lambda$ measurements. A lines are remeasured, and 23 new lines in A II, 57 in A III, 23 in A IV, and 10 in A V are tabulated. The nebular lines $\lambda 4711\cdot4$ and $\lambda 4740\cdot2$ are due to "forbidden" transitions in A IV. Ionisation potentials are A I 15·69, A II 27·80, A III 40·78, A IV 61 approx., and A V 78 volts approx. N. M. B.

Near ultra-violet spectrum of copper produced by the hot spark *in vacuo*. R. H. ZINSZER (Trans. Kansas Acad. Sci., 1934, 37, 175—185).—Measurements of 536 lines (2175—5428 Å.) are recorded. CH. ABS. (*e*)

Spectrum of trebly-ionised zinc. T. S. SUBBARAYA (Proc. Indian Acad. Sci., 1935, 2, A, 113—118).—The fundamental multiplet and term vals. of the Zn IV spectrum are deduced and about 50 lines classified. J. W. S.

Molecular spectrum of selenium vapour. II. B. ROSEN and M. DÉSIRANT (Bull. Acad. roy. Belg., 1935, [v], 21, 723—735; cf. this vol., 799).—The region 3400—8000 Å. of Se is discussed. The ultra-violet spectrum ends sharply at 3400 Å., and these short bands of narrow lines appear to be an independent and not a $^1\Sigma - ^1\Sigma$ system. A vibrational analysis is examined. There is predissociation at approx. 29,400 cm.$^{-1}$ The 5000—8000 Å. system of broad bands is attributed to fluctuations between a quasistable and the normal level of the Se_2 mol. Potential energy curves are given, and the calc. dissociation energy of Se_2 is approx. 1·9 volts. An expression is found for the principal $^1\Sigma - ^1\Sigma$ system. N. M. B.

Emission spectrum of the flame of bromine burning in hydrogen and mechanism of the reaction. T. KITAGAWA (Proc. Imp. Acad. Tokyo, 1935, 11, 262—264).—Wave-nos. and intensities for the heads of 43 emission bands, degraded towards the red, in the range 6875—5600 Å. are tabulated. A vibrational analysis leads to an expression for the band heads. If ' denotes the excited mol., $HBr'+Br_2=HBr+Br_2'$ and $HBr'+Br_2=HBr+2Br$ may take place simultaneously in the flame, the former showing the mechanism of the emission bands, and the latter with $Br_2'+Br_2=Br_2+2Br$ showing the mechanism of the chain branching in the combustion. N. M. B.

Spectrum of rubidium in mercury arc. I. A. BALINKIN and D. A. WELLS (Physical Rev., 1934, [ii], 45, 124).—At 1·45 amp. and 40 volts, 0·25—2% of Rb suppresses almost completely the Hg lines in the specially-designed Hg-arc lamp, which then operates with full Rb glow. L. S. T.

Rh I-like isoelectronic sequence to the spectrum of Ag III. W. P. GILBERT (Physical Rev., 1935, [ii], 48, 338—342).—Using the spectrum of Ag from the hollow-cathode discharge in He for the range 500—2600 Å. for identification of Ag III lines, 55 terms are established and data and classifications for 257 lines of the spark spectrum of Ag for the range 500—3000 Å. are tabulated. Term vals. are obtained, and the the ionisation potential of Ag III is 35·9 volts. N. M. B.

Spectra of van der Waals molecules. W. FINKELNBURG (Z. Physik, 1935, 96, 699—713).—The properties of van der Waals mols. and of their spectra are discussed. Consideration of the potential curves leads to conclusions regarding the expected spectra. The differences between valency-linked and van der Waals mols. are emphasised. The application of the Franck–Condon principle, and its limitations, are considered. The line resonance fluorescence of van der Waals mols. is considered as the analogue of resonance fluorescence of more stable mols. It is shown that the phenomenon is not connected with the existence of a stable vibration state of the excited mol., but each line absorbed can be re-emitted. Excited van der Waals states in liquids are also considered with special reference to the absorption spectrum of aq. solutions of Hg and the orientation of Hg mols. A. J. M.

Interpretation of the spectrum of the cadmium van der Waals molecule, Cd_2. W. FINKELNBURG (Z. Physik, 1935, 96, 714—719).—The general discussion of the behaviour of van der Waals mols. (cf. preceding abstract) is applied to the absorption spectrum of Cd_2 (A., 1934, 1147). The band at 2125 Å. is shown to be a singlet band and must be ascribed to the 2^1S term. A. J. M.

Isotope displacement in the arc spectrum of tungsten. K. R. MORE (Physical Rev., 1934, [ii], 45, 132—133; cf. A., 1934, 339).—Several of the stronger W I lines in the region 4000—5600 Å. show three components approx. equally spaced and of the same order of intensity, which are hence attributed to W^{182}, W^{184}, and W^{186}. L. S. T.

New energy levels in Au II, Hg III, Tl IV, Pb V, and Bi VI. J. E. MACK and M. FROMER (Physical Rev., 1935, [ii], 48, 357—366).—Corrections of existing data and identifications of all the previously unknown $5d^{10}$, $5d^96s$, and $5d^96p$ levels and some $5d^6d$ and $5d^97s$ levels are tabulated. N. M. B.

Spectrum of mercury in the photographic infra-red. K. MURAKAWA (Proc. Phys.-Math. Soc. Japan, 1935, 17, 14—33).—130 lines (6072—11,286 Å.) were measured. CH. ABS. (e)

Effect of heat on the intensity of mercury lines and bands. J. G. WINANS (Physical Rev., 1934, [ii], 45, 125).—The changes in intensity of Hg_2 bands on heating are the same as the well-known effects in

fluorescence. In addition, the continuous spectrum from 2650 to 2536 follows the 3300 Å. band in intensity changes. L. S. T.

Glow discharge with liquid air cooling. H. SCHÜLER and T. SCHMIDT (Z. Physik, 1935, 96, 485—488).—A glow discharge with both electrodes cooled by liquid air enables hyperfine structure of the Tl 5351 Å. line to be photographed with 10^{-6} g. of Tl. A. B. D. C.

Relative intensities in the principal doublet of thallium under arc and fluorescence excitation. L. N. MORSCHER, jun. (Physical Rev., 1935, [ii], 48, 406—407).—In agreement with theory, the components of the Tl resonance doublet $(6^2P_{1/2,\,3/2}—7^2S_{1/2})$ have approx. the same relative intensities under arc and fluorescence excitations. The average val. of the ratio is 0·92, the violet line being the stronger. N. M. B.

Nature of the "forbidden" lines in the Pb I spectrum. J. BLATON and H. NIEWODNICZAŃSKI (Physical Rev., 1934, [ii], 45, 64—65).—An interpretation of the lines previously reported (this vol., 138). L. S. T.

Band spectrum of Pb_2 in absorption and emission. E. N. SHAWHAN (Physical Rev., 1935, [ii], 48, 343—346).—A band system was observed when light is absorbed by Pb vapour at about 1400°, and is also found in emission. Data and a vibrational analysis are given for about 90 band heads, of a system degraded towards the red, in the range 4600—5200 Å. N. M. B.

Intensities in $^2\Pi-^2\Sigma$ transitions in diatomic molecules. L. T. EARLS (Physical Rev., 1935, [ii], 48, 423—424).—Simplified forms of the expressions due to Hill and Van Vleck (cf. A., 1928, 1076) are obtained. Calc. numerical vals. are plotted for all branches in typical cases. N. M. B.

Hyperfine structure in the solar spectrum. E. McMILLAN (Physical Rev., 1934, [ii], 45, 134).—Additional lines showing evidence of hyperfine structure of Mn I, Cu I, and Ba II in the sun have been found. L. S. T.

Dissociation, excitation, and emission in condensed sparks at high pressure. W. FINKELNBURG (Physical Rev., 1934, [ii], 45, 133). L. S. T.

Current–voltage relation for the spray discharge. H. SCHNITGER (Z. Physik, 1935, 96, 551—558).—Current increases with voltage, as does emission of electrons at high field intensities. A. B. D. C.

Measurement of X-ray wave-lengths by large ruled gratings. J. A. BEARDEN (Physical Rev., 1935, [ii], 48, 385—390).—In order to overcome errors of spacing due to using only a few lines of the grating, the latter was placed between the crystals of a double-crystal spectrometer, thus employing a large grating surface to determine the shape of the diffracted line and the position of max. intensity. Measurements were made on the Cu $K\alpha$ line. Differences between ruled grating and calcite crystal vals. of the lines Cu $K\alpha$, β, Cr $K\alpha$, β, and Al $K\alpha$ are found, using as the "true" calcite grating const. $d=3.02810$ Å. The consts. d, N, e, and h are re-calc. N. M. B.

Retardation loss of cathode rays on encountering atomic nuclei. A. SOMMERFELD and A. W. MAUE (Ann. Physik, 1935, [v], **23**, 589—596).—Mathematical. A. J. M.

Scattering coefficients of X-rays at short wave-lengths. S. J. M. ALLEN (Physical Rev., 1934, [ii], **45**, 122—123).—Mass absorption coeffs. of homogeneous X-rays have been measured down to λ 0·05 Å., and electronic scattering coeffs. at $\lambda\lambda$ 0·005—0·417 Å. are tabulated for 21 elements. L. S. T.

K-Series of magnesium and sodium. V. KUNZL (Nature, 1935, **136**, 437—438).—Using the ionic tube previously described (A., 1933, 881) new lines in the X-ray spectra of Mg and Na have been observed. L. S. T.

K Spectrum of silicon and some of its compounds. I. H. K. SON FLEMBERG (Z. Physik, 1935, **96**, 167—172).—K Spectra are given for cryst. Si, SiC, and SiO_2. A. B. D. C.

Direct and fluorescence excitation of the K level in thick targets of gold. K. B. STODDARD (Physical Rev., 1935, [ii], **48**, 43—46; cf. this vol., 138).—The ratio of the no. of $K\alpha$ line quanta, produced by direct cathode electron impact, to the no. of quanta produced by fluorescence was measured over a voltage range. The ratio of the probability of K-shell ionisation to continuous quantum excitation was determined. N. M. B.

Relative probabilities of the ionisation of K and L electrons of equal ionisation energy. B. G. EATON (Physical Rev., 1934, [ii], **45**, 131).—These probabilities have been determined by measuring, from the X-ray spectra of TlBr and $Tl(MoO_4)_2$, the relative nos. of quanta emitted from the K and L levels under cathode-ray bombardment. Under such bombardment any K electron is one half as likely to become ionised as any L_{22}. L. S. T.

Wave-length measurements of the Ni $L\alpha_{1,2}$ and Ni $L\beta_1$ lines of metallic nickel and of nickel salts. J. SHEARER (Phil. Mag., 1935, [vii], **20**, 504—513).—Photometric curves and λ data are given for the spectra from Ni, Ni_2O_3, NiO, and NiS. The λ of the max. and of the short-λ edge is approx. the same for each substance. The frequency difference between the Ni L lines equals that between the Ni $K\alpha_1$ and Ni $K\alpha_2$ lines. N. M. B.

Ratio between electronic and ionic current on a glow cathode which is subjected to a discharge in mercury vapour. S. GVOSDOVER (Physikal. Z. Sovietunion, 1935, **7**, 274—291).—When the conditions at the cathode are such that the field strength is zero, the ratio of the electronic to the ionic current is between 435 and 395. This ratio does not agree with that calc. from the theory of the double space-charge layer. Under certain conditions the current emitted by a W cathode which is surrounded by positive ions is > the saturation current at a similar cathode in a vac. O. J. W.

Ionisation effect of cathode rays in air. W. GERBES (Ann. Physik, 1935, [v], **23**, 648—656).—The energy loss ϵ per ion pair ($= V/S$, where V is the initial energy of the electron, and S the no. of ion pairs produced throughout the whole of its range) has been re-determined. A small correction is necessary in Eisl's val. (A., 1930, 5). ϵ is not independent of electron velocity between 9 and 60 kv., but increases as velocity decreases. A. J. M.

Influence of the medium on the photo-electric effect from metal to dielectric. L. V. GROSCHEV (Physikal. Z. Sovietunion, 1935, **7**, 619—630).—The internal photo-electric effect in rock-salt coloured red by colloidal Cu is regarded as an external photo-electric effect from the Cu to the NaCl as dielectric. In the region of complete light absorption the effect increases with decreasing λ. A weak max. at 5900—6000 Å. corresponds with a max. in the absorption curve. The limit for the photo-electric effect of Cu to NaCl is about 6400 Å., as against 2600 Å. for Cu to a vac. J. W. S.

Determination of thermionic work function of metals : application to nickel. G. W. FOX and R. M. BOWIE (Proc. Iowa Acad. Sci., 1933, **40**, 154).—The sample is heated by electron bombardment. As it cools, the electron emission from it charges a condenser, which is discharged at intervals through a ballistic galvanometer. Results for Ni agree with photo-electric determinations. CH. ABS. (e)

Theory of thermionic constants for pure metals. D. BLOCHINZEV and S. DRABKINA (Physikal. Z. Sovietunion, 1935, **7**, 484—500). W. R. A.

Nuclear photoelectric effect. J. CHADWICK and M. GOLDHABER (Proc. Roy. Soc., 1935, A, **151**, 479—493; cf. A., 1934, 1053).—Measurements have been made of the relative effects of the photo-neutrons from D_2 and Be under the action of Ra and Ra-Th γ-rays, as determined by the relative nos. of slow neutrons obtained in a paraffin scatterer. The reaction $D^2 + h\nu \rightarrow H^1 + n^1$ has been established, both protons and neutrons having been detected. The binding energy of the deuteron is $2\cdot1 \times 10^6$ e.v. Using the masses of H and D from disintegration data, the mass of the neutron is 1·0084, definitely > that of the H atom. The probability of disintegration of the deuteron by γ-rays is in agreement with theoretical calculations. The main reaction with Be is $Be^9 + h\nu \rightarrow Be^8 + n^1$, and the energy necessary to remove a neutron from Be is about $1\cdot6 \times 10^6$ e.v. No evidence of a nuclear photo-disintegration has been found in any other elements. L. L. B.

Distribution of velocities of photo-electrons in thin metallic films (Al). E. VASSER (Physikal. Z. Sovietunion, 1935, **7**, 532—546).—The energy distribution amongst photo-electrons emitted from thin Al films has been investigated as a function of the λ of the light and of the thickness of the Al. The results are discussed with reference to possible deduction of the energy vals. of electrons in the metal and the mechanism of their emission. J. W. S.

Emission of electrons under the influence of chemical action. VI. Reactions of liquid NaK_2 with gaseous ClCN, $HgBr_2$, $(OH)_2$, O_3, and with some gases giving small negative emission. A. K. DENISOFF and O. W. RICHARDSON (Proc. Roy. Soc., 1935, A, **150**, 495—519).—The heterogeneous reactions between liquid NaK_2 and gaseous ClCN,

$HgBr_2$, $(OH)_2$, and O_3, at very low pressures, give rise to a negative emission from the metal, comparable in magnitude with that observed with the gaseous halogens (A., 1934, 468). The reactions with MeCl, $(CN)_2$, $Hg(CN)_2$, and H_2S give a very small negative emission. The electron energy spectra obtained with $HgBr_2$, $(OH)_2$, ClCN, and O_3 are examined with the object of ascertaining their structure by the method based on the relation $E_m = D_0 = const.$ The theory of the chemical electron emission previously developed (this vol., 557) is supported.   L. L. B.

Problems of the new quantum theory of the electron. V. WEISSKOPF (Naturwiss., 1935, **23**, 631—637, 647—653, 669—674).—A review.
                                        A. J. M.

Motion of electrons in electric and magnetic fields taking into consideration the action of the space charge. S. J. BRAUDE (Physikal. Z. Sovietunion, 1935, **7**, 565—571).—The space-charge density, distribution of potential, and the electron paths are deduced for a plane plate condenser.   J. W. S.

Velocity distributions of elastically colliding electrons. P. M. MORSE, W. P. ALLIS, and E. S. LAMAR (Physical Rev., 1935, [ii], **48**, 412—419).— Mathematical. The velocity distribution function is determined for the case of electrons in a uniform electric field and for a homogeneous beam of electrons shot into a field-free space. Satisfactory agreement with experiment is found.   N. M. B.

Polarisation of electron waves by scattering. H. HELLMANN (Z. Physik, 1935, **96**, 247—250).— Theoretical.   A. B. D. C.

Total scattering of electrons in helium. A. L. HUGHES and W. HARRIS (Physical Rev., 1935, [ii], **48**, 408—411).—Total scattering, measured for the electron energy range 1000—200 volts, agrees with the vals. given by Morse's formula at 1000 and 700 volts; a slight discrepancy at 500 increases down to 200 volts.   N. M. B.

Emission of positrons from a thorium-active deposit. A. I. ALICHANOV, A. I. ALICHANIAN, and M. S. KOSODAEV (Nature, 1935, **136**, 475—476).— The no. and energy distribution of positrons from Al activated with Th-$B+C$ agree with the Hulme–Jaeger theory of internal conversion of γ-rays on negative levels.   L. S. T.

Production of high-energy electron pairs. W. H. FURRY and J. F. CARLSON (Physical Rev., 1934, [ii], **45**, 137).—The production of an electron pair by a γ-ray traversing the field of a nucleus has been studied in greater detail. The production of pairs by 3×10^6 volt γ-rays is consistent with experimental results obtained with artificial γ-rays from Be, but for energies $> 2 \times 10^7$ volts the predicted pair production is $>$ that computed by Oppenheimer and Plesset and irreconcilable with experiment.
                                        L. S. T.

Production of electron pairs. G. RACAH (Nature, 1935, **136**, 393—394).—The cross-section for the production of electron pairs by collisions between electrons and nuclei is discussed, and several approx. formulæ are submitted.   L. S. T.

Production of electrons and positrons by a collision of material particles. II. E. LIFSCHITZ (Physikal. Z. Sovietunion, 1935, **7**, 385—398; cf. ibid., 1934, **6**, 244).—The cross-section for the production of electron pairs by a collision of two particles with a velocity much $<$ that of light is calc.   W. R. A.

Statistics of electron interaction. E. L. HILL (Physikal. Z. Sovietunion, 1935, **7**, 447—451).—The influence of the Pauli principle on the interaction of electrons is discussed. The theory of Wigner and Seitz (cf. this vol., 153) relating the statistical correlation to repulsive terms only between electrons with parallel spin components should be replaced by different correlations between electrons with parallel or anti-parallel resultant spins. The calculations for two electrons and for a completely degenerate system of many electrons are given.   W. R. A.

Radiation from the mutual annihilation of protons and electrons. A. L. HUGHES and G. E. M. JAUNCEY (Physical Rev., 1934, [ii], **45**, 217—218).   L. S. T.

Light-excitation in He by He atoms of 0 to 6000 volts energy. W. MAURER (Z. Physik, 1935, **96**, 489—502).—This excitation process has much in common with excitation by electrons of 0—40 volts energy.   A. B. D. C.

Charging and ionising cross-section of helium with respect to He^+. F. WOLF (Ann. Physik, 1935, [v], **23**, 627—647).—Apparatus previously described (this vol., 1048) is used for determining the charging and ionising cross-section of He with respect to He^+. The charging cross-section decreases in the velocity range 20—1020 volts, with increasing velocity. It is $\ll$ the effective cross-section. Ionisation of He by He^+ occurs below 400 volts. The efficiency increases slowly with increasing velocity, but even at 1020 volts ionising cross-section is little > 0.5 cm.^{2}/cm.^{3}
                                        A. J. M.

Normal state of the helium molecule ion, He_2^+. S. WEINBAUM (J. Chem. Physics, 1935, **3**, 547—550).—Theoretical. Calc. vals. for D_e and r_e are 2.22 e.v. and 1.097 Å., respectively.   H. J. E.

Ionisation of neon and argon by singly-charged magnesium ions. J. C. MOUZON and N. H. SMITH (Physical Rev., 1935, [ii], **48**, 420—422).—The efficiency of the Mg ions is about 60% of that of Na ions for both gases. The influence of mean free path is discussed.   N. M. B.

Theory of combination coefficients for large ions. W. R. HARPER (Phil. Mag., 1935, [vii], **20**, 740).—A correction (cf. A., 1934, 937).

Elastic and inelastic cross-sections of the mercury atom. F. L. ARNOT and G. O. BAINES (Proc. Roy. Soc., 1935, **A**, **151**, 256—274).—Using a new apparatus and method, curves have been obtained showing the variation of the total, elastic, and inelastic cross-sections of the Hg atom for electrons of energy 4—180 volts. The ionisation and excitation functions for the 2^3P_1 (4.86 volts), 2^1P_1 (6.67 volts), and 3^1D_2 (8.8 volts) states have also been obtained.   L. L. B.

Effective collision cross-sections of the alkali atoms in various gases. S. ROSIN and I. I. RABI (Physical Rev., 1935, [ii], 48, 373—379).—The mean free paths and effective collision cross-sections of neutral atoms of Li, Na, K, Rb, and Cs were measured in H_2, D_2, He, Ne, and A by the method of mol. beams. Results show a larger collision cross-section in D_2 than in H_2 for all the alkalis except Li, and this effect is interpreted as due to the smaller spacing of the D_2 rotational levels. N. M. B.

Introduction of quantum periods into Mendeléef's table. A. MAZZUCCHELLI (Gazzetta, 1935, 65, 467—473).—The sub-division of Mendeléef's table according to the quantum nos. of the external electrons of the atoms is discussed. O. J. W.

Systematisation of isotopes. K. SITTE (Z. Physik, 1935, 96, 512—519).—Systematisation follows by plotting nuclear charge, Z, against $(m - Z)/Z$, where m is the nuclear mass. A. B. D. C.

Relative abundance of the lithium isotopes. G. P. HARNWELL and W. BLEAKNEY (Physical Rev., 1934, [ii], 45, 117).—Li ions from a filament coated with spodumene gave for the current ratio $Li^7 : Li^6$ an average val. of 8·4. L. S. T.

Isotopes of arsenic, selenium, mercury, and lead. H. J. WALKE (Phil. Mag., 1935, [vii], 20, 479—481).—Isotopic constitution is discussed on the basis of a theory recently proposed (cf. this vol., 275, 427, 910). N. M. B.

Isotopic constitution of gold from band-spectroscopic examination. S. IMANISHI (Nature, 1935, 136, 476).—The AuH violet $^1\Sigma \rightarrow {}^1\Sigma$ band system gives no evidence for the existence of Au^{199}, in agreement with Dempster's result (this vol., 1048). L. S. T.

Iridium isotopes and their nuclear spins. B. VENKATESACHAR and L. SIBAIYA (Proc. Indian Acad. Sci., 1935, 2, A, 203—207).—The hyperfine structure of Ir lines indicates that it consists of two isotopes with nuclear spins $\frac{1}{2}$ and $\frac{3}{2}$. Consideration of the known isotopes of heavy metals indicates that these have mass nos. 191 and 193, respectively. As the relative abundance is about 1 : 2, the accepted at. wt. of Ir (193·1) is probably too high. J. W. S.

Iridium isotopes and their nuclear spin. B. VENKATESACHAR and L. SIBAIYA (Nature, 1935, 136, 437; see preceding abstract).—The estimated relative abundance of Ir^{191} and Ir^{193} is 1 : 2, giving an at. wt. < 193. L. S. T.

Efficiency of the tube counter. S. M. SKINNER (Physical Rev., 1935, [ii], 48, 438—447).—A detailed mathematical survey. Expressions are obtained for the efficiency of counting, average recovery time, average voltage impulse delivered to the amplifier, average no. of particles counted per unit time in terms of no. of particles arriving per unit time, the time const. of the counter, and a parameter const. for a given counter. N. M. B.

Collisions of α-particles in hydrogen. E. POLLARD and H. MARGENAU (Physical Rev., 1935, [ii], 48, 402—405; cf. this vol., 910).—The projection of protons by Po α-particles was investigated. The variation of the yield of projected protons with α-particle velocity agrees with the Rutherford–Darwin law for low velocities, and a smooth rise for higher velocities. No resonance effects were observed. The effect of α-particle straggling on the detectability of resonance effects is examined. N. M. B.

Registration of the ionisation curve of a single α-particle. (A) G. STETTER. (B) H. ALFVÉN (Nature, 1935, 136, 394; cf. this vol., 1048).— Polemical. L. S. T.

Radioactivity of solids determined by α-ray counting. (MISS) G. D. FINNEY and R. D. EVANS (Physical Rev., 1935, [ii], 48, 503—511).—A complete theory of α-ray counting for thin and thick radioactive sources is developed, and vals. of numerical consts. are tabulated. New methods for determining the Th content of geological samples are described. Analyses of a series of igneous rocks show Th contents $3·9$—$16·5 \times 10^{-6}$ g. Th per g., with an average Th/U ratio of 7. N. M. B.

β-Ray of actinium. D. E. HULL, W. F. LIBBY, and W. M. LATIMER (J. Amer. Chem. Soc., 1935, 57, 1649—1652).—β-Particles from Ac, having a max. energy of about 220,000 e.v., have been detected. E. S. H.

Energy spectrum of the β-rays of radium-E. F. A. SCOTT (Physical Rev., 1935, [ii], 48, 391—395).— Using the magnetic focussing method and Geiger counter, the energy distribution curve was measured. The max. of the spectrum was at $3·87 \times 10^5$ e.v., and the end point at $(15·34 \pm 0·28) \times 10^5$ e.v., corresponding with an $H\rho$ of 6604 ± 98. The distribution does not agree with that of Fermi's theory. Available data are examined. N. M. B.

Mass of the neutron. R. M. LANGER (Physical Rev., 1934, [ii], 45, 137).—The mass of the neutron calc. from data for $Li^7 + H^2 \rightarrow 2He^4 + n^1$ (A., 1933, 1100) is $1·0062 \pm < 0·001$, and the binding for H^2 is of the order of 5×10^5 volts. The val. $1·0062$ agrees with Kurie's disintegration experiments (this vol., 7) assuming that the neutron is not captured. Evidence for non-capture disintegrations with neutrons in N_2 is strong. L. S. T.

Mass of the neutron and the stability of heavy hydrogen. R. LADENBURG (Physical Rev., 1934, [ii], 45, 224—225, 495).—Mainly a discussion. L. S. T.

Neutrons. G. E. MONOD-HERZEN (Ann. Physique, 1935, [xi], 4, 137—201).—Using the Wilson cloud-track method and a Po+Be or Rn+Be source, 7500 photographs were taken, giving 85 long and 100 short measurable tracks in H_2 corresponding with fast and slow particles. Statistical interpretation of the measurements indicates that the neutron–proton collision is inelastic, and that the source emits slow neutrons strongly scattered by matter and fast neutrons undergoing little scattering. Examination of the function of neutron mass in nuclei with reference to nuclear binding energy and the no. of isotopes of each element shows that the mass-losses of the nuclei bear a simple relation to the at. no., and that the sub-groups of the at. nuclear sequences coincide

with those arising from the distribution of the isotopes. The neutron mass is taken as 1.009 ± 0.001. N. M. B.

Energy of neutrons and the Fermi effect. I. V. KURTSCHATOV, L. MISOVSKI, M. EREMEJEV, and G. SCHTSCHEPKIN (Physikal. Z. Sovietunion, 1935, **7**, 257—261).—The radioactivity of Al, Si, P, Fe, Br, Ag, and I excited by neutrons from F and Be has been studied. When the nucleus is formed by capture of a neutron without emission of a heavy particle, radioactivity is produced. Neutrons from F produce artificially radioactive P. O. J. W.

Excitation of γ-rays by slow neutrons. S. KIKUCHI, K. HUSIMI, and H. AOKI (Proc. Imp. Acad. Tokyo, 1935, **11**, 253—255).—When bombarded by slow neutrons, γ-rays were emitted by Hg, Au, Cd, Ni, Fe, Cu, and to a smaller extent by Pb and Al. The estimated cross-section of interaction is approx. 5×10^{-21} cm.^{2} for Cu, Fe, and Ni. No Fermi proton effect is shown by Fe and Ni. There is evidence of the reactions $Ni^{60} + n^1 \rightarrow Ni^{61} + h\nu$; $Fe^{56} + n^1 \rightarrow Fe^{57} + h\nu$. N. M. B.

Cross-section of heavy nuclei for slow neutrons. J. H. VAN VLECK (Physical Rev., 1935, [ii], **48**, 367—372).—Mathematical. N. M. B.

Distribution-in-angle of protons projected by neutrons. N. A. DOBROTIN (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 516—520).—The distribution-in-angle of protons projected from paraffin by neutrons, referred to unit solid angle (θ), corresponds with $\cos^5 \theta$. Using paraffin films 10—25 μ thick the distribution is $\cos \theta$ for small θ, since the effective paraffin layer does not then depend on angle. These results correspond with a collision between elastic spheres, in contrast to Bonner and Mott-Smith, and others (cf. A., 1934, 1151). R. S. B.

Scattering of slow neutrons by hydrogen. M. EREMEJEV, I. V. KURTSCHATOV, and G. SCHTSCHEPKIN (Physikal. Z. Sovietunion, 1935, **7**, 267—273).—A method for determining the mean free path of slow neutrons in compounds containing H is described. The effective collision radius of slow neutrons with protons is 2×10^{-12} cm. O. J. W.

Emission of protons and neutrons from various targets bombarded by three-million-volt deutons. E. O. LAWRENCE and M. S. LIVINGSTON (Physical Rev., 1934, [ii], **45**, 220; cf. this vol., 141).—Under bombardment by 3×10^6-volt deutons the neutron yields from many substances are higher for the lighter elements, but the variation with at. no. is much $<$ is the case with 1.3×10^6-volt deutons. Approx. relative yields are Be 100, Li 62, B_2O_3 34, CaF_2 18, NH_4NO_3 10, Al 10, $Ca(OH)_2$ 8, and Pt 1. With Be the no. of recoil protons corresponds with an emission of approx. 10^7 neutrons per sec., and these high neutron yields with a deuton current of 3×10^{-8} amp. indicate the possibility of producing neutron radiation of an intensity comparable with that of X-rays. Large proton yields are also obtained from these targets, and their approx. proportionality to the neutron yields suggests a common nuclear reaction, probably disintegration of the deuton itself. In addition to these protons, groups of protons of definite range are also obtained from some of the targets. Al emits a group of range 68 cm. approx., which may result from a reaction of deutons with Al nuclei in which neutrons are added to the nuclei and protons emitted. L. S. T.

Neutron scattering in water and lead. M. DEISENROTH-MISOVSKI, I. V. KURTSCHATOV, G. D. LATISCHEV, and L. MISOVSKI (Physikal. Z. Sovietunion, 1935, **7**, 656—669).—The energy distribution of neutrons from Be, B, and F has been investigated by filtration of the neutrons through Pb and H_2O layers of various thicknesses and measurement in a Wilson chamber of the no. of recoil protons emitted by the neutrons from a paraffin plate through various thicknesses of Al. The results indicate that most of the neutrons have an energy of 6—8×10^6 e.v., but some attain 10—12×10^6 e.v. J. W. S.

Observations in the Wilson chamber and the Fermi effect. I. V. KURTSCHATOV and G. D. LATISCHEV (Physikal. Z. Sovietunion, 1935, **7**, 262—266).—The emission of electrons in the disintegration of radioactive Br is much $>$ that of positrons. A considerable proportion of the neutrons emitted by Be and Rn passes through a 10-cm. layer of H_2O. O. J. W.

High-voltage technique for nuclear physics studies. M. A. TUVE, L. R. HAFSTAD, and O. DAHL (Physical Rev., 1935, [ii], **48**, 315—337).—A description of the construction and use of electrostatic generators and multiple-section high-voltage tubes of the Coolidge " cascade " type for the production of high-speed protons and deuterons for studies of nuclear transmutations. N. M. B.

Transmutation functions for some cases of deuteron-induced radioactivity. E. O. LAWRENCE, E. McMILLAN, and R. L. THORNTON (Physical Rev., 1935, [ii], **48**, 493—499; cf. this vol., 559).—The variation with deuteron energy of the transmutation cross-section was investigated for the radioactivity produced in Na, Al, Si, and Cu bombarded with deuterons of energies 0—3.6×10^6 volts. Results agree with Oppenheimer's theory. Results require a proton–neutron binding energy in the deuteron of 2—2.24×10^6 volts. N. M. B.

Transmutation function for deuterons. J. R. OPPENHEIMER and M. PHILLIPS (Physical Rev., 1935, [ii], **48**, 500—502; cf. preceding abstract).—Mathematical. The effect of the finite size and ready polarisability of the deuteron on the probability of transmutations involving the capture of the neutron is examined. Results are in good agreement with experiment. N. M. B.

Disintegration of lithium by slow neutrons. D. Z. BUDNIZKI, I. V. KURTSCHATOV, and G. D. LATISCHEV (Physikal. Z. Sovietunion, 1935, **7**, 474—483).—Collisions between Li and neutrons lead to $_3Li^6 + _0n^1 = _2He^4 + _1H^3$, the $_2He^4$ and $_1H^3$ being ejected in opposite directions with ranges of 20 and 65 mm. of air. The collision cross-section for slow neutrons is 2×10^{-22} cm.^{2} W. R. A.

γ-Rays from lithium bombarded with protons. C. C. LAURITSEN and H. R. CRANE (Physical Rev., 1934, [ii], **45**, 63—64).—γ-Rays from LiF bombarded

with protons have approx. the same quantum energy as γ-rays from Ra filtered through 2 cm. of Pb.
L. S. T.

Range of transmuted particles of some light elements obtained by bombardment with rapid protons. H. NEUERT (Physikal. Z., 1935, 36, 629—642).—The ranges of particles obtained by bombarding light elements with 200-kv. protons were determined by the cloud chamber method. For B there was a continuous frequency distribution with a wide max. at 22 mm. and a less well-defined max. at 44 mm. For Be, particles of range 7·5 mm. only were observed. The short-range particles from Li in H_2 possess only two ranges (12 and 8·2 mm.). The mass of He^3 is $3·0172 \pm 0·0007$. No transmuted particles could be observed when F was bombarded with 200-kv. protons.
A. J. M.

Disintegration of beryllium by deutons. H. R. CRANE and C. C. LAURITSEN (Physical Rev., 1934, [ii], 45, 226—227; cf. A., 1934, 714).
L. S. T.

Disintegration of boron by neutrons. H. J. TAYLOR (Proc. Physical Soc., 1935, 47, 873—876).—A detailed account of results previously reported (cf. this vol., 426). A second mode of disintegration corresponding with $B^{10} + n^1 \rightarrow He^4 + He^4 + H^3$ has been found.
N. M. B.

Carbon radioactivity and other resonance transmutations by protons. L. R. HAFSTAD and M. A. TUVE (Physical Rev., 1935, [ii], 48, 306—315).—From measurements with 200—900 kv. d.c., and currents of deuterons and protons $\not> 10$ microamp. excitation function curves are given. The induced radioactivity from the reaction $C + H^1$ is produced by a resonance process with resonance lines at about 400 and 480 kv., but the efficiency of the corresponding process for $C + D^2$ increases approx. exponentially. The γ-rays emitted in the reaction $Li + H^1$ show resonances at 450 and 850 kv.; the γ-rays from $F + H^1$ suggest resonances at 320, 700, and 800 kv.; the γ-rays from $Be + H^1$ do not appear to be produced by a resonance process.
N. M. B.

Disintegration of neon by neutrons. R. JAECKEL (Z. Physik, 1935, 96, 151—162).—Ne always disintegrates by emission of α-particles to $_8O^{17}$.
A. B. D. C.

Artificial radioactivity. II. H. FAHLENBRACH (Z. Physik, 1935, 96, 503—511; cf. this vol., 803).—Using α-rays of Th-C' Si gives a transition product, P^{32}, of half-life period approx. 14 days. Mg gives two transition products, Al^{28}, of half-life 2 min., and Mg^{24}, of half-life 6·7 min.
A. B. D. C.

Induced radioactivity of nickel and cobalt. J. ROTBLAT (Nature, 1935, 136, 515).—Bombardment of Ni with neutrons from Rn + Be gives two slight activities, one of a period of a few hr. probably due to $_{28}Ni^{58} + _0n^1 = _{28}Ni^{59}$ or $_{28}Ni^{62} + _0n^1 = _{28}Ni^{63}$, and another of 20 min. period, probably due to $_{28}Ni^{60} + _0n^1 = _{27}Co^{60} + _1H^3$. Irradiation of Co immersed in H_2O gives, in addition to the known radio-Mn^{56} of approx. 2·5 hr. period, an activity of approx. 20 min., arising from $_{27}Co^{59} + _0n^1 = _{27}Co^{60}$, which does not appear in absence of a H medium.
L. S. T.

Artificial radioactivity on irradiating gold with neutrons. I. V. KURTSCHATOV and G. D. LATISCHEV (Physikal. Z. Sovietunion, 1935, 7, 652—655).—Measurements with a Wilson chamber give no evidence of disintegration with emission of heavy particles when Au is irradiated with neutrons from Be. The half-life period of the β-radioactive product is 3 days. No evidence was obtained of a product of half-life period 5 hr. emitting γ-rays (cf. this vol., 426).
J. W. S.

Atomic collision and radiation of meteors. E. ÖPIK (Acta Comm. Univ. Tartu., 1934, A, 26, No. 2, 39 pp.).—Theoretical.
CH. ABS. (e)

Nuclear reactions at stellar temperatures. T. E. STERNE (Trans. Electrochem. Soc., 1935, 68, 275—287).—Surface temp. of stars may be obtained in various ways, and fairly closely concordant vals. are obtained when the methods are applied to the same star.
W. P. R.

Atmospheres of planets. G. PICCARDI (Atti R. Accad. Lincei, 1935, [vi], 21, 576—577).—The presence of CH_4 in the atm. of planets very distant from the sun is more readily explained by the direct formation of the mol. CH, stable at high temp., than by the reduction of CO_2.
O. J. W.

Theory of the origin of cosmic radiation. R. M. LANGER (Physical Rev., 1934, [ii], 45, 138).—Many cosmic and terrestrial phenomena can be explained on the assumption that nuclear charges can slowly disappear.
L. S. T.

Absorption measurements on the cosmic rays at 11° 30′ geomagnetic latitude and 2370 metres elevation. S. DE BENEDETTI (Physical Rev., 1934, [ii], 45, 214—215).
L. S. T.

Directional measurements on the cosmic rays near the geomagnetic equator. B. ROSSI (Physical Rev., 1934, [ii], 45, 212—214).
L. S. T.

Penetrating power of cosmic secondary radiation. O. ZEILLER (Z. Physik, 1935, 96, 121—136).—Comparison of Pb and Al absorptions show absorption $\propto$ mass.
A. B. D. C.

Secondary effects of primary cosmic rays. A. SCHWEGLER (Z. Physik, 1935, 96, 62—75).
A. B. D. C.

Progress of the directional survey of cosmic-ray intensities and its application to the analysis of the primary cosmic radiation. T. H. JOHNSON (Physical Rev., 1935, [ii], 48, 287—299). N. M. B.

Inelastic scattering of quanta with production of pairs. M. S. PLESSET and J. A. WHEELER (Physical Rev., 1935, [ii], 48, 302—306).—Mathematical. The probability of processes in which an incoming quantum produces an electron–positron pair in the field of a nucleus is investigated. N. M. B.

Nuclear masses. C. F. VON WEIZÄCKER (Z. Physik, 1935, 96, 431—458).—Theoretical.
A. B. D. C.

Interaction between neutrons and protons. R. M. LANGER (Physical Rev., 1934, [ii], 45, 137—138).—The interaction is probably mainly magnetic.
L. S. T.

Structure of light atomic nuclei. S. Flügge (Z. Physik, 1935, **56**, 459—472).—Theoretical.
A. B. D. C.

Structure of light atomic nuclei. W. Heisenberg (Z. Physik, 1935, **96**, 473—484).—Mass defects are calc. by an extension of Hartree's method.
A. B. D. C.

Structure of the ionosphere. J. Hollingworth (Proc. Physical Soc., 1935, **47**, 843—851).—Mathematical. A method of finding the approx. intensity of ionisation in the space between the E and F layers is deduced.   N. M. B.

Dirac's vector model for multiplet spectra. M. Markov (Physikal. Z. Sovietunion, 1935, **7**, 553—564).—Mathematical.   J. W. S.

Dirac electron in a gravitational field. O. Halpern and G. Heller (Physical Rev., 1935, [ii], **48**, 434—438).—Mathematical. Special cases are considered. The red shift in a gravitational field is derived without reference to a special at. system, and a treatment of the gyromagnetic effect is given.
N. M. B.

Dirac's spin theory and non-linear field equations. W. Wessel (Z. Physik, 1935, **96**, 520—533).   A. B. D. C.

Three-centre problem. I. G. S. Gordadse (Z. Physik, 1925, **96**, 542—545).   A. B. D. C.

Uncertainty principle and the zero-point energy of the harmonic oscillator. R. A. Newing (Nature, 1935, **136**, 395).—Zero-point vibration energy calc. from the uncertainty principle is $\frac{1}{2}h\omega/2\pi$.
L. S. T.

Elements of the quantum theory. IV. The linear harmonic oscillator. VA. The rigid rotator. S. Dushman (J. Chem. Educ., 1935, **12**, 381—389, 436—444; cf. this vol., 1187).   L. S. T.

Atomic energy states for excited helium. W. S. Wilson (Physical Rev., 1935, [ii], **48**, 536—537).—Using Slater's method the total at. energies for the excited states $1s^2$, $1s2s$, $1s2p$, $2s^2$, $2s2p$, and $2p^2$ of He have been calc. with the use of Hartree functions previously found (cf. this vol., 804).
N. M. B.

Determination of h by X-rays. P. Kirkpatrick and P. A. Ross (Physical Rev., 1934, [ii], **45**, 135).
L. S. T.

Polarisability and related properties of molecular hydrogen and the diatomic hydrogen ion. J. O. Hirschfelder (J. Chem. Physics, 1935, **3**, 555—556).—Theoretical.   H. J. E.

Four-vector problem and its application to energies and intensities in platinum-like spectra. A. T. Goble (Physical Rev., 1935, [ii], **48**, 346—356). —Mathematical. The magnetic interaction between the spin and orbital moments of each electron of a two-electron system is examined by a simplified method based on the correspondence principle. Results are checked by reference to an isoelectronic sequence (see Mack, this vol., 1292).   N. M. B.

Gas laws, Wien's displacement law, and the radiation law of the gaseous state. E. Wertheimer (Z. Physik, 1935, **96**, 137—147).—The gas laws are deduced from Wien's law, and the two are

brought into relation with that for radiation of the gaseous state.   A. B. D. C.

The potential barrier. K. C. Kar (Current Sci., 1935, **4**, 93—94).—A discussion.   L. S. T.

Electron theory of metals. I. S. Schubin and S. Vonsovski (Physikal. Z. Sovietunion, 1935, **7**, 292—328).—Mathematical. A more detailed treatment (cf. A., 1934, 827).   O. J. W.

Thermodynamic foundations of the theory of electrical equilibrium and of permanent currents in metallic conductors. F. Odone (Atti R. Accad. Lincei, 1935, [vi], **21**, 515—521).—Mathematical.
O. J. W.

Fundamental paradox of the quantum theory. R. Peierls (Nature, 1935, **136**, 395).   L. S. T.

Calculation of the emergence work (Austrittsarbeit) in Sommerfeld's metal model. H. Frölich (Physikal. Z. Sovietunion, 1935, **7**, 509—510).—Theoretical.   W. R. A.

Quantum theory of ionisation and neutralisation on metallic surfaces. N. D. Morgulis (J. Exp. Theor. Phys. U.S.S.R., 1934, **4**, 684—689).—Theoretical. The probabilities of the ionisation of atoms, and of the neutralisation of gaseous ions, on metallic surfaces were calc.   Ch. Abs. (e)

Photochemical reaction of cellulose. III. Determination of the relative spectral distribution of energy in the light from a quartz-mercury vapour lamp. S. Oguri (J. Soc. Chem. Ind. Japan, 1935, **38**, 392—393B).—The data reported were obtained with a thermopile and a const. spectrometer slit width. There are max. at about 2500, 3000, 4000, and 5750 Å.   A. G.

Factors affecting ultra-violet solar radiation intensities. W. W. Coblentz and R. Stair (J. Res. Nat. Bur. Stand., 1935, **15**, 123—150).—Solar radiation of λ 2900—3500 Å. has been studied under varied conditions of atm. and locality. The spectrum transmitted by fog is diminished in intensity, but approx. unchanged in quality. Snow gives a high degree of reflexion. A rise of 2 km. in altitude corresponds with a 40—50% increase in intensity of the band at 2900—3130 Å. It is inferred that the quantity of O_3 in the stratosphere during the afternoon is < that during the forenoon, and for the same solar altitude decreases with the latitude. Biological effects are discussed.   R. S. B.

N–H bands at λ 3360. G. W. Funke (Z. Physik, 1935, **96**, 787—798).—An analysis of the N–H bands at λλ 3360 and 3370 is given, and their splitting and widening are considered.   A. J. M.

Ultra-violet absorption spectrum of gaseous, liquid, and dissolved ammonia. A. Briot and B. Vodar (Compt. rend., 1935, **201**, 500—501).—Absorption by liquid NH_3 was continuous and extended to greater λλ with rising temp. The absorption bands of gaseous NH_3 were not displaced by changes in temp. and pressure. Absorption by aq. NH_3 was continuous and increased with the concn.
H. J. E.

Molecular spectrum of heavy hydrogen (HD) in the extreme ultra-violet region. Y. Fujioka

and T. WADA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1935, **27**, 210—234).—A no. of lines of the HD mol. in the region 61,000—98,000 cm.$^{-1}$ are recorded and classified. J. W. S.

Hydrogen-isotope effect in the OH bands, 3064 and 3121 Å. R. W. SHAW and R. C. GIBBS (Physical Rev., 1934, [ii], **45**, 124).—Bands arising from the isotope of H of approx. mass 2 in the OH mol. have been photographed for the cases of the (0,0) and (1,1) vibrational changes, and a rotational analysis is made. The width of the spin doubling for D is $>$ for the ordinary OH mol. L. S. T.

β Bands of boron monoxide. A. ELLIOTT (Proc. K. Akad. Wetensch. Amsterdam, 1935, **38**, 736—738). —Measurements of doublet separations are recorded. E. S. H.

Predissociation in the $C^1\Sigma$ state of CO. R. SCHMID and L. GERÖ (Z. Physik, 1935, **96**, 546—550). —Predissociation in this state gives a heat of dissociation for CO of 8·40 volts. A. B. D. C.

5 *B* Bands of carbon monoxide. R. SCHMID and L. GERÖ (Z. Physik, 1935, **96**, 198—202). A. B. D. C.

Search for TiO isotope bands. H. P. KNAUSS, H. M. STRONG, and H. L. JOHNSTON (Physical Rev., 1934, [ii], **45**, 124).—A C arc fed with powdered TiO_2 failed to reveal an isotopic shift, due to Ti^{46}, in the (1—0) band at 4955 Å. The existence of Ti^{46} is not excluded. L. S. T.

Spectrum of neodymium oxide in the vapour state. G. PICCARDI (Atti R. Accad. Lincei, 1935, [vi], **21**, 584—588).—λλ and intensities are recorded for $>$ 200 bands, mostly in the red–green region. There are a few in the violet and none in the ultra-violet region. O. J. W.

Spectrum of samarium oxide in the vapour state. G. PICCARDI (Atti R. Accad. Lincei, 1935, [vi], **21**, 589—593; cf. preceding abstract).—Similar data are recorded for Sm oxide. O. J. W.

Absorption spectra of the halides of some elements of the second group : $CdCl_2$, $CdBr_2$, CdI_2, $ZnCl_2$, $ZnBr_2$, and $SrCl_2$. C. M. B. RAO and M. KARIM (Current Sci., 1935, **4**, 97).—λλ of the max. of absorption are recorded. $ZnCl_2$ does not appear to obey Beer's law. L. S. T.

Absorption spectra of solutions of coloured metallic salts at low temperatures. Y. SHIBATA and K. HARAI (J. Chem. Soc. Japan, 1935, **56**, 1—18). —Absorption spectra of $CoCl_2$, $CoBr_2$, CoI_2, $Co(SCN)_2$, $NiCl_2$, $Cu(NO_3)_2$, $CuBr_2$, $UO_2(NO_3)_2$, $FeCl_3$, $KMnO_4$, H_2PtCl_6, and $HAuCl_4$ in various org. solvents were measured at room temp. and at —60° to —80°. Many bands were observed at low temp. with $COMe_2$ solutions of $CoCl_2$, $CoBr_2$, and $UO_2(NO_3)_2$. CH. ABS. (*e*)

Absorption spectrum of tin sulphide. E. N. SHAWHAN (Physical Rev., 1935, [ii], **48**, 521—524).— Data are tabulated for bands photographed at moderate dispersion for 3200—4600 Å., and at high dispersion for 4000—4600 Å. An expression is found for the near ultra-violet system, and for a new system in the visible which is limited by predissociation to two v'' progressions. N. M. B.

Absorption spectrum of diacetylene in the near ultra-violet. S. C. WOO and T. C. CHU (J. Chem. Physics, 1935, **3**, 541—543).—The spectrum with a 130 cm. absorption tube at 1 mm. pressure consisted of bands at λλ $<$ 2490 Å. With increasing pressure these were replaced by continuous absorption, additional bands appearing at longer λλ (up to λ 2860 Å. at 252 mm. pressure). 80 bands were measured and classified. Resemblances between C_4H_2 and C_2N_2 are discussed. H. J. E.

Absorption spectra and dissociation energies of cyanic acid and some carbimides. S. C. WOO and T. K. LIU (J. Chem. Physics, 1935, **3**, 544—546).— The absorption was continuous, the long λλ of the continua being : HNCO 2240, MeNCO 2550, EtNCO 2480, PhCNO 2420 Å. For HNCO, 16 diffuse bands between 2570 and 2250 Å. were observed. For PhNCO bands due to the C_6H_6 ring were observed. The optical dissociation energy suffices only for the splitting of the R·N linking. The absence of the characteristic $>C:O$ absorption is discussed. H. J. E.

Ultra-violet absorption spectra of *cis*- and *trans*-dichloroethylenes. H. E. MAHNCKE and W. A. NOYES, jun. (J. Chem. Physics, 1935, **3**, 536— 540; cf. this vol., 1055).—For both isomerides there is general absorption from approx. 1600 to 2400 Å., the limits depending on the pressure. Bands occur at 1350—1570 Å.; they are shaded to the violet for the *cis*-form (I) and to the red for the *trans*-form (II). For (I) there was continuous absorption at still shorter λλ. For (II) there were, in this region, a no. of structureless broad bands, which merged with increasing pressure. Ionisation potentials for (I) were predicted at 9·58, 9·63 e.v. This val. was confirmed by the electron bombardment method. H. J. E.

Ultra-violet absorption spectra of the α-ethylenic nitriles. A. CASTILLE and E. RUPPOL (Bull. Soc. chim. Belg., 1935, **44**, 351—375).—λ–log ϵ data are given for the substituted *cis*- and *trans*-α-crotononitriles from C_5 to C_{12}. Absorption is greater in the *trans*-form. J. S. A.

Absorption spectra of free radicals. L. C. ANDERSON (J. Amer. Chem. Soc., 1935, **57**, 1673— 1676).—The absorption spectrum of CPh_3Br in SO_2 closely resembles that of CPh_3^+ in H_2SO_4, $HClO_4$, or Me_2SO_4 (A., 1931, 86); hence CPh_3Br is ionised and $(CPh_3)_2$ dissociated in SO_2 and CPh_3^+ is quinonoid. The spectrum of CPh_3 in Et_2O resembles that of solutions of $O:C_6H_4:R$ (R=O, NOH, or NCl); it follows that the non-ionised free radical is quinonoid. In dil. solutions the heights of the quant. absorption curves of CPh_3Br and CPh_3 in SO_2 are the same; the former absorption is unaffected by temp., from which it is concluded that CPh_3Br and $(CPh_3)_2$ are completely dissociated in dil. solution in SO_2. The spectra of CPh_3 and CPh_3Na (very dil.) in SO_2 are scarcely affected by temp.; that of CPh_3 in Et_2O is very sensitive, probably owing to increasing ionisation at higher temp. R. S. C.

Ultra-violet absorption of aromatic hydrocarbons. III. Constitution of tetrahydrodiphenyl. M. PESTEMER and L. WILIGUT (Monatsh.,

1935, **66**, 119—128; cf. A., 1934, 1287).—The extinction–wave-no. curves for CHPh:CH$_2$, CHPh:CHMe, CH$_2$Ph·CH:CH$_2$, PhPr, Ph$_2$, CHPh:CH·CH:CHMe, and of tetrahydrodiphenyl (I), obtained from Ph$_2$ by reduction with Na and C$_5$H$_{11}$·OH, have been determined in C$_6$H$_{14}$ and MeOH. Comparison shows that the double linking in (I) must be conjugated with the C$_6$ ring, proving (I) to be identical with 1-phenyl*cyclo*hexene.

<div align="right">J. S. A.</div>

Optical absorption and double linking. I. Problems and methods. K. W. HAUSSER, R. KUHN, A. SMAKULA, and K. H. KREUCHEN. **II. Polyene aldehydes and polyene carboxylic acids.** K. W. HAUSSER, R. KUHN, A. SMAKULA, and M. HOFFER. **III. Furan series.** K. W. HAUSSER, R. KUHN, A. SMAKULA, and A. DEUTSCH. **IV. Diphenylpolyenes.** K. W. HAUSSER, R. KUHN, and A. SMAKULA (Z. physikal. Chem., 1935, B, **29**, 363—370, 371—377, 378—383, 384—389).—I. In determining the absorption spectra of polyene dyes photoelectric photometry, the photographic method, and the spectrophotometer yield concordant results, but the positions of absorption max. obtained with the grating spectroscope may differ, owing to a contrast effect, by as much as 8 mμ from those found by the other methods.

II. For the aldehydes Me·[CH:CH]$_n$·CHO and acids Me·[CH:CH]$_n$·CO$_2$H (cf. A., 1931, 1273) the absorption coeff. at the absorption max., $\kappa_{max.}$, and the intensity of absorption, $\int\kappa . d\nu$, increase linearly with n. The displacement of the absorption bands towards the visible caused by increase in n falls as n rises.

III. In respect of the position of the absorption bands of longest wave-length of various aldehydes and acids of the furan series the furan ring is practically equiv. to an aliphatic system with two conjugated double linkings. α-*Furylheptatrienoic acid*, m.p. 199·5—200°, has been prepared from α-furylpentadienal and malonic acid in C$_5$H$_5$N.

IV. For the diphenylpolyenes, Ph·[CH:CH]$_n$·Ph, $\kappa_{max.}$ and the intensity of absorption increase approx. linearly with n (cf. A., 1928, 281). The absorption curves in EtOH are shifted towards shorter wavelengths compared with those in C$_6$H$_6$ by an approx. const. amount, independent of n (cf. A., 1931, 1351).

<div align="right">R. C.</div>

Asymmetric synthesis. II. Addition of chlorine to trinitrostilbene.—See this vol., 1358.

Absorption spectrum and constitution of carvone hydrosulphide. R. PADMANABHAN (Current Sci., 1935, **4**, 95—96).—The ultra-violet absorption spectrum favours the structure of Steele (Proc. C.S., 1911, **27**, 240).

<div align="right">F. N. W.</div>

Reflexion power of aqueous solutions in the infra-red. F. MATOSSI and H. FESSER (Z. Physik, 1935, **96**, 12—28).—Reflexion of the 3 and 6 μ fundamental frequencies of H$_2$O has been measured for solutions of NaCl, NaBr, NaI, LiCl, KCl, CaCl$_2$, and LiNO$_3$. The positions and intensities of the bands vary with presence of ions, due to their depolymerising effect and their hydration. Decrease of cationic radius increases both depolymerisation and hydration; anions show little hydration, and depolymerisation of the H$_2$O groups increases with anionic radius. A. B. D. C.

Infra-red absorption spectrum of water containing protium and deuterium. A. L. CASSELMAN (Physical Rev., 1934, [ii], **45**, 221—222).—With H$_2$O containing 56% of D the ordinary H$_2$O bands at 3 and 6·2 μ are considerably reduced and the 4·8 μ band almost disappears. New bands appear at approx. 4·2 and 6·9 μ. The former is probably due to the combinations D ←→ D and O^{16} ←→ D, and the latter to H^1 ←→ D. L. S. T.

Infra-red spectrum of fluorine monoxide. G. HETTNER, R. POHLMAN, and H. J. SCHUMACHER (Z. Physik, 1935, **96**, 203—209).—The spectrum has been determined between 1 and 27 μ; intense bands appear near 5·75, 7·8, 10·8, and 12·0 μ, and the angle FOF is 100° (cf. this vol., 428). A. B. D. C.

Infra-red absorption spectrum of solid hydrogen chloride. P. E. SHEARIN (Physical Rev., 1935, [ii], **48**, 299—301).—Data for 13 lines of the 3·7 μ band are given. If the centre is taken to be the 2669 cm.$^{-1}$ line, the band, in contrast to that of gaseous HCl, has a zero line. N. M. B.

Chemical and physical characteristics of water of crystallisation. I. Hydrates containing up to three molecules of water. II. Hydrates containing more than three molecules of water. L. PASSERINI (Gazzetta, 1935, **65**, 502—511, 511—517).—I. The infra-red absorption spectra between 1·30 and 2 μ of the following hydrates are recorded : (NH$_4$)$_2$C$_2$O$_4$,H$_2$O ; citric acid monohydrate; H$_2$C$_2$O$_4$,2H$_2$O ; BaCl$_2$,2H$_2$O ; CaSO$_4$,2H$_2$O ; K$_4$[Fe(CN)$_6$],3H$_2$O ; NaOAc,3H$_2$O ; and Pb(OAc)$_2$,3H$_2$O. The two H$_2$O bands for the various hydrates either coincide with those of H$_2$O vapour (1·38 and 1·83 μ) or of ice (1·474 and 1·976 μ), or occupy an intermediate position.

II. Similar data are recorded for 16 salt hydrates containing > 3H$_2$O. The absorption bands either coincide with those of ice or fall between those of ice and H$_2$O vapour. O. J. W.

Infra-red band of arsine. W. V. NORRIS and H. J. UNGER (Physical Rev., 1934, [ii], **45**, 68).—The weak 1·63 μ band of AsH$_3$ at 1 atm. has been investigated with the automatic recording spectroscope.

<div align="right">L. S. T.</div>

Infra-red spectra of acetylene containing H^2. H. M. RANDALL and E. F. BARKER (Physical Rev., 1934, [ii], **45**, 124—125).—The infra-red spectra of acetylene gas generated from D$_2$O show relatively few mols. of C$_2$H$_2^1$ and approx. equal concns. of C$_2$H^{1}D and C$_2$D$_2$.

<div align="right">L. S. T.</div>

Infra-red absorption spectra of the linear molecules carbonyl sulphide and deuterium cyanide. P. F. BARTUNEK and E. F. BARKER (Physical Rev., 1935, [ii], **48**, 516—521).—Data for the vibration–rotation bands of COS are tabulated and the vibrational energy level scheme of the mol. is determined. Data for the rotation lines of the 17·5 μ band of DCN zero branch 570 cm.$^{-1}$ and the 14 μ band of HCN zero branch 712 cm.$^{-1}$ are tabulated. The moments of inertia are : DCN 22·92×10^{-40}, HCN 18·72×10^{-40} g.-cm.^{2}, and from these the internuclear distances are : H—C 1·06×10^{-8}, C—N 1·15×10^{-8} cm.

The zero order quadratic potential energy expression is computed. N. M. B.

Analysis of the infra-red bands of formaldehyde. A. NORDSIECK (Physical Rev., 1934, [ii], **45**, 133—134).—The theoretically-expected structure of the infra-red bands of CH_2O has been worked out on the basis of Wang's theory of the asymmetric rotator (*ibid.*, 1929, **58**, 730). L. S. T.

Convergence error in depolarisation measurements. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1935, **2**, A, 133—142).—Errors in depolarisation measurements due to the use of convergent beams are treated mathematically. J. W. S.

Longitudinal light scattering by liquids. S. M. MITRA (Z. Physik, 1935, **96**, 34—36).—Plotnikow and Splait's scattering of light parallel to the incident beam could not be observed (cf. A., 1930, 664). A. B. D. C.

Polarisation of scattered radiation. I. Rayleigh scattering. S. M. MITRA (Z. Physik, 1935, **96**, 29—34).—The degree of depolarisation of light scattered by C_6H_6 and CS_2 normal to the incident beam is independent of λ. A. B. D. C.

Raman spectrum of heavy water. R. ANANTHAKRISHNAN (Nature, 1935, **136**, 551—552).—The principal band of the Raman spectrum of 99·2 wt.-% D_2O consists of three imperfectly resolved components 2646, 2500, and 2366 cm.$^{-1}$, corresponding with 3630, 3435, and 3200 cm.$^{-1}$ for ordinary H_2O, and indicating that D_2O is polymerised in a manner similar to H_2O. A new band with a shift of 1231 cm.$^{-1}$ occurs with the 4358 and 4046 Å. excitations. A third band of 178 cm.$^{-1}$ shift also occurs, due, presumably, not to internal vibrations of the D_2O mol., but to rotation or vibration of the mol. as a whole. L. S. T.

Depolarisation of the light scattered by heavy water. S. BHAGAVANTAM (Current Sci., 1935, **4**, 94).—The depolarisation of 99·5% D_2O is 0·04, compared with approx. 0·06 for H_2O, showing that the D_2O mol. is similar to that of H_2O in possessing only feeble optical anisotropy. L. S. T.

Raman spectrum of a ferromagnetic oxide. L. F. BATES and H. E. HOGWOOD (Proc. Physical Soc., 1935, **47**, 877—878).—No Raman spectrum was found for Cr_5O_9. N. M. B.

Raman spectra of iodic acid and the alkaline iodates as solids and solutions. C. S. VENKATESWARAN (Proc. Indian Acad. Sci., 1935, **2**, A, 119—132).—Cryst. HIO_3 shows 5 intense Raman lines and a no. of weak and sharp lines which are replaced by intense broad bands for solutions. The Raman spectra of 0·15—18N solutions show anomalous intensity and frequency changes with concn. Evidence is obtained that dissociation is incomplete at 0·5N. It is suggested that the acid is appreciably associated, especially in conc. solution. The spectra of $NaIO_3$ and KIO_3 show two lines identified with the parallel oscillation of the pyramidal form of mols. of the AX_3 type, whilst $LiIO_3$ and HIO_3 also show lines corresponding with the two perpendicular oscillations. It is suggested that low frequencies observed with cryst. HIO_3, $LiIO_3$, and KIO_3 are due to oscillational motions or restricted rotations of the mols. in the solid state. Cryst. $KH(IO_3)_2$ contains an extra line, indicating the existence of I_2O_6'' ions. Its solution behaves as a mixture of HIO_3 and KIO_3. J. W. S.

Raman spectrum of dioxan. M. WOLKENSTEIN and J. K. SYRKIN (J. Chem. Physics, 1935, **3**, 594).—Villar's measurements (cf. A., 1931, 145) are amplified and corr. H. J. E.

Comparison of the Raman spectra of $\alpha\alpha\alpha$- and $\alpha\alpha\beta$-trichloroethane. G. F. HULL, jun. (J. Chem. Physics, 1935, **3**, 534—535).—Vals. are recorded, and their interpretation is discussed. The CCl_3 and $CHCl_2$ radicals have tetrahedral symmetry. H. J. E.

Raman spectra of isoprene, dipentene, and ocimene. P. S. SRINIVASAN (Proc. Indian Acad. Sci., 1935, **2**, A, 105—112).—The Raman frequencies of these compounds are tabulated and discussed with reference to their infra-red absorption frequencies and their structures. J. W. S.

Raman spectrum and symmetry of the benzene molecule. K. W. F. KOHLRAUSCH (Naturwiss., 1935, **23**, 624—625).—The identification of the f line (1000 cm.$^{-1}$), in the Raman spectrum of mono-, m-di-, and 1 : 3 : 5-tri-substituted C_6H_6, with the λ line (992 cm.$^{-1}$) of C_6H_6, from which it has been argued that C_6H_6 has trigonal symmetry, is incorrect. The conclusion does not agree with the Raman spectra of many C_6H_6 derivatives, nor with the fact that the p-form possesses the highest symmetry. The C_6 ring has hexagonal symmetry. The occurrence of the f line with C_6H_6 derivatives is due to the activation of a line which in C_6H_6 itself is inactive. The agreement of frequencies of the f and λ lines is accidental. The vibrational forms of the C_6 ring are described and the frequencies calc. A. J. M.

Polarisation of Raman radiation of p-, m-, and o-xylene. W. C. NARKIEWICZ (Z. Physik, 1935, **96**, 177—190).—Depolarisation and intensity of Raman lines due to the three isomerides have been measured, and from them the symmetry character of the vibrations and the groups to which they belong are deduced. A. B. D. C.

Raman spectrum of isomeric nitrotoluenes. R. M. ANSIDEI (Atti R. Accad. Lincei, 1935, [vi], **21**, 581—584).—New measurements of the Raman spectra of o-, m-, and p-$C_6H_4Me\cdot NO_2$ confirm the existence of the line 1520 cm.$^{-1}$ characteristic of the NO_2 group and of the line 990 cm.$^{-1}$ characteristic of m-disubstituted derivatives (cf. A., 1931, 1353; 1932, 109). O. J. W.

Raman spectra of substances with two benzene nuclei. P. DONZELOT and M. CHAIX (Compt. rend., 1935, **201**, 501—503).—Data are recorded for Ph_2 and for mols. of the type XPh_2 ($X=CH_2$, O, S, Se, $CH\cdot OH$, and Hg). H. J. E.

Depolarisation of light scattering in gases and vapours. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1935, **2**, A, 153—160).—Previous data are criticised. The depolarisation of CH_4 is about

0.3% and is probably due to the highly depolarised vibration Raman lines. The depolarisation increases with increasing mol. wt. in the hydrocarbon series, and, in accord with observations on homologues, the val. for *cyclo*propane is low (0.52%) and for CHMe:CH$_2$ high (2.91). MeCl is more anisotropic than EtCl and much more so than CH$_4$. The depolarisation of CCl$_4$ is about 0.15% and that of A probably 0, whilst H$_2$S and other hydrides have low vals. (about 0.3%), probably owing to their pseudo-inert gas structures.
J. W. S.

Scattering of light in protein solutions. P. PUTZEYS and J. BROSTEAUX (Trans. Faraday Soc., 1935, **31**, 1314—1325).—In the apparatus described, the relative scattering powers of solutions of ovalbumin, amandin, excelsin, and hæmocyanin are in the ratio of the mol. wt. of the proteins as determined by ultracentrifuge. Ionisation and hydration of the protein play a negligible part in the light-scattering process.
J. G. A. G.

Investigation of mitogenetic radiation with the counter tube. H. BARTH (Naturwiss., 1935, **23**, 688; cf. A., 1932, 544; 1934, 555).—Secondary mitogenetic radiation is detected by means of a counter tube. As primary sources the dissolution of Al in HCl and of mouse carcinoma in Ringer's glucose solution were used. Three methods of investigation are described.
A. J. M.

Fading of zinc phosphors in single crystals. III. V. V. ANTONOV-ROMANOVSKI (Physikal. Z. Sovietunion, 1935, **7**, 366—379; cf. A., 1934, 1290).—The rate of decay of large crystals obeys a bimol. relationship.
O. J. W.

Polarisation of photo-luminescence of dye solutions. A. JABŁOŃSKI (Z. Physik, 1935, **96**, 236—246).—Theoretical. Depolarisation limits are deduced for photo-luminescence arising either from the final absorption level or from another level. Depolarisation varies with the absorption band used in excitation.
A. B. D. C.

Structure of group-resonators. XV. Theory of the fluorescence of organic substances. D. RĂDULESCU and C. DRĂGULESCU. **Structure and properties of organic chromophores and group-resonators. XVI. Quantitative law of the frequency of absorption band maxima of group-resonators.** D. RĂDULESCU and F. BĂRBULESCU. **XVII. Influence of substituents on the absorption bands.** D. RĂDULESCU. **XVIII. Relation of the frequency of absorption bands in the vapour state. Absorption bands of benzoquinone vapour. XIX. Physical interpretation of the frequency relation between the bands. Relation between the absorption bands and the fluorescence bands of the same substance. XX. Coloured nitro- and polynitro-derivatives of benzene.** D. RĂDULESCU and V. ALEXA. **XXI. The hydrogen of the benzene nucleus can, under certain conditions of polarity, become ionisable and be replaced by metals.** D. RĂDULESCU and S. POPA (Bull. Soc. Chim. România, 1935, **17**, 9—37, 39—47, 49—53, 55—61, 63—68, 69—83, 85—86; cf. A., 1931, 1351).—XV. The influence of state, solvents, and substituents on the fluorescence spectra

of anthracene, phenanthrene, pyrene, naphthacene, and perylene has been studied and found to be in accord with the view that the resonator responsible for absorption is identical with that producing fluorescence. The frequencies of the band max. of both spectra are given by $F_x = F_0\rho^{\pm x}$ (i), where x is an integer and $\rho = 1.01048$. The frequency of the fluorescent emission is a max. in the vapour state.

XVI. The absorption band max. of a no. of org. compounds calc. with the aid of relation (i) are in close agreement with the most exact experimental vals.

XVII. Absorption bands are replaced by new bands on the introduction of substituents into an org. nucleus, and the new band max. can be calc. from relation (i), where F_0 refers to the parent substance. The variation of x with the type and position of substituents has been studied.

XVIII. Relation (i) applies with great exactitude to the absorption band data of Light for benzoquinone vapour.

XIX. The absorption, fluorescence, and Tesla luminescence spectra of C$_6$H$_6$ and C$_{10}$H$_8$ consist of identical series of the type (i). Each series is related to a favoured state of excitation of the mol.

XX. ·NO$_2$ can exist in two electromeric forms. That in which N is negative gives coloured compounds. The influence of substituents on the electromeric equilibrium of mono-, di-, and tri-nitro-derivatives is discussed. The absorption band max. is increased in solvents containing strong bases but not displaced, in accordance with the view that the absorption is due to the coloured electromeride of ·NO$_2$.

XXI. C$_6$H$_3$(NO$_2$)$_2$ gives the reddish-brown salt [C$_6$(NO$_2$)$_3$]$_2$Ba$_3$,6H$_2$O with Ba(OH)$_2$, showing that the H are ionisable.
R. S.

Luminescence of compounds of organic molecules with metallic salts when irradiated with X-rays. E. WEYDE (Z. wiss. Phot., 1935, **34**, 216—234).—The X-ray luminescence of compounds of heterocyclic bases with metallic chlorides has been investigated with reference to the nature of the inorg. salt and its linking with the base. The intensity of the luminescence of quinoline and other heterocyclic bases is increased by the addition to the base of chlorides of heavy metals which are good absorbents of X-rays. The linking between the salt and the base must not be too strong. Effective chlorides are those of metals which show a tendency towards complex formation (*e.g.*, Hg, Cd, Zn); replacement of Cl by Br or I causes weakening of the luminescence. The metal must be linked with N in the ring. Only those bases of which aq. solutions of the hydrochlorides will themselves show photoluminescence will give X-ray luminescence when combined with metallic chlorides. The purer is the metallic salt the more it is effective. The effect is, therefore, not dependent on the presence of traces of impurities. Only the solid compounds luminesce. At room temp. no phosphorescence is observed, but after irradiation at —80° the substances show phosphorescence on warming to room temp.
A. J. M.

Mechanism of ionic movement in solid electrolytes. W. SCHOTTKY (Z. physikal. Chem., 1935,

B, 29, 335—355).—Theoretical. In the theory of the electrolytic conduction of heteropolar lattices it is not admissible to assume that for each ionic species the no. of ionic voids is equal to the no. of inter-lattice ions of the same species (cf. A., 1934, 11). In close-packed lattices, e.g., the rock-salt type, the concn. of inter-lattice ions is negligible compared with that of voids for each ionic species. The general relation between the concn. of points of disarray and the determining energy magnitudes is derived thermo-dynamically. It is deduced that in alkali halide and alkaline-earth oxide lattices ionic conduction depends almost entirely on the voids. The method of calculating the concn. of voids is not yet exact.

R. C.

Surface ionisation of potassium iodide on tungsten. M. J. COPLEY and T. E. PHIPPS (J. Chem. Physics, 1935, 3, 594).—The positive ion current obtained with a const. ray of KI mols. striking a W filament has been studied. For a flashed filament the adsorbed salt mol. is first dissociated and the K then ionised. H. J. E.

Photo- and dark-conductivities of cuprous oxide. D. NASLEDOV and L. NEMENOV (Physikal. Z. Sovietunion, 1935, 7, 513—531).—The non-penetration of photo-electrons through the non-illuminated portion of polycryst. Cu_2O at liquid air temp. is attributed to the non-homogeneous nature of the Cu_2O reducing the life of the photo-electrons. The polarisation of Cu_2O at liquid air temp. is similar to that of a dielectric, and the leakage current becomes very low within 5 min. of applying a p.d. The distri-bution of potential indicates that a large p.d. is created at the Cu_2O-metal interface which diminishes under the influence of light, which, in the limit, renders the potential distribution linear. It is suggested that there is a highly-resistant surface film of unknown structure at the interface. J. W. S.

Rôle of photo-conductivity of the stopping layer in the photo-emission at the surfaces of semi-conductors. G. LIANDRAT (Physikal. Z. Sovietunion, 1935, 7, 670—671).—Polemical against Jousé (this vol., 1218). J. W. S.

Photo-electromotive forces in cuprite crystals. A. JOFFÉ and A. F. JOFFÉ (Physikal. Z. Sovietunion, 1935, 7, 343—365).—A study of the potential dis-tribution on the surface of cuprite crystals during illumination indicates that there is a steady flow of electrons from the illuminated area in all directions. This flow is compensated by the conductivity current. An expression for the photo-e.m.f. is derived, which accounts satisfactorily for the variation of the e.m.f. with temp. and light intensity. O. J. W.

Breakdown of dielectrics under high voltage, with particular reference to thermal instability. S. WHITEHEAD and W. NETHERCOT (Proc. Physical Soc., 1935, 47, 974—997).—Breakdown of a thermal and non-thermal type is discussed. A theory of ionisation coeffs. is developed to explain conductivity phenomena with a.c. and d.c., and ionisation potentials are deduced. Experimental data for cellulose acetate and cellulose Et ether are given. N. M. B.

Electronic conductance as a result of the non-stoicheiometric composition of substances. J. H. DE BOER (Chem. Weekblad, 1935, 32, 106—110).—Wagner's theory (A., 1933, 888) is discussed.

D. R. D.

Electrical conductivity of deformed NaCl crystals and their crystalline structure. Z. GYULAI (Z. Physik, 1935, 96, 210—218).—Pastilles prepared from powdered NaCl at temp. from 20° to 500° and at pressures from 2000 to 23,000 kg. per sq. cm. show ionic loosening potentials similar to those of single crystals. Those prepared at lower temp. show, on further tempering, a sudden increase in conductivity similar to observed sudden recrystallis-ation. A. B. D. C.

Electrical conductivity of copper oxide films showing interference colours. F. H. CONSTABLE (Nature, 1935, 136, 517).—The electrical resistance of films of Cu oxide on Cu showing interference colours of the first order varies from 0·002 to 15 ohms per sq. cm. at 25°. L. S. T.

Electrical conductivity of rust. G. COHN (Z. Elektrochem., 1935, 41, 660—664).—The conductivity of Fe rust is 1—30 mho per cm., which is about 10^6 times as great as that of goethite. The cathodic influence of rust on corrosion is due mainly to the inclusion of graphite and cementite, and to a smaller extent to Fe_3O_4. E. S. H.

Electrical properties of mineral aggregates. I. Natural and artificial aggregates of crystall-ised lead sulphide. R. S. DEAN and J. KOSTER (U.S. Bur. Mines, Rept. Invest. No. 3268, 1935, 21—50).—Massive galena crystals have a normal positive coeff. of resistance, whereas fine-grained steel galena (I) has a negative temp. coeff., the resistance–temp. curve having an exponential form. It behaves somewhat like a leaky condenser, the a.c. resistance being a function of the current passed through the specimen. The d.c. resistance of (I) ∝ the square of a superimposed radio-frequency current, but is independent of the frequency. Determinations of the effect of grain size on the voltage–current charac-teristics at various temp. of synthetic (I) pastilles showed that the graphs are linear for all sizes and temp. The theoretical implications of the results are discussed with reference to the electronic structure.

A. R. P.

Dielectric properties of electrolytically pro-duced layers of aluminium oxide. H. ZAUSCHER (Ann. Physik, 1935, [v], 23, 597—626).—Layers of Al_2O_3, about 0·1 mm. thick, were produced by anodic oxidation of Al electrodes in $H_2C_2O_4$ solution. With d.c. the layers are vitreous, colourless, and porous; with a.c. yellow. The hygroscopic and dielectric properties of the layers prepared by the two methods are compared. The porosity of the layers decreases as the thickness increases, so that the properties of the layer depend on thickness below 50 μ. The dielectric loss was determined for layers which had been soaked in oil. The loss is < that for dried layers at high alternating potentials. A. J. M.

Anomalous dispersion of electric waves (3—8 m.) in solutions of organic zwitterions ; a mole-

cular resonance phenomenon of sphingomyelin.
I. HAUSER, R. KUHN, and F. GIRAL (Naturwiss.,
1935, **23**, 639—641).—The dielectric const. (ϵ) has
been determined for zwitterions of the formula
$^+NMe_3 \cdot [CH_2]_n \cdot CO_2^-$ ($n = 1, 4, 5, 14, 16$) in H_2O and
EtOH solution, and for EtOH solutions of sphingo-
myelin (I), at various concns. (c), temp., and $\lambda\lambda$. For
small concns., $\Delta\epsilon$ is a linear function of c. This
relationship holds for higher concns. the smaller is the
dissolved dipole. The dipole moments arc calc. from
$\Delta\epsilon/\Delta c$ by the Debye method, if the dissolved mols.
behave as a gas. The vals. obtained agree with those
calc. from the mol. model. When $n = 4$ and 16, the
dipole moments arc 18 and 41×10^{-18}, respectively.
For (I) it is 30×10^{-18}. The betaine mols. arc there-
fore extended, and the substances arc unimol. in
solution. In H_2O, the betaines did not show anomalous
dispersion, but in EtOH this was found for waves of
3—6 m. For long dipoles the anomalous dispersion
depends on the viscosity of the solvent in the case of
betaines, but not in the case of (I). This is discussed
in the light of the constitutional formula of (I), and it
is concluded that the mol. acts as a resonator of very
low characteristic frequency. A. J. M.

**Absorption of decimetre waves in ionised
gases, and the problem of the demonstration of
the absorption of longer waves by excited
hydrogen atoms.** T. HAASE (Ann. Physik, 1935,
[v], **23**, 657—676).—The absorption of waves of
7—30 cm. in H_2, N_2, and CO_2, during the passage
of the glow discharge, has been measured. The no.
of electrons in the gas during the passage of the dis-
charge was determined by Langmuir's method, and
the measured absorption coeff. agrees with that calc.
by Stewart's formula (Physical Rev., 1923, [ii],
22, 324) from the no. of electrons. The no. of ex-
cited atoms caused by the passage of the glow dis-
charge through H_2 was determined from the intensity
of the H_α radiation. The no. is so small that it is
impossible to show the absorption of 10-cm. waves
by excited H atoms. A. J. M.

**Tensor nature of the dielectric constant and
magnetic permeability in anisotropic media.**
J. H. VAN VLECK (Physical Rev., 1934, [ii], **45**, 115—
116).—Theoretical. L. S. T.

Dipole moments of isotopic molecules. R. P.
BELL (Trans. Faraday Soc., 1935, **31**, 1345—1347).—
Since, with certain exceptions, the dipole moment,
μ, of a mol. is a function of its amplitude of vibration,
the μ of isotopic mols. will differ, and such difference
should be detectable between compounds of H and D.
J. G. A. G.

**Dielectric constant and specific conductance
of liquid hydrogen sulphide at 194·5° abs.** W. G.
BICKFORD and J. A. WILKINSON (Proc. Iowa Acad.
Sci., 1933, **40**, 89—91; cf. A., 1933, 210).—The sp.
conductivity and dielectric const. at 194·5° abs. were
$1·17 \times 10^{-9}$ ohm^{-1} c.c. and 8·3, respectively.
CH. ABS. (*e*)

Dielectric constant of ionised air. S. K. MITRA
and S. S. BANERJEE (Nature, 1935, **136**, 512—513).—
Measurements of the variation of ϵ with wave fre-
quency verify the Eccles–Larmor theory of the de-
crease of ϵ of ionised air below unity, and show that
the anomalous increase reported by previous investig-
ators is due to the conductivity acquired by the ionised
air. L. S. T.

Dielectric constant of water vapour. J. D.
STRANATHAN (Physical Rev., 1935, [ii], **48**, 538—544).
—Deviations from linearity of the dielectric const.–
pressure curves were investigated, and anomalies are
corr. or explained. Accurate dielectric data and an
expression for these were obtained in the temp. range
21·3—197·9°. Results fall accurately along a Debye
line, yielding an electric moment of $(1·831 \pm 0·006) \times 10^{-18}$ e.s.u. for the H_2O mol. N. M. B.

**Dielectric constants of gases and vapours.
III.** M. KUBO (Sci. Papers Inst. Phys. Chem. Res.
Tokyo, 1935, **27**, 295—304; cf. this vol., 916).—By
taking into account the mutual action of dipoles, the
Debye equation for the mol. polarisation (P) takes the
form $P = A + B/T + 3AB^2\rho/8\pi N\beta^3 T^2$, where $A = 4\pi N\alpha/3$, $B = 4\pi N\mu^2/9k$, and β is the effective mol.
radius. P for H_2, N_2, CH_4, and air is independent of
temp. and pressure, in accord with theory, but the small
increase of P for CO_2 with increasing pressure must be
due to an effect unaccounted for in this equation. P
for NH_3 increases linearly with 1/mol. vol., in accord
with theory, the val. of the mol. radius calc. from the
rate of increase being in accord with vals. calc. from
viscosity measurements and from van der Waals'
const. b. J. W. S.

**Dipole moments of hydrazine and its deriv-
atives. II.** H. ULICH, H. PEISKER, and L. F.
AUDRIETH (Ber., 1935, **68**, [*B*], 1677—1682; cf. A.,
1933, 339).—Measurements are recorded for
$NHMe \cdot NH_2$, *o*-, *m*-, and *p*-$C_6H_4Me \cdot NH \cdot NH_2$, *p*-
$C_6H_4Br \cdot NH \cdot NH_2$, *p*-$NO_2 \cdot C_6H_4 \cdot NH \cdot NH_2$, and 2 : 4-
$(NO_2)_2C_6H_3 \cdot NH \cdot NH_2$. The results are readily ex-
plained qualitatively and quantitatively according to
the views of Penney *et al.* (A., 1934, 1158) on the
constitution of hydrazines. H. W.

**Dielectric investigations of nitromethane and
chloropicrin.** C. P. SMYTH and W. S. WALLS (J.
Chem. Physics, 1935, **3**, 557—559).—Measurements
at 25° and 50° of dielectric const. for solutions of
$MeNO_2$ in C_7H_{16} and of chloropicrin in C_7H_{16} and in
C_6H_6 are recorded. The dipole moments are < those
for the vapours. Müller's relationship is not satisfied
(cf. A., 1933, 1103). Measurements with liquid and
solid $MeNO_2$ (−90° to 27·4°) gave no evidence for mol.
rotation in the solid state. There was no sudden
change in the dielectric const. just above the m.p.,
showing that there is no increased formation of mol.
aggregates in this region. H. J. E.

Dipole moment of ethyl benzoate. E. BERG-
MANN and A. WEIZMANN (J. Amer. Chem. Soc., 1935,
57, 1755).—The dipole moment in C_6H_6 solution at
24·6° is 1·91 D. E. S. H.

**Dipole moments of some substituted benzalde-
hydes.** J. N. PEARCE and L. BERHENKE (Proc.
Iowa Acad., 1933, **40**, 93).—Dielectric consts. of
solutions of *p*-$C_6H_4Me \cdot CHO$, *p*-anisaldehyde, and *p*-
$OH \cdot C_6H_4 \cdot CHO$ were determined at 25°. Dipole
moments ($\times 10^{-18}$) were 3·26, 3·70, and 4·62, respect-
ively. CH. ABS. (*e*)

Dielectric investigations on cellulose derivatives in organic liquids. V—VII. S. Lee and I. Sakurada (J. Soc. Chem. Ind. Japan, 1935, 38, 389B).—The mol. polarisation of ethylcellulose is dependent on the concn. because it associates to a non-polar complex; it is dependent also on the temp. Benzylcellulose and cellulose triacetate are less sol. and have lower dipole moments.   A. G.

Orienting action of an electric field on the molecules of anisotropic fluids. V. Frederiks and V. Tzvetkov (Compt. rend. Acad. Sci. U.R.S.S., 1935, 2, 528—534).—The orienting influence of an electric field on films of p-azoxyanisole (I), p-acetoxy-benzylideneazine (II), and dibenzylidenebenzidine (III) has been studied, using a magnetic field to overcome the orienting action of the glass wall. With a field of frequency 10^3 (I) and (II) are oriented perpendicular, and (III) is oriented parallel, to the field. Using a frequency of 3—6×10^5 the magnetic field may be dispensed with in the case of (II) and (III). The orientation of (III), which is a symmetrical mol., is contrary to Zocher's rule (A., 1928, 226).   R. S. B.

Refraction equivalents of the triple carbon linking.—See this vol., 1222.

Rotatory dispersion of organic compounds. XXVIII. Ultra-violet absorption of ketones. T. M. Lowry and R. E. Lishmund (J.C.S., 1935, 1313—1319).—Absorption curves which are symmetrical on a scale of λλ are given by three alicyclic ketones, two OH-ketones, and two enolic ketones. Curves which are steeper on the side of longer λλ are given by simple aliphatic ketones and their Cl-derivatives, as well as by camphor and piperitone. Curves which are symmetrical on a scale of frequencies, or steeper on the side of shorter λλ, have not been observed. The ketonic absorption band is displaced towards the visible region when H is replaced by Cl, but towards the ultra-violet when replaced by OH. Cooling to the temp. of liquid air displaces $\lambda_{max.}$ by about 50 Å. towards the extreme ultra-violet, but has no great effect on the intensity of the band.   O. J. W.

Evaluation of the structural theory of organic chemistry. I. J. K. Senior (J. Chem. Educ., 1935, 12, 409—414).—A lecture.   L. S. T.

Mass spectrum analysis of the products of ionisation by electron impact in nitrogen, acetylene, nitric oxide, cyanogen, and carbon monoxide. J. T. Tate, P. T. Smith, and A. L. Vaughan (Physical Rev., 1935, [ii], 48, 525—531).—A special mass spectrograph is described. A direct comparison in a N_2–A mixture showed that the ionisation potential of N_2 is at least 0.04 volt $<$ that of A, and therefore $\not>$ 15.60 ± 0.05 volts. The ions formed by electron impacts in C_2H_2, NO, and C_2N_2, and their appearance potentials are : $C_2H_2^+$ 11.2 ± 0.1, C_2H^+ 17.8 ± 0.2, C_2^+ 23.8 ± 0.3, CH^+ 22.2 ± 0.5, C^+ 24.5 ± 1.0, H^+ 21.7 ± 1.0 and 25.6 ± 1.0; NO^+ 9.5 ± 0.1, N^+ 22.0 ± 0.5, NO^{++} 44 ± 1.0; $C_2N_2^+$ 14.1 ± 0.1, C_2N^+ 19.8 ± 0.5, CN^+ 21.3 ± 0.3, C_2^+ 18.6 ± 0.5. Negative O^- ions appear in NO. An ion of mass 27 found in C_2H_2 is ascribed to $C^{12}C^{13}H_2$. The calc. $C^{13} : C^{12}$ abundance ratio is 1 : 100.   N. M. B.

Energy formula and potential distribution of diatomic molecules. E. A. Hylleraas (J. Chem. Physics, 1935, 3, 595).—Theoretical.   H. J. E.

Wave equation for a triatomic molecule. M. Eliashevitsch (Physikal. Z. Sovietunion, 1934, 6, 569—586).—A method of obtaining the vibrational–rotational wave equation is given, and is applied to a non-linear triat. mol.   Ch. Abs. (e)

M.p. law and lattice binding. R. Forrer (Ann. Physique, 1935, [xi], 4, 202—269).—The m.p. obey the same law, $T = F\sqrt{N}$, as the Curie points, where N is the no. of " contacts " of the at. electrons with those of the neighbouring atoms, and F is a const. having the same val. for each element as in the Curie law. For several elements of low m.p. the no. of contacts is tested by the theory of the electronic lattice, the structure of which determines the rigidity of the solid. Consideration of the no. of electrons in the structure of this lattice leads to the conception of lattice-valency. The relation of a no. of properties of elements to the electronic lattice is discussed.
N. M. B.

Exchange of vibration and translation energies between iodine molecules and inert gases. F. Rössler (Z. Physik, 1935, 96, 251—267).—Collision efficiency for rotation and vibration energy exchange determined from fluorescence extinction gives cross-sections 25 times the gas kinetic val. and considerably $>$ that given by acoustic dispersion.   A. B. D. C.

Current views concerning the liquid state. R. D. Spangler (Proc. Iowa Acad. Sci., 1933, 40, 150).—Existing definitions are inadequate.
Ch. Abs. (e)

Chemical force in the light of quantum mechanics. II. W. Jost (Z. Elektrochem., 1935, 41, 667—674; cf. this vol., 15).—Theoretical. Bimol. and resonance energies are discussed.   E. S. H.

EK [energy coefficient] system. A. E. Fersman (Compt. rend. Acad. Sci. U.R.S.S., 1935, 2, 559—566).—With a view of solving geochemical and crystallographical problems, EK, the energy contributed to a heteropolar compound by each of the ions brought from infinity, and u, the ionisation energy of the compound, have been approx. calc. according to $U = 256.1(aEK_{cat.} + bEK_{an.})$, $EK = Kw^2/2R$, where a and b are the no. of atoms of cation and anion in the compound, and w is the valency and R the radius of the ion in question. $K = 1$ for all anions, and $=$ approx. 1 for cations of $R = 1.0$—1.5 Å. Tables of EK are given for geochemically important ions. Vals. of U are additive within 6—12%.   R. S. B.

Theory of thermal disarrangement in crystals. W. Schottky (Naturwiss., 1935, 23, 656—657).—The no. of particles in the inter-lattice and lattice holes of a lattice disordered by heat is not necessarily the same. Consideration of the thermal equilibrium leads only to the product of the concns. of particles in the two positions. The individual concns. are dependent on several conditions not previously sufficiently considered. For lattices consisting only of neutral particles, the equilibrium concns. of particles in the holes and within the lattice are dependent only on temp., but may differ widely. In the case of ionic

lattices the new theory suggests possibilities not previously envisaged. A. J. M.

Energy level scheme for electrons in crystals. P. TARTAKOVSKI (Z. Physik, 1935, **96**, 191—197).— Energy level schemes are deduced for NaCl, KCl, and diamond. A. B. D. C.

Electronic structure of molecules. X. Aldehydes, ketones, and related molecules. XI. Electroaffinity, molecular orbitals, and dipole moments. XII. Electroaffinity and molecular orbitals, polyatomic applications. R. S. MULLIKEN (J. Chem. Physics, 1935, **3**, 564—573, 573—585, 586—591; cf. this vol., 1188).—X. Electron configurations are given for the normal states of CH_2O, MeCHO, and $COCl_2$, and for the low excited states of CH_2O. The structures, ionisation potentials, and longest λ electronic band spectra of these mols. and other aldehydes, ketones, thioaldehydes, and thioketones, are interpreted in relation to these configurations.
XI, XII. Theoretical. H. J. E.

Parachor and chemical constitution. III. Structure of carbamide and thiocarbamide. S. K. RAY (J. Indian Chem. Soc., 1935, **12**, 404—409). —From measurements of the surface tension and d at 28—30° of aq. solutions of carbamide (I) and thiocarbamide (II), the parachors of (I) and (II) correspond with the carbamide structure and not with Werner's cyclic formulæ. Low vals. of the parachor were obtained for (I) in MeOH and EtOH, owing to mol. association, and in $HCO \cdot NH_2$, and for (II) in C_5H_5N. J. G. A. G.

Ionisation constants and parachors of some furan compounds. H. GILMAN, W. E. CATLIN, and R. K. DAVIS (Proc. Iowa Acad. Sci., 1933, **40**, 115).—2-Furoic acid is distinctly, and 3-furoic acid slightly, stronger than BzOH. Dissociation consts. of halogen-substituted furoic acids indicate that the furan nucleus is non-planar. The parachors of simple furan compounds are normal. CH. ABS. (r)

Parachor of some heteropolar crystals. A. ROMANSKI (J. Phys. Chem. U.S.S.R., 1934, **5**, 779— 780).—Vals. for Na and K halides are discussed. The accepted val. $\sigma = 92$ for KBr is uncertain.
CH. ABS. (e)

Multiple Laue spots. C. C. MURDOCK (Physical Rev., 1934, [ii], **45**, 117—118).—Double or triple spots were always obtained from a certain specimen of quartz. The triple spots are attributed to the ideally perfect nature of the crystal, and they may provide a method for locating large perfect blocks within a quartz crystal and for surveying their boundaries.
L. S. T.

Spectroscopy of ultra-soft X-rays. V. M. SIEGBAHN and T. MAGNUSSON (Z. Physik, 1935, **96**, 1—11).—Data are given for C in the form of graphite, diamond, carbides, and carbonates; the last give exceptionally sharp $K\alpha$ lines. A. B. D. C.

Absorption factor for the powder and rotating-crystal methods of X-ray crystal analysis. A. J. BRADLEY (Proc. Physical Soc., 1935, **47**, 879—899).— Mathematical. Data are calc. for obtaining the absorption factor, accurate to 1%, for any angle of reflexion. N. M. B.

Intensity of X-ray reflexions from crystalline powders. J. C. M. BRENTANO (Proc. Physical Soc., 1935, **47**, 932—947).—In the determination of the dispersion of F-vals. in the range of the L-absorption levels, factors determining quant. measurements by the flat powder layer and mixed powders method, effect of the size of crystallites, use of spacing materials, absorption effect of particles of different absorbing power, and reflexions obtained from a flat layer are discussed. N. M. B.

X-Ray interference at the single-crystal anticathode. W. KOSSEL and H. VOGES (Ann. Physik, 1935, [v], **23**, 677—704).—X-Ray interference has been produced from the X-ray source itself, viz., a single-crystal anticathode. The observed interferences can be explained as the result of the reflexion of plane waves at lattice planes, and the depth to which the cathode rays have penetrated can be calc. Peculiarities in the reflexions are discussed, particularly variations in intensity ("bright-dark" lines), which can be explained by the new theory of Laue.
A. J. M.

Fluorescence X-radiation of single crystals (with a note on electron diffraction). M. VON LAUE (Ann. Physik, 1935, [v], **23**, 705—746; cf. this vol., 918).—The theory of the interference of rays emitted from single crystals (see preceding abstract) is developed by combining the Maxwell reciprocal law with the dynamic theory of X-ray interference.
A. J. M.

Mosaic zinc crystals. E. P. T. TYNDALL and H. K. SCHILLING (Proc. Iowa Acad. Sci., 1933, **40**, 156; cf. Poppy, this vol., 20).—Crystals of a distinct mosaic type were observed. CH. ABS. (e)

Diffraction of X-rays by liquid Na–K alloy in a magnetic field. C. W. HEAPS (Physical Rev., 1935, [ii], **48**, 491—493).—Although the alloy shows magnetoresistance, any diffraction change due to a magnetic field is $< 2\%$ in a field of 2700 gauss. An attempt to detect magnetostriction showed no vol. change per unit vol. $> 3 \times 10^{-7}$ in a field of 7800 gauss.
N. M. B.

Reflexion of cathode ray from a crystal surface. S. MIYAKE (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1935, **27**, 286—294).—The position and breadth of the reflexion spectrum calc. from the wave equation of electrons for a simple potential model in the crystal agree with experiment for ZnS crystals.
J. W. S.

Electronic structure of diamond. G. E. KIMBALL (J. Chem. Physics, 1935, **3**, 560—564).— Theoretical. The energy levels of the C atom are broadened into bands similar to the energy bands in metals. In a metal there is always an incompletely-filled energy band, whereas in diamond the low-energy bands are all completely filled, and a large amount of energy would be necessary to promote an electron to an unfilled band. H. J. E.

Dynamical theory of the diamond lattice. III. Diamond–graphite transformation. N. S. N. NATH (Proc. Indian Acad. Sci., 1935, **2**, A, 143—152;

cf. this vol., 150, 1058).—The transformation of diamond structure into graphite structure is interpreted as a definite relative displacement of the two face-centred lattices, a definite homogeneous dilatation of the whole crystal along the same direction, and a definite homogeneous gliding of the planes obtained by these transformations perpendicular to the same direction. For a certain displacement of the component lattices diamond attains max. energy of its configuration, becomes unstable, and changes to graphite. The calc. temp. of transformation is in good agreement with experiment. J. W. S.

Incomplete atomic arrangement in crystals. E. J. W. VERWEY (J. Chem. Physics, 1935, 3, 592—593).—γ-Fe_2O_3, γ-Al_2O_3, and γ'-Al_2O_3 (obtained by electrolytic oxidation of Al) are averaged structures with regard to the cations. The γ and γ' oxides have the same O lattice, but there is a difference in the degree of incomplete arrangement of the cations. γ- and γ'-Al_2O_3 and Fe_2O_3 are intermediate between the amorphous and the totally arranged state. In γ'-Al_2O_3 only the anions are arranged regularly. On heating to 900°, γ-Al_2O_3 is formed, with a partial arrangement of the cations. Complete arrangement of the cations occurs at $> 1000°$, α-Al_2O_3 being formed. H. J. E.

Structure of metallic coatings, films, and surfaces. C. H. DESCH (Trans. Faraday Soc., 1935, 31, 1045—1048).—A lecture. E. S. H.

Formation of nuclei in recrystallisation. I. Dependence of incubation period on the deformation and heating conditions. M. KORNFELD (Physikal. Z. Sovietunion, 1935, 7, 432—441).—The dependence of the velocity of formation of nuclei and of the linear velocity of growth of new nuclei on the degree of deformation has been obtained. These data are used to explain the mechanism of the formation of nuclei. W. R. A.

Grain growth in carbonyl iron and the preparation of single crystals of iron. W. TANGERDING (Arch. Eisenhüttenw., 1935—1936, 9, 113—114). —Repeated annealing of carbonyl Fe alternately in oxidising and reducing atm. leads to rapid grain growth, so that it is possible to prepare large Fe single crystals in this way if the metal is free from impurities restraining grain growth. The more rapidly the metal is cooled from above $Ac3$ the greater is the veining which occurs in the ferrite and the higher is the coercivity; this behaviour is in agreement with the assumption that the veining constituent is a layer with a distorted α-lattice due to the presence of traces of impurities. A. R. P.

(A) **Temperature dependence of the number of crystal nuclei in supercooled liquids.** F. K. GORSKI. (B) **Velocity of crystallisation in a magnetic field.** R. J. BERLAGA and F. K. GORSKI (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 522—526, 527—530).—(A) Without a field the no. of nuclei formed in supercooled piperine as a function of temp. shows max. at 42° and 45°, with a deep min. at 43°. With a field (2000—4300 volts per cm.) the max. and min. are shifted to lower temp., and accentuated.

(B) The linear velocity of crystallisation of H_2O,

4 s

salol, and $NHPh_2$ was unchanged by fields up to 17,000 gauss. CH. ABS. (e)

Crystallisation of thin metal films. E. N. DA C. ANDRADE (Trans. Faraday Soc., 1935, 31, 1137—1143).—The spherulitic crystallisation of sputtered films of Au and Ag on heating is described. Experiments show that the surface of the metal is mobile at temp. above a crit. val., which depends partly on the thickness of the film. E. S. H.

Function of hydrogen in intermolecular forces. J. D. BERNAL and H. D. MEGAW (Proc. Roy. Soc., 1935, A, 151, 384—420).—An examination of the crystal structure of the metallic hydroxides confirms the hypothesis that the force between OH groups is a function of the charge and size of the cation with which they are linked. With a small, highly-charged ion, this force acquires the character of a secondary linking only less powerful than the H linking of acids. This linking (length 2·7—2·8 Å.) is called the OH linking, and its occurrence is explained in terms of changes in the internal electronic structure of the OH group. The polarised OH group is assumed to have a tetrahedral structure with a negative region which serves to bind the positive H atom of a neighbouring OH. This hypothesis of the OH linking is used to predict the structure of $Te(OH)_6$. Intramol. H linkings in salicylaldehyde and o-nitrophenol are considered. L. L. B.

Powder diagrams of magnetised nickel crystals. S. KAYA and J. SEKIYA (Z. Physik, 1935, 96, 53—61).—Discontinuities are shown by the cubic and dodecahedral surfaces according as magnetisation is along the tetragonal or diagonal axis (cf. A., 1934, 1059, 1160). A. B. D. C.

Dispersion of X-rays by nickel. II. Relationship between the intensity of the diffraction lines and the temperature. J. UMANSKI and V. VEXLER (Physikal. Z. Sovietunion, 1935, 7, 336—342).—The intensity of the (311) diffraction line of Ni has been measured in the temp. range 290—740° abs. The intensities observed at 480° and 590° abs. differ only slightly from those calc. by means of Waller's formula. Divergences at higher temp. are discussed. O. J. W.

Lattice dimensions of zinc oxide. C. W. BUNN (Proc. Physical Soc., 1935, 47, 835—842).—High-precision measurements by Cu and Co $K\alpha$-radiation powder photographs of pure ZnO condensed from the smoke give, at 18°, a_0 3·2426±0·0001, c_0 5·1948±0·0003, axial ratio c_0/a_0 1·6020±0·0001. Comparisons with available data are discussed. N. M. B.

Temperature variation of the lattice constants of manganous oxide. (MLLE.) B. RUHEMANN (Physikal. Z. Sovietunion, 1935, 7, 590—607).—The lattice const. (a) of MnO is 4·4335 Å. at 0°, and its coeff. of expansion is const. at $1·45 \times 10^{-5}$ down to 175° abs., below which it decreases slowly with fall of temp. At −115·9° abs. it shows an anomaly similar to that of NH_4Br (A., 1930, 986) owing to the appearance of a lattice with const. a' of 4·416 Å. as against 4·4258 Å. for a at this temp. This is in accord with sp. heat data (A., 1928, 936).

The two lattices co-exist between 77° and 116° abs. The lattice with const. a' is not strictly cubic.

J. W. S.

Relation between the alum structures. H. LIPSON (Proc. Roy. Soc., 1935, A, **151**, 347—356).— There are ≮ 3 different alum structures, and in order to study the relation between them the parameters of Rb alum (α structure), Cs alum (β), and Na alum (γ) have been determined. The structure of a particular alum is dependent on the radius of the univalent ion. The α structure is typical of medium-sized ions, the β, of larger ions, and the γ, of the small Na atom. The γ structure is not directly related to the other two, but exists merely as an alternative way of fitting together the various groups while maintaining the disposition of linkings around the H_2O mols.

L. L. B.

X-Ray diffraction study of the structure of soda–silica glass. B. E. WARREN and A. D. LORING (J. Amer. Ceram. Soc., 1935, **18**, 269—276; cf. B., 1934, 883).—X-Ray diffraction patterns made on seven Na_2O–SiO_2 glasses (0–46% Na_2O) showed, for small Na_2O content, a single strong peak at sin $0/\lambda = 0.12$, which diminished in intensity without abrupt change with increasing Na_2O content, a new peak (at sin $0/\lambda = 0.18$) becoming the more pronounced. A picture of the at. arrangement in the glass, yielding theoretical X-ray intensity curves in good agreement with experiment, is described. Each Si atom is tetrahedrally surrounded by four O atoms, part of which are shared between two, and the others linked to one, Si. The doubly-linked O build up a continuous Si–O framework, in the holes of which Na atoms are located at random. There is no evidence for existence of compounds in compositions studied.

A. L. R.

Crystal structure of swedenborgite, $NaBe_4SbO_7$. L. PAULING, H. P. KLUG, and A. N. WINCHELL (Amer. Min., 1935, **20**, 492—501).—The hexagonal unit, a 5·47, c 8·92 Å., contains $2NaBe_4SbO_7$; space-group C_{6v}^4. The crystal contains octahedral SbO_6 groups, and groups of four Be tetrahedra with one corner common to all four, the others being shared with tetrahedra of other groups and with Sb octahedra. The large O and Na ions together form a double hexagonal close-packed aggregate.

L. S. T.

Crystals and melt in stretched rubber. P. A. THIESSEN and W. WITTSTADT (Z. physikal. Chem., 1935, B, **29**, 359—362).—In the stretching of rubber, arrangement of the mols. of the melt into a lattice continues for some time after extension has ceased, and for a given extension a definite equilibrium between cryst. material and melt is reached at each temp. over a wide range, the amount of melt increasing with rise in temp. The change is reversible and the equilibrium is affected by pressure.

R. C.

X-Ray investigation of cellotriose and its derivatives. C. TROGUS and K. HESS (Ber., 1935, **68**, [B], 1605—1610).—Diagrams are given of cellotriose, its α- (I) and β-hendeca-acetate (II), β-hendeca-methylcellotriose, β-octamethylcellobiose, and 2 : 3 : 6-trimethylglucose. With mixtures of (I) and (II) containing ⊁ 50% of (I), only the interferences of (II) are visible in the diagram. The phenomenon, which appears widespread in the carbohydrate and sugar group, is attributed to the widely differing tendencies of the individuals towards crystallisation. Probably the detectable form functions as crystal carrier for the non-recognisable component.

H. W.

X-Ray analysis of textile fibres. III. Structure of the cellulose crystallite as interpreted from X-ray diffraction data. W. A. SISSON (Textile Res., 1935, **5**, 119—133; cf. this vol., 18).— A review.

CH. ABS. (*p*)

Electron diffraction and surface structure. G. I. FINCH, A. G. QUARRELL, and H. WILMAN (Trans. Faraday Soc., 1935, **31**, 1051—1080).—A review of the present state of electron-diffraction technique, with special reference to the study of metallic films and surfaces.

E. S. H.

Inner potentials of crystals and electron diffraction. W. E. LASCHKAREV (Trans. Faraday Soc., 1935, **31**, 1081—1095).—Theoretical. The effective potential is not a const., but increases with the order of the diffracted reflection, asymptotically approaching the average grating potential. A method for calculating from X-ray data the potential distribution in the grating and the mean grating potential is outlined. The temp. factor is discussed.

E. S. H.

Thickness of the amorphous layer on polished metals. H. G. HOPKINS (Trans. Faraday Soc., 1935, **31**, 1095—1101).—Polished Au surfaces were examined by electron-diffraction technique after removing the polished surface progressively by cathodic sputtering. The results show that the thickness of the amorphous layer is about 30 Å., and that there is a gradual increase in crystal size below the polished surface.

E. S. H.

Structure of polished metal surfaces. C. S. LEES (Trans. Faraday Soc., 1935, **31**, 1102—1106).— Electron-diffraction analysis of polished surfaces of Cu and Au, after progressive electrolytic etching, shows that the amorphous surface layer is separated from the polycryst. interior by a layer of oriented crystals. The thicknesses of the layers have been determined. The orientation appears to be due to deformation of the crystals by compression. The actual surface does not consist of crystal faces.

E. S. H.

Molecular layers of fatty substances on metals. J. J. TRILLAT and H. MOTZ (Trans. Faraday Soc., 1935, **31**, 1127—1135).—New electronic interferences, foreign to the ordinary diagram of the metals, have been observed in the examination of numerous metallic layers of a thickness of a few mμ; they are independent of the physical treatment of the metal and are particularly intense with aged specimens. Results obtained by the artificial formation of layers of org. mols. on metallic surfaces show that the abnormal diagrams are due to the formation and crystallisation of thin films of fatty substances composed of linear mols. with long chains of C atoms. E. S. H.

Diffraction experiments with slow electrons at galena, pyrites, and stibnite, the change of

the crystal surface of semi-conductors on electron bombardment, and the effect of temperature on the form of the diffraction curve. R. SUHRMANN and H. HAIDUK (Z. Physik, 1935, **96**, 726—740).—The changes in the surfaces of semi-conductors on bombardment with electrons have been examined in the case of PbS, FeS$_2$, and Sb$_2$S$_3$, to elucidate the mechanism of crystal rectification. A method is described by which the intensity of electron beams incident on and reflected from crystal surfaces can be registered photographically after a short exposure, although the beams are very weak (10^{-7} and 10^{-9} amp., respectively). The electron diffraction curves for a Bi layer on FeS$_2$ and PbS surfaces after bombardment with slow electrons (100 volts; 10^{-5} amp.) are obtained. Electron bombardment results in the removal of the diffraction max., which returns after 1 hr., the time depending on temp. The results can be explained by supposing that the surface crystal lattice is distorted by the incident electrons, in the neighbourhood of the cations. Temp. influences the form of the diffraction max.; the lower is the temp. the steeper is the max. A. J. M.

Inner potential of galena, pyrites, stibnite, and bismuth from diffraction curves with slow electrons. R. SUHRMANN and H. HAIDUK (Z. Physik, 1935, **96**, 741—753).—The diffraction max. of PbS, FeS$_2$, Sb$_2$S$_3$, and Bi (cf. preceding abstract) can be explained either by assuming the existence of several diffracting lattice planes, or only one such plane. In both cases the spectra are given by integral order nos., but the vals. of the lattice potentials obtained are different. By the first method the inner potential of PbS is 2·88 volts, and of FeS$_2$ 7·61 volts. The other substances give negative vals., whilst by the second method all give negative vals. (PbS −3·63, FeS$_2$ −3·54, Bi −1·72, Sb$_2$S$_3$ −1·25 volts). A. J. M.

Diffraction of fast electrons by crystallised rock-salt. S. PINSKER (Physikal. Z. Sovietunion, 1935, **7**, 464—467).—Electron diffraction by cryst. NaCl has been studied and interpretations are discussed. W. R. A.

Electron diffraction by vitreous silica powder. N. A. SCHISCHAKOV (Nature, 1935, **136**, 514).—The electron diffraction pattern of vitreous SiO$_2$ powder shows distinct rings indicating the presence of tetragonal cristobalite crystallites constituting the vitreous SiO$_2$. L. S. T.

Electron diffraction from vacuum-sublimed layers. K. LARK-HOROWITZ, E. M. PURCELL, and H. J. YEARIAN (Physical Rev., 1934, [ii], **45**, 123).—The material is condensed in a high vac. on to a volatile substance, e.g., camphor or C$_{10}$H$_8$, at the temp. of liquid air, and the support is allowed to evaporate when the required thickness is attained. Films of Zn thus prepared give an electron diffraction pattern which agrees with the X-ray pattern with only the first two lines differing in intensity distribution. L. S. T.

Distribution of ferromagnetism among the metals. D. R. INGLIS (Physical Rev., 1934, [ii], **45**, 128).—Theoretical. L. S. T.

Magnetic behaviour of superconducting tin spheres. K. MENDELSSOHN and J. D. BABBITT (Proc. Roy. Soc., 1935, **A**, **151**, 316—333).—The magnetic field in the neighbourhood of superconducting Sn spheres has been studied by two methods. When the specimen is cooled in an external field below its threshold val., lines of force are pressed out and the induction decreases, but part of the flux remains in the specimen, and this residual flux is greater for the hollow than for the solid sphere. L. L. B.

Magnetisation cycle of superconducting lead. I. N. RJABININ and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1934, **6**, 557—568; cf. A., 1934, 1061).—The magnetisation cycle of polcryst. Pb has been plotted at 4·24° abs. CH. ABS. (e)

Magnetisation curve of single iron crystals. R. JAANUS (Physikal. Z. Sovietunion, 1935, **7**, 380—384).—The conclusions of Hill (A., 1934, 1163) are considered to be incorrect. O. J. W.

Abnormal magnetic behaviour of treated cobalt wire. T. F. WALL (Nature, 1935, **136**, 397).—Co wire heated in H$_2$ at 1200° has saturation val. of the intensity of magnetisation only approx. 60% of that for normal Co. L. S. T.

Magnetism and electronic state of metallic solid solutions and elements. U. DEHLINGER (Z. Elektrochem., 1935, **41**, 657—659).—Published vals. for the magnetic saturation moments of Co, Ni, Cu, and their solid solutions deviate only slightly from the theoretical vals. for Co$^+$, Ni$^+$, and Cu$^+$. The greater deviation of Fe is traced to the magnetic difference between α- and γ-Fe. E. S. H.

Layer-like magnetisation in magnetite crystals. N. J. MILLER and D. S. SCHTEINBERG (J. Exp. Theor. Phys. U.S.S.R., 1934, **4**, 717—722).—Magnetisation was in layers perpendicular to the octahedral faces, and having a thickness of 0·03—0·3 mm. In rolled Ni the direction of magnetisation is in that of max. compression. CH. ABS. (e)

Magnetisation curves for magnetite powders. V. H. GOTTSCHALK and F. S. WARTMAN (U.S. Bur. Mines, Rept. Invest. No. 3268, 1935, 67—81).—Curves for four varieties of Fe$_3$O$_4$ show that at low field strengths the permeability increases with increase in grain size to 40 μ, then remains const. As the field strength is increased the permeability decreases and becomes more uniform, i.e., decrease in grain size has less effect. The coercive force increases linearly with increase in sp. surface and in packing density, and the retentivity increases linearly with increase in sp. surface and parabolically with increase in packing density. A. R. P.

Coercive force of magnetite powders. V. H. GOTTSCHALK (U.S. Bur. Mines, Rept. Invest. No. 3268, 1935, 83—90).—The fact that the coercive force of magnetite powders increases with decrease in grain size (cf. preceding abstract) is held to be additional direct proof of the fundamental correctness of the dispersion theory of magnetic hardness previously advanced (Rept. Invest. No. 3223). The coercive force of magnetite is decreased by dilution with non-magnetic material. A. R. P.

Magnetic properties of mineral powders and their significance. C. W. DAVIS (U.S. Bur. Mines, Rept. Invest. No. 3268, 1935, 91—100).—Fe_2O_3 obtained by dehydration of lepidocrocite at 370° or by dehydration of artificial γ-hydrated Fe_2O_3 at 250° has a high coercive force and remanence. Fe, Mn, and Mg ferrites produced under conditions which favour the development of a large interfacial area, Fe_3O_4 produced by reduction of Fe_2O_3, and heat-treated titaniferous magnetite have also similar favourable magnetic properties. The bearing of these results on a.c. magnetic separation of minerals is discussed.
A. R. P.

Elementary theory of galvanomagnetic phenomena in crystals. J. FRENKEL and T. KONTOROVA (Physikal. Z. Sovietunion, 1935, 7, 452—463).—The galvanomagnetic phenomena in bivalent metals with cubic symmetry are discussed by tracing the action of magnetic and electric fields on the separate electrons and positive holes (cf. Blochinzev et al., A., 1933, 893). W. R. A.

Application of the thermomagnetic analysis to the study of the oxides of iron. G. CHAUDRON (Bull. Soc. chim. Belg., 1935, 44, 339—350).—A lecture on the method of thermomagnetic analysis (cf. this vol., 469). The ferromagnetism of FeS is greatly increased by traces of dissolved S. R. S.

Magnetic reversal nuclei. V. Propagation of large Barkhausen discontinuities. K. J. SIXTUS (Physical Rev., 1935, [ii], 48, 425—430; cf. A., 1933, 768).—The size and growth are examined of stable regions of antisaturated magnetisation produced by short application of high local fields in a Ni–Fe wire in which a preferred direction of magnetisation is created by application of tension. N. M. B.

Viscosity bands in magnetic spectra. O. VELETZKAJA (Z. Physik, 1935, 96, 173—176).—Variation of permeability of Fe and permalloys with frequency to $\lambda\lambda$ of 1 cm. is in agreement with Arkadiev's theory of magnetic viscosity (Ann. Physik, 1919, 58, 105). A. B. D. C.

Electrical conductivity of semiconductors. II. Electrical and optical properties of vanadium pentoxide crystals. A. N. ARSENIEVA and B. V. KURTSCHATOV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 576—583; cf. A., 1934, 1291).—Monocryst. V_2O_5 (rhombic; $a : b : c = 0.3932 : 1 : 0.9590$) was obtained by slow cooling of a melt. Electrical conductivity is due to lower oxides. Vals. in different axial directions are recorded. CH. ABS. (e)

Some piezoelectric and elastic properties of β-quartz. H. OSTERBERG and J. W. COOKSON (J. Franklin Inst., 1935, 220, 361—371).—The piezoelectric and elastic properties of β-quartz are those which are theoretically characteristic of the hexagonal holoaxial class. The simple theory of the yz and zx shear-modes is verified and these modes exist independently in β- but not in α-quartz. 847° is a transition point at which β-quartz changes to another form (γ), not piezoelectric. W. R. A.

Inversion phenomena in the polarisation of Rochelle salt crystals. I. V. KURTSCHATOV and A. SCHAKIROV (Physikal. Z. Sovietunion, 1935, 7, 631—638).—For polarising potentials < 160 volts the velocity of depolarisation of the crystals is > the velocity of polarisation, whilst for > 160 volts the reverse is observed. This may be due to mechanical stresses. J. W. S.

Hall effect in solid gallium. I. FAKIDOV and B. G. LASAREV (Physikal. Z. Sovietunion, 1935, 7, 677—678).—By comparison with Cu the Hall effect const. (R) of Ga has been determined as -6.3×10^{-4} c.g.s. unit. The product $R\sigma$ (σ=sp. conductivity) is 12, the low val. being in accord with the fact that Ga is a superconductor. J. W. S.

Reflexion of metals (Cu, Zn, Ni, Ag, and " Hochheim " alloys) in the spectral region 300 to 186 mμ. F. HLUČKA (Z. Physik, 1935, 96, 230—235). A. B. D. C.

Validity of Drude's optical method of investigating transparent films on metals. L. TRONSTAD (Trans. Faraday Soc., 1935, 31, 1151—1158).—A discussion of theoretical principles, sources of error, and fields of application. E. S. H.

Optical research on evaporated metal layers. L. S. ORNSTEIN (Trans. Faraday Soc., 1935, 31, 1158—1166).—Technique for determining the optical consts. of thin layers of metal is described, and applications of the method to the investigation of the transition points of metals and to corrosion are indicated. E. S. H.

Metallic absorption of light. T. MUTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1935, 27, 179—194).—Mathematical. J. W. S.

Optical properties of solids. A. H. WILSON (Proc. Roy. Soc., 1935, A, 151, 274—295).—Mathematical. In deriving the fundamental formula, which is a generalisation of the Kramers–Heisenberg dispersion formula, it is unnecessary to assume that the size of the crystal is small compared with λ. The dispersion formulæ for metals (with special reference to Ag) and insulators are discussed, and the relation between absorption and dispersion is considered. The photo-electric response in an insulator is determined much more by the refractive index than by the absorption coeff. L. L. B.

Determination of refractive index of vitreous silica and the calibration of silica refraction thermometers between 18° and −200°. J. B. AUSTIN and R. H. H. PIERCE, jun. (Physics, 1935, 6, 43—46).—The variation of n for the He 5877.2 A. line was determined for vitreous SiO_2 from 18° to −200°, no min. being observed. The results are applied in refraction thermometer calibration. CH. ABS. (e)

Light absorption in heteropolar crystals. D. BLOCHINZEV (Physikal. Z. Sovietunion, 1935, 7, 639—651).—From the theory developed it is deduced that the widths of the absorption bands of heteropolar crystals should be independent of temp. J. W. S.

Heat of loosening of metals from recrystallisation data. J. A. M. VAN LIEMPT (Z. Physik, 1935, 94, 534—541).—The heat of loosening of metal lattices has been calc. for Fe, Ni, Au, Ag, Cu, Al, Pt, Ta, W, Mo, and Pb. A. B. D. C.

Structure of a deformed crystal and recovery phenomena. M. KORNFELD (Physikal. Z. Sovietunion, 1935, 7, 608—619).—A plastically deformed crystal consists of small particles which are bounded by the slip-planes of the crystal and are partly de-oriented relatively to one another. The lattice is distorted along the edges of the particles. The particles are also elastically distorted. The recovery of distorted Al crystals has been investigated as a function of the time and temp. of heating.
J. W. S.

Transition from brittleness to plasticity with rising temperature of crystals. G. TAMMANN and W. MÜLLER (Z. anorg. Chem., 1935, 224, 194—212).—Many crystals brittle at room temp. become plastic near the m.p. The influence of temp. on the surface figures produced by scratching or pressing crystals of rock-salt, galena, fluorspar, calcite, ice, and quartz has been investigated. Et nitrocinnamate, m-$C_6H_4Cl\cdot NO_2$, p-toluidine, o-$NO_2\cdot C_6H_4\cdot OH$ (I), 2 : 4-$C_6H_3Cl(NO_2)_2$, p-$C_6H_4Cl_2$, p-$C_6H_4Me\cdot NO_2$, m-$C_6H_4Br\cdot NO_2$, 1 : 2 : 4 : 6-trinitroanisole (II), azobenzene (III), m-$C_6H_4(NO_2)_2$, m-nitrotoluidine, BzOH, benzoin (IV), and o-$NO_2\cdot C_6H_4\cdot CO_2H$ (V) show no plasticity up to the m.p. Camphor, camphene, and pinene hydrochloride pressed between glass plates give a thin film with a rounded boundary; borneol, isoborneol, PhCl, PhBr, and $C_6H_4(NO_2)_2$ break into irregular pieces which reunite to partly transparent films; (I), $C_6H_4Cl_2$, (II), (III), trinitrotoluidine, BzOH, (IV), and (V) acid give only fine, opaque powders. The phenomena are discussed.
T. G. P.

Cathode material and the electrical strength of rock-salt. A. VOROBJEV (Z. Physik, 1935, 96, 148—150).—The less is the emission potential of electrons from the cathode material the less is the breakdown potential in approx. homogeneous fields.
A. B. D. C.

Investigation by the optical method of the elastic limit of rock-salt crystals as a function of the rate of increase of the deformative force. V. D. KUZNETZOV and M. M. DEGTIAREV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 643—650).—Within certain limits the rate of increase of tension on NaCl does not affect the crit. limit before rupture. Tempering of the crystals at 600—650° must be continued 2—3 days, with slow raising and lowering of the temp., to obtain crystals satisfactory for optical purposes.
CH. ABS. (e)

Plastic deformation of rock salt. III. N. A. BRILLIANTOV and I. V. OBREIMOV (Physikal. Z. Sovietunion, 1934, 6, 587—602).—During deformation of NaCl by compression normal to a cube face, it is postulated that small rotations of the cryst. lattice (about [001] in the (110) glide plane) are the primary effect. This, when extended over large domains, gives the illusion of translation.
CH. ABS. (e)

Increase in deformability and decrease in cleavability [of metals] with rise in temperature. G. TAMMANN and W. MÜLLER (Z. Metallk., 1935, 27, 187—189).—When Zn, Bi, or Sb single crystals are indented with a ball, characteristic twin lamellæ appear in well-defined crystallographic directions around the impression; similarly scratching with a diamond point produces small parallel fissures at an angle to the scratch. As the temp. of the test is raised these phenomena become less marked and eventually disappear at a temp. at which the metal becomes workable; i.e., Zn 130°, Bi 150°, and Sb 300°. Single crystals of Bi can be bent without fracture at > 100°, those of Sb only at > 350°; the brittleness of Bi at 20° is approx. equal to that of Sb at 300°, i.e., the two metals are equally brittle at temp. which are the same fraction of their abs. m.p.
A. R. P.

Corresponding states of deformed lattices. J. A. M. VAN LIEMPT (Chem. Weekblad, 1935, 32, 546—550).—The formula $T(13\cdot5+\log t)=$const. is derived for the recovery of deformed metals. S. C.

Effect of magnetisation on Young's modulus of elasticity of some ferromagnetic substances. K. NAKAMURA (Sci. Rep. Tôhoku, 1935, 24, 303—331).—Three methods of measuring Young's modulus and its variation with magnetisation are described. Results for Fe, Co, Ni, and Fe–Ni alloys are discussed (cf. this vol., 816).
W. R. A.

Polymorphism in the series of normal fatty dicarboxylic acids.—See this vol., 1351.

Linear velocity of transformation of white into grey tin. A. KOMAR and B. G. LASAREV (Physikal. Z. Sovietunion, 1935, 7, 468—473).—A method for the electrolytic infection of white Sn by grey is given. The linear velocities of transformation have been investigated from 18° to −80° and are 200 times recorded vals. The dependence of the velocity on supercooling and pressure are discussed.
W. R. A.

Mechanical twinning structure in calcspar. D. B. GOGOBERIDZE and E. G. ANANIASCHVILI (Physikal. Z. Sovietunion, 1935, 7, 547—552).—There is a const. angle between the axes of the two portions of twinned calcite crystals. The lattice is only turned, the form of the X-ray pattern remaining unchanged. The crystal surface is partly distorted along the line of twinning.
J. W. S.

Significance of magnetic measurements for chemical problems. II. W. KLEMM (Angew. Chem., 1935, 48, 617—624; cf. A., 1931, 547).—Chemical applications of magnetic susceptibility measurements are reviewed, with special reference to solid phase equilibria, molecular complexity, and free radicals. The latter have zero orbital moment, i.e., the spin moment of one electron. Neumann's formulation of K peroxide as KO_2 (cf. A., 1934, 242) is not justified.
J. S. A.

Influence of the formation of hydrates on the diamagnetism of chemical compounds. P. S. VARADACHARI (Proc. Indian Acad. Sci., 1935, 2, A, 161—175).—The magnetic susceptibilities (χ) of H_2SO_4–H_2O mixtures containing > and < 86% H_2SO_4 are respectively > and < the vals. calc. from the additivity law. Max. deviations are observed at concns. corresponding with $2H_2SO_4,H_2O$, H_2SO_4,H_2O, $H_2SO_4,3H_2O$, $H_2SO_4,6H_2O$, and $H_2SO_4,18H_2O$, hydrates which are also indicated by other physical properties. AcOH–H_2O mixtures obey the additivity

law, even at the composition of the compound AcOH,H$_2$O. When cryst. Na$_2$SO$_4$,10H$_2$O or its solutions are heated to > 33° no change in χ is observed, suggesting that the binding of the H$_2$O is very loose compared with that of H$_2$SO$_4$ hydrates. Evidence is put forward to indicate that no increase of susceptibility is likely to occur on hydration of KI, as suggested by Cabrera *et al.* (A., 1934, 841).
J. W. S.

Magnetism of copper. S. R. Rao (Nature, 1935, **136**, 436).—The diamagnetic susceptibility, χ, of Cu depends on particle-size. χ increases from 0·080 to 0·090 × 10⁻⁶ as particle size decreases from 10 to 0·8 μ.
L. S. T.

Magnetic properties of Rochelle salt. C. T. Lane (Physical Rev., 1934, [ii], **45**, 66).—No variation in magnetic susceptibility in the three principal directions of a single crystal could be detected. χ is —0·54 × 10⁻⁶ if χ_{Au} is 0·145 × 10⁻⁶.
L. S. T.

Magnetochemical investigations. XVI. Magnetic investigation of system CoS–CoS$_2$. H. Haraldsen (Z. anorg. Chem., 1935, **224**, 85—92).—Susceptibility measurements show that from CoS to CoS$_{1·3}$ a one-phase system is formed, with χ little dependent on T. Between CoS$_{1·3}$ and CoS$_2$, CoS$_2$ appears as a second solid phase which becomes ferromagnetic at —183°.
J. S. A.

Magnetic susceptibility of bromine vapour. J. Shur and R. Jaanus (Physikal. Z. Sovietunion, 1935, **7**, 501—506).—An apparatus for the determination of the magnetic susceptibility of active vapours is described. The val. of the susceptibility of Br$_2$ vapour is —0·46 × 10⁻⁶ and is in agreement with the recorded val. for liquid Br$_2$.
W. R. A.

Longitudinal thermo-electric effect. II. Nickel in longitudinal magnetic fields. T. H. Pi and W. Band. **III. Aluminium.** M. K. Li and W. Band. **IV. Further study of aluminium.** W. Band. **V. Silver.** J. L. Ch'en and W. Band (Proc. Physical Soc., 1935, **47**, 852—858, 859—861, 862—872, 904—909; cf. A., 1934, 950).—II. The e.m.f. produced by asymmetrical temp. distributions in a Ni wire can be represented by a formula similar to that previously found for Cu. The consts. are evaluated, and their variation with magnetic field is investigated.

III. The thermo-electric e.m.f. was investigated. No satisfactory temp. distribution formula could be found.

IV. A formula is found agreeing with the presence of an allotropic form of Al having a transition temp. at 79°, with delayed reverse transition. The crit. temp. is the same for all tensions. A recrystallisation theory is supported.

V. Using improved methods the thermo-electric consts. of Ag are found, and their dependence on tension is shown. The consts. change sharply at a crit. temp. near 200°, connected probably with the elastic limit of the wire.
N. M. B.

Thermo-electric effects of the alkalis. A. Sommerfeld (Physical Rev., 1934, [ii], **45**, 65—66).—Theoretical.
L. S. T.

Change of the resistance of liquid metals in a magnetic field. I. Fakidov and I. Kikoin (Physikal. Z. Sovietunion, 1935, **7**, 507—508).—The relative change of resistance for liquid K is dependent on the field H according to $\Delta r/r = aH + b$.
W. R. A.

Standing ultrasonic waves rendered visible in transparent solid substances. II. Optical investigations with a block of glass. E. Hiedemann and K. H. Hoesch (Z. Physik, 1935, **96**, 268—272; cf. *ibid.*, **95**, 383). The line separation of the standing wave lattice varies greatly with the plane of polarisation of the incident light wave.
A. B. D. C.

Precision determinations of elastic constants of isotropic transparent solid substances. E. Hiedemann (Z. Physik, 1935, **96**, 273—276).—Lattice consts. of the ultrasonic wave lattice determined by the method described (cf. preceding abstract) lead to precise vals. of elastic moduli.
A. B. D. C.

Temperature scales of niobium, thorium, rhodium, and molybdenum at 0·667 μ. L. V. Whitney (Physical Rev., 1935, [ii], **48**, 458—461).—Temp. scales were established by measuring spectral emissivities at λ = 0·667 μ, after rigorous heat-treatment. Emissivities and temp. ranges covered are, respectively: Nb, 0·374, 1300—2200°; Th, 0·380, 1300—1700°; Rh, 0·242, 1300—2000°; Mo, 0·382, 1300—2100° abs.
N. M. B.

Theory of solids at high temperatures, with special reference to the variation of C_v with temperature. G. Damköhler (Ann. Physik, 1935, [v], **24**, 1—30).—The Grüneisen–Debye theory of solids has been extended by assuming the vibration frequency to be dependent only on temp. The expression obtained for C_v shows that this should decrease again at high temp. An expression is derived for the variation of compressibility with temp. by the use of which the effect of temp. on C_v of NaCl, KCl, KBr, Ag, Cu, and Pb is calc. With the exception of Cu and Pb, C_v decreases at high temp. as expected. The Helmholtz free energy and the Gibbs thermodynamic potential of a linear chain at high temp. are derived.
A. J. M.

Specific heat of superconducting alloys. L. V. Schubnikov and V. I. Tschotkevitsch (Physikal. Z. Sovietunion, 1934, **6**, 605—607).—The sp. heat curve of a Pb–Bi alloy (65% Pb) was continuous in the range 5—12° abs.
Ch. Abs. (*e*)

Specific heat of a superconducting alloy. K. Mendelssohn and J. R. Moore (Proc. Roy. Soc., 1935, A, **151**, 334—341).—The sp. heats of the alloy PbTl$_2$ have been measured in the temp. range 3—6° abs. The fact that there is no discontinuity in the sp. heat at the transition point indicates that Rutgers' formula (this vol., 20) is inapplicable in this case.
L. L. B.

Molecular heat capacity equation of sulphur vapour, S$_2$. I. N. Godnev (Physikal. Z. Sovietunion, 1935, **7**, 442—446).—The calculation of the mol. heat of S$_2$ vapour from spectroscopic data is discussed and two equations are derived to fit the theoretical mol. heat curve from 300° to 1300° abs.
W. R. A.

Density of 100% heavy water. L. TRONSTAD, J. NORDHAGEN, and J. BRUN (Nature, 1935, **136**, 515).—For pure D_2O, d_{20}^{20} (pyknometric) varies from 1·10711 to 1·10714, the latter being the nearest approach to the correct val. Taylor and Selwood's higher val. (A., 1934, 590) is due probably to a greater % of O^{18} in the samples used. The isotopic ratio of the O in the 100% D_2O products is practically the same as the ordinary ratio. d_{20}^{20} for H_2O with < 1 of D_2O in 2×10^5 is $0·9999815 + 1\gamma$. L. S. T.

Specific volume of fused diabase at high temperatures. M. P. VOLAROVITSCH and A. A. LEONTEVA (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 535—538).—The sp. vol. of diabase has been determined at 1120—1360°. At 1160—1360° and 1140—1160° the coeff. of expansion is respectively 3·15 and $7·08 \times 10^{-4}$, a sudden change, due to the beginning of crystallisation, occurring at 1150°. The fluidity at 1250—1360° varies linearly with the sp. vol., in agreement with the formula for unassociated liquids; at lower temp. slight curvature indicates some association. R. S. B.

Specific volume of fused salts at high temperatures. M. P. VOLAROVITSCH and A. A. LEONTEVA (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 539—542).—The coeff. of expansion of fused NaH_2PO_4, $NaPO_3$, and K_2SiO_3 are, respectively, $5·3 \times 10^{-5}$ (at 620—935°), $4·3 \times 10^{-4}$ (at 600—770°), and $4·6 \times 10^{-5}$ (at 1000—1200°). For NaH_2PO_4 and K_2SiO_3 fluidity varies linearly with sp. vol. except at low temp., where the slight curvature indicates some association. $NaPO_3$ is unassociated. R. S. B.

Vapour pressure of krypton. E. JUSTI (Physikal. Z., 1935, **36**, 571—574).—The v.p. of Kr between 73·33° and 121·16° abs. has been determined. The triple point is $116·11 \pm 0·10°$ abs. and 522·2 mm. The b.p. is $120·86 \pm 0·10°$ abs. The sublimation curve is of the form $\log p = A + B/T + C/T^2 + D/T^3$, A, B, C, and D being consts., the vals. of which are given. The form of the sublimation curve excludes the possibility of any allotropic changes in Kr over the temp. range considered. A. J. M.

Comparison of physical properties of hydrogen and deuterium bromides. J. R. BATES, J. O. HALFORD, and L. C. ANDERSON (J. Chem. Physics, 1935, **3**, 531—534; cf. this vol., 1064).—The absorption spectra of HBr and DBr have been measured. The frequency difference between their absorption curves is approx. three times as great as can be accounted for by zero-point energy differences. Reasons for this effect are discussed. The v.-p. curves are almost identical (b.p. of DBr 206·3°, triple point 185·7°). The heat of vaporisation of DBr is 4258 g.-cal. The effect of the substitution of D for H on Trouton's const. is discussed. H. J. E.

Physical properties of compressed gases. V. Joule–Thomson coefficient for nitrogen. W. E. DEMING and (Mrs.) L. S. DEMING (Physical Rev., 1935, [ii], **48**, 448—449; cf. A., 1934, 247).—Previously reported vals. of μ (cf. A., 1931, 553) are corr. $\mu = $ const. contours are shown on a p-t diagram. The inversion temp. for zero pressure is approx. 326°. N. M. B.

Joule–Thomson effect in nitrogen. J. R. ROEBUCK and H. OSTERBERG (Physical Rev., 1935, [ii], **48**, 450—457; cf. this vol., 22).—Data for the isenthalpic curves are given and plotted. Vals. of the Joule–Thomson coeff. over the field $-150°$ to 300° and 1—200 atm. are calc., plotted, and tabulated as functions of pressure and temp. The inversion curve and C_p data for the pressure and temp. range are given. N. M. B.

New kinetic theory of gases. I. I. RABI (Rev. Sci. Instr., 1935, [ii], **6**, 251—253).—A brief review.

Experimental confirmation of the new theory of the equation of state. W. JACYNA (Z. Physik, 1935, **96**, 119—136; cf. this vol., 1198). A. B. D. C.

Structure of liquids and the mechanism of viscosity. W. K. LEWIS and L. SQUIRES (Refiner Nat. Gas Mfr., 1934, **13**, 448).—A qual. explanation is given of the effect of mol. wt. and mol. structure on volatility, b.p., liquid d, and on η. CH. ABS. (e)

Viscosity of liquid helium. J. O. WILHELM, A. D. MISENER, and A. R. CLARK (Proc. Roy. Soc., 1935, **A**, **151**, 342—347).—The change in the viscosity of liquid He with temp. has been measured between 4·2° and 2·0° abs. A marked change occurs at 2·19° abs. as the liquid changes from He I to He II. The results suggest that the difference of the two liquid states is intimately concerned with a difference of at. arrangement. L. L. B.

Viscosity data for boron trioxide. G. S. PARKS and M. E. SPAGHT (Physics, 1935, **6**, 69—71).—The η of B_2O_3 glass at 267—443° varies from $2·1 \times 10^{11}$ to $2·1 \times 10^5$ poises. A val. of 10^{13}—10^{14} poises is associated with the transition region in glassy materials. CH. ABS. (r)

Viscosity of molten salts. I. V. IPATOV (J. Phys. Chem. U.S.S.R., 1934, **5**, 790—792).—The relation between η and sp. vol. (v) is given for molten NaCl and KNO_3 to $\pm 2\%$ by $\eta = C/(v - \omega)$, where C and ω are for the two salts, respectively, 0·000654, 0·6080; 0·00095, 0·5036 in the temp. ranges 816—997° and 318—542° (cf. Dantuma, A., 1928, 1208). CH. ABS. (e)

Diffusion equation with consideration of molecular velocity. B. I. DAVIDOV (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 474—478).—Mathematical. W. R. A.

Diffusion of heavy water into ordinary water. M. TEMKIN (Nature, 1935, **136**, 552).—Contrary to the results of Orr and Thomson (this vol., 25), the diffusion const. of D_2O is of the expected order of magnitude. L. S. T.

Time variation of gas emission from heated wires *in vacuo*. G. EURINGER (Z. Physik, 1935, **96**, 37—52).—Time variation of H_2 emitted from heated Ni has been determined, and follows diffusion laws; the solubility at 40 mm. and 800° is 0·196 c.c. of H_2 (0° and 760 mm.) per c.c. Ni, and the diffusion coeff. is 1×10^{-7} cm.² per sec. A. B. D. C.

Rate of diffusion of deuterium hydroxide in water. W. J. C. ORR and J. A. V. BUTLER (J.C.S., 1935, 1273—1277).—Measurements have been made of the diffusion coeff. (D) of DOH (about 3%) in

H_2O between 0° and 45°, and from the results an estimate is made of the rate of self-diffusion in H_2O. In neutral solutions the effect of the mobility of the H^+ ions is probably negligible. This effect should be detectable in N-acid solution, but is obscured by a decrease of D caused by the electro-striction of H_2O by the ions.   O. J. W.

Formation of drops in supersaturated vapour of heavy water. L. TRONSTAD and H. FLOOD (Nature, 1935, **136**, 476).—Measurements of the crit. degree of expansion for $D_2O–H_2O$ mixtures with and without an electric field give a val. of 4·5 for the crit. supersaturation of D_2O at 264° abs. To agree with Volmer's theory of nuclei formation, γ for D_2O must be > the val. given by Selwood and Frost (A., 1933, 1233).   L. S. T.

Alloys of lithium with mercury and indium. G. GRUBE and W. WOLF (Z. Electrochem., 1935, **41**, 675—681).—The compounds Li_6Hg, Li_3Hg (m.p. 375°), Li_2Hg, $LiHg$ (m.p. 590°), $LiHg_2$, and $LiHg_3$ are reported. The compound LiIn (m.p. 625°) forms a continuous series of solid solutions with Li.
                                       E. S. H.

β-Transformation in copper alloys. I. OBINATA (Kinzoku, 1934, **4**, 289—291, 333—335).—A $\beta \rightarrow \beta_1$ transformation occurs in the systems Cu–Zn, Cu–Sn, and Cu–Al. There is a eutectic transformation in the β-phase resembling the Al transformation of steel, a metastable intermediate phase being formed. In the Cu–Zn system the β-phase is stable at room temp., but the eutectic transformation may occur below room temp.   Ch. ABS. (e)

Arsenic–lead alloys. O. BAUER and W. TONN (Z. Metallk., 1935, **27**, 183—187).—The system has been investigated up to 30% As; alloys containing more As cannot be prepared by melting at atm. pressure. At the eutectic (2·6% As and 290°) the Pb retains 0·045—0·05% As in solution; the solubility of As in Pb decreases rapidly with fall in temp. and is < 0·01% at 20°. Since the primary crystals of hypereutectic alloys are almost pure As the solubility of Pb in solid As is practically nil. No segregation occurs in hypoeutectic alloys, but the As tends to rise to the surface in hypereutectic alloys. The d of alloys with 0—5% As decreases linearly with increase in As. The Brinell hardness of the cast alloys rises slowly with > 0·1% As up to 9 at the eutectic composition, but that of alloys quenched from 280° reaches 9 at 0·03% As and 12 at 0·06—3·5% As; after ageing for 6 weeks at 20°, the hardness of the quenched alloys falls considerably owing to pptn. of As from solid solution. Addition of As to Pb has no effect on its rate of corrosion in H_2O.   A. R. P.

Transformations in irreversible iron–manganese alloys. E. SCHEIL (Arch. Eisenhüttenw., 1935—1936, **9**, 115—116).—Recorded irregularities in the dilatometric curves for low-C alloys of Fe with 7—12% are shown to be due to the ε—γ transformation. On cooling these alloys, the effects of the γ–α (expansion) and of the γ–ε (contraction) changes mask one another to a considerable extent. In the 20% Mn alloy the ε—γ transformation occurs at 250° and the α—γ at 560° on heating, and the γ–ε at 80° on cooling.   A. R. P.

Magnetic susceptibility of some alloys of " γ-brass " structure. C. S. SMITH (Physics, 1935, **6**, 47—52).—Changes in diamagnetic susceptibility with composition are recorded for the γ-brass phases of the systems Cu–Zn, Cu–Cd, Ag–Zn, and Ag–Cd. The limits of existence of the γ-phase agree with those determined otherwise.   CH. ABS. (e)

Mutual solubility of heavy water and organic liquids. J. TIMMERMANS and G. POPPE (Compt. rend., 1935, **201**, 524—527).—Replacement of H_2O by D_2O in the system $H_2O–PhOH$ increases the crit. solution temp. (C) by 12·25°. For MeCN the corresponding increase is 6·5°, whilst for NEt_3 the lower C is depressed by 3·8°. The upper C for $PrCO_2H$ and H_2O is raised 23·45° by replacing H_2O by D_2O.   H. J. E.

Dependence of mist absorption by liquids on the bubble size. II. H. REMY and W. SEEMAN (Kolloid-Z., 1935, **72**, 279—291; cf. this vol., 1067).—The regularities formerly described are complicated when the bubble size is altered by varying the diameter of the leading tube. An important factor influencing the amount of absorption is the time of formation of the bubbles.   E. S. H.

Solubility equilibria of sodium sulphate at temperatures of 150° to 350°. I. Effect of sodium hydroxide and sodium chloride. W. C. SCHROEDER, A. GABRIEL, and E. P. PARTRIDGE (J. Amer. Chem. Soc., 1935, **57**, 1539—1546).—Solubility data for Na_2SO_4 and NaCl in H_2O are recorded and the solid phases in equilibrium with aq. Na_2SO_4 indicated. Addition of NaOH decreases the solubility of Na_2SO_4 at 150—250°, but increases it at 300—350°; addition of NaCl decreases the solubility of Na_2SO_4 at 150—300°, but causes a slight increase at 350°. In mixtures of NaOH and NaCl, each constituent exerts its effect on the solubility of Na_2SO_4 independently of the presence of the other.   E. S. H.

Solubility of alkali chlorides in liquid ammonia and their influence on each other's solubility. G. PATSCHEKE and C. TANNE (Z. physikal. Chem., 1935, **174**, 135—155; cf. A., 1933, 456).—The solubility of KCl in liquid NH_3 is small and falls with rise of temp.; the eutectic point is −77·2°. No solid compounds are formed. The solubility is considerably increased by the presence of NH_4Cl or NaCl. Data for the system $NaCl–NH_4Cl–NH_3$ at −10°, 0°, and 10° are recorded; moderate amounts of NH_4Cl increase the solubility of NaCl. The solubility of NH_4Cl has been determined at −53° to 37°. NaCl crystallises from solutions in NH_3 containing KCl or NH_4Cl in octahedra truncated by cube faces.   R. C.

Solubility of strong, highly soluble electrolytes in methyl alcohol– and hydrogen peroxide–water mixtures at 25°. G. ÅKERLÖF and H. E. TURCK (J. Amer. Chem. Soc., 1935, **57**, 1746—1750).—Data for NaCl, KCl, $NaNO_3$, KNO_3, KBr, KI, K_2SO_4, NH_4Cl, and $Pb(NO_3)_2$ in $MeOH–H_2O$ and for NaCl, KCl, $NaNO_3$, KNO_3, K_2SO_4, $KClO_4$, and NaF in $H_2O_2–H_2O$ are recorded. The influence of changes in the dielectric const. is discussed.   E. S. H.

Determination of the solubility of acetophenone and chloroacetophenone in several solvents.

V. A. Kireev, S. I. Kaplan, and K. I. Vasneva (J. Phys. Chem. U.S.S.R., 1934, **5**, 739—741).—Data are recorded for the solubility of COPhMe in C_6H_6 (I) and EtOH at —15° to 20°, and for $CH_2Cl \cdot COPh$ in C_6H_6 (II), EtOH, COPhMe (III), and CCl_4 at —23° to 53·5°. The systems (I), (II), and (III) show eutectics at —15°, —1·6°, and 5·9° (57, 76, and 70% of solute), respectively. Ch. Abs. (e)

Solubility and surface tension. V. K. Sementschenko (Uspekhi Khim., 1934, **3**, 710—751).— Using the Boltzmann principle and the idea of generalised moments, solubility and surface tension are explained on a common basis. Data for the systems $Pr^\beta OH–NaCl–H_2O$, iso-$C_5H_{11} \cdot OH–(CH_2 \cdot OH)_2–H_2O$, and $PrOH–NaBr–H_2O$ are discussed.
Ch. Abs. (e)

Arbitrarily induced crystallisation of melts. C. Weygand (Z. anorg. Chem., 1935, **224**, 265—272; cf. Meyer et al., this vol., 811).—The influence of temp., pressure (rubbing, scratching, etc.), and nuclei on the nature of substances crystallising from melts is discussed in the light of the available data.
T. G. P.

Solubility of hydrogen in molten aluminium. L. L. Bircumshaw (Trans. Faraday Soc., 1935, **31**, 1439—1443).—The vols. at n.t.p. of H_2 dissolved by 100 g. of Al at 700°, 800°, 900°, and 1000° are respectively 0·23, 0·89, 1·87, and 3·86 c.c. The calc. heat of dissolution, assuming the H to be dissolved as atoms, is 43·4 kg.-cal. per mol. F. L. U.

Hydrogen in palladium. J. Franck (Physical Rev., 1934, [ii], **45**, 290). L. S. T.

Permeability of palladium to hydrogen. V. Influence of temperature. Experiments with commercial and pure palladium. Permeability at low temperatures. V. Lombard and C. Eichner (Bull. Soc. chim., 1935, [v], **2**, 1555—1577; cf. A., 1934, 250, 497, 1302).—The vol. (c.c.) of H_2 which diffuses per hr. through 1 sq. cm. of Pd 1 mm. thick can be expressed by $V = AT^{\frac{1}{2}}\varepsilon^{-B/T}$ at 250—650°. For a commercial sample of Pd A and B were found to be 27·75 and 2165 as compared with 9·55 and 1279 for pure Pd. The diffusibility is reduced to 1/2000 on cooling from 225° to 125°, and a delay in recovery occurs on reheating. Variable results were obtained at 180—190°. J. W. S.

Adsorption of hydrogen. T. D. Phillips (Physical Rev., 1934, [ii], **45**, 215).—The rate of adsorption of H_2 by charcoal at liquid air temp. depends on the time which elapses between the out-gassing and the commencement of adsorption. The results support the view that physical adsorption consists of the formation of concentric rows of adsorbed mols. (cf. A., 1931, 1005). L. S. T.

Sorption of hydrogen in tungsten. W. Frankenburger and R. Hodler (Naturwiss., 1935, **23**, 609).—The sorption of H_2 by W powder at —80° to —10° and 60° to 180° has been regarded as an example of "activated adsorption," but since the phenomenon is dependent on the time which elapses between the outgassing and the adsorption, on the thermal treatment of the W, and on the type of apparatus used, other factors must be considered. The phenomenon of "activated adsorption" completely disappears when the W is carefully purified, but reappears when traces of org. vapours (tap-grease etc.) and O_2 are admitted. Neither the org. compounds nor the O_2 alone restore the effect. The phenomena mistaken for "activated adsorption" are due to self-purification of the metal, traces of oxide oxidising the adsorbed org. mols. A. J. M.

Adsorption of hydrogen by iron synthetic ammonia catalysts. P. H. Emmett and R. W. Harkness (J. Amer. Chem. Soc., 1935, **57**, 1631—1635).—Determinations of the rates and amounts of adsorption as a function of pressure (25—760 mm.) and temp. (—195° to 450°) indicate the existence of two types of activated adsorption, (a) above —90°, (b) above 100°, in addition to the usual physical adsorption. Both types appear to be due in part at least to adsorption on the surface rather than to activated diffusion into cracks or to dissolution within the lattice. E. S. H.

Diffusibility of deuterium in metals. T. Franzini (Atti R. Accad. Lincei, 1935, [vi], **21**, 577—580).—Further evidence is provided to show that H occluded by Pd is removed by the application of an electric field (cf. A., 1934, 949). There is no analogous effect with D. O. J. W.

Sorption of gases by titania gel. I. Relation between the condition of preparation and the sorptive power of the gel. I. Higuti (Bull. Inst. Phys. Chem. Res. Japan, 1935, **14**, 853—861).—The concn. of the Ti salt solution and the nature, concn., and rate of addition of the precipitant used in preparing TiO_2 gel by coagulation do not greatly affect the adsorptive power of the gel for SO_2 at 0° and 1 atm., but SO_4'' is better than Cl'. The presence of a little Fe_2O_3 increases the activity. No difference is shown by gels made by dehydration of α- and β-titanic acids. J. W. S.

Effect of temperature on selective adsorption by silica gel from binary mixtures. M. R. A. Rao (J. Indian Chem. Soc., 1935, **12**, 371—378; cf. A., 1930, 1109; 1931, 1006).—The selectivity of the adsorption by SiO_2 gel from each of the binary mixtures (i) C_6H_6–C_7H_{16}, (ii) $EtOH$–C_6H_6, and (iii) C_5H_5N–H_2O over the entire ranges of concn. decreases by sp. amounts as the temp. is raised from 30° to 98°, but the point of zero selectivity is unchanged in the S-shaped curve of system (iii). Systems (i) and (ii) give U-shaped selectivity curves, and an equation is deduced consistent with the results.
J. G. A. G.

Adsorption of sodium hydroxide and sodium carbonate by aluminium hydroxide. I. I. Iskolidski and B. V. Gromov (Legk. Metal., 1934, **3**, No. 9, 29—39).—The size of the Al_2O_3 particles pptd. by adding CO_2 to Na_3AlO_3 solutions (80 g. of Al_2O_3 per litre) is greatest when pptd. at 25° or 50°; with 300 g. of Al_2O_3 per litre the max. size occurs at 75°. The $[Na_2O]$ in the ppt. increases with $[Al]$, temp., time of contact of ppt. with solution, and with the presence of CO_3'' and HCO_3' in the solution.
Ch. Abs. (e)

Sorption of water vapour on cellulosic materials. E. Filby and O. Maass (Canad. J. Res.,

1935, **13**, B, 1—10).—Sorption and desorption measurements have been carried out in an all-glass apparatus free from stopcocks and Hg. Data are given for standard cellulose, white spruce, bleached surgical cotton, Kodak rag cellulose, and bleached sulphite pulp.   R. S.

Phenomena of hygroscopicity. P. DEMOUGIN (Chim. et Ind., 1935, **34**, 517—525).—A review.   H. J. E.

Behaviour of water held in fine-pored media. B. H. WILSDON, D. R. G. BONNELL, and (MISS) M. E. NOTTAGE (Trans. Faraday Soc., 1935, **31**, 1304—1312).—The force of retention of H_2O by kaolin, ball clay, puzzuolana, sand, and carborundum has been determined at 20° by four methods. In all cases, the vals. calc. from the osmotic data are very much $>$ the vals. from the hydrostatic experiments. This and other anomalies may be due to mol. orientation effects in thin liquid films occurring in fine-pored systems.   J. G. A. G.

Sorption in an ideal soil. W. O. SMITH (Physical Rev., 1934, [ii], **45**, 767).—The sorption of vapour is discussed. During dehydration, saturation can exist at a v.p. $<$ that which prevails when the soil is hydrated. Hydration from complete dryness to saturation, and the reverse process with dehydration, are followed, and the intersections of the two curves determined. Hysteresis occurs during the absorption cycle. Surface adsorption is important only when the grains approach colloidal size.   L. S. T.

Fine structure of wood. II. Vapour-pressure lowering of different liquids on their adsorption by wood and lignin. H. SAECHTLING and H. ZOCHER (Kolloid-Z., 1935, **72**, 336—345; cf. this vol., 165).—The v.-p. isotherms of C_6H_6, Et_2O, and $COMe_2$ are of one type, and those of MeOH and H_2O are of another type, independently of the adsorbent. Lignin adsorbs preferentially Et_2O and $COMe_2$; wood adsorbs preferentially MeOH and H_2O.   E. S. H.

Inner adsorption in salt crystals. D. BALAREV (Z. anal. Chem., 1935, **102**, 241—262; cf. this vol., 819).—The influence of all relevant factors on the purity of analytical ppts. is discussed in the light of the author's theory of inner adsorption. The greater unsaturation obtaining at the edges of crystallites is held to counterbalance the increased solubility of small particles, so that this attains a min. for particles of a certain size (unit crystallites). The law of const. proportions can be true only in the limit for pptd. cryst. substances.   J. S. A.

Activated adsorption. J. B. ZELDOVITSCH (J. Phys. Chem. U.S.S.R., 1934, **5**, 924—925).—A discussion.   CH. ABS. (e).

Thermodynamic foundations of the adsorption of gaseous mixtures. I. R. KRITSCHEVSKI (J. Phys. Chem. U.S.S.R., 1934, **5**, 742—749).—Theoretical. It is shown that when one gas is only slightly adsorbed, the adsorption of the second may be increased. The behaviour of $O_2 + CO_2$ towards SiO_2 gel is discussed.   CH. ABS. (e)

Cathode-ray oscillography of gas adsorption phenomena. I. Method for measuring high- velocity approach to certain physical and chemical equilibria. **II. Duration of an adsorbed state of oxygen on tungsten.** M. C. JOHNSON and F. A. VIELS (Proc. Roy. Soc., 1935, A, **151**, 296—307, 308—316).—I. By connecting the plates of a cathode-ray oscillograph across a high resistance carrying a thermionic current from a filament, before, during, and after exposure of the latter to an adsorbable gas, photographic traces are obtained recording the progress of any gas reactions which modify the electron emission from a solid surface. A new time control is described, and an analysis is made of the transient thermal and pressure instabilities which occur when gas is admitted to a high vac., or the temp. of a solid is suddenly raised.

II. The above method has been used to determine the average time interval (τ) between deposition and re-evaporation of O_2 on W at high temp. A linear relation is maintained between $\log \tau$ and $1/T$, from which the val. 147,000±3000 g.-cal. per g.-atom is calc. for the heat of evaporation. The val. of τ increases from 0·36 sec. at 2548° abs. to 3·49 sec. at 2362° abs. The val. 8×10^{-14} sec. is calc. for the τ_0 of Frenkel's theory, which supports the suggestion that τ_θ is closely associated with the period of vibration of an atom in the metal lattice.   L. L. B.

Adsorption theory of electrokinetic potential. A. MARCH (Trans. Faraday Soc., 1935, **31**, 1468—1478).—Reasons are given for regarding the total p.d. (ε) between a colloidal particle and the dispersion medium as composed of a part ζ (electrokinetic) and another part ($\varepsilon - \zeta$) which are independent and have different origins. The general behaviour of ζ is adequately accounted for on the basis of the unequal adsorption of ions, and its order of magnitude can be correctly calc. from experimental data.   F. L. U.

Surface chemistry. N. K. ADAM (Nature, 1935, **136**, 499—500).   L. S. T.

Surface energy experiment. J. R. CALDWELL (J. Chem. Educ., 1935, **12**, 444—445).—The spontaneous emulsification of castor oil in H_2O and the spontaneous dispersion of rosin in H_2O are described.   L. S. T.

Surface tension and solvation. H. G. TRIESCHMANN (Z. physikal. Chem., 1935, B, **29**, 328—334).—The surface tension, γ, of binary mixtures of alcohols with org. liquids indicates that solutes with little or no tendency to solvation give non-linear γ-concn. curves. The degree of curvature may serve as a measure of solvation. Inorg. salts are surface-inactive in aq. solution owing to the heavy ionic hydration. Introduction of a double linking into a solute in a polar solvent depresses the surface activity. In polar solvents solute mols. which have a strongly polarisable residue as well as a polar group, or which are dipole-free but easily polarised, are surface-inactive.   R. C.

Surface tensions of ternary solutions. I. Surface tensions of aqueous solutions of (a) sodium and potassium chlorides, (b) sodium chloride and hydrochloric acid. II. Surface tensions of (a) ethyl alcohol–water–salt mix-

tures, (*b*) **acetic acid–water–salt mixtures.** J. W. Belton (Trans. Faraday Soc., 1935, **31**, 1413—1419, 1420—1425).—I. The variation of surface tension (σ) with concn. has been determined for aq. solutions of NaCl, KCl, HCl, NaCl–KCl, and NaCl–HCl. The changes in σ produced by the mixtures are approx. additive. The surface adsorption of H_2O is calc. by Gibbs' equation.

II. In presence of aq. EtOH (2 mol.-%) σ diminishes, linearly at first, with increase of [salt], whilst it increases in presence of AcOH (0·35 mol.-%). The results are discussed in relation to Gibbs' equation. F. L. U.

Titration of some substances affecting the surface tension of water. E. Angelescu and N. Mazilu (Bull. Soc. Chim. România, 1935, **17**, 151—176; cf. A., 1930, 692).—The point of inflexion in the surface tension–titration curve of cresols with NaOH and $Ba(OH)_2$ approximates to the equivalence point only in dil. solutions. No point of inflexion is obtained with NH_3. The titration of toluidines with strong acids gives accurate vals., but weak acids show no inflexion owing to hydrolysis. Assuming that the change in surface tension is due only to adsorbed mols., dissociation consts. have been calc. These are abnormally low because of strong adsorption in the dil. solutions. R. S.

Superficial salting-out by electrolytes. I. Superficial salting-out and dielectric constant. V. K. Sementschenko and E. A. Davidovskaja. **II. Dependence on temperature.** V. K. Sementschenko and A. F. Gratscheva (Kolloid-Z., 1935, **73**, 24—30, 30—35).—I. The surface tensions, γ, of solutions of *iso*amyl alcohol in (*a*) H_2O and (*b*) $(CH_2 \cdot OH)_2$, in presence and in absence of NaBr, have been determined. In both solvents at a certain concn. of *iso*amyl alcohol γ is independent of [NaBr]. The variation of this crit. concn. with the dielectric const. of the solvent is discussed.

II. Measurements of γ for BuOH solutions in H_2O containing NaBr show that the [BuOH] at which γ becomes independent of [NaBr] increases with rise of temp. In the system H_2O–NaBr–BuOH at 0°, 20°, and 40°, the surface activity, G, is related to [NaBr], C_e, by the expression $G = G_0 + \alpha \sqrt{C_e^3}$, where G_0 is the surface activity in absence of electrolyte and α const. E. S. H.

Mutual interaction of liquid films. J. Don and J. Harrison (Kolloid-Z., 1935, **72**, 257—261).—Oleic acid in contact with acid $KMnO_4$ gives a film, which is characteristically altered by the presence of many org. compounds. The changes produced by the addition of human blood sera have been examined photomicrographically. Sera which show the Wassermann reaction cause a marked change in the film, but the effect is not sp. for syphilitic sera. E. S. H.

Laminar systems. II. Kinetics of the formation of uni- and multi-molecular layers of cupric sulphide at the surface of copper sulphate solutions. S. G. Mokruschin and N. M. Demjanova (Kolloid-Z., 1935, **72**, 261—267; cf. this vol., 161).—The influence of concn. of reagents and duration of reaction has been studied, and an equation for the rate of growth of the film developed. CuS films of

thickness 60—80 Å. are impermeable to H_2S. The thickness of the unimol. layer is calc. as 3·23 Å. E. S. H.

Theory of flotation. P. Siedler (Z. physikal. Chem., 1935, **174**, 73—76).—Polemical against Ostwald (this vol., 1201). R. C.

Electro-osmosis at certain porcelain diaphragms. J. Velíšek and A. Vašíček (Chem. Listy, 1935, **29**, 250—253).—Measurements of the conductivities of 0·0000216—0·2N-KCl on both sides of a porcelain diaphragm indicate the validity of Ohm's equation, $V = Il/\lambda q$ (V=p.d., I=intensity of current, λ=actual conductivity within diaphragm), showing that the resistance of the diaphragm remains const. over the range of concns. studied. R. T.

Electro-endosmosis. VII. Measurements with non-aqueous liquids and high voltages. H. P. Dakin, F. Fairbrother, and A. E. Stubbs (J.C.S., 1935, 1229—1233).—The electro-endosmosis of a no. of alcohols and ethers through a diaphragm of sintered Jena glass powder has been measured with applied voltages (E) up to nearly 6000 volts per cm. At low voltages the relation between E and velocity of flow of the liquid is linear, or nearly so, but departs to an increasing degree at high E. A continuous photographic method of recording the rate of electro-endosmosis is described, which permits observations to be made of high speeds over a short time and of any change of speed during a run. The electro-endosmotic flow attains a const. speed within a very small fraction of a sec. after E is applied. O. J. W.

Osmotic pressures of a mixed vapour. [Earl of] Berkeley (Phil. Mag., 1935, [vii], **20**, 481—504).—Mainly mathematical. Since satisfactory membranes are not available for the investigation of mixed vapours, the pressure of the pure vapour in osmotic equilibrium with the mixed vapour cannot be determined experimentally. Methods for calculating this quantity are considered. N. M. B.

Compressions and specific volumes of aqueous solutions of resorcinol and methyl alcohol at 25° and the behaviour of water in these solutions. R. E. Gibson (J. Amer. Chem. Soc., 1935, **57**, 1551—1557).—The apparent compression of resorcinol (I) varies linearly with $\sqrt{\text{concn.}}$ The apparent vols. of (I) and the apparent compressions and vols. of MeOH in aq. solution bear a less simple relation to concn. The effect of concn. on the partial vols. of the components indicates that MeOH and (I) promote the association of H_2O. The sp. compressions (up to 1000 bars) of all MeOH–H_2O mixtures from 0 to 15% are the same as for H_2O. The compressions of pure MeOH determined at various pressures up to 1000 bars do not agree with published vals. E. S. H.

Viscosity of dilute solutions of non-electrolytes. B. Prasad (J. Indian Chem. Soc., 1935, **12**, 499—503).—The viscosities of dil. aq. solutions of sucrose, fructose, and glucose have been determined. The results can be represented by $\eta/\eta_0 = 1 + \alpha C$, where α is independent of temp., but changes with the solute. R. S.

Properties of higher polymerides in solution. II. Viscosity of solutions of aliphatic hydrocarbons. K. H. Meyer and A. van der Wyk (Helv. Chim. Acta, 1935, **18**, 1067—1079).—Measurements of η in CCl_4 solution are recorded for 7 saturated hydrocarbons between $C_{17}H_{36}$ and $C_{24}H_{70}$. For solutions containing 0·886% of solute $\eta_{sp.} \times 10^5 = 195\cdot6n - 1421$, where n=no. of C atoms in the chain. Data for *iso-* and *cyclo*-paraffins and other long mols. are recorded. The val. of η is determined by the constitution as well as by the length of the mol.
H. J. E.

Effect of pressure on the refractive index of aqueous solutions of ethyl alcohol. F. E. Poindexter and J. S. Rosen (Physical Rev., 1934, [ii], **45**, 760).—From 1 atm. to 1800 kg. per sq. cm. $n = a + bp + cp^2 + dp^3$, the coeffs. of which are tabulated for the Hg arc lines 4060, 4360, 5460, and 5790 Å.
L. S. T.

Dielectric behaviour of dilute binary solutions. F. E. Hoecker (Physical Rev., 1934, [ii], **45**, 741).—Dil. solutions of EtOH in CCl_4, C_6H_6, and CS_2 exhibit the usual anomalous behaviour of polar liquids in non-polar solvents at low concns. By considering the dissolved solute as a vapour occupying the entire vol. of the solution, the effect is shown to be probably fictitious.
L. S. T.

Frictional dispersion of polar solutions with short electric waves. W. Müller (Ann. Physik, 1935, [v], **24**, 99—112).—The dielectric const. (ϵ) of a 10 vol.-% solution of $PhNO_2$ in paraffin and in Shell oil (I) have been determined for λ 60 cm. and at 2—40°. For the solution in (I) ϵ varies considerably with temp., since the frequency for this solution falls within the range of frictional dispersion. The relaxation time and transport coeff. (α) have been determined.
A. J. M.

B.-p. elevation in solutions of potassium iodide in ethyl alcohol. J. N. Pearce and M. L. McDowell (Proc. Iowa Acad. Sci., 1933, **40**, 93—94).—The b.-p. elevation–molality curve follows closely that of a normal undissociated solute. The activities and free energy relations are calc.
Ch. Abs. (e)

Vapour pressure of phosphoric acid solutions. I. A. Kabalukov and K. I. Zagvosdkin (Z. anorg. Chem., 1935, **224**, 315—321; cf. this vol., 694).
T. G. P.

Viscosity of electrolytes in aqueous solution and the lyotropic numbers. J. H. C. Merckel (Kolloid-Z., 1935, **73**, 67—75).—Viscosity determinations for aq. solutions of a large no. of salts of alkali and alkaline-earth metals show that for a given cationic or anionic series there is a linear relation between η and the lyotropic no. of the ion. The results are discussed in relation to the determination of degrees of hydration.
E. S. H.

Determination of dielectric constants of aqueous solutions of strong electrolytes by means of a high-frequency bridge. E. Fischer (Physikal. Z., 1935, **36**, 585—593).—A high-frequency bridge for use with solutions of electrolytes over the frequency range 10^6—10^7 is described. Solutions of NaCl, Na_2SO_4, $Ca(NO_3)_2$, $MgSO_4$, $CaSO_4$, $CdSO_4$, and $Ba_2Fe(CN)_6$ were used, and give results agreeing in general with the Debye–Falkenhagen theory, although deviations occur at the higher concns. ($> 0\cdot002N$), the dielectric const. being $<$ that required by theory. With smaller frequencies (λ=300 m.) there are no deviations.
A. J. M.

Faraday effect of strong electrolytes in aqueous solutions. II. A. Okazaki (Mem. Ryojun Coll. Eng. Inouye Comm. Vol., 1934, 209—212; cf. A., 1934, 723).—Vals. of Scharf's " corr." sp. rotation are recorded for aq. HCl, LiCl, NaCl, and KCl.
Ch. Abs. (e)

Observation of the Brownian movement with the unaided eye. E. Kappler (Physikal. Z., 1935, **36**, 643—646; cf. this vol., 699).—The effect observed with the unaided eye is attributable to a variation of brightness and colour of the surface elements of the prep. and is not due to Brownian movement. The conditions under which the phenomenon is observed indicate that it is an interference effect.
A. J. M.

Preparation of mercury sols by reduction. E. Sauer and D. Steiner (Kolloid-Z., 1935, **73**, 42—44).—Hg sols may be prepared from aq. $HgCl_2$ by reducing with N_2H_4,H_2O in presence of NaOH and gum arabic. Under similar conditions $Hg(NO_3)_2$, $Hg(ClO_4)_2$, and $Hg(CN)_2$ do not give stable sols of Hg. The conditions for formation of a stable sol are (1) slight dissociation of $Hg^{\cdot\cdot}$ and (2) ability to form colloidal Hg_2O as an intermediate.
E. S. H.

Determination of particle size of silicic acid in a silicic acid glycerosol. F. Erbe (Kolloid-Z., 1935, **73**, 1—14).—The properties of SiO_2,xH_2O sols in aq. glycerol have been investigated. The mean particle diameter has been determined by ultramicroscopy (< 160 mμ), ultrafiltration (> 30 mμ), centrifuging ($\nleqslant 42$ mμ), diffusion in porous glass discs ($\ngtr 57$ mμ), and diffusion in agar gels (45 mμ).
E. S. H.

(A) Electrical charges of disperse systems forming the seats of physico-chemical reactions. (B) Mechanism of division of small liquid systems. II. Instability of two-phase systems. N. Rashevsky (Physics, 1935, **6**, 33—34, 35—37).—(A) A discussion of the factors which affect an ionic reaction occurring within a liquid drop.
(B) Theoretical. A discussion of the conditions of stability of two concentric spherical drops, when an ionic reaction occurs only in the external phase.
Ch. Abs. (e)

Diffuse dispersion of light in white, non-metallic sols. G. P. Lutschinski (Kolloid-Z., 1935, **73**, 39—42).—The distribution of intensity in the incident and scattered light has been studied with sols of AgCl and colophony. A modification of Lambert's formula is proposed.
E. S. H.

Viscosity and plasticity of disperse systems. VI. Influence of temperature and electrolytes on the plastic properties of kaolin. M. Volarovitsch and D. M. Tolstoi. **VII. Investigation of plastic flow.** D. M. Tolstoi (Kolloid-Z., 1935, **73**, 92—96, 96—101; cf. this vol., 932).—VI. Between 10° and 57° the flow resistance θ of kaolin–H_2O mix-

tures is independent of temp.; η does not decrease with rising temp. so markedly as in the case of H_2O. Increase of [NaOH] ($0\cdot0096$—$0\cdot96\%$) diminishes the plastic consts.; increase of [NaCl] (1—7%) increases η and decreases θ slightly.

VII. Apparatus and technique for the determination of flow-resistance are described.   E. S. H.

Highly - polymerised compounds. CXVII. Classification of colloids. H. Staudinger. **CXVIII. Viscosity of organic sphero- amd linear colloids.** H. Staudinger and E. Husemann (Ber., 1935, 68, [B], 1682—1691, 1691—1697).—CXVII. Colloids are subdivided into those with spherical particles solutions of which obey Einstein's law and can only have low viscosity and conform to the Hagen–Poiseuille law, and those with extended particles (linear colloids) solutions of which exhibit deviations from the above laws. Characteristic of the latter is their ability to form gel solutions. It is further deemed advisable to classify colloids according to their chemical as well as their physical properties, and thus to distinguish between inorg. colloids, mainly elements, or their heteropolar compounds, and org. colloids the variety of which is due to the homopolar C·C and C·H linking. Org. colloids are further subdivided into micellary colloids with spherical particles including suspensoids and emulsoids of org. substances in suitable media (a micelle is defined as a no. of small mols. held together by van der Waals forces) and micellary colloids with rod-like particles such as solutions of soap in H_2O and many org. media. The most important group of org. colloids is that of the mol. colloids which includes the complex natural products. These are arranged into mol. colloids with spherical particles, illustrated by a series of albumins, but not hitherto obtained synthetically, and mol. colloids with thread-like mols. The homopolar subdivision of the latter class is sub-divided into hemicolloids of mol. wt. about 10,000 and chain length 50—250 Å. which give sol solutions, are powdery or sticky when solid, yield films of little tenacity, and dissolve without swelling, mesocolloids of chain length about 250—2500 Å., and eucolloids with chain length $>$ 2500 Å. which are characterised by forming gel solutions. The heteropolar mol. colloids are similarly subdivided, but in consequence of the action of the thread ions the colloidal phenomena are far more complex than with the homopolar division. Mol. colloids with thread mols. are also classified according to their limited or unlimited swelling ability.

CXVIII. Re-calculation of $\eta_{sp.}s/c$ for suspensions of latex and S sols gives the theoretical val. $0\cdot025$ if the concn. is not too great; this val. is also shown by solutions of glucose, galactose, maltose, lactose, sucrose, erythritol, and mannitol in H_2O at 20°, of glucose penta-acetate in $COMe_2$ and m-cresol, of $(CH_2)_6N_4$ in $CHCl_3$, and of CPh_3Cl in CCl_4. Polystyrene latex is obtained by heating an emulsion of styrene in Na oleate solution at 30—100° for 2—6 days. From it, polystyrene can be pptd. by acids, EtOH, or $COMe_2$, and after repptn. from C_6H_6 by EtOH or $COMe_2$ forms a fibrous mass similar to a eupolystyrene prepared from pure styrene at low temp. Since the mol. wts. of the two products are closely similar, emulsion-polymerisation affords a ready method of rapidly obtaining eucolloids. The $\eta_{sp.}s/c$ val. of the synthetic latex is about $0\cdot025$, is independent of the particle size of the latex droplets and of the mol. wt. of the polystyrenes from which the droplets are derived, and is const. over a relatively large range of concn. As sphero-colloid, the latex obeys Einstein's law. On the other hand, the sp. viscosity of similarly conc. solutions of polystyrenes in C_6H_6 varies greatly with the length of the dissolved thread mols. Similar results are obtained with an emulsion-polymerisate of vinyl acetate and butyrate. Latex emulsions do not show deviations from the Hagen–Poiseuille law, and an evaporated latex can be emulsified in H_2O without swelling. Solutions of linear colloids do not obey this law, and show macromol. viscosity phenomena. Linear colloids usually dissolve with marked swelling.   H. W.

Dielectric investigations of benzene solutions of ethyl- and benzyl-cellulose. I. Sakurada and S. Lee (Kolloid-Z., 1935, 72, 320—325).—Dielectric const. and d have been determined at different temp. and concn. The mol. polarisation of ethylcellulose varies greatly with concn., and the val. of the dipole moment varies with temp.   E. S. H.

Structure of cellulose nitrate solutions. S. A. Glikman (J. Phys. Chem. U.S.S.R., 1934, 5, 885—893).—Solutions of cellulose nitrate (I), acetate, or benzoate, which have macro- or micro-scopic aggregates, do not obey Poiseuille's law. Ca$^{\cdot\cdot}$ adsorbed on (I) increases η, but Na$^{\cdot}$ does not. With increasing [(I)] the ζ-potential decreases; it is lowered by Ca salts or acids and raised by alkalis. The η of various fractions obtained by partial pptn. are not always in the same order as the particle size.   Ch. Abs. (e)

Stability of silver iodide sols. G. N. Gorochovski and J. R. Protass (Z. physikal. Chem., 1935, 174, 122—134).—The stability in presence of excess of I′ or Ag$^{\cdot}$ has been examined by measuring the light scattering power of the sol. The isoelectric point is at p_{Ag} $4\cdot2$—$5\cdot5$, depending on the concn. of the sol. At p_{Ag} $2\cdot5$—$3\cdot25$ and p_I $2\cdot75$—$3\cdot0$ the stability is a max. The points of max. stability correspond with saturation of the inner coating of the double layer with Ag$^{\cdot}$ and I′, respectively; further increase in the concn. of excess electrolyte probably consolidates the diffuse coating and thus lowers the ζ-potential. Foreign cations which do not obey the Paneth–Fajans rule have an influence on the stability very similar to that of Ag$^{\cdot}$ and I′; this suggests that the influence is a pure adsorption effect. These conclusions have been tested by ζ-potential measurements. Th$^{\cdots\cdot}$ is able to charge AgI positively.   R. C.

Coagulation of organosols of cellulose nitrate by electrolytes. I. S. Papkov (Kolloid-Z., 1935, 73, 82—84).—High concns. of $FeCl_3$ and $ZnCl_2$ are required to coagulate sols of cellulose nitrate in $COMe_2$. The process is complicated by the action of the hydrolysis products of the electrolytes.

E. S. H.

Upper stability limit of drops in collision. S. V. Gorbatschev and V. M. Nikiforova (Kolloid-

Z., 1935, **73**, 14—20).—Studies of collisions between H_2O droplets in air show that when the velocity of collision is between 0·1 and 1·5 m. per sec. the droplets neither coalesce nor disintegrate. The dependence of the crit. velocity for disintegration on the angle of collision and the influence of surface-active substances have been determined. The crit. velocity increases as the size of the droplets decreases.   E. S. H.

Lower stability limit of drops in collision. S. V. Gorbatschev and E. R. Mustel (Kolloid-Z., 1935, **73**, 20—24; cf. preceding abstract).—The lower limiting velocity at which droplets of H_2O in air coalesce on collision has not been determined accurately, but is about 6·4 cm. per sec. for droplets of about 1 mm. diameter. This val. is not altered by the presence of surface-active substances.
    E. S. H.

Action of water and alkali on the coagulation of albumin. J. L. Donnelly (Kolloid-Z., 1935, **73**, 76—82).—Attention is directed to the different behaviour of diluted albumin on coagulation. It is recommended that tests be carried out with the original substance.   E. S. H.

Cryolysis, diffusion, and particle size.—See this vol., 1276.

Chemical and physical characteristics of water contained in colloidal substances. I. Some organic colloids. II. Some inorganic colloids. L. Passerini (Gazzetta, 1935, **65**, 518—528, 529—533).—I. The infra-red absorption spectra between 0·8 and 2 μ of org. gels and sols (gelatin, agar-agar, sol. starch, egg-albumin, dextrin, and gum arabic) have been examined. In the gels the H_2O bands are appreciably displaced (up to $5 \times 10^{-2} \mu$) towards longer $\lambda\lambda$ compared with those of pure H_2O. This displacement is the larger the higher is the concn. of the gel. A parallelism between the amount of displacement and certain physical properties of the gel, *e.g.*, rigidity, is indicated. With sols the displacement of the H_2O bands $(1—2 \times 10^{-2} \mu)$ is appreciable only with the more viscous preps., *e.g.*, natural albumin and 60% gum arabic.

II. Infra-red absorption spectra of gels of opal, $Si(OH)_4$, $Sn(OH)_4$, $Al(OH)_3$, $Ti(OH)_4$, $ZnHAsO_4$, $MnHAsO_4$, $FePO_4$, and $NiHPO_4$ have been measured. Except in the case of opal and of an aged $Si(OH)_4$ gel, the spectra are similar to that of pure H_2O. The state of the H_2O in the various substances is discussed.   O. J. W.

Structure of rigid gels, such as that of silicic acid. W. O. Smith (Physical Rev., 1934, [ii], **45**, 748).—Theoretical.   L. S. T.

Properties of gels. N. A. Yajnik, D. N. Goyle, J. D. Verma, and C. L. Rampal (Kolloid-Z., 1935, **73**, 57—67).—Velocity of gelation, surface tension, elasticity, d, velocity of sound, resistance to cutting, loss of liquid on heating, diffusion of solutions, transparency, light absorption, and surface reflexion of light have been studied for gels of Sn phosphate, SiO_2, agar, Th phosphate, Mn arsenate, and cellulose acetate.   E. S. H.

Influence of ultrasonic waves on the colloid solubility of metal hydroxides. I. N. Sata and

S. Watanabe (Kolloid-Z., 1935, **73**, 50—57).—The peptisation of $Fe(OH)_3$ (prepared from $FeCl_3$ and aq. NH_3) is increased under the influence of ultrasonic waves; peptisation occurs in the almost complete absence of electrolytes. The solid-phase rule appears to hold good and the sols thus formed are more sensitive to coagulation by electrolytes than those prepared by other methods.   E. S. H.

Iodine-amylum reaction. G. van Iterson, jun., and J. Coumou (Proc. K. Akad. Wetensch. Amsterdam, 1935, **38**, 700—705).—The temp. of gelation of starch solutions is raised by adding aq. I and lowered by aq. KI. A suspension of starch in 10% aq. KI, saturated with I, cannot be brought to gelation even at the b.p.   E. S. H.

Chemical reactions between colloids. II. Mercury and sulphur. E. Sauer and D. Steiner (Kolloid-Z., 1935, **73**, 45—47; cf. this vol., 1074).—When sols of Hg and S are mixed and excess of S is removed by extraction with conc. aq. Na_2SO_3, the residue consists of HgS.   E. S. H.

Sedimentation thixotropy of stabilised suspensions. N. Jermolenko (Kolloid-Z., 1935, **72**, 312—320).—The stability of suspensions of CuO in dil. aq. NH_3, and of Ni_2O_3 and Fe_2O_3 in dil. aq. HCl has been investigated. The stability is at a max. when a medium amount of solid phase is present; the max. is const. after repeated shaking. The conditions existing at the surface of the particles are reviewed in the light of recent theories.   E. S. H.

Extension of theory of complex coacervation to ionic disperse systems. H. R. Kruyt and H. G. B. de Jong (Proc. K. Akad. Wetensch. Amsterdam, 1935, **38**, 714—721).—An intermediate stage in the separation of solid from certain supersaturated aq. electrolyte solutions is described; it is analogous to the complex coacervation observed when two oppositely-charged hydrophilic sols are mixed.   E. S. H.

Lyophilic colloids. VIII (2). Interaction of agar fractions. S. M. Liepatov and A. A. Morosov (Kolloid-Z., 1935, **72**, 325—335; cf. this vol., 932).—Fractionation of agar by progressive washing shows that the more insol., highly associated fractions are stabilised by the more sol. fractions. The sol. fractions also influence the swelling and peptisation of the more insol. fractions, and reduce the viscosity.
    E. S. H.

Inductive precipitation and dissolution processes in which ferric and chromic salts participate. Z. Karaoglanov and B. Sagortschev (Kolloid-Z., 1935, **72**, 291—301).—When aq. solutions containing $Fe(NO_3)_3$, $Cr(NO_3)_3$, and NH_4OAc are boiled, colloid systems are formed; their properties vary with the ratio Fe : Cr. The pptd. product contains $Fe(OH)_3$, $Cr(OH)_3$, and OAc′.   E. S. H.

Humic acids. I, II. W. Scheele, W. Schulze, and H. Spandau (Kolloid-Z., 1935, **72**, 301—312; **73**, 84—90).—I. The equiv. wt. of humic acid, prepared from different sources by different methods, has been determined by conductometric and potentiometric methods. The results for the different preps. are all about 150. In spite of the agreement in equiv. wt., it is believed that there is a variation in mol. wt.

II. Na humate is decomposed by excess of aq. NaOH, especially in hot solution, with the formation of one or more H_2O-sol. products having acidic properties. E. S. H.

Periodic phenomena in colloidal systems. P. F. MICHALEV (J. Phys. Chem. U.S.S.R., 1934, 5, 820—823).—Periodic layers are formed by the diffusion of sols of $Fe(OH)_3$, gum mastic, As_2S_3, and Au into EtOH, $(CH_2 \cdot OH)_2$, Et_2O, $Bu^a OH$, allyl alcohol, and $COMe_2$. CH. ABS. (e)

Morphology of chemical reactions in gels. VIII. Effect of acids and alkalis on Liesegang rings and the "radial rosette," and some observations in the absence of gels. F. M. SCHEMJAKIN (J. Phys. Chem. U.S.S.R., 1934, 5, 755—762).— Liesegang ring formation in gelatin has been studied with $K_2Cr_2O_7$, $NaCl+0.0005M$-H_2SO_4, KCNS, and $KCNS+0.00005M$-H_2SO_4 as the inner and $AgNO_3$ as the outer electrolyte. Diffusion rosettes are obtained, without gelatin, from $UO_2(NO_3)_2$, or $CuSO_4$, and NaOBz (I). $AgNO_3$ and (I), KCNS, or HCl give periodic structures. $UO_2(OAc)_2$ with (I) or Na salicylate gives rings only in absence of gelatin. Addition of H_2SO_4 or KOH changes considerably the shape of the ring formation in all cases.
CH. ABS. (e)

Precipitation of l-, dl-, and m-cystine by phospho-12-tungstic acid.—See this vol., 1356.

Phosphatide auto-complex coacervates as ionic systems and their relation to the protoplasmic membrane. H. G. B. DE JONG and J. BONNER (Proc. R. Akad. Wetensch. Amsterdam, 1935, 38, 797—806).—The characteristics of auto-complex coacervates of phosphatides are described. Interaction of the phosphatide ions in the coacervate is determined by (a) electrostatic attraction due to oppositely-charged, ionised groups, (b) repulsion due to hydration, and (c) attraction due to "lipophilic" groups. The phosphatide ions in the surface of the coacervate are oriented with their polar groups inwards and their hydrocarbon chains outwards. It seems probable that, when two such oriented films meet, a highly stable double film is produced. The special properties of the protoplasmic membrane may depend on the existence of such a double film.
E. S. H.

Electric streaming potential in turbulent flow. H. REICHARDT (Z. physikal. Chem., 1935, 174, 15—21).—It is deduced theoretically that flow in the electric double layer remains viscous, and Helmholtz' streaming potential equation therefore remains valid, even when flow within the tube is turbulent. Experiment shows that the ratio of streaming potential to pressure head is const., independent of the type of flow. R. C.

Relation between particle size and cataphoretic mobility. I. KEMP (Trans. Faraday Soc., 1935, 31, 1347—1357).—The mobilities, U, of SiO_2 and gamboge particles in 10^{-2}—$10^{-4}N$-Na K acetate buffers at const. ionic strengths vary little with changes of p_H, showing that p_H has little effect on the surface charge density of the particles. In 10^{-2}—$10^{-5}N$-KCl, U decreases with decrease of radius of particle and

the slope of the curve relating U to radius (0·1—1·0 μ) increases as [KCl] decreases. The results agree with the predictions of Henry's formula (A., 1931, 1232) within the limits of experimental error ($\pm 5\%$)
J. G. A. G.

Microscopical observation of the electrophoresis of dyes, bacteria, blood corpuscles, etc. with Cellophane as semi-conductor. H. H. WAELSCH (Kolloid-Z., 1935, 73, 36—39).—The migration of the individual particles in liquid drops, hanging from the semi-conductor, has been observed.
E. S. H.

Equilibrium between n-propyl alcohol, propyl ether, and water at 190°.—See this vol., 1349.

First ionisation constant of carbonic acid, 0° to 38°, from conductance measurements. T. SHEDLOVSKY and D. A. MacINNES (J. Amer. Chem. Soc., 1935, 57, 1705—1710).—Determinations of the conductance of aq. H_2CO_3 and $KHCO_3$ yield the ionisation const. 4.31×10^{-7} at 25° and 4.82×10^{-7} at 38°. The calc. heat of ionisation at 25° is 2075 g.-cal. E. S. H.

Thermodynamic ionisation constants of carbonic acid at 38° from electromotive force measurements. D. A. MacINNES and D. BELCHER (J. Amer. Chem. Soc., 1935, 57, 1683—1685).—The vals. 4.91×10^{-7} and 6.25×10^{-11} have been obtained for the first and second dissociation consts., respectively. E. S. H.

Activity coefficients of HCO_3' ions. Y. KAUKO and J. CARLBERG (Z. Elektrochem., 1935, 41, 721—724).—Measurements of p_H lead to a val. which is in good agreement with published work. E. S. H.

Ionisation constant of acetic acid in methyl alcohol-water mixtures from 0° to 40°. H. S. HARNED and N. D. EMBREE (J. Amer. Chem. Soc., 1935, 57, 1669—1670).—E.m.f. of the cells $H_2|AcOH(m_1)$, $NaOAc(m_2)$, $NaCl(m_3)|AgCl|Ag$ in 10% and 20% aq. MeOH have been determined at 10° intervals from 0° to 40°. From these and electrode potential data the ionisation const. of AcOH has been calc. Log. K is approx. $\propto$ the reciprocal of the dielectric const. E. S. H.

Electron-sharing ability of organic radicals. IX. Dissociation constants of amines and acids in ethyl alcohol. L. D. GOODHUE and R. M. HIXON (J. Amer. Chem. Soc., 1935, 57, 1688—1691; cf. A., 1934, 868).—K is determined for AcOH, p-$C_6H_4Me \cdot CO_2H$, BzOH, p-$C_6H_4Br \cdot CO_2H$, m-$C_6H_4Cl \cdot CO_2H$, NH_2Bu, o-$C_6H_4Cl \cdot CH_2 \cdot NH_2$, p-$C_6H_4Me \cdot NH_2$, NH_2Ph, and m-$C_6H_4Cl \cdot NH_2$ in EtOH, using a H_2 electrode. The Hg–HgI_2 half-cell is a suitable reference electrode for MeOH or EtOH solutions. R. S. C.

Apparent dissociation constants of canavanine and canaline. T. TOMIYAMA (J. Biol. Chem., 1935, 111, 45—49; cf. A., 1933, 1059).—The titration curves of canavanine (I) and canaline (II) are determined with the glass electrode and the p_K and free energy change of ionisation are calc. The basic group of (I) lies between those of the guanidine group of arginine and the glyoxaline group of histidine.

The basic character of (II) apart from the α-NH_2 is very weak.   H. D.

Polyvanadates existing in alkaline solution. H. BRINTZINGER and J. WALLACH (Z. anorg. Chem., 1935, **224**, 103—106).—Determination of ionic wts. from the rate of electrodialysis in alkaline Na_3VO_4 solutions of varying p_H indicates the existence of the following ions. From p_H 14·0 to 12·2, $V_2O_7^{4-}$ or $[VO_3(H_2O)_6]^{3-}$; p_H 11·0 to 10·0, $[V_2O_7(H_2O)_6]^{4-}$ or $V_3O_{10}^{5-}$; p_H 8·8 to 7·0, $V_4O_{13}^{6-}$.   J. S. A.

Molybdate and tungstate ions in solutions of varying hydrogen-ion concentration. H. BRINTZINGER and C. RATANARAT (Z. anorg. Chem., 1935, **224**, 97—102).—Ionic wt. determinations by the method of electrodialysis in solutions of Na_2MoO_4 of varying p_H show the uniform presence of MoO_4'' at p_H 8·0 to 7·0, and of $[Mo_6O_{20}]^{4-}$ or $[Mo_6O_{21}]^{6-}$ at p_H 5·0 to 1·5. Between p_H 7 and 5 two or more species coexist. Potentiometric titration confirms the ionic wt. measurements and indicates the existence of trimolybdate between p_H 5·2 and 6·3. Aq. Na_2WO_4 similarly contains the ion WO_4'' at p_H 7·5—8·0, and $[W_6O_{20}]^{4-}$ or $[W_6O_{21}]^{6-}$ at p_H 6·0—7·0. At p_H 4·5 a *dodecatungstate* $[W_{12}O_{38}]$ or $[W_{12}O_{39}]$ is present.
                         J. S. A.

Interpretation of the dissociation pressures of the palladium–hydrogen system. M. H. HEY (J.C.S., 1935, 1254—1258).—An equation is derived from simple kinetic considerations which gives a satisfactory account of the dissociation pressures of the Pd–H system, on the assumption that there is only one phase present throughout. The limiting composition of the system is PdH, which possibly has a NaCl type structure.   O. J. W.

Lower sulphides of palladium. Equilibrium diagram of system Pd–PdS. F. WEIBKE and J. LAAR [with K. MEISEL] (Z. anorg. Chem., 1935, **224**, 49—61).—Thermal analysis, coupled with micrographic and X-ray examination, shows that the only lower sulphide stable at room temp. is Pd_4S. A solid β-phase stable at high temp. undergoes peritectic decomp. at 554° into Pd_4S+PdS (m.p. of PdS, 970°). With < 69·5 at.-% Pd, two liquid phases occur. S is insol. in solid Pd.   J. S. A.

Equilibrium of Fe_3O_4, Fe_2O_3, and oxygen. J. W. GREIG, E. POSNJAK, H. E. MERWIN, and R. B. SOSMAN (Amer. J. Sci., 1935, [v], **30**, 239—316; cf. A., 1931, 310).—Hæmatite (I) containing < 1% of Fe_3O_4 in solid solution coexists in stable equilibrium with solid solutions of magnetite (II) containing approx. 30%, 24·5%, and 13% of Fe_2O_3 at 1452°±5, 1388°±3, and 1200°, respectively, in presence of O_2 at 1 atm., 159 mm., and approx. 2 mm., respectively. In a sealed SiO_2 tube, (I) coexists with (II) containing 8·5% and 16·8% of Fe_2O_3 at approx. 1085° and 1300°, respectively. The m.p. of Fe_3O_4, 1591°±5 under low p_{O_2}, is depressed by increasing p_{O_2} and O_2 is absorbed. A eutectic between (I) and (II) (solid solution) is inferred. The relation between temp. and composition of (II) in equilibrium with O_2 at 1 atm. and 159 mm. has been determined at 1400—1565°. The pressure–temp. relations are illustrated by a diagram, and certain optical and crystallographic data are recorded.   J. G. A. G.

Systems $BeSO_4$–H_2O and $BeSO_4$–H_2SO_4–H_2O. L. SCHREINER and A. SIEVERTS (Z. anorg. Chem., 1935, **224**, 167—172).—Ice and $BeSO_4,4H_2O$ coexist at the eutectic (27% $BeSO_4$, —18°). Isotherms at 0°, 25°, 50°, and 75° for $BeSO_4$–H_2SO_4–H_2O suggest that $BeSO_4,4H_2O$ and possibly anhyd. $BeSO_4$ are stable solid phases.   T. G. P.

Application of the thaw–melt method to binary inorganic systems. A. BENRATH, P. HARTUNG, and M. WILDEN (J. pr. Chem., 1935, [ii], **143**, 298—304).—The nitrate hexahydrates of Co, Ni, Mg, and Mn form mixed crystals in all proportions with one another, and that of Zn forms unstable 1 : 1 compounds with the others. The nitrate tetrahydrates of Zn and Co form mixed crystals. $Co(NO_3)_2,6H_2O$ and $Ca(NO_3)_2,4H_2O$ give a eutectic. The tetra- and hexa-hydrates of the same nitrate give peri-eutectics, and the m.p. of the tetrahydrate is only slightly depressed by small additions of the hexahydrate. This is best explained by assuming that the melt of the hexahydrate contains both hydrates and H_2O in equilibrium. This assumption agrees with a max. m.p. in mixtures of $Ni(NO_3)_2,6H_2O$ and $Zn(NO_3)_2,4H_2O$, which presumably give an equilibrium of the hexa- and tetra-hydrates of each salt in the melt. Systems containing $AgNO_3$ or NH_4NO_3 form eutectics and afford evidence of 1 : 1 compounds. The perchlorate hexahydrates of Ni, m.p. 209°, Co, m.p. 191°, Mg, m.p. 193°, Mn, m.p. 153°, and Zn, m.p. 163° (cf. lit.), form mixed crystals in all proportions. The system $Mg(ClO_4)_2,6H_2O$–$Ni(NO_3)_2,6H_2O$ is characterised by a eutectic.   R. S. C.

Systems alkaline-earth chloride–alkaline-earth oxide and the decomposition of alkaline-earth chlorides by steam. B. NEUMANN, C. KRÖGER, and H. JÜTTNER (Z. Elektrochem., 1935, **41**, 725—736).—Equilibrium data are recorded for the systems $SrCl_2$–SrO, $BaCl_2$–BaO (800—1300°), and $CaCl_2$–CaO (600—1300°). The existence of $4SrCl_2,SrO$, $SrCl_2,2SrO$, $BaCl_2,2BaO$, $BaCl_2,3BaO$, and $4CaCl_2,CaO$ has been established. Steam begins to decompose $SrCl_2$ at 950°, $BaCl_2$ at 910°, and $CaCl_2$ at 780°. The reactions have been studied over a range of temp. and are discussed in relation to the equilibrium diagrams.   E. S. H.

Effect of pressure on phase equilibria of sodium tungstate and related thermodynamic properties. R. W. GORANSON and F. C. KRACEK (J. Chem. Physics, 1935, **3**, 546; cf. this vol., 447).—A correction.   H. J. E.

Cryoscopic investigation of anomalies in the behaviour of ethylene chloride. H. HUETTIG, jun., and C. P. SMYTH (J. Amer. Chem. Soc., 1935, **57**, 1523—1526).—F.-p. data give no evidence of compound formation in the system $C_2H_4Cl_2$–C_6H_6, but indicate the existence of an unstable compound $C_2H_4Cl_2,3Et_2O$.   E. S. H.

Heterogeneous equilibria in two-component systems with thymol as one component. K. HRYNAKOWSKI and M. SZMYT [with S. KUROWSKI, R. PERTKIEWICZ, J. MARCZUK, M. NIKLEWICZ, and (MLLES.) H. PRZEDPELSKA, W. JURKOWSKA, and E. NIZIOLKIEWICZ] (Arch. Pharm., 1935, **273**, 418—

427).—M.p. have been determined for mixtures of thymol (I) with $CO(NH_2)_2$ (43°; 95·5%), NHPhAc (16·5°; 65%), PhOH (6·7°; 37·5%), o-OH·C_6H_4·CO_2H (46·2°; 96·2%), and salol (15·6°; 37·5%), the figures in parentheses being the m.p. and % of (I) for the eutectic mixtures. (I) and antipyrine probably form a 1 : 1 compound. (I) with 30—70% of camphor has m.p. < −15° and is probably associated in the mixtures. R. S. C.

Molecular compounds in the systems acid–salt, anhydride–salt, acid–ester (acetic, butyric, phenylacetic acids). M. BAKUNIN and E. VITALE (Gazzetta, 1935, 65, 593—616).—Thermal diagrams have been obtained for the following binary systems : AcOH–MOAc (M=K, Na); $Pr^\alpha CO_2H$–$Pr^\alpha CO_2Na$; CH_2Ph·CO_2H–CH_2Ph·CO_2M (M=Li, Na, K, Rb, Ba, various radicals); $(CH_2Ph$·$CO)_2O$–CH_2Ph·CO_2M (M= Na, Li). Several mol. compounds are recorded. The influence in the Perkin synthesis of compound formation and of the nature of the metal or radical which replaces the carboxylic H is discussed. O. J. W.

System water–potassium chloride–cupric chloride. A CHRÉTIEN and R. WEIL (Bull. Soc. chim., 1935, [v], 2, 1577—1591).—The system has been studied between −65° and 121·5°. KCl,CuCl₂ is stable between 119·9° and 59°, but at 75° and below it has not a congruent solubility. The *compound* $CuCl_2$,KCl,$2H_2O$ occurs at 50° and below, but without congruent solubility. $CuCl_2$,$2KCl$,$2H_2O$ occurs between 92° and −63·2° without congruent solubility. The ternary eutectic corresponding with $CuCl_2$,KCl,$2H_2O$, $CuCl_2$,$2H_2O$, and ice is reached at −65° and contains 39·9% $CuCl_2$ and 0·20% KCl. J. W. S.

System NH_4Cl–NH_4NO_3–H_2O at 0·4°, 25°, and 50°. C. F. PRUTTON, J. C. BROSHEER, and S. H. MARON (J. Amer. Chem. Soc., 1935, 57, 1656—1657). —No evidence of the formation of complex salts, solid solutions, or hydrates has been obtained. E. S. H.

System potassium fluoborate–potassium periodate–water at 35°. R. C. RAY and H. C. MITRA (Trans. Faraday Soc., 1935, 31, 1312—1314).— The solubility data show that no double salt is formed. It is suggested that IO_4' is too large to replace BF_4' in the lattice of KBF_4. J. G. A. G.

System alkali oxide–CaO–Al_2O_3–SiO_2–CO_2. IV. CO_2 pressure of the silica-rich portion of the system Li_2O–SiO_2–CO_2 and the action of alumina on lithium carbonate. C. KRÖGER and E. FINGAS (Z. anorg. Chem., 1935, 224, 289—304; cf. this vol., 935).—Pressure–temp. diagrams for the systems Li_2O–SiO_2–CO_2 and Li_2O–Al_2O_3–CO_2 have been derived from a study of the reactions between Li_2CO_3 and (a) Li_2O–SiO_2 mixtures and (b) Al_2O_3. From the temp. dependence of the equilibria, heats of reaction and heats of formation of the silicates and aluminates are calc. T. G. P.

Ternary system stannous oxide–sulphur trioxide–water. H. G. DENHAM and W. E. KING (J.C.S., 1935, 1251—1253).—The existence of the following solid phases has been established : $SnSO_4$,$2SnO$,$4H_2O$ at 25°; $SnSO_4$,$2SnO$,$2H_2O$ at 50°;

and $SnSO_4$ (cf. A., 1926, 587) at both temp. The solubility data at 25° and 50° afford no evidence of a hydrated normal sulphate. O. J. W.

Solid–liquid equilibria in ternary systems in which congruently melting binary compounds are formed. II. K. HRYNAKOWSKI and M. SZMYT (Z. physikal. Chem., 1935, 174, 60—72; cf. this vol., 825).—The equilibrium diagrams for the systems salicylic acid–$CO(NH_2)_2$–NHPhAc and $CO(NH_2)_2$–β-$C_{10}H_7$·OH–NH_2Ac have been obtained. R. C.

Equilibrium between cobalt aquopentammine sulphate and its sulphuric acid solution at 45°. O. T. LIOU and S. M. WANG (Contr. Inst. Chem. Nat. Acad. Peiping, 1934, 1, 49—101; Bull. Nat. Acad. Peiping, 1934, 5, No. 5, 15—67).—From analytical data for the solid residue and mother-liquor the composition of the solid phases in equilibrium with various [H_2SO_4] is deduced. CH. ABS. (e)

Equilibrium : $NaCl(s) + NaHSO_4(s) \rightleftharpoons Na_2SO_4(s)+HCl(g)$. F. ISHIKAWA, K. MASUDA, and T. TAKAI (Bull. Inst. Phys. Chem. Res. Japan, 1935, 14, 833—843).—From measurements of the equilibrium pressure of this reaction the following data are deduced for 1 atm. pressure : $\Delta F_{25°}$ =2930 g.-cal.; $\Delta H_{25°}$ =10·45 kg.-cal. The temp. coeffs. are also derived. For the reactions $S+Na+0.5H_2+2O_2=NaHSO_4(s)$, $2NaHSO_4(s)=Na_2S_2O_7(s)+H_2O$ (g. 1 atm.), and $2S+2Na+3\frac{1}{2}O_2=Na_2S_2O_7(s)$ $\Delta F_{25°}$ = −235,508, 8950, and −407,560 g.-cal., respectively. The pressure at 100° decreases with increasing [Na_2SO_4], but when the latter is > six times the [NaCl] the pressure becomes independent of its concn. The velocity of reaction between $NaHSO_4$ and NaCl and between Na_2SO_4 and HCl follows the law $p=a+b \log t$ ($p=$ pressure, $t=$time, and a and b are consts.). J. W. S.

Oxidation equilibrium of magnesium chloride. K. SANO (Sci. Rep. Tôhoku, 1935, 24, 240—249).—The equilibrium const. of $MgCl_2+0.5O_2=MgO+Cl_2$, determined by passing O_2 over $MgCl_2$ at 592°, 632°, 652°, and 670°, is given by $\log K_p = −1413/T+1.93$, whence $\Delta F_{25°}$=4770 g.-cal., $\Delta H_{25°}$= 8560 g.-cal., $\Delta S_{25°}$=12·71 g.-cal. per degree. The following vals. for $Mg+Cl_2=MgCl_2$ are also calc. : $\Delta F_{25°}$ −140,890, $\Delta H_{25°}$ −151,500, $\Delta S_{25°}$ −35·60. J. W. S.

Designation of Nernst's heat theorem as a third law of thermodynamics. H. SCHMOLKE (Z. Elektrochem., 1935, 41, 654—657).—A discussion. E. S. H.

Development of thermochemistry. F. D. ROSSINI (J. Washington Acad. Sci., 1935, 25, 399—403).—Historical. C. W. G.

Ionic activities of hydrochloric acid. Z. SZABÓ (Z. physikal. Chem., 1935, 174, 22—32).—A method of determining diffusion potentials by measurements with concn. cells with transport is described. For HCl|HCl at 25° the diffusion potential is given by the empirical equation $\epsilon = −36.79 \log (m_1/m_2)$ mv. ($m=$molality) up to $m=0.2$. This disagrees with the vals. calc. by Henderson's equation. It is deduced that up to $m=0.2$ both ionic activity coeffs. are equal to each other and to the mean ionic activity coeff.,

4 T

but the vals. differ from those calc. by Lewis and Randall (" Thermodynamics," p. 382). R. C.

Heat of dilution of nitric acid. G. BECKER and W. A. ROTH (Z. physikal. Chem., 1935, **174**, 104—114).—The heat of dilution at 20° has been measured from $HNO_3,4\cdot5H_2O$ to $HNO_3,3800H_2O$. It is so small as to be negligible in practice, and for bomb calorimetry the heat of formation of HNO_3 can be taken as const. $=14\cdot8_5$ g.-cal. per millimol. R. C.

Heat of formation of zinc sulphide. Comments on the sodium peroxide method of Mixter. H. ZEUMER and W. A. ROTH (Z. anorg. Chem., 1935, **224**, 257—264).—Errors in Mixter's method (A., 1917, ii, 123) are discussed. Previous vals. for heats of formation of metallic oxides obtained by this method are uncertain. $Zn+S_{rhomb.}=ZnS_{reg.}+41\cdot5\pm1\cdot5$ kg.-cal. per mol. at 20°. T. G. P.

Heats of formation and dissolution of potassium dithionate. H. ZEUMER and W. A. ROTH (Z. anorg. Chem., 1935, **224**, 253—256; cf. this vol., 1078).—Since $K_2S_2O_6=K_2SO_4+SO_2-5\cdot03\pm0\cdot13$ kg.-cal. per mol., the heat of formation of $K_2S_2O_6$ from the elements is 418·9 kg.-cal. per mol. at 20°. The heat of dissolution of $K_2S_2O_6$ is $-13\cdot1(5)$ kg.-cal. per mol. T. G. P.

Heat of formation and specific heat of aluminium nitride. S. SATOH (Bull. Inst. Phys. Chem. Res. Tokyo, 1935, **14**, 862—871).—The mean sp. heat of AlN is $0\cdot1803+2\cdot750\times10^{-4}t-1\cdot937\times10^{-7}t^2$. From this equation and equilibrium data for the system Al_2O_3–C–N_2–CO–AlN at high temp. the heat of formation of AlN is 74,700 g.-cal. per mol. J. W. S.

Analysis of admissible error in calculating heat of isothermal evaporation of salt solutions relative to pure water. K. P. MISCHTSCHENKO and I. Z. PRONINA (J. Appl. Chem. Russ., 1935, **8**, 769—778).—Mathematical. R. T.

Heats of transition of triglycerides. M. M. R. RAO and S. K. K. JATKAR (J. Indian Chem. Soc., 1935, **12**, 574—581).—The heats of dissolution of the two forms of tristearin, tripalmitin, and trilaurin have been measured in various org. solvents using a double calorimeter. The difference in the heats of dissolution of the two forms is const. (about 15 g.-cal. per g.) and equal to the difference in the latent heats (heat of transition). The latent heats of fusion of the two forms of tristearin have been measured. O. J. W.

Thermal data. IV. Heats of combustion of adenine, hypoxanthine, guanine, xanthine, uric acid, allantoin, and alloxan. V. Heat capacities, entropies, and free energies of adenine, hypoxanthine, guanine, xanthine, uric acid, allantoin, and alloxan. R. D. STIEHLER and H. M. HUFFMAN (J. Amer. Chem. Soc., 1935, **57**, 1734—1740, 1741—1743; cf. this vol., 304).—IV. The heats of combustion determined are: adenine 663·74±0·21, hypoxanthine 580·20±0·14, guanine 596·89, xanthine 516·02±0·36, uric acid 458·84±0·20, allantoin 409·55±0·16, alloxan 273·58±0·16 kg.-cal.

V. Heat capacities of the above substances have been determined over the range 90—298·1° abs., and the entropies and free energies calc. E. S. H.

Electrical conductivity of some strong electrolytes in dilute solution and its variation over the temperature range 18—85°. C. J. B. CLEWS (Proc. Physical Soc., 1935, **47**, 818—823).—Work previously described (cf. this vol., 37) is extended to $0\cdot0005N$ solutions of KNO_3, K_2SO_4, and Na_2SO_4. Results support the Debye–Hückel theory of uni-univalent electrolytes. Agreement is less satisfactory for Na_2SO_4 and K_2SO_4. N. M. B.

Conductivity of strong acids in mixtures of light and heavy water. A. FINK, P. GROSS, and H. STEINER (Monatsh., 1935, **66**, 111—118).—The conductivity of HCl and $HClO_4$ (about $0\cdot01N$) in H_2O containing 0—97% of D_2O has been measured at 18°, and Λ_∞ calc. therefrom. Λ_∞ falls from 377 in H_2O to 250 in 100% D_2O. Reasons for the non-linear variation of Λ with $[D_2O]$ are discussed. J. S. A.

Mobility of the hydrogen-ion constituent in aqueous mixtures of hydrogen chloride and calcium chloride at 25°. L. G. LONGWORTH (J. Amer. Chem. Soc., 1935, **57**, 1698—1700).—The mobility of $H^{\cdot}$ in aq. HCl–$CaCl_2$ mixtures, of which the total concn. is $0\cdot1N$, has been calc. from transport and conductance data. The decrease in mobility when HCl is replaced by $CaCl_2$ is compared with the val. calc. from the interionic attraction theory. E. S. H.

Anomalous forms of ionic movements. D. KREICHGAUER and F. MÖNCH (Z. Physik, 1935, **96**, 107—116).—Current is carried through $ZnSO_4$ solutions for a time by the Zn ions alone. This is a labile state and passes over to that in which both move; the smaller is the current, the greater the concn., or the higher the temp., the longer is the life of the labile state. A. B. D. C.

Normal potential of the silver–silver iodide electrode from 5° to 40°. B. B. OWEN (J. Amer. Chem. Soc., 1935, **57**, 1526—1528).—The normal potential has been obtained without extrapolation by comparing the AgI and AgCl electrodes in $NaBO_2$ solutions containing the corresponding halide. Results obtained with electrolytic and with fused AgI are practically identical. Determinations of the dissociation const. of HBO_2 agree with previously reported vals. obtained by extrapolation. E. S. H.

Molal electrode potential of the silver–silver chloride electrode in methyl alcohol–water mixtures. H. S. HARNED and H. C. THOMAS (J. Amer. Chem. Soc., 1935, **57**, 1666—1668).—E.m.f. of the cells $H_2|HCl(m)$ in 10% and 20% aq. MeOH$|$AgCl$|$Ag have been determined at 5° intervals from 0° to 40°. The v.p. and d of MeOH–H_2O mixtures have been measured over the same range. The mol. electrode potential in 10% aq. MeOH is given by $0\cdot21818-555\cdot63\times10^{-6}(t-20)-4\cdot128\times10^{-6}(t-20)^2$ and in 20% aq. MeOH by $0\cdot21151-529\cdot10\times10^{-6}\times(t-20)-4\cdot706\times10^{-6}(t-20)^2$. E. S. H.

Standard electrode potential of lithium in methyl alcohol. A. MACFARLANE and (SIR) H. HARTLEY (Phil. Mag., 1935, [vii], **20**, 611—616).—The val. $-3\cdot095$ volts has been obtained from measurements with amalgam electrodes in the cell

0·35% Li amalgam|LiCl in MeOH|AgClAg. The standard electrode potentials of Li, Na, Tl, H, Ag, I, Br, and Cl in MeOH, EtOH, and H_2O, and the observed and calc. partial molal free energies of transfer of a no. of electrolytes between infinitely dil. solutions in these solvents are given and the limitations of Born's equation for the calculation of free energies of transfer are discussed.   N. M. B.

Dependence of the electrochemical properties of an element on the state of aggregation. I. Potential of gallium and gallium amalgam in gallium salt solutions. O. STELLING (Z. Elektrochem., 1935, **41**, 712—721).—The behaviour of Ga amalgam electrodes in dil. aq. HCl and NaOH has been studied. Similar experiments with Ga in HCl gave nobler potentials than with the amalgam, but in no case were reversible conditions realised. Passivation readily occurs, particularly with liquid Ga. When a Ga electrode in aq. $GaCl_3$ is warmed, the potential suddenly becomes somewhat less noble at 29·5°, but at 30° there is a rapid change of about 0·3 volt in the opposite direction; on cooling no essential change occurs at the f.p., but the reverse change of potential takes place suddenly with the solidification of the Ga at about 25°. A max. difference of about 0·4 volt between the potentials of solid and supercooled liquid Ga at the same temp. has been observed.   E. S. H.

Theoretical evaluation of electrode potentials. S. MAKISHIMA (Z. Elektrochem., 1935, **41**, 697—712). —Theoretical. The thermodynamics of the following cyclic process are discussed : the metal is vaporised, the vapour ionised, the ions are dissolved in a solvent, and the solvated ions brought back to the metal through the electrode process. Formulæ are derived for calculating the normal potential of the metal in terms of the energy changes involved in the different stages of these processes. The nature of electrode potential and its relation to the Volta effect and the emission of photo- and thermo-electrons are discussed.   E. S. H.

Influence of hydrogen-ion concentration on the potential of African manganese dioxide. N. C. CAHOON (Trans. Electrochem. Soc., 1935, **68**, 323—331).—The potential $E_{H, = 0}$ of African MnO_2 in $ZnCl_2$-NH_4Cl solutions is given by $E_{H, = 0} = 1·070 - 0·0608 p_H$ over the range p_H 1—12. Previous failure to obtain a linear relation is due to the presence of HCl in the electrolyte.   S. J. G.

Physico-chemical characteristics of the eutectic point. P. Z. FISCHER (Mem. Inst. Chem. All-Ukrain. Acad. Sci., 1934, **1**, 191—195).—The electrode potentials and rates of dissolution in 4·8N- and 6·6N-HCl of Cd–Pb, Cd–Bi, Cd–Zn, and Sn–Zn alloys have been determined. Slowly cooled eutectics are always more electropositive than the corresponding mixtures which have been rapidly cooled. Their rates of dissolution in HCl are greater, and the tendency to become passive when used as anode is less.   CH. ABS. (e)

Capacity of polarised mercury electrode. P. P. PORFIROV (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 542—548).—The polarisation capacity (c) of a Hg electrode has been measured using a.c. and d.c.

simultaneously. c increases with the density of the a.c., the effect of which depends on the p.d. and not on the frequency. The increase in c and decrease in effective resistance give rise to a decrease in H overvoltage. The intermediary resistance (r) has also been measured. It is inferred that r is not the sole cause of H overvoltage, and that the formation of a H envelope, to which r is due, begins at very small cathode polarisation. r decreases with increasing density of the d.c. The max. val. of r corresponds with the beginning of the ascent of the c.d. on the curve c.d.–p.d.   R. S. B.

Significance of depolarisation potentials deduced from the current–voltage curves in electrolysis with a dropping mercury electrode. J. HEYROVSKÝ and D. ILKOVIČ (Chem. Listy, 1935, **29**, 234—238).—Published data (this vol., 936) are discussed.   R. T.

Potential oscillations of iron in nitric acid. II. M. KARSCHULIN (Z. Elektrochem., 1935, **41**, 664—667 ; cf. this vol., 706).—The reddish-brown film, which forms periodically over the surface of Fe in HNO_3 under certain conditions, has been shown by spectrographic observations to consist of $Fe[NO](NO_3)_2$.   E. S. H.

Dissolution of metallic monocrystals. L. E. SABININA and L. A. POLONSKAJA (J. Phys. Chem. U.S.S.R., 1934, **5**, 946—953).—During the initial stages of dissolution of a Zn monocrystal in 0·1N-H_2SO_4 the potential increases rapidly by about 5%. In N-H_2SO_4 it passes through a high max., and then falls rapidly.   CH. ABS. (e)

Surfaces of contact between solutions. V. ČUPR (Chem. Listy, 1935, **29**, 253—257).—After a short period the sum of the diffusion potentials between the four layers N-HCl|0·01N-KCl|0·5N-HCl+0·005N-KCl|N-HCl is equal to zero, and remains so for several hr., after which it gradually approaches —1·46 mv., in accordance with the val. calc. from Planck's equation. A theoretical interpretation of the phenomena is given.   R. T.

Variation of diffusion potential with concentration. I. Z. SZABÓ (Z. physikal. Chem., 1935, **174**, 33—40).—Diffusion potentials at the junctions HCl|HCl and HCl|KCl up to 0·5M are, for a fixed concn. on one side, a linear function of the logarithm of the concn. on the other. At the junction between solutions of different concn. of the same electrolyte the potential is independent of the structure of the transition layer and const.; the superposition principle is strictly valid. To obtain steady and reproducible potentials between solutions of different electrolytes the transition layer must have cylindrical symmetry.   R. C.

Salt effect of certain indicators in slightly buffered solutions. J. A. DUDYCHA and B. H. PETERSON (Proc. Iowa Acad. Sci., 1933, **40**, 97).— The colorimetric and quinhydrone electrode vals. of p_H have been compared for a series of salt solutions. The salts used increase the p_H according to the electrode indications, but reduce it according to the colorimetric observations ; the effect is more

pronounced at lower concns. The colorimetric p_H is unchanged at concns. from $1M$ to saturation.

CH. ABS. (e)

Acid–base equilibrium and the Henderson formula. D. VAN SLYKE (Bull. Soc. Chim. biol., 1935, **17**, 1184—1186).—Inaccuracy in the p_H determination is the chief source of error in the calculation of the CO_2 pressure by the Henderson formula.

A. L.

Fuel cell working at moderately high temperatures. I. General treatise and preliminary experiments. S. TAMARU and K. OCHIAI. **II. Main difficulties and their elimination.** S. TAMARU and M. KAMADA (J. Chem. Soc. Japan, 1935, **56**, 92—102, 103—113).—I. The e.m.f. of the cell at 560—640° is 0·8—0·9 volt, corresponding with $2CuO+C=Cu_2O+CO$. The electrodes are Cu covered with an oxide film, and C, the electrolyte being a mixture of K_2CO_3, Na_2CO_3, and KF, NaF, or NaCl.

II. Polarisation at 550—600° can be eliminated by addition of salts of Mn and B as O carriers.

CH. ABS. (e)

Thallous–thallic oxidation–reduction potential. J. R. PARTINGTON and H. I. STONEHILL (Trans. Faraday Soc., 1935, **31**, 1357—1371).—Liquid contact potentials etc. are eliminated by extrapolating to [Tl]=0 vals. of the e.m.f. of the cells
(i) $Pt|Tl_2SO_4+Tl_2(SO_4)_3+H_2SO_4(c)|H_2SO_4(c)|H_2,Pt$,
(ii) $Pt|Tl_2SO_4+Tl_2(SO_4)_3+H_2SO_4(c)+Hg_2SO_4(sat.)|$
$Hg|Hg_2SO_4(sat.)+H_2SO_4(c)|H_2,Pt$ obtained when c is const., [Tl] is varied, and [Tl˙]/[Tl˙˙˙]=1·0022. The extrapolation vals., E', from (i) and (ii) coincide for each val. of c in the range 1·0—0·0125M. By extrapolating a function of E' to $c=0$, the standard Tl potential, E_0, at 25° referred to the standard H electrode (a_H.=1) is —1·1992 volt, but vals. of a_H. for aq. H_2SO_4 are somewhat untrustworthy. Vals. of a_H. calc. from the e.m.f. of the cell $Hg|Hg_2SO_4,H_2SO_4|H_2,Pt$, and data involving liquid junction potentials lead to E_0 1·2207, which is preferred.

J. G. A. G.

Redox potential of glutathione.—See this vol., 1265.

Redox potential of porphyrexide and porphyrindine.—See this vol., 1252.

Electrical activation of passive iron wires in nitric acid. R. S. LILLIE (J. Gen. Physiol., 1935, **19**, 109—126).—The electrical behaviour under various conditions is described, and resemblances are found with the electrical stimulation of living tissues.

F. A. A.

Passivity. XXVII. Anodic behaviour of iron in sodium chloride and hydrochloric acid solutions. W. J. MÜLLER and W. MACHU (Z. Elektrochem., 1935, **41**, 641—653; cf. this vol., 1079).—Film passivity is observed at all concns., but the current–time curves differ from those for Fe in H_2SO_4 and sulphates. The end-val. is higher throughout, indicating that the film produced in Cl′ solutions is more porous than that in SO_4'' solutions. Periodic changes in potential have been observed under certain conditions in NaCl solutions. Observations in the polarisation microscope show the duration of the primarily-formed salt film to be very short. The influence of concn. and p_H on the passivation time has been investigated. Chemical passivity, involving the entry of Fe˙˙˙ into solution, occurs only at very high c.d. ($> 0·5$ amp. per sq. cm.), and is never complete; the production of Fe˙˙˙ reaches a max. val. of 55% in saturated aq. NaCl at 0° with a c.d. of 8 amp. per sq. cm. Rise of temp. favours the production of Fe˙˙.

E. S. H.

Passivity of gold. W. J. MÜLLER and E. LÖW (Trans. Faraday Soc., 1935, **31**, 1291—1299).—Trustworthy vals. for the time of passivation, t, are obtained only with " protected " electrodes which prevent convection etc. Optical methods show that a strongly anisotropic metal surface is laid bare immediately the current, i, is passed through a Au anode in 5N-HCl. Such a surface darkens progressively on exposure to air, and t is thereby diminished. The phenomena are due to an oxide film and not to a superficial change in the structure of the Au. When i falls sharply to the val. characteristic of passivity, the diffuse layer of crystals deposited on the Au is transformed into a continuous strongly reflecting layer. The electrode then exhibits alternating periods of passivity and activity, showing that during passivity the oxide film is slowly destroyed. In N- and 0·05N-HCl, a passivated electrode becomes reactivated only on interrupting the current. Two kinds of oxide layers are inferred : (i) the air-formed layer scarcely sol. in dil. acid, and (ii) the layer produced by chemical passivation and sol. in dil. acid. These results and those of others (cf. A., 1932, 1209 ; 1933, 1242 ; this vol., 38) are in accord with the theory of passivation by layers.

J. G. A. G.

Cathode passivity of silver in silver nitrate solution. A. G. SAMARTZEV (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 478—485).—Experiments on electrolytic crystallisation of Ag from $AgNO_3$ solutions showed that metallic deposition on active portions of the cathode was possible only at definite c.d. The passivation of the Ag surface is due to oxide or adsorption layers.

W. R. A.

Structure of the dielectric in aluminium-electrolyte condensers. A. SIMON and O. JAUCH (Z. Elektrochem., 1935, **41**, 739—759).—The oxide film covering the Al surface is porous; the pores penetrate to the bare metal and occupy about 10^{-5}—10^{-6} of the total surface area. The layer also contains O_2; the dependence of the residual current on p.d. and temp. is traced to variations in the velocity of diffusion of O_2 through the pores. The " forming " velocity is independent of the concn. of electrolyte and the temp. Addition of colloids to the electrolyte has a deleterious effect on " forming." The capacity of the condenser varies with the concn. of electrolyte, but the thickness of the oxide layer remains const. A theory of the valve action of this layer is advanced, according to which it offers resistance to anions but not to electrons.

E. S. H.

Primary molecular interaction in chemical kinetics. P. V. ZIMAKOV (J. Phys. Chem. U.S.S.R., 1934, **5**, 824—831).—A theoretical review.

CH. ABS. (e)

Spark ignition of low inflammable gas mixtures. III. Influence of presence of nitrogen on the spark ignition of hydrogen–oxygen mixtures. K. YUMOTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1935, **27**, 275—285).—In mixtures with low and const. $[H_2]$, the spark energy required for ignition initially decreases with increasing $[N_2]$ up to 5% N_2, but at higher $[N_2]$ increases with increasing $[N_2]$. With const. low $[O_2]$ the addition of N_2 decreases the sparking energy required for ignition. Differences exist between the mechanisms of ignition by an ordinary spark and by a capacity spark. J. W. S.

Oxidation and ignition at hot surfaces. PRETTRE (Mém. Poudres, 1934—1935, **26**, 239—267).—The homogeneous reaction of a $2H_2+O_2$ mixture in contact with a hot glass wall covered with KCl is about 0·02 as fast as when it is in contact with a vitreous wall. The chief characteristics of the reaction (high apparent order, accelerating effect of inert gases, and inhibition by the wall) are, however, not appreciably different. The reaction is therefore a chain reaction, as it also is on glass, SiO_2, and porcelain. KCl cannot be regarded as being more effective than vitreous materials. All of the surfaces promote the formation of active centres, which initiate chains, these not being initiated in the gaseous phase, and KCl forms far fewer chains than the vitreous surfaces. There is therefore a considerable retardation of the reaction and a consequent reduction of the ignition temp. KCl plays a part in the initial stages of the reaction alone. W. J. W.

Ignition temperatures of diethyl ether and ethylene in air and oxygen. G. W. JONES, W. P. YANT, W. E. MILLER, and R. E. KENNEDY (U.S. Bur. Mines Rept. Invest., 1935, No. 3284, 6 pp.).—By the drop method, the min. temp. of inflammation, t, of Et_2O in air is 304—380°, depending on the conditions. With O_2, t is 182°. Et_2O containing 3·5% of EtOH gives slightly higher vals. of t. With 3—38 vol.-% C_2H_4–air mixtures, t has a min. val., 490°, with 28% of C_2H_4. Vals. of t by the concentric-tube method (i) are slightly $>$ by the SiO_2-bulb method (A., 1933, 1249) at low $[C_2H_4]$. The min. val. of t for 3—62·4% C_2H_4–O_2 mixtures by method (i) is 485° with 34·5% of C_2H_4. J. G. A. G.

Thermal decomposition of _n_-pentane.—See this vol., 1348.

Rates of reaction of sodium atoms with hydrogen and deuterium chlorides. C. E. H. BAWN and A. G. EVANS (Trans. Faraday Soc., 1935, **31**, 1392—1400).—The reactions have been studied by the diffusion flame method and found to proceed at approx. equal rates, although the zero point energies of HCl and DCl differ by 1200 kg.-cal. The activation energies of the reactions differ by 300 kg.-cal., which approx.=the difference in zero point energies of the mols. in the initial and transition states. F. L. U.

Mechanism of reactions between alkali [metal] atoms and halogen hydrides. A. G. EVANS and M. G. EVANS (Trans. Faraday Soc., 1935, **31**, 1400—1410; cf. preceding abstract).—The mechanism of reactions of Na and K vapours with HCl, HBr, and

HI is discussed and the calc. and experimental results are compared. F. L. U.

Kinetics of the oxidation of gaseous glyoxal. E. W. R. STEACIE, W. H. HATCHER, and J. E. HORWOOD (J. Chem. Physics, 1935, **3**, 551—555).—Oxidation at 220° yielded CO_2, CO, H_2O, and glyoxylic acid, the proportions changing with the temp. The oxidation is a chain reaction, to which the general mechanism of Steacie _et al._ for the oxidation of gaseous aldehydes is applicable (cf. this vol., 308). The rate was approx. $\propto [C_2H_2O_2]^2$ and was independent of $[O_2]$, provided the latter was in excess of a 1 : 1 mol. ratio. H. J. E.

Valency chemistry of the phosphorus sulphides. W. D. TREADWELL and C. BEELI (Helv. Chim. Acta, 1935, **18**, 1161—1171).—The production of P_4S_5 by Boulouch's method (A., 1904, ii, 253) was confirmed. It is unimol. in CS_2 solution. The heats of formation of P_4S_3 from the elements and of P_4S_7 from P_4S_3 and S were 29·4 and 36·3 kg.-cal., respectively. The reaction of I with P_4S_3 in CS_2 solution is $7P_4S_3 + 24I_2 = 16PI_3 + 3P_4S_7$. That of Br is similar. The potentiometric titration of P, P_4S_3, and P_4S_7 with $0·1N$-KBr–$KBrO_3$ is described. Vals. for d of P–S melts are recorded. Analyses of the products of acid and alkaline hydrolysis of P_4S_3, P_4S_7, and P_4S_{10} are given. The electronic structures are discussed. H. J. E.

Rate of alkaline chlorination of ketones.—See this vol., 1353.

Influence of substituents on energy of activation. D. H. PEACOCK (J.C.S., 1935, 1326).—Polemical (cf. A., 1934, 35). J. G. A. G.

Reaction between potassium permanganate and oxalic acid. O. M. LIDWELL and R. P. BELL (J.C.S., 1935, 1303—1305).—If insufficient or only a small excess of $H_2C_2O_4$ is added to $KMnO_4$–$MnSO_4$–H_2SO_4 mixtures, the reaction is not unimol., but there is an initial rapid reaction which gives way abruptly to a slower change, the velocity of which is probably determined by the complex $[Mn(C_2O_4)_3]'''$. The results negative Launer's reaction mechanism (A., 1932, 1002) and indicate that the velocity is independent of $[C_2O_4'']$. J. G. A. G.

Kinetics of hypobromite decomposition. C. F. PRUTTON and S. H. MARON (J. Amer. Chem. Soc., 1935, **57**, 1652—1655).—In buffered solutions within the range p_H 6·4—7·8, at 25°, the complete rate equation is given by $d[HOBr]/dt = k_3[HOBr]^3[OH]$, where k_3 is $4·4 \times 10^8$ when the time is in min. and concns. in g.-mol. per litre. E. S. H.

Influence of temperature on velocity of ionic reactions in aqueous solutions of non-electrolytes. A. VON KISS and I. BOSSÁNYI (Z. anorg. Chem., 1935, **224**, 33—39).—The temp. coeff. of the $CH_2Br\cdot CO_2'$ and S_2O_3'' reactions in aq. MeOH, EtOH, PrOH, $COMe_2$, $CO(NH_2)_2$, and sucrose between 15° and 55° decreases with rise in temp., and is lowered by the non-electrolyte $\propto$ [non-electrolyte] except for $CO(NH_2)_2$ and sucrose. The energy of activation calc. from both k and Brönsted's h is lowered $\not> 7\%$ by the presence of non-electrolytes. J. S. A.

Mechanism of reactions in which the reactants diffuse through a membrane. A. VON KISS and A. URMÁNCZY (Z. anorg. Chem., 1935, 224, 40—48).—The velocity of dialysis of HCl, HNO₃, H₂SO₄, AcOH, and NaOH, in H₂O and neutral salt solutions, $\propto \sqrt{R}$ (R=rate of stirring) for highly permeable membranes, and the rate of neutralisation then $\propto \sqrt[3]{R}$. The rates of dialysis and neutralisation in salt solutions are sp. functions of the compounds concerned.   J. S. A.

Exchange reaction between acetone and deuterium oxide. Kinetics and equilibrium. J. O. HALFORD, L. C. ANDERSON, J. R. BATES, and R. D. SWISHER (J. Amer. Chem. Soc., 1935, 57, 1663—1665).—The introduction of the first D is a pseudo-unimol. reaction, which has a high-temp. coeff., approx. zero heat of reaction, and limiting equilibrium const. 2·1. Considerable amounts of acetones of higher D content are formed.   E. S. H.

Stability against interchange of the iodine atoms in diphenyliodonium iodide. F. JULIUS-BURGER, B. TOPLEY, and J. WEISS (J.C.S., 1935, 1295—1296).—Using radioactive NaI prepared by neutron bombardment, the facility of interchange, in solution, of iodide ions with the two different I atoms in Ph₂I⁺·I⁻ has been examined by means of a Geiger counter. In EtOH and in aq. EtOH interchange occurs with the negative I only. In a solution of Ph₂I⁺·I⁻ (with the I⁻ active) in PhI no detectable exchange takes place even under conditions so extreme that considerable decomp. into 2PhI occurs. If both the decomp. and exchange reactions involve an activated complex it is probable that the activation energy for decomp. is < for exchange.   O. J. W.

Stimulus to precipitate formation. N. P. SMIRNOV (Compt. rend. Acad. Sci. U.R.S.S., 1935, 2, 548—555).—The stimulus to ppt. formation (ϕ) is defined by $\phi = A^p B^q / L$, where A and B are the concns. and p and q the charges of ions, and L is the solubility product. When $\phi = 1$, $L = A^p B^q$ (at the beginning and end of pptn.); when $\phi > 1$, the ppt. forms, and when $\phi < 1$ it dissolves. It is contended that ϕ is a dynamic quantity which measures the stimulus.   R. S. B.

Velocity of reaction in systems consisting of two liquid phases. G. I. TSCHUFAROV and N. N. AGAFONOV (J. Phys. Chem. U.S.S.R., 1934, 5, 926—935).—The reaction of I and Na₂S₂O₃ was studied at 25° in the stirred systems CCl₄–H₂O, CHCl₃–H₂O, and CS₂–H₂O, the I being dissolved in the first component and the Na₂S₂O₃ in H₂O. The reaction was pseudo-unimol. Surface-active substances (e.g., stearic acid or CH₂Ph·CO₂H) do not affect the reaction proceeding on the phase boundary. NaI accelerates the reaction by changing the distribution coeff.   CH. ABS. (e)

Kinetics of decomposition of solid solutions of silicon in aluminium. M. I. ZACHAROVA (Z. Physik, 1935, 96, 754—760).—The effect of temp. and duration of tempering on the decomp. of solid solutions of Si in Al has been investigated. The rate of decomp. is accelerated by plastic deformation. The isothermal decomp. of undeformed alloys at 218° and 280° shows three stages : (1) a latent period, in which the lattice consts. remain unchanged. This period is the longer the lower is the temp. (2) A period of spontaneous decomp. (3) A period of growth and coagulation of crystallites. The Brinell hardness reaches a max. at the beginning of the third period.   A. J. M.

Oxidisability of nickel. G. VALENSI (Compt. rend., 1935, 201, 523—524).—Measurements of the rate of oxidation of Ni at 715—1045° confirm Pilling and Bedworth's results (B., 1923, 359). For pure Ni oxidation starts at 550°. This temp. is lowered by the presence of H₂O, or of impurities in the Ni. The product, from X-ray analysis, consists of NiO. Some O₂ is dissolved and can be pumped off in vac.   H. J. E.

Induced reaction. R. HORIUCHI (Bull. Chem. Soc. Japan, 1935, 10, 314—318).—Examples are discussed. It is suggested that inducer and acceptor must be chemically similar.   R. S.

Chemical induction. A. SKRABAL (Monatsh., 1935, 66, 129—168).—A mathematical investigation of the kinetics of systems with successive and simultaneous reactions. The relation of the latter type to induced reactions and to induced catalysis is discussed.   J. S. A.

Effect of neutral salts on the rate of hydrolysis of ethyl acetate in presence of strong acids, and the theory of Brönsted. N. V. SAPOSHNIKOVA and Z. A. PETSCHERKINA (J. Phys. Chem. U.S.S.R., 1934, 5, 116—125).—The effects of NaCl, KCl, MgCl₂, and NaCl+KCl in 0·1N-HCl, and of Na₂SO₄, MgSO₄, K₂SO₄, KCl+K₂SO₄, and NaCl+Na₂SO₄ in 0·1—0·5M-H₂SO₄ were studied. The rise in reaction velocity continues for each addition of chloride. With sulphates in acid solution the velocity decreases with each addition of sulphate to approx. 1M, further additions being almost without effect.   CH. ABS. (e)

Effect of strong electrolytes on the rate of inversion of sucrose at 25°. J. N. PEARCE and M. THOMAS (Proc. Iowa Acad. Sci., 1933, 40, 93).—For each salt the inversion coeff. $\propto$ the molality, the order of decreasing effect on the coeff. being BaCl₂, NaCl, KCl. The velocity is decreased by K₂SO₄ owing to formation of HSO₄'. The results are discussed from the viewpoint of dipole orientation and ionic charge.   CH. ABS. (e)

Auto-esterification of lactic acid. P. DUQUÉNOIS (J. Pharm. Chim., 1935, [viii], 22, 251—254).—The amount of self-esterification in N-lactic acid has been determined. Sb₂O₃ has little effect on the [free acid] or on the [ester].   R. S.

Rôle of ozone as oxidation catalyst. IX. Ozonisation of anisaldehyde, vanillin, and piperonal. E. BRINER and A. GELBERT (Helv. Chim. Acta, 1935, 18, 1239—1242; cf. A., 1932, 1212).—Treatment of these aldehydes, and of methyl- and ethyl-vanillin, in CCl₄ solution with 2—4% ozonised O₂ gave a yield of acid > that attributable to the action of O₃ alone. The O₃ induces the reaction of part of the O₂. No peroxidation products were detected.   H. J. E.

Oxidation of sugars by air in presence of ceric hydroxide sol and cerous hydroxide gels. J. C.

GHOSH and P. C. RAKSHIT (J. Indian Chem. Soc., 1935, **12**, 357—370).—Rates of oxidation of glucose (I) and fructose (II) were determined at 27—48° in solutions with p_H vals. between 6·6 and 8·8. The rate of oxidation of (II) in presence of $Ce(OH)_4$ sol is accelerated by rise of p_H and by illumination, the quantum efficiency of the light reaction being 0·3—1·1. The data are consistent with (II) being strongly adsorbed by and reacting at the surface of the colloid particles. (I) gives similar results. With $Ce(OH)_3$ gel, a brown ppt. of ceric hydroperoxide (III) is formed, showing that H_2O_2 is produced. It is inferred that the sugars are dehydrogenated on the gel particles preliminary to the combination of the H_2 with O_2 to form H_2O_2. A steady rate of O_2 absorption is eventually attained which is the difference between the rates of H_2O_2 formation and decomp. of (III). Glycine retards the oxidation and (III) is not formed.   J. G. A. G.

Inhibition in the benzoin reaction. B. F. FERREIRA and T. S. WHEELER (Current Sci., 1935, **4**, 94—95).—Contamination with benzoquinone (1 part in 10^7), I (1 part in 5×10^5), or S (1 part in 2×10^4) causes a measurable fall in the rate of reaction between solid KCN and PhCHO. Traces of H_2O tend to increase the rate.   F. N. W.

Effect of calcium fluoride on the thermal synthesis of calcium ferrites. S. NAGAI and T. YOSHIURA (J. Soc. Chem. Ind. Japan, 1935, **38**, 374—376B).—CaO,Fe_2O_3 and $2CaO,Fe_2O_3$ are formed by heating a mixture $2CaO + Fe_2O_3$ at 1000—1100° and 1200°, respectively. Addition of 1% of CaF_2 lowers the temp. of formation by 50—100° (*e.g.*, reaction is completed after 1 hr. at 1100°).
    J. A. S.

Effect of heating a nickel catalyst on its ability to accelerate the transformation of para-hydrogen, and dependence of pyrophoric property of nickel on the temperature of heating. G. TAMMANN (Z. anorg. Chem., 1935, **224**, 25—26).— The loss of pyrophoric properties and a decrease in the catalytic activity of reduced Ni towards the ortho–para-H_2 conversion set in roughly simultaneously on heating at 355—390°.   J. S. A.

Catalytic interconversion of ortho–para-hydrogen over iron, platinum, and nickel catalysts. P. H. EMMETT and R. W. HARKNESS (J. Amer. Chem. Soc., 1935, **57**, 1624—1631).—The ortho-para conversion over Fe catalysts has been studied as a function of temp., pressure, time of contact, and the presence of various poisons; kinetic expressions have been obtained. The poisoning effect of activated adsorption of H_2 on the para–ortho conversion at −190° over Pt and Ni is strong evidence that the activated adsorption is in part at least a surface phenomenon.
    E. S. H.

Adsorption of light and heavy hydrogen in connexion with hydrogenation of ethylene. II. R. KLAR (Z. physikal. Chem., 1935, **174**, 1—14; cf. A., 1934, 593).—The rate of hydrogenation with D_2, K_D, on an Fe catalyst was up to ~100° <, but at 100—175° >, the rate of hydrogenation with H_2, K_H. K_D was a max. at ~150°, K_H at ~125°, and K_H/K_D at 53°. The heat of activation for reaction with H_2

is 10·0 kg.-cal., and that for D_2 8·0 kg.-cal. up to 50° and 12·5 kg.-cal. above. It is suggested that in the reaction with D_2 at higher temp. hydrogenation is preceded by an exchange reaction between activated adsorbed D_2 and the H atoms of activated adsorbed C_2H_4; the rate of the process as a whole is decided by the rate of activation of C_2H_4. From measurements of the rate of adsorption of H_2 and D_2 on Ni (cf. this vol., 27) it is calc. that at 0—30° the energy of activation of H_2 is 1·49 and that of D_2 2·37 kg.-cal.; at 80—120° the difference between the two rises to 1800 g.-cal.   R. C.

Simple demonstration of catalysis. H. KAMMIN (J. Chem. Educ., 1935, **12**, 362).—The decomp. of H_2O_2 by MnO_2 is used.   L. S. T.

Effect of porous silica gel catalyst carrier on the velocity of oxidation of sulphur dioxide gas. I. G. I. TSCHUFAROV, N. N. AGAFONOV, E. P. TATIEVSKAJA, and K. I. KULPINA (J. Phys. Chem. U.S.S.R., 1934, **5**, 936—945).—Vals. are recorded for the SO_3 yield as a function of gel porosity for 16 platinised gels (porosities 118 to 19) at 360—500°. At porosities > 50 the difference in yield is small. Below 50 it falls rapidly, particularly at low temp. Decreased yields also occur with porosities > 100.
    CH. ABS. (*e*)

Sulphuric acid catalysis. VI. Vanadic acid contact masses.—See B., 1935, 898.

Platinised copper gauze for oxidation of ammonia.—See B., 1935, 946.

Use of van der Waals adsorption isotherms in determining the surface area of iron synthetic ammonia catalysts. S. BRUNAUER and P. H. EMMETT (J. Amer. Chem. Soc., 1935, **57**, 1754—1755). —Van der Waals adsorption isotherms for N_2 at −195·8° and −183°, O_2, CO, and A at −183°, CO_2 at −78·5°, and n-C_4H_{10} at 0° have been determined. By extrapolation the vol. of gas needed to form a unimol. layer on the catalyst, and hence the area of the catalyst surface, has been calc. Results obtained for the different gases are in good agreement.
    E. S. H.

Catalytic oxidation of ammonia–methane mixtures to hydrocyanic acid. L. ANDRUSSOV (Angew. Chem., 1935, **48**, 593—595).—The catalytic oxidation of equimol. $CH_4 + NH_3$ mixtures to HCN, and of NH_3 to N_2O, in presence of Pt is discussed in terms of the author's nitroxyl theory of NH_3 oxidation. Pt is a sp. catalyst, Ni being ineffective.   J. S. A.

[Catalytic] preparation of carbon tetrachloride.—See B., 1935, 938.

[Catalytic] hydrolysis of chlorobenzene in the vapour phase.—See B., 1935, 938.

Cascade electrolytic process for separating the hydrogen isotopes. H. C. UREY and M. H. WAHL (Physical Rev., 1935, [ii], **45**, 566).—An outline of the method is given.   L. S. T.

Fractionation of the isotopes of oxygen in a commercial electrolyser. E. R. SMITH and M. WOJCIECHOWSKI (J. Res. Nat. Bur. Standards, 1935, **15**, 187—188; cf. this vol., 175).—Commercial electrolytic " equilibrium " H_2O after treatment with

NH_3 and purification gave d 11 p.p.m. $>$ for normal pure H_2O, instead of 31 p.p.m. as previously reported, due to enrichment in O^{18}. The electrolytic separation factors for the H and O isotopes are, respectively, 3·5 (lit. 2·4) and 1·05. R. S. B.

Concentration of the heavier isotopes of oxygen in commercial electrolytic cells. W. H. HALL and H. L. JOHNSTON (J. Amer. Chem. Soc., 1935, **57**, 1515—1517).—Samples of electrolyte from cells which had been in use for 7 years showed an increase of 4 p.p.m. in d of H_2O as a measure of the enrichment of O^{17} and O^{18}. E. S. H.

Electrolytic preparation of hydrogen peroxide. H. SIDERSKY (J. South African Chem. Inst., 1935, **18**, 44—61).—The electrolytic prep. of $K_2S_2O_8$ gave low current yields and on distilling the aq. solution conc. distillates of H_2O_2 could not be obtained without extensive loss of active O. With $(NH_4)_2SO_4 + H_2SO_4$ as anolyte, 50% H_2SO_4, as catholyte, and porous pot for separation, 83% current yield of $(NH_4)_2S_2O_8$ was obtained, 82% of the active O coming over as H_2O_2 on distillation. A Pb cathode was not detrimental, but traces of Cr, Mn, and Fe must be avoided if economic yields are desired. By fractional condensation it is possible to concentrate dil. H_2O_2 solutions up to 30%. S. J. G.

Large-scale laboratory experiments for making calcium. Z. V. VASILIEV, V. P. MASCHOVETZ, B. V. POPOV, and A. J. TAITZ (Legk. Metal., 1934, **3**, No. 10, 28—34).—Fused $CaCl_2$ and NH_4Cl were electrolysed in a graphite cell with an Fe cathode. With external heating, 430 g. of Ca were obtained at a consumption of 32 kw.-hr. per kg. CH. ABS. (e)

Electrosynthesis of silver, tin, and zinc amalgams and their chemical structure. K. DUCZKO (Wiadom. Farm., 1934, **61**, 633—636, 667—671, 683—686, 698—700).—The amalgams were prepared by a modification of Kerp's method (A., 1898, ii, 516), or by mixing electrolytically dispersed Ag with Hg. The Ag amalgams contain the compound AgHg, those of tin contain Sn_7Hg, and Zn amalgams are physical mixtures. CH. ABS. (e)

Electrolytic deposition of metals from their pyrophosphate solutions. S. KOYANAGI (Bull. Chem. Soc. Japan, 1935, **10**, 355—356).—Conditions are given for the deposition of Ni, Co, Cu, Zn, and Cd. R. S.

Simultaneous discharge of nickel and hydrogen ion from the solutions of simple nickel salts. O. ESSIN and E. ALFIMOVA (Trans. Electrochem. Soc., 1935, **68**, 255—262).—Current efficiencies calc. from the equation for the simultaneous discharge of two ions (cf. this vol., 450) are in agreement with experimental data over a range of [Ni··], [H·], cathode c.d., and electrolyte temp. R. S.

Cathodic film in the electrolytic reduction of aqueous chromic acid solutions. E. MÜLLER (Trans. Faraday Soc., 1935, **31**, 1194—1203).—When pure aq. $HCrO_4$ is electrolysed with a smooth Pt cathode, continuous reduction does not occur; a film of reduction product is formed at the cathode surface and is impermeable to $HCrO_4$. The film is permeable to H· and to HSO_4', and on addition of H_2SO_4 breaks down, so that continuous reduction proceeds. The conditions of stability of the film have been studied by determining the c.d.–p.d. curves in electrolytes containing different amounts of H_2SO_4. Within certain limits of c.d. and concn. the formation of the film occurs periodically with time and is accompanied by regular pulsations of p.d. The mechanism is discussed. E. S. H.

Mechanism of chromium deposition from the chromic acid bath.—See B., 1935, 857.

Electrolysis of salts of weak bases. M. LEMARCHANDS and J. DEBIESSE (Bull. Soc. chim., 1935, [v], **2**, 1697—1698).—Dil. solutions of Cu, Pb, Ni, and Zn salts on electrolysis using a high c.d. yield deposits consisting of a mixture of the metal and its hydroxide. Since this effect is increased by increased dilution, by increased c.d., or by addition of NaOAc, it is attributed to cataphoresis of the hydroxide produced by hydrolysis of the salts. Limiting concns. at which the effect is observable with various c.d. and with various metals are recorded. J. W. S.

Alternating-current corrosion.—See B., 1935, 855.

Electrodeposition of iron–nickel alloys.—See B., 1935, 905.

Conditions governing the formation of highly-insulating anodic layers on aluminium.—See B., 1935, 955.

Electrolytic preparation of thin layers of U_3O_8. M. FRANCIS (Compt. rend., 1935, **201**, 473—474; cf. this vol., 589).—If the U salt is insufficiently pure the first material deposited contains Pa, Ra, Po, and other radioactive elements. The radioactivity of such a deposit will be $>$ that for pure U_3O_8. H. J. E.

Arrangements of micro-crystals in lead deposited by electrolysis. H. HIRATA, Y. TANAKA, and H. KOMATSUBARA (Bull. Chem. Soc. Japan, 1935, **10**, 391—396; cf. this vol., 920).—Needle-shaped and foliated deposits of Pb have been examined by X-rays. The angles between the directions of max. growth of the micro-crystals coincide with the angles between their (211) axes. R. S.

Electrodeposition of lead from perchloric acid solution.—See B., 1935, 906.

Electrolysis of organic substances in non-aqueous media. I.—See this vol., 1349.

Electrolytic reduction of succinimide.—See this vol., 1378.

Photolysis of dry ozone at $\lambda\lambda$ 208, 254, 280, and 313 mμ. II. Reaction kinetics. L. J. HEIDT (J. Amer. Chem. Soc., 1935, **57**, 1710—1716; cf. A., 1934, 1079).—Quantum yields, referred to O_3 mols. decomposed per quantum absorbed, are approx. equiv. at 208 and 313 mμ. The temp. coeff., 1·15±0·02 at 0—60°, is apparently independent of the mol. fraction of O_3 in O_2 and of the temp. interval, even when the dark rate is 20% of the total decomp. The temp. coeff. of the dark rate at 20—60° is 3±0·1 for small mol. fractions of O_3 in O_2. The mechanism is discussed. E. S. H.

Photo-dissociation of single crystals of nitrates in polarised light. L. K. NARAYANSWAMY (Trans. Faraday Soc., 1935, **31**, 1411—1412).—Crystals of metal nitrates undergo dissociation in light of $\lambda < 250$ mμ, giving nitrite which is confined to a thin surface layer. KNO_3 is much more sensitive to light vibrating in the plane of the NO_3' ions than to light vibrating normally to this plane. Similar behaviour is shown by single crystals of $NaNO_3$ and NH_4NO_3.   F. L. U.

Influence of time, light, and temperature on the keeping of hypochlorite solutions. R. P. JACQUEMAIN and J. H. DOLL (Bull. Soc. chim., 1935, [v], **2**, 1669—1678).—Addition of KI to a mixture of $NaOCl$, $NaClO_2$, and $NaClO_3$ in dil. AcOH, followed by titration with $Na_2S_2O_3$, permits determination of $[NaOCl]+[NaClO_2]$, whilst the same reaction in conc. HCl gives $[NaOCl]+[NaClO_2]+[NaClO_3]$. Titration of the mixture with KI in presence of $NaHCO_3$ until I is just formed, owing to reaction of the IO_3' produced with I', determines the $[NaOCl]$. This system of analysis is applied to the study of the decomp. of NaOCl solution. This reaction is principally controlled by light, rise of temp. having little effect, and the initial product is $NaClO_2$. The decomp. of the latter to $NaClO_3$ and NaCl is scarcely influenced by light, but is greatly accelerated by rise of temp. Dil. solutions are more readily decomposed than conc. solutions. J. W. S.

Inorganic photosyntheses. G. CALCAGNI (Gazzetta, 1935, **65**, 558—566).—By the action of sunlight on S, Se, P, As, Sb, B, and Si suspended in H_2O, the following have been obtained : H_2SO_4, H_2SeO_3, H_3PO_3, H_3PO_4, H_3AsO_3, H_3SbO_3, H_3BO_3, and $SiH(OH)_3$.   O. J. W.

Photochemical investigations. I. Effect of ammonia pressure on the quantum yield for the decomposition of ammonia. E. O. WIIG (J. Amer. Chem. Soc., 1935, **57**, 1559—1562).—The quantum yield for λ 2100 Å. depends on the NH_3 pressure, rising from about 0·10 at 1—10 mm. to about 0·30 at 65—120 mm., and then falling to 0·18 at 1 atm.   E. S. H.

Photodissociation of nitrous oxide. P. K. SEN-GUPTA (Nature, 1935, **136**, 513—514).—A crit. discussion (cf. A., 1934, 1153).   L. S. T.

Action of light in the dissolution of amorphous selenium in carbon disulphide. J. SHIDEI, S. HASHIZUME, and S. KITAHARA (Bull. Chem. Soc. Japan, 1935, **10**, 374—378).—The velocity of dissolution of amorphous Se is accelerated, whilst that of monoclinic Se is unaffected.   R. S.

Influence of atmospheric oxygen on the photographic process of bleaching out. M. BLAU (Phot. Korr., 1935, **71**, Beil. 3, 21—28; cf. A., 1935, 177).—The Herschel effect is less in vac. than in air, especially in plates desensitised with pinakryptolyellow; desensitised plates show an increase of sensitivity in vac. Detailed experiments show that in all cases O_2 plays an important part; the theory of bleaching processes is discussed.   J. L.

Topographical relations in image reversals. LÜPPO-CRAMER (Phot. Korr., 1935, **71**, 89—92).—Desensitised AgBr emulsions show a quicker second reversal by light of high intensity; this is attributed to penetration of the light to depths in the AgBr grain where dye has not reached. AgI emulsions show no solarisation if a halogen acceptor is present; the solarisation of pure AgI emulsions, which is also dependent on the intensity of the light, is ascribed to a " regression " (rehalogenation) process. Various data bearing on the latter theory are discussed.   J. L.

Theory of desensitisation and the Herschel effect. K. WEBER (Phot. Korr., 1935, **71**, 107—111).—The desensitising power of a dye is the greater the more positive is the reduction–oxidation potential (ϵ_h), the vals. for neutral-red, phenosafranine, Nile-blue, and methylene-blue being $-0·320$, $-0·230$, $-0·080$, and $-0·005$, respectively; thionine ($\epsilon_h + 0·045$) falls into line for physical development, but not for chemical development, wherein a catalytic acceleration of the development appears to be produced. Since the potential for $Ag|AgNO_3$ is $+0·77$ volt, for $Ag|AgBr +0·44$ volt, and for nascent Ag about 0·0, desensitisation cannot be due to oxidation of Ag, except to a small extent, as the formation of leuco-base would at once hinder such a reaction. Various other factors (cf. Mudrovčić, B., 1929, 227) lead to the conclusion that desensitisation is due to oxidation of the optical or chemical sensitisers present, leuco-base formed being rapidly re-oxidisable to dye by atm. O_2. The Herschel effect must also be due to an oxidation process, since it is not obtainable in a vac., and the relation of desensitising action to ϵ_h also holds for this effect. The Ag latent image is in a state of excitation on exposure to red light and has then a more negative ϵ_h than normal Ag, and thus becomes oxidisable.   J. L.

Photographic development effect. P. O. HOFMANN (Physikal. Z., 1935, **36**, 650).—If two exposures are made on a plate (1) with long exposure (t) and small intensity (I), and (2) with short t and great I, so that the blackening produced on normal development would be the same, the exposure made under the first conditions always appears first on development.   A. J. M.

Relation between density of blackening and X-ray intensity for characteristic copper radiation and Agfa-Laue film. F. D. MILES (Trans. Faraday Soc., 1935, **31**, 1452—1460).—The relation between photographic density (D) and the intensity of Cu α radiation, determined by two methods, is nearly linear. The error involved in assuming linearity up to $D=1·0$ is $\ngtr 4\%$ of the highest D measured. There is no evidence of threshold effect.   F. L. U.

Formation of the Röntgen image with regard to scattered irradiation. G. SPIEGLER (Z. wiss. Phot., 1935, **34**, 197—204, 205—215).—By placing Pb plates at varying angles and distances from the film, in a scattering cell filled with H_2O, the contrast of the shadow in relation to the object distance is measured. The results are given with and without a scattered light screen. A method of evaluating density differences of images is outlined.   J. L.

Sensitivity of certain reactions to light. C. WINTHER (Z. physikal. Chem., 1935, **174**, 41—48).—

Contrary to the findings of Bhattacharya and Dhar (A., 1929, 37) the oxidation of citric, tartaric, lactic, and oxalic acids by H_2CrO_4 and of KI by $K_2S_2O_8$ is not sensitive to light. R. C.

Photochlorination of pentane. T. D. STEWART and B. WEIDENBAUM (J. Amer. Chem. Soc., 1935, 57, 1702—1704).—The reaction in the liquid phase, using λ 3650 Å., has a quantum efficiency of 192 ± 14 at 25°. The reaction rate $\propto [Cl_2]$ at const. light intensity. E. S. H.

Effect of slow electrons on metal surfaces. J. B. PHILIPSON (Proc. Iowa Acad. Sci., 1933, 40, 150—151).—Differences in reactivity were observed after bombardment. CH. ABS. (e)

Effect of cathode rays on metal surfaces. E. WILCOX (Proc. Iowa Acad. Sci., 1933, 40, 150).—Metal surfaces which have been bombarded with cathode rays have a different chemical reactivity towards vapours from those not so bombarded. H. J. E.

Effect of low-voltage cathode rays on photographic film. A. R. BROWN (Proc. Iowa Acad. Sci., 1933, 40, 151).—Differences were observed in the effect of electrons at different voltages. CH. ABS. (e)

Heavy hydrogen (deuterium) and its compounds. E. DARMOIS (Bull. Soc. chim., 1935, [v], 2, 1513—1544).—A lecture.

Preparation of hydrogen peroxide [from potassium persulphate].—See B., 1935, 849.

Li_3FeF_6. A. H. NIELSEN (Z. anorg. Chem., 1935, 224, 84).—The *compound* Li_3FeF_6 is obtained as an insol., white isotropic powder (n 1·42) by the action of aq. Li_2CO_3 on a solution of $FeCl_2$ in HF. J. S. A.

Percarbonates. R. R. KAMTIKAR and S. HUSAIN (J. Osmania Univ. Coll., 1934, 2, 39—40).—The so-called compounds $Na_2C_2O_6$ and $Na_2CO_4,1·5H_2O$ obtained by action of CO_2 on Na_2O_2 or NaO_2H (Wolffenstein *et al.*, A., 1908, ii, 180) are mixtures of Na_2CO_3 and $NaHCO_3$ with a small amount of active O, probably due to Na_2O_2 and NaO_2H; whilst the $Na_2C_2O_6,H_2O_2$ is $Na_2CO_3,NaHCO_3,H_2O_2,xEtOH$. The formula of Tanatar's compound $Na_2CO_3,H_2O_2,0·5H_2O$ (A., 1899, ii, 482) is confirmed. J. W. S.

Dissolution of silver in potassium cyanide solutions. A. SIMON and H. DECKERT (Z. Elektrochem., 1935, 41, 737—738).—Evidence is adduced in support of the view that H_2O_2 is formed as an intermediate product when Ag dissolves in aq. KCN. Small amounts of H_2O_2 ($\rightleftharpoons 0·3\%$) increase the rate of dissolution, but greater amounts retard it. E. S. H.

Compounds of basic oxides and metalloids [non-metals]. M. LEMARCHANDS and (MLLE.) D. SAUNIER (Bull. Soc. chim., 1935, [v], 2, 1709—1716).—A detailed account of work already noted (A., 1934, 613; this vol., 592). J. W. S.

Action of charcoal on aqueous solutions of silver nitrate. T. R. BOLAM and W. A. PHILLIPS (Trans. Faraday Soc., 1935, 31, 1443—1452).—$AgNO_3$ is rapidly adsorbed, and then slowly reduced to Ag, by carefully purified sugar C. The Ag thus formed does not remain on the surface of the C. Experiments are described to show the influence of concn., acidity, duration of contact, ageing, and preliminary treatment of the C. F. L. U.

Behaviour of metal ammoniates in water containing deuterium oxide. H. ERLENMEYER and H. LOBECK (Helv. Chim. Acta, 1935, 18, 1213—1215; cf. A., 1934, 1321).— Bankowski's results (this vol., 458) are criticised on the grounds that interchange with undissolved complex salt is incomplete, and that fractionation may have occurred during distillation. Complete exchange occurs for the NH_3 and H_2O groups of $[Cu(NH_3)_4]SO_4,H_2O$. H. J. E.

Yellow cuprous oxide. M. STRAUMANIS and A. CIRULIS (Z. anorg. Chem., 1935, 224, 107—112).—The identical lattice dimensions of red and yellow Cu_2O prepared by various methods indicate their identity. Yellow Cu_2O passes into red on growth of the crystallites, *e.g.*, on ignition, as is shown by the increase in sharpness and no. of the diffracted Röntgen lines with the redness of the material. J. S. A.

Double salt of copper chloride and lithium chloride. J. M. LOPATKIN (Trans. Butlerov Inst. Chem. Tech. Kazan, 1934, No. 1, 13—21).—Solubility data for the system $CuCl_2$–$LiCl$–H_2O are recorded. The *compound* $CuCl_2,4LiCl,10H_2O$ was isolated. It is very hygroscopic, and decomposes with H_2O to form $CuCl_2,LiCl,2H_2O$. CH. ABS. (e)

Action of carbon monoxide on ammoniacal solutions of cupric salts. I. Carbon monoxide and amminocupric compounds in absence of metallic copper. II. Carbon monoxide and amminocupric compounds in presence of metallic copper. H. MÖLLER (Z. anorg. Chem., 1935, 224, 113—129, 130—152).—I. CO is absorbed by aq. NH_3 solutions of tetramminocupric hydroxide, carbonate, acetate, chloride, sulphate, and nitrate to give CO_2 and Cu^I salts. Absorption is most rapid in the hydroxide solution, and slowest in solutions of the mineral acid derivatives. Slow initially, it accelerates autocatalytically or on addition of a small amount of amminocuprous salt, in presence of which the solutions might be applied to gas analysis or to the technical prep. of Cu^I salts. Mechanisms are discussed.

II. Absorption of CO by solutions of tetramminocupric hydroxide, carbonate, chloride, and sulphate is strongly accelerated by addition of Cu, which acts partly catalytically and partly by dissolving to form amminocuprous salts. The initial velocities of absorption vary with the acid radical in the opposite direction to those recorded in the absence of Cu (above). The rate of dissolution of Cu in the above tetramminocupric salts in absence of CO depends on [Cu]. Mechanisms are suggested to explain these processes, and the pptn. of Cu by ammino-cupric or -cuprous salts saturated with CO. Tetramminocupric salts + Cu are suggested for use in gas analysis and for the technical prep. of Cu^I salts. T. G. P.

Action of carbon monoxide on cupric salts. H. MÖLLER and K. LESCHEWSKI (Z. anorg. Chem.,

1935, **224**, 153—172; cf. preceding abstract).—CO is absorbed (a) rapidly by aq. $CuCl_2+Cu$, especially in presence of conc. HCl, and (b) slowly by aq. NH_3+Cu. $CO+O_2$ are absorbed (a) rapidly by aq. $[Cu(NH_3)_4]Cl_2+Cu$ and (b) more rapidly by aq. NH_3+Cu than is pure CO. Mechanisms are discussed. T. G. P.

Boric acid and alkali borates. VIII. (Addendum.) System B_2O_3–H_2O. H. MENZEL (Z. anorg. Chem., 1935, **224**, 23—24; cf. A., 1934, 1174).—Tensimetric measurements show that no higher hydrate than H_3BO_3 exists at 0°. J. S. A.

Boric acid and alkali borates. IX. System $Na_2B_4O_7$–H_2O. H. MENZEL [with H. SCHULZ, L. SIEG, and M. VOIGT] (Z. anorg. Chem., 1935, **224**, 1—22; cf. A., 1934, 1174).—$Na_2B_4O_7,10H_2O$ (I) undergoes dehydration in two ways. (a) (I) previously incubated at 50° passes reversibly into cryst. $Na_2B_4O_7,5H_2O$ (II) (" stable dehydration "). (b) Fresh (I) passes irreversibly at very low v.p. of H_2O into an amorphous material with about $2H_2O$ (" unstable dehydration "), which may be rehydrated to (II). (II) dehydrates reversibly over drying agents or in boiling xylene to an amorphous $Na_2B_4O_7,2H_2O$, which passes into amorphous $Na_2B_4O_7,H_2O$ at 190°. Anhyd. $Na_2B_4O_7$ is formed by dehydration at $> 400°$, and crystallises rapidly at 600°. Supercooled melted $Na_2B_4O_7$ glass crystallises in three crystallographically distinct forms : form B, m.p. 738°, stable at high temp., on inoculation, and on spontaneous crystallisation either forms A, m.p. 710°, or C, m.p. 663°. $Na_2B_4O_7,4H_2O$ does not occur in the dehydration of higher hydrates. For analytical purposes, (I) should be hydrated over saturated aq. NaCl + sucrose. J. S. A.

Hydrothermal synthesis of kaolinite, dickite, beidellite, and nontronite. R. H. EWELL and H. INSLEY (J. Res. Nat. Bur. Stand., 1935, **15**, 173—186).—On keeping copptd. hydrogels of Al_2O_3 and SiO_2 (ratio 1 : 2) for 21 days the product remains amorphous, in disagreement with Schwarz and Brenner (A., 1923, ii, 569). No crystallisation occurs at 95°, but at 310° and 97 atm. kaolinite (I), $Al_2O_3,2SiO_2,2H_2O$, is formed. At 345—365° and 157—202 atm. dickite (II), $Al_2O_3,2SiO_2,2H_2O$, results. (I) may also be formed from the mixed gels, and böhmite from copptd. gels of $Al_2O_3 : SiO_2 >1 : 2$. Beidellite (III), $Al_2O_3,3SiO_2,nH_2O$ (n variable),is formed from mixtures of Al_2O_3 and SiO_2 at 350—390° and 167—260 atm., and from copptd. $Al_2O_3 : 2SiO_2$ gels at 390° and 260 atm. Measurements in which the oxides react after diffusion show that (III) is formed by transport of dissolved SiO_2 to solid Al_2O_3, and that NaOH must be present. Nontronite, $Fe_2O_3,3\cdot43SiO_2,1\cdot04H_2O$ (pure=$Fe_2O_3,3SiO_2,nH_2O$), has been synthesised from copptd. $Fe_2O_3 : 2SiO_2$ gels at 350° under pressure. In all cases optical and X-ray characteristics of the synthetic agree with those of the natural materials. The stability ranges of (I), (II), and (III) probably occur in the order given with rise of temp., in agreement with geological evidence. R. S. B.

Thermal investigation of aluminium hydroxide–aluminium oxide by emanation method.

R. JAGITSCH (Z. physikal. Chem., 1935, **174**, 49—59).—The nature of specimens of $Al(OH)_3$ prepared in various ways and the changes on heating at 20—1300° have been studied. With rise of the temp. of pptn. the rate of transformation of the $Al(OH)_3$ formed initially (cf. A., 1926, 34) increases rapidly. On heating, the surface reaches a max. in the region of existence of γ-AlO_2H (200—300°). Above 300° γ-Al_2O_3 is formed and corresponding with increasing grain size the emanating power gradually declines. At 1100—1200° there is a rapid change in structure, due to transformation of γ- into α-Al_2O_3. The emanating power of $Al(OH)_3$ falls when the latter is kept over drying agents. R. C.

Separation of europium from other rare earths. H. N. McCoy (J. Amer. Chem. Soc., 1935, **57**, 1756).—The mixture of rare-earth chlorides, containing dil. AcOH, is passed through a column of amalgamated Zn. $EuCl_3$ is reduced to $EuCl_2$, which is collected in aq. $MgSO_4$ in a CO_2 atm., giving a ppt. of $EuSO_4$. E. S. H.

Substances analogous to graphite. IV. R. CIUSA and F. BELLINO (Gazzetta, 1935, **65**, 461—464; cf. A., 1932, 1109).—Various " graphites " are obtained by heating tetraiodofuran (new prep. described) to temp. of 300—910°. The product of heating at 500° has the approx. composition $(C_4O)_n$. After heating at 910° the substances still contain $2\cdot60\%$ O. O. J. W.

Intermediate states of oxidation of stannous chloride. T. R. BALL, W. WULFKUEHLER, and R. E. WINGARD (J. Amer. Chem. Soc., 1935, **57**, 1729—1730).—Magneto-optical analysis of the partial oxidation of $SnCl_2$ in HCl with $K_2Cr_2O_7$ indicates the existence of $\not> 0\cdot01\%$ of $SnCl_3$. E. S. H.

Double compound of stannic chloride and acetic acid. C. N. MURTI and S. HUSAIN (J. Osmania Univ. Coll., 1933, **1**, 87—93).—Attempts to prepare $SnCl_2,2AcOH$ by the method of Fichter et al. (A., 1928, 603) were unsuccessful. Evaporation of anhyd. or hydrated $SnCl_4$ with glacial AcOH in a vac. over $CaCl_2$ yields a syrup of $SnCl_2,4AcOH$, which shows no change in composition after 3 months. Use of NaOH as drying agent decomposes the compound, which could not be obtained solid. Distribution coeff. measurements between H_2O and xylene confirm the existence of $SnCl_4,4AcOH$ in solution. The f.-p. depression of H_2O by a mixture of $SnCl_4$ and AcOH is $>$ the sum of the effects of the components. It is suggested that this may be due to decomp. of the $SnCl_4$ into $SnCl_2$ and Cl_2. J. W. S.

Hydrolysis of phosphorus trichloride. B. BLASER (Ber., 1935, **68**, [B], 1670—1674).—Hydrolysis of PCl_3, best by passing the vapour in a stream of dry N_2 through a well-stirred phosphate buffer solution with initial p_H 6·3, gives a 75% yield of a compound, probably an isomeride of $P(OH)_3$, which is very stable in approx. neutral solution but passes fairly rapidly into $P(OH)_3$ in an acid medium. It differs from $P(OH)_3$ in its great stability towards I in acid and H carbonate in alkaline solution. H. W.

Thermal degradation of sulphur in blue ultramarine. K. LESCHEWSKI and E. PODSCHUS

(Ber., 1935, **68**, [*B*], 1872—1876; cf. A., 1934, 1318).—Ultramarine-blue (I) is essentially characterised by a peculiar cryst. structure in which S, alkali, and O are arranged in proportions variable within certain limits. The elastic receptivity for the 3 structural elements is dependent on the " cavity lattice " structure of (I) and the possibility of schematic representation is excluded. (I) is unaffected in N_2 at 800°, gradually loses lustre and colour at $> 800°$, and becomes colourless at 950°. The changes are accompanied by increasing loss of S, which is almost complete at $> 1000°$, whereas alkali and Al silicate remain almost unchanged. The lattice of (I) passes at $> 950°$ into that of nepheline (II), which persists at 1200°. The decolorisation of (I) in flowing H_2 at 400° is ascribed to the penetration of at. H into the cavities in which it becomes loosely attached to the firmly bound S. At higher temp. the colour becomes dark blue and then bluish-green without appreciable change in S content or lattice. At 850—875° S is almost completely evolved as H_2S; colour disappears and the lattice of (I) is replaced by that of (II). In flowing O_2 dry (I) retains its lattice and approx. its composition at 600°. At 600—750° about half the S is oxidised to sulphite and sulphate, which are retained in the lattice, whilst the remainder is evolved as SO_2 or SO_3. Products obtained at $> 700°$ do not evolve H_2S when treated with acid. At $> 750°$ they pass into alkali aluminosilicates with deposited sulphate-S with a lattice differing slightly from that of (I). Above 1100° S is more and more completely lost and almost S-free alkali aluminosilicates remain, the lattice of which has nothing in common with (I) or (II). H. W.

Reactions in liquid sulphur dioxide. J. Cornog and V. A. Lamb (Proc. Iowa Acad. Sci., 1933, **40**, 97—98).—The solvent usually participates in reactions in liquid SO_2. At atm. pressure it does not react appreciably with Cl_2 except in presence of a catalyst. The reaction $SOCl_2 + Na_2SO_3 = 2NaCl + 2SO_2$ does not take place in liquid SO_2. ICl and KCNS in SO_2 form $I(CNS)_3,2SO_2$ and I. Ch. Abs. (*e*)

Reaction between sulphurous and nitrous acids in a dilute system.—See B., 1935, 848.

Properties of the alkaline persulphates. H. Bottu (J. Pharm. Chim., 1935, [viii], **22**, 247—251).—The stability of $K_2S_2O_8$ in H_2O, dil. H_2SO_4, aq. K alum, Na_2CO_3, and $Na_2CO_3 + NaCl$ has been studied. Decomp. is a min. in the alkaline solutions. R. S.

Yellow coloration of hydrochloric acid containing selenium. II. Behaviour of hydrochloric acid containing selenium on cooling and on diluting with water. F. Ullrich and H. Ditz (Z. anorg. Chem., 1935, **224**, 213—224; cf. this vol., 181).—Titration with $SnCl_2$ has also been studied. T. G. P.

Fractionation of isotopic isomerides by distillation. D. F. Stedman (Canad. J. Res., 1935, **13**, B, 114—121).—Fractionation of CCl_4 with a special column gave a head fraction containing Cl of at. wt. 0·042 $<$ normal val. For CH_2Cl_2 the isotopic separation by fractionation was very small. Fractionation of H_2O gave a head fraction in which 26·5%

of the original O^{18} content was shown by mass spectrum analysis to have been removed. By fractionation of liquid O_2 the $[O^{18}]$ was raised from 0·2 to 0·25%. The b.p. of MeD is approx. 0·5° $<$ that of CH_4. Separation of MeD from natural CH_4 is possible. Published vals. for the v.p. of D_2O at $< 40°$ may be slightly high. H. J. E.

Reaction between chlorine monoxide and ammonia. R. Schwarz and H. Striebich (Z. anorg. Chem., 1935, **224**, 29—32).—Cl_2O reacts with NH_3 at low temp. ($< -101°$) to give NH_4Cl, H_2O, and N_2. Since ammonolysis of the O does not occur, Cl is to be regarded as the more electropositive element in Cl_2O. J. S. A.

Bromine oxide Br_2O. W. Brenschede and H. J. Schumacher (Z. physikal. Chem., 1935, **B**, **29**, 356—358).—By reaction between HgO and a CCl_4 solution of Br the Br may be partly converted into Br_2O. The solution is stable in the dark at $-20°$, but in light or at room temp. decomposes : $Br_2O \rightarrow Br_2 + 0·5O_2$; $Br_2O + CCl_4 \rightarrow COCl_2 + Br_2 + Cl_2$. R. C.

Preparation of dibromoamine and its reactions with Grignard reagents. G. H. Coleman, C. B. Yager, and H. Soroos (Proc. Iowa Acad. Sci., 1933, **40**, 112; cf. A., 1934, 615).—$NHBr_2$ was prepared by passing dry NH_3 into Br in cold Et_2O. The solution is stable at $-72°$ and decomposes rapidly at 0°. $NHBr_2$ reacts with MgRX to give NH_2R, NHR_2, NH_3, and N_2, the % yields from MgBuCl being : NH_2Bu 7·8, $NHBu_2$ 2·2, NH_3 79·0, and N_2 5·9%, and for $CH_2Ph·MgCl$: $NH_2·CH_2Ph$ 29·6, $NH(CH_2Ph)_2$ 5·5, NH_3 42·8, and N_2 4·7%. Ch. Abs. (*e*)

Lower oxides and sulphates of iodine. R. K. Bahl and J. R. Partington (J.C.S., 1935, 1258—1263).—Contrary to published work, interaction of conc. HNO_3 (*d* 1·50) and I produces I_2O_5. The intermediate product in the prep. of I_2O_4 from HIO_3 and hot conc. H_2SO_4 is an approx. equimol. mixture of I_2O_4,H_2SO_4 and I_2O_3,H_2SO_4 (cf. J.C.S., 1909, **95**, 656), but if the mixture is heated until I is evolved, or if I is added, the product is chiefly I_2O_3,H_2SO_4. $I_2O_3,SO_3,0·5H_2O$ was not obtained. I_2O_4 decomposes at $> 85°$ and at 110—130° the reaction is $5I_2O_4 = 4I_2O_5 + I_2$. I_4O_9 is produced in a gas phase reaction by passing ozonised O_2 over warm I. I_4O_9 is a hygroscopic solid which decomposes at $> 75°$; at 85—120° the reaction is $4I_4O_9 = 6I_2O_5 + 2I_2 + 3O_2$. J. G. A. G.

Oxidation of oxalic acid by iodic acid and interference with the assumption of a stationary state by the reaction intermediate. E. Abel and L. Blumenkranz (Monatsh., 1935, **66**, 181—192).—The stationary concn. of I′ in the oxidation of $H_2C_2O_4$ to CO_2 by HIO_3 has been artificially altered by addition of $AgI + AgIO_3$. The liberation of I is not entirely suppressed. Addition of I by partition from a C_6H_6 solution favours the oxidation of $H_2C_2O_4$. J. S. A.

Amorphous and crystalline oxide hydrates and oxides. XXIII. Formation of ozone during the oxidation of ferric hydroxides and ferric oxides. Existence of peroxide compounds of

iron. A. KRAUSE [with E. KEMNITZ, F. WYSZYNSKI, and J. SAWICKI] (Ber., 1935, **68**, [*B*], 1734—1743).—O_2 is evolved from boiling solutions of $K_2S_2O_8$ and dil. H_2SO_4. With increasing $[H_2SO_4]$, O_3 is produced in increasing amount which is at a max. with an optimal concn. of acid. At higher concns. ($> 3N$) the formation of O_3 declines and H_2O_2 is formed in ever-increasing quantity. The formation of H_2O_2 is related to the hydrolysis of Caro's acid which under certain conditions is formed in this system. O_3 is produced in addition to O_2 as a result of the reducing action of H_2O_2 on the remaining $K_2S_2O_8$. Addition of Fe^{III} hydroxides and $Fe_2(SO_4)_3$ induces formation of O_3 at $[H_2SO_4]$ at which it is not produced in their absence. Under certain conditions $FeSO_4$ is more effective than $Fe_2(SO_4)_3$. On the other hand, Fe compounds can accelerate the decomp. of O_3. $Fe(OH)_3$ and γ-FeO_2H exhibit individuality in their ability to promote the production of O_3. It is therefore probable that an unstable intermediate Fe^{III} peroxide exists analogous in structure to Caro's acid. For the production of such a compound the rate of dissolution of the Fe^{III} compound must keep pace with the rate of oxidation in order that the favourable moment for its formation may not be passed. This explains why Fe^{III} oxides can cause evolution of O_3 only when they are suitably sol. The sparingly sol. goethite, α-Fe_2O_3,H_2O, behaves similarly. Too sparing solubility reacts unfavourably on the yield of O_3, whereas too rapid dissolution causes decomp. of O_3. The final result in the system $K_2S_2O_8$–H_2SO_4 is due to several single processes which influence the production of O_3 and H_2O_2 favourably and unfavourably.   H. W.

Behaviour of ferric chlorosulphate. F. SCAFILE (Gazzetta, 1935, **65**, 588—593).—Fe^{III} chlorosulphate is not a complex salt, but a double salt of probable formula $Fe_2(SO_4)_3,FeCl_3,18H_2O$. By pptn. with EtOH of a solution containing this salt and Na_2SO_4 the *compound* $3Na_2SO_4,Fe_2(SO_4)_3,2FeSO_4(OH),7H_2O$ is obtained.   O. J. W.

Oxalato-compounds. H. BRINTZINGER and W. ECKARDT (Z. anorg. Chem., 1935, **224**, 93—96).—The complex oxalates of bivalent Fe, Co, Ni, Mn, Cu, Cd, and Zn, empirically formulated $R_2[M(C_2O_4)_2]$ (I), are shown by measurements of electrodialysis to have the doubled ionic formula $[M_2(C_2O_4)_4]^{4-}$. The ions $[M(C_2O_4)_3]$ of tervalent Fe, Co, Mn, Cr, and the bivalent compounds (I) with M=TiO, VO, UO_2, have the simple formula. Complex oxalates of Th and Zr have ionic wts. corresponding with $[Th_2(C_2O_4)_8]^{8-}$ and $[Zr_4(C_2O_4)_{16}]^{16-}$, respectively.
                               J. S. A.

Complex pyrrylo- and indylo-salts. O. SCHMITZ-DUMONT and S. PATERAS (Z. anorg. Chem., 1935, **224**, 62—72).—Excess of the K salt of pyrrole (I), prepared from (I) and KNH_2, reacts with $[Fe(NH_3)_6]Cl_2$ in liquid NH_3 to give *dipotassium tetrapyrrylo-iron*, $[Fe(C_4H_4N)_4]K_2$. Attempts to obtain the simple Fe salt $Fe(C_4H_4N)_2$ led to ammonolysis, forming $Fe(NH_2)_2$ and ultimately Fe nitride. $[Ni(NH_3)_6]Cl_2$ similarly gives with indole the *compound* $[Ni(C_8H_6N)_4]K_2$. The salts are readily sol. in liquid NH_3, and sensitive to air and moisture. $CoCl_2$ in

liquid NH_3 gives the deep violet-blue, partly ammonolysed, unstable *potassium di-indyloamino-cobalt*, $[(C_8H_6N)_2CoNH_2]K$. With $[Cr(NH_3)_5Cl]Cl_2$, C_8H_6NK forms the *salt* $[(C_8H_6N)_3Cr\cdot NH_2(NH_3)_2]K$. $[Co(NH_3)_6]Cl_3$ similarly gives the μ-diamino-binuclear complex *salt* $[(C_8H_6N)_3(NH_3)Co(NH_2)_2Co(C_8H_6N)_3(NH_3)]K_2$. By the action of KNH_2 on $CrCl_3$ in liquid NH_3, the insol. *amide* $[(NH_3)_3Cr(NH_2)_3]$ is obtained.
                               J. S. A.

Purification and analysis of purpureo-cobaltic chloride. F. J. GARRICK (Z. anorg. Chem., 1935, **224**, 27—28).—Crude $[Co(NH_3)_5Cl]Cl_2$ (I) is converted into $[Co(NH_3)_5H_2O]_2(C_2O_4)_3$, which is separated from insol. $[Co(NH_3)_6]_2(C_2O_4)_3$ by dissolution in cold dil. aq. NH_3. (I) is finally purified by one pptn. with HCl from cold aq. solution. For analysis, the acidified solution of (I) is treated at 0° with a slight excess of $0\cdot1N$-$AgNO_3$. The AgCl is separated from the bulk of liquid by decantation, thereby avoiding reaction with complex-bound Cl.   J. S. A.

Affinity. LXV. Tensimetric analysis of system CoS–CoS_2. O. HULSMANN and W. BILTZ [with K. MEISEL] (Z. anorg. Chem., 1935, **224**, 73—83).—The highest sulphide of Co is CoS_2, which is partly miscible with both S and CoS. The reported Co_2S_3, from the action of H_2S on complex Co salts, is a mixture of CoS and CoS_2. Linneite, Co_3S_4, is not formed during tensimetric degradation of CoS_2.
                               J. S. A.

Constitution, optical activity, and photochemical behaviour of platinous complexes. I. I. LIFSCHITZ and W. FROENTJES (Z. anorg. Chem., 1935, **224**, 173—193).—An attempt is made to assess the hypothesis that α- and β-bisdiethyl sulphide platinous dihalides are structural isomerides (A., 1934, 397). α-, β-, and a dimeric *form* of $(MeEtS)_2PtCl_2$, m.p. 63°, 127°, and 133°, respectively, were isolated. Optical resolution of the β-form yielded indefinite results. *r*-*S*-Ethyl-α-thiolactic acid, b.p. 134—135°/23 mm., yielded *d*- and *l*-forms, $[\alpha]_D^{18}$ +107° in EtOH, $\pm127\cdot8°$ in C_6H_6. Each acid gave two *forms* of $Pt(CHMe\cdot SEt\cdot CO_2)_2$ [$=PtX_2$], converted into *dichlorides* by HCl : α-PtX_2, m.p. 208—209°; β-PtX_2, m.p. 188—189°; α-$Cl_2Pt(XH)_2$, m.p. 149—150°; β-$Cl_2Pt(XH)_2$, m.p. 163—164°; α-*d*- (or *l*-)PtX_2, m.p. 205—206° (decomp.), $[\alpha]_D^{18}$ +80° (EtOH), +93·8° $(COMe_2)$, +76·6° (H_2O); β-*d*- (or *l*-)PtX_2, m.p. 180—182°, $[\alpha]_D^{18}$ 85·3° $(COMe_2)$; α-*d*- (or *l*-)$Cl_2Pt(XH)_2$, m.p. 140—142°, $[\alpha]_D$ +9·7° (EtOH); β-*d*- (or *l*-)$Cl_2Pt(XH)_2$, m.p. 170—171°, $[\alpha]_D^{18}$ +15·5°. α-forms of $Cl_2Pt(XH)_2$ react rapidly, β- only slowly, with $AgNO_3$. All α-forms give β- on irradiation with ultra-violet light. A solution of *d*-α-form yields on crystallisation *d*-α- and *l*-β-; *l*-α- yields *l*-α- and *d*-β-. The results are difficult to reconcile with the Werner formulation (A., 1914, i, 13).   T. G. P.

Analytical applications of the Raman effect. L. PIAUX (Chim. et Ind., 1935, **34**, 507—516).—A comprehensive review of applications of the method in the study of liquid mixtures.   H. J. E.

Mass-spectrograph determination of the relative abundance of heavy hydrogen in a sample. O. LUHR and L. HARRIS (Physical Rev., 1934, [ii],

45, 843).—The ion of mass 4 ($H^1H^1H^{2+}$) is used in the mass spectrograph to determine the concn. of D when the relative % is small. A four-fold enrichment of D by diffusion of H_2 through Pd is thus indicated (cf. A., 1934, 156). L. S. T.

Antimony electrode for measuring p_H. G. A. Bravo (L'Ind. Chimica, 1935, **17**, 521—523).—The vals. of a and b in $E=a+bp_H$ for this electrode are, respectively, —0·008 and 0·0525 at 15°, —0·007 and 0·0545 at 20°, and —0·005 and 0·059 at 25°. Measurements in presence of NaCl, KCl, KNO_3, Na_2SO_4, and NaBr give irregular results, especially at low p_H vals., [H·] being not raised, as would be expected, but lowered. This is explained by the formation of additive compounds, by mol. hydration, and by the presence of OH-acids in the buffer solutions. The Sb electrode may be used in presence of substances which prevent the use of the H_2 or quinhydrone electrode and does not alter the composition of the solution being tested. T. H. P.

Mixed indicators. H. A. J. Pieters (Chem. Weekblad, 1935, **32**, 539—541).—The following mixed indicators are recommended : bromocresol-green and Me-red (1 : 1, colour change red to green, p_H 5·6) for NH_3 titrations; neutral-red and bromothymol-blue (I) (3 : 4, red to green, p_H 7·0) for strong acids and bases; cresol-red and (I) (5 : 1, yellow to violet, p_H 7·9) for picric acid. Me-orange is the best indicator for CO_3'' titrations. S. C.

p_H determination with two-colour indicators by a dilution method. J. McCrae (J. South African Chem. Inst., 1935, **18**, 62—66).—9·7 c.c. of H_2O+0·25 c.c. of indicator solution are put in each of two test-tubes, 0·75 in. diameter, placed one behind the other; 2 drops of dil. alkali are added to one and 2 drops of dil. acid to the other. The total colour is compared with that of 9·5 c.c. of the solution under test in a third tube, either the acid or the alkali solution being diluted 0·1 c.c. at a time until an approx. match is obtained. A final exact match is made after diluting the coloured test solution to $20D/(D+1)$ c.c. with fresh test solution so as to equalise total indicator concn. of comparison tubes with that of test solution [D=dilution=$v/(v+10)$, v being vol. added to comparison tube]. The unknown p_H= $p_K \pm \log D'$, where D'=dilution for exact match, and p_H the p_H val. at middle point of colour change of the indicator. The p_K of the indicator chosen must lie within ±0·8 of the p_H of the solution under test. S. J. G.

Determination of water. E. von Migray (Ind. Eng. Chem. [Anal.], 1935, **7**, 348).—The procedure is (1) distillation of the material with xylene or PhMe, (2) dehydration of the distillate with a weighed amount of anhyd. $CuSO_4$, and (3) determination of H_2O from the increase of wt. of the $CuSO_4$. E. S. H.

Comparison of several electrometric and nephelometric methods for the determination of small amounts of chloride. N. H. Furman and G. W. Low, jun. (J. Amer. Chem. Soc., 1935, **57**, 1588—1591).—Comparison of three electrometric and two nephelometric methods shows that the electrometric methods are quicker and more accurate.

A new photronic nephelometer is described. The chief difficulty in nephelometry is the reproducibility of the suspensions. E. S. H.

Use of the concentration cell in quantitative analysis. I. Determination of small amounts of chloride in salts. N. H. Furman and G. W. Low, jun. (J. Amer. Chem. Soc., 1935, **57**, 1585—1588).—The procedure consists in measuring the e.m.f. between two Ag–AgCl electrodes, one of which is immersed in a solution containing the unknown amount of Cl', and the other in a similar solution to which is added a known amount of Cl'. An advantage over the nephelometric method is that foreign salts do not cause difficulties; 0·00035 g. of Cl' per litre can be determined accurately. E. S. H.

Titration of iodides in presence or absence of chlorides and bromides with starch iodide as indicator. E. Chirnoagă (Z. anal. Chem., 1935, **102**, 339—342).—Addition of I from extraneous sources in Kolthoff's method (A., 1917, ii, 420) is avoided by adding 1—2 drops of aq. $Fe_2(SO_4)_3$ as oxidant. In presence of Cl', but not of Br', NaOAc may be added in place of $(NH_4)_2CO_3$. J. S. A.

Simplified Penfield method for determination of fluorine in phosphorites and apatites. S. N. Rosanov (Z. anal. Chem., 1935, **102**, 328—336; cf. B., 1930, 55).—Simplifications in the author's variation of the Penfield–Treadwell method are described. J. S. A.

Colorimetric determination of dissolved oxygen [in water].—See B., 1935, 928.

Determination of oxygen with alkaline solutions of trihydroxybenzenes and of sodium hyposulphite in varying concentrations.—See B., 1935, 947.

Separation and determination of [elementary] sulphur and selenium. E. Cheraskova and L. Veissbruth (Z. anal. Chem., 1935, **102**, 353).—Material containing free S and Se is boiled for 2 hr. with 10% aq. Na_2SO_3, whereby $Na_2S_2O_3$ and Na_2SSeO_3 are formed. The solution is warmed with CH_2O, when Se is deposited. S is determined in the solution as $Na_2S_2O_3$. J. S. A.

Successive potentiometric determination of sulphide, thiocyanate, and chloride ions. A. I. Bursuk and A. M. Zaniko (Ber. Ukrain. wiss. Forsch-Inst. phys. Chem., 1934, **4**, 83—88).—To the aq. solution of the alkali salts are added 10 g. $Ba(NO_3)_2$ and 10 ml. of conc. aq. NH_3, the solution being diluted to 100 ml. The solution is titrated potentiometrically with $AgNO_3$ with a Ag electrode, the first break in the curve giving the S'' content. The solution is then acidified with HNO_3. The next break gives the CNS' and the last the Cl'. Ch. Abs. (e)

Analysis of mixtures of sulphites, sulphates, meta-arsenites, and arsenates. V. S. Malinovski and E. P. Lopatina (J. Appl. Chem. Russ., 1935, **8**, 944—947).—$SO_3''+SO_4''$ are determined by oxidation with $Br–H_2O$, followed by pptn. as $BaSO_4$, $AsO_2'+AsO_4'''$ by oxidation with $Br–H_2O$, followed by reduction to AsO_2', and I titration,

SO_3''+AsO_2' by I titration, and AsO_2' by adding aq. CH_2O, NaOAc, and AcOH, and titrating with $0.1N$-I.   R. T.

Determination of sulphate in water.—See B., 1935, 880.

Potentiometric titration of hyposulphite. T. MUROOKA (Bull. Inst. Phys. Chem. Res. Japan, 1935, **14**, 844—852).—$Na_2S_2O_4$ can be titrated potentiometrically with AgCl or $AgNO_3$ in NH_3 solution, with $HgI_2,2KI$ in NaOH solution, with $Hg(CN)_2,2KCN$ in AcOH solution with or without addition of acetate, or with $CuSO_4$ in NH_3 solution.   J. W. S.

Rapid gravimetric determination of selenates. R. RIPAN-TILICI (Z. anal. Chem., 1935, **102**, 343—344).—$PbSeO_4$ is pptd. by adding a slight excess only of aq. $Pb(NO_3)_2$, and 30 vol.-% of EtOH is added. The ppt. is collected after 4 hr., and dried at room temp.   J. S. A.

Colour reaction of ammonia with hypobromite and thymol. P. A. HANSEN (Z. anal. Chem., 1935, **102**, 279).—Priority is claimed over Lapin and Hein (A., 1934, 1189).   J. S. A.

Volumetric determination of nitrites by means of ceric sulphate solution. H. BENNETT and H. F. HARWOOD (Analyst, 1935, **60**, 677—680).—The NO_2' is added to excess of $Ce(SO_4)_2$, which is titrated back with $Fe(NH_4)_2(SO_4)_2$ using erioglaucine as internal indicator. Small amounts of K may be determined by pptn. as cobaltinitrite, which is similarly titrated.   E. C. S.

Stable colorimetric scale for rapid determination of nitrates in water. R. GROS (J. Pharm. Chim., 1935, [viii], **22**, 244—246).—The NO_3' is converted into $NO_2 \cdot C_6H_4 \cdot ONH_4$, which is determined colorimetrically. Standard comparison solutions containing $K_2Cr_2O_7$ and $NiSO_4$ are described.   R. S.

Electroscopic detection of yellow phosphorus in presence of tetraphosphorus trisulphide. W. D. TREADWELL and C. BEELI (Helv. Chim. Acta, 1935, **18**, 1052—1060).—An apparatus for the measurement of ionisation in an air stream is described. The P is vaporised in a stream of N_2 and mixed with air in the ionisation chamber. P mixed with P_4S_3 may be detected by this method.   H. J. E.

Analysis of phosphorus sulphides. C. BEELI (Helv. Chim. Acta, 1935, **18**, 1172—1180).—Mixtures of P_4S_3 and P_4S_7, and of P_4S_7 and P_4S_{10}, may be separated by fractional crystallisation from CS_2. A melt of the composition P_2S_3 was separated by this method into P_4S_5 and P_4S_7. White P could be separated from a liquid mixture with S by fractional sublimation in a vac. Complete separation of P_4S_3 and P, of P_4S_3 and S, and of P_4S_7 and P_4S_{10}, by vac. sublimation was not possible. Pure P_4S_3 could be sublimed from a mixture of it with P_4S_7. S could be similarly separated from P_4S_{10}. The rates of sublimation were compared with the solubilities in CS_2. The ease of reaction with H_2O increases in the order P_4S_3, P_4S_{10}, and P_4S_7. This serves to differentiate the sulphides.   H. J. E.

Separation and determination of metal and phosphate ions in presence of one another. II. S. ISHIMARU (J. Chem. Soc. Japan, 1935, **56**, 62—75; cf. this vol., 56).—After removal of metals of the third group by 8-hydroxyquinoline, the PO_4''' remaining in the solution may be determined by the molybdate method.   CH. ABS. (e)

Potentiometric determination of phosphate. J. A. ATANASIU and A. J. VELCULESCU (Z. anal. Chem., 1935, **102**, 344—350).—PO_4''' is titrated potentiometrically at 60—70° with $UO_2(OAc)_2$ in presence of 0.5—1% of p-$C_6H_4(OH)_2$, using Pt–Ni, but not Pt–Hg_2Cl_2, electrodes. The solution should have p_H 5.5—6. With mono-, di-, or tri-basic orthophosphates, the end-point occurs when $UO_2^{\cdot\cdot} : PO_4'''$ = 1 : 1.   J. S. A.

Removal of phosphoric acid in qualitative micro-analysis. (MLLE.) S. GINSBURG and H. PRINGSHEIM (Bull. Soc. chim., 1935, [v], **2**, 1694—1697).—H_3PO_4 can be removed from solutions buffered with NH_4OAc by aged $Fe(OH)_3$ sol, preferably with two successive additions and filtrations. $NiSO_4$, $FeCl_3$, $MnSO_4$, $Al_2(SO_4)_3$, and $ZnSO_4$ do not affect the extraction, but in presence of $Cr_2(SO_4)_3$ a greater quantity of $Fe(OH)_3$ is required.   J. W. S.

Test for phosphate and arsenate. L. W. MARRISON (Chem. and Ind., 1935, 872).—A drop of solution + a drop of $0.02N$ aq. Na_2S, on filter-paper, is allowed to mix with a drop of dil. $(NH_4)_2MoO_4$, acidified with H_2SO_4. In presence of 0.0005 mg. of PO_4''' or AsO_4''' a blue colour develops. SCN', $Fe(CN)_6'''$, and $Fe(CN)_6''''$ should be absent.   J. S. A.

Micro-alkalimetric studies. I. J. MIKA (Publ. Dept. Min. Met. Palatin-Joseph Univ., 1934, **6**, 227—237).—Micro-titrations of borax with $0.01N$-HCl can be made with an accuracy of 0.1%.   CH. ABS. (e)

Volumetric determination of silicic acid. S. KITAJIMA (Bull. Chem. Soc. Japan, 1935, **10**, 341—345).—The conditions for the complete pptn. of SiO_2 by $(NH_4)_2MoO_4$ have been studied. The SiO_2 in the ppt. can be determined gravimetrically, by titration with NaOH, or by reduction and back-titration with $KMnO_4$.   R. S.

Determination of very small amounts of carbon monoxide in air.—See B., 1935, 880.

Photocolorimetric determination of carbon dioxide in air.—See B., 1935, 976.

Determination of fumigants. I. Residual hydrocyanic acid in stored products.—See B., 1935, 928.

Zinc cobaltinitrite for the detection of potassium. J. ADAMS, M. HALL, and W. F. BAILEY (Ind. Eng. Chem. [Anal.], 1935, **7**, 310—311).—Zn cobaltinitrite may be used in place of the Na salt when the solution has subsequently to be tested for Na. A yellow ppt. forms after 15 min. when 0.4—0.6 mg. of K· per c.c. is present.   E. S. H.

[Determination of potassium, iron, and magnesium in water.]—See B., 1935, 880.

Determination of potassium.—See B., 1935, 966.

Determination of alkalis in felspars. Modified hydrofluoric acid method. E. W. KOENIG (Ind. Eng. Chem. [Anal.], 1935, **7**, 314—315).—Modified procedure for removal of Al, Fe, Mg, Ca, F, and SiO_2 is recommended. E. S. H.

Determination of calcium as oxide. A. IEVIŊŠ (Latvij. Univ. Raksti, 1935, **2**, 465—472).—If either the carbonate or oxalate is ignited over the blast or Bunsen burner the resulting oxide will contain SO_4''. A protector should be used or the ignition conducted in an electric furnace. E. H. S.

Calcium, strontium, barium, and magnesium oxalates. J. HASLAM (Analyst, 1935, **60**, 668—672).—The behaviour of the oxalates, separately and together, when pptd. and washed by Dick's method (A., 1929, 901), has been investigated. For Ca, titration of C_2O_4'' in the ppt. gives more trustworthy results than weighing, particularly when sintered glass crucibles are used, but EtOH must be completely removed by heating at 100°. Sr is pptd. as SrC_2O_4,H_2O, but pptn. is incomplete, the ppt. is unstable at 100°, and its titration is unsatisfactory owing to interference of $SrSO_4$. Ba is pptd. as $BaC_2O_4,0.5H_2O$, which is fairly stable at 100°. Titration is unsatisfactory in presence of H_2SO_4 (cf. Sr), but may be carried out in presence of $HClO_4$. Mg is pptd. as $MgC_2O_4,2H_2O$, which is sol. in aq. NH_3, but is likely to be co-pptd. with Ca, so that a double pptn. of Ca should be carried out in presence of Mg. Sr and Ba interfere with the determination of Ca. E. C. S.

Argentometric determination of barium oxide and sulphide in barium aluminate.—See B., 1935, 947.

Gravimetric determination of lead as lead salicylaldoxime and its solubility measurement by using Th-B as radioactive indicator. M. ISHIBASHI and H. KISHI (Bull. Chem. Soc. Japan, 1935, **10**, 362—368; cf. this vol., 577, 720).—Pptn. of Pb is quant. from solutions of $p_H \not< 6.5$ (neutral or NH_3). R. S.

Electrolytic determination of lead as dioxide and its conversion into lead monoxide by ignition. A. J. LINDSEY (Analyst, 1935, **60**, 598—599).—Determination of Pb in electrodeposited PbO_2 by ignition to PbO in an electric furnace at 700° is impracticable owing to slow volatilisation of PbO at this temp. E. C. S.

Spectral analytical determination of lead in commercial tin.—See B., 1935, 954.

Electrolytic determination of tin and lead in ores.—See B., 1935, 955.

Electrometric determination of thallium. W. R. A. HOLLENS and J. F. SPENCER (Analyst, 1935, **60**, 672—676).—Tl^I is oxidised to Tl^{III} with Cl_2, which is completely removed. The I liberated by Tl^{III} from KI is then titrated with $Na_2S_2O_3$ or Na_3AsO_3, using Foulk and Bawden's bimetallic electrode (A., 1926, 927). Good end-points are obtained with as little as $0.002N$-Tl. In the case of $Na_2S_2O_3$, the [AcOH] may be varied within wide limits. Zn and Fe^{II} do not interfere, but Cu behaves similarly to Tl and must be determined separately. E. C. S.

Macro- and micro-gravimetric determination of copper. G. SPACU and C. G. MACAROVICI (Z. anal. Chem., 1935, **102**, 350—352).—To a cold dil. aq. solution containing Cu, NH_4CNS is added and then a 2% solution of benzidine in EtOH. $[Cu(C_6H_4\cdot NH_2)_2(CNS)_2]$ is pptd. The ppt. is washed with H_2O and ignited to CuO. Tolidine may also be used. J. S. A.

Determination and separation of metals with "thionalide." II. R. BERG and W. ROEBLING (Angew. Chem., 1935, **48**, 597—601; cf. this vol., 591, 950).—Cu, Ag, Hg, and Bi may be quantitatively pptd., and separated from Pb, Cd, and Tl, by addition of 1—2% aq.-EtOH or -AcOH solutions of " thionalide " (thioglycollic naphthalide) (I) to their dil. HNO_3 solution. The ppts. may be dried at 100°, or ignited, or may be determined volumetrically with I, or by Bucherer's filtration method. Fe and other oxidising agents must be absent. [Cl] must be $< 0.1N$. Excess of (I) may be removed as insol. $(C_{10}H_7\cdot NH\cdot CO\cdot CH_2\cdot S)_2$ by treatment of the solution with I. J. S. A.

Application of X-ray spectroscopic method to the analysis of the rarer elements. III. Determination of praseodymium in rare-earth mixtures. S. SHINODA. **IV. Determination of gadolinium in rare-earth mixtures.** K. KIMURA and Y. TSUNODA (J. Chem. Soc. Japan, 1935, **56**, 76—80, 81—91).—III. The intensities of the $L\beta_2$ line of Pr and the $L\beta_3$ line of Nd are equal when the oxides are mixed in the wt. ratio $Nd_2O_3/Pr_6O_{11}=6.4$.

IV. The intensities of the $L\alpha_1$ lines of Gd and Nd are equal when $Nd_2O_3/Gd_2O_3=4.45$. CH. ABS. (e)

Volumetric determination of aluminium. W. DAUBNER (Angew. Chem., 1935, **48**, 589).—The Al solution (neutral or slightly acid with AcOH; 1 mg. Al in 10 c.c.) is added in the cold to a solution containing NH_4Cl 5, AcOH 5, and As_2O_5 0.45%. The mixture is heated to the b.p. $AlAsO_4$ is pptd., washed with EtOH, dissolved in HCl, and the H_3AsO_4 determined volumetrically. With $> 0.53\%$ of As_2O_5 in the pptg. solution high vals. are obtained, due to incomplete conversion of $Al_2(HAsO_4)_3$ into $AlAsO_4$. With $<0.38\%$ of As_2O_5, $Al_4(AsO_4)_3(OH)_3$ is pptd., and the result is low. Silicates do not interfere. Fe must first be separated from the Al. H. J. E.

Volumetric determination of aluminium in solutions. M. K. BACHMUTOVA (Legk. Metal., 1934, **3**, No. 9, 37—41).—Al was determined in HCl solution by titrating one portion with NaOH (phenolphthalein) to determine the total acidity. To a second portion a slight excess of $K_2C_2O_4$ is added to bind the Al, and the free acid is titrated with NaOH [$K_4Fe(CN)_6$ indicator]. CH. ABS. (e)

Quantitative separation of aluminium from manganese, nickel, cobalt, and zinc. T. KÔZU (J. Chem. Soc. Japan, 1935, **56**, 22—30).—Al is pptd. alone at room temp. by $(CH_2)_6N_4$ (1 mol., slightly acidic with H_2SO_4) from a mixture containing Al, Mn, Ni, and Co. CH. ABS. (e)

Modified persulphate–arsenite method for determination of manganese.—See B., 1935, 854.

Victoria-blue BX as internal indicator in ceriometry. J. M. Caldwell and M. E. Weeks (Trans. Kansas Acad. Sci., 1934, **37**, 117—118).—The colour change is from sky-blue to light pink. It is irreversible, but overstepped end-points can be redetermined by adding a Fe^{II} solution and further indicator. The indicator is unsuitable for Fe determinations with the $SnCl_2$ method of reduction, but works well with reduction by means of Cd, Al, or Zn. To the reduced Fe solution 5 c.c. of H_3PO_4 (d 1·70), 20 c.c. of $10N$-H_2SO_4, and 5 drops of 0·2% dye solution in EtOH are added, and the solution is titrated with $Ce(SO_4)_2$. Ch. Abs. (e)

Determination of iron in iron ores and silicates.—See B., 1935, 853.

Errors in quantitative spectrographic analysis in the iron–silicon system.—See B., 1935, 854.

Application of citric acid to determination of nickel in presence of salts of iron and of phosphoric acid. V. P. Golendeev (Rep. U.S.S.R. Fat and Margarine Inst., 1935, No. 2, 22—26).—10 c.c. of 10% aq. Na citrate are added to 20 c.c. of solution, the mixture is heated at 100° for 15—20 min., cooled, 10 c.c. of 10% aq. NH_3 are added, and H_2O to 250 c.c. 10 c.c. of 0·04N-KCN are added to 20 c.c. of this solution, and excess of KCN is titrated with 0·02N-$AgNO_3$. R. T.

Potentiometric titration of organic precipitates. II. Indirect volumetric determination of nickel. S. Ishimaru (J. Chem. Soc. Japan, 1935, **56**, 19—21).—The end-point in the titration of excess of $K_2Cr_2O_7$ with $FeSO_4$ is determined potentiometrically (cf. *ibid.*, 1933, **54**, 367). This is more convenient for larger amounts of Ni. Ch. Abs. (e)

Titration of chromium. II. Oxidation of tervalent chromium to sexavalent chromium. D. Brard (Ann. Chim. Analyt., 1935, [iii], **17**, 257—262).—$Cr^{\cdots}$ is oxidised to CrO_4'' by heating with $<50\%$ $HClO_4 + H_2SO_4$. The solution is diluted, and boiled to remove Cl. CrO_4'' is then determined volumetrically or, with $<0·3$ mg., colorimetrically with diphenylcarbazide. $K_2S_2O_8$ in presence of $AgNO_3$ may also be used as oxidant in absence of Cl. J. S. A.

Colorimetric determination of molybdenum in special steels.—See B., 1935, 952.

Colorimetric determination of titanium in cast iron and steel.—See B., 1935, 952.

Reactions of titanium and manganese with hydrogen peroxide in basic solution. L. E. Porter and G. N. Cade, jun. (J. Amer. Chem. Soc., 1935, **57**, 1604—1605).—The impossibility of separating Ti from Mn by the use of H_2O_2 and NaOH is due to the adsorption of peroxidised Ti by the pptd. MnO_2. The amount of Ti in the ppt. is reduced by increasing $[H_2O_2]$. E. S. H.

Determination of small quantities of zirconium in rocks by the phosphate method. V. A. Oschman and T. K. Zertschaninova (Redk. Met., 1934, **3**, No. 6, 36—37).—Zr should be pptd. in 1%

4 u

H_2SO_4; more conc. solutions cause considerable loss. Ti must first be eliminated. In testing qualitatively for Zr with 2 : 1-$NO \cdot C_{10}H_6 \cdot OH$, sulphates, if present, must be removed with $BaCl_2$. Ch. Abs. (e)

Hexammine cobaltic compounds in the gravimetric determination of vanadium. W. G. Parks and H. J. Prebluda (J. Amer. Chem. Soc., 1935, **57**, 1676—1678).—When $Co(NH_3)_6^{\cdots}$ is added to neutral, basic, and acid solutions, respectively, of VO_3' the compounds pptd. are $Co(NH_3)_6(VO_3)_3$, $[Co(NH_3)_6]_4(V_2O_7)_3$, and $[Co(NH_3)_6]_4(V_6O_{17})_3$. The ppt. formed in acid solution can be used for the quant. separation of V from P, AsO_4''', $Fe^{\cdots}$, $Cu^{\cdots}$, and $Ca^{\cdots}$, but not from WO_4'', MoO_4'', or $Pb^{\cdots}$. E. S. H.

Photometric titration. Application of the copper–cuprous oxide cell, and determination of vanadium in steel.—See B., 1935, 854.

Analysis of bismuth by means of selenious acid. O. Funakoshi (Bull. Chem. Soc. Japan, 1935, **10**, 359—362).—The influence of $[SeO_2]$, $[HNO_3]$, and various cations on the pptn. of Bi has been studied. Bi is most accurately determined if weighed as Bi_2O_3. R. S.

Detection and determination of gold by means of carbon monoxide. R. N. Costeanu (Z. anal. Chem., 1935, **102**, 336—338).—A few mg. of material are dissolved in $HCl + HNO_3$, and the solution is applied to filter-paper. The purple colour produced by the action of CO at room temp. during 20—30 min. is matched against that of paper treated with Au solutions of known concn. J. S. A.

Toluene–mercury thermo-regulator for room control. H. Barrell and J. C. Evans (J. Sci. Instr., 1935, **12**, 281—284).—The bulb has a very large sp. surface. Room temp. may be kept const. to 0·1°. C. W. G.

Apparatus for raising or lowering the temperature of a laboratory furnace in a predetermined manner. F. Adcock (J. Sci. Instr., 1935, **12**, 285—288).—A moving potential divider provides a steadily increasing or decreasing e.m.f., opposing that due to a thermocouple in the furnace. The resulting current, by means of a relay, controls the heating current. C. W. G.

Temperature bath for scientific measuring instruments. L. Ubbelohde and C. Walther (Oel u. Kohle, 1935, **11**, 610).—The instrument (*e.g.*, a viscosimeter) is supported in a vapour bath which can be used with liquids of different b.p. The condensing surface is H_2O-cooled, and forms part of an inverted cone at the top of the boiling tube. H. J. E.

Heat capacities and entropies of organic compounds. I. Thermodynamic temperature scale in terms of the copper–constantan thermocouple from 12° to 273° abs. J. G. Aston, E. Willihnganz, and G. H. Messerly (J. Amer. Chem. Soc., 1935, **57**, 1642—1646).—The Cu–constantan couples have been compared with a He thermometer. The temp. scale derived is in satisfactory agreement with the Leiden scale, using H_2 and O_2 v.-p. thermometers. E. S. H.

Electrical method of determining specific heats. E. C. McCRACKEN (Proc. Iowa Acad. Sci., 1933, **40**, 157).—Sp. heats were measured by comparing the rate of heating of H_2O by direct passage of current with that when the H_2O contains small particles of the material. The method is specially applicable when the method of mixtures cannot be used. CH. ABS. (e)

Nickel-plated Parr bombs for peroxide fusion. C. L. TSENG, M. HSU, and M. HU (Sci. Quart. Nat. Univ. Peking, 1935, **5**, 382).—Ni bombs for peroxide fusions for As determinations etc. can be replaced by Ni-plated steel bombs provided these are polished before and after plating. They should be replated after being used 2 or 3 times. H. G. M.

Use of oil diffusion pumps for evacuating X-ray tubes. J. A. BEARDEN (Rev. Sci. Instr., 1935, [ii], **6**, 276—277).—The oil is heated by an immersed nichrome wire coil. C. W. G.

Colorimeter tube for p_H determinations. K. BUCH (Finska Kem. Medd., 1934, **43**, 112—114).—The tube is provided with two very short side arms which are ground and fitted with plane glass, the solution being viewed perpendicular to the longitudinal axis of the tube. CH. ABS. (e)

Electrode arrangement for spark spectrography. P. S. WILLIAMS and G. H. SCOTT (Rev. Sci. Instr., 1935, [ii], **6**, 277—278).—The electrode lines are eliminated by the optical configuration of the apparatus. C. W. G.

Illuminator for printing Laue photographs. C. H. DWIGHT and H. KERSTEN (Rev. Sci. Instr., 1935, [ii], **6**, 287).—By means of a non-rectilinear sector in a rotating disc the negative is so illuminated that the centre of the positive is not over-exposed. C. W. G.

Reproducible process for accurate photomicrography of dispersions, with special reference to the examination of bituminous emulsions for road construction. I. HVIDBERG (Kolloid-Z., 1935, **72**, 274—279).—A description of technique. E. S. H.

Integrating α-ray photometer for X-ray crystal analysis. G. J. MUELLER (Physical Rev., 1934, [ii], **45**, 762). L. S. T.

X-Ray camera for low temperatures. (MLLE.) B. RUHEMANN (Physikal. Z. Sovietunion, 1935, **7**, 572—582).—In the vac. X-ray camera described, the substance under test, but not the film, is in a vac. One form can be used for any temp. between room temp. and that of liquid H_2 with a constancy of $\pm 0 \cdot 1°$ during exposure for several hr. J. W. S.

Determination of refractive index of liquids. —See B., 1935, 833.

Method for determining the orientation of a crystal under a microscope. R. G. WOOD and S. H. AYLIFFE (J. Sci. Instr., 1935, **12**, 299).—The microscope, with its axis horizontal, is placed between the collimator and telescope of a photogoniometer. A stage goniometer is mounted on the microscope. C. W. G.

Purification of electrode carbons for spectral analysis. T. ZÜRRER and W. D. TREADWELL (Helv. Chim. Acta, 1935, **18**, 1181—1189).—C electrodes are readily purified by passing a flame arc (12 amp.) for 2—3 min. in an atm. of A or N_2. Addition of 5% of Cl_2 to the inert gas assists the purification, and is essential for the removal of B, Cu, and Mg. Addition of HCl hinders the purification. H. J. E.

Preparation of light pencils and ovens from Nernst oxides. C. TINGWALDT (Physikal. Z., 1935, **36**, 627—629).—Four methods of prep. are described. A. J. M.

Microcolorimeter. T. W. PRATT and A. L. TATUM (Science, 1935, **82**, 305—306). L. S. T.

Preparation of the sample in X-ray emission spectroscopy. E. A. W. MÜLLER (Z. wiss. Phot., 1935, **34**, 181—196).—A review discussing the avoidance of impurities in the anode in X-ray emission spectroscopy, and describing the procedure adopted for compact solids, powders, gases, and substances of high v.p. and low m.p., by the primary and secondary methods. A. J. M.

Hydrogen discharge tube for absorption spectroscopy. W. H. WATSON and D. G. HURST (Canad. J. Res., 1935, **13**, A, 19—21).—A compact H_2O-cooled tube with the capillary and electrodes arranged axially is described. H. J. E.

Standards of electromotive force. G. W. VINAL, D. N. CRAIG, and L. H. BRICKWEDDE (Trans. Electrochem. Soc., 1935, **68**, 263—274).—Saturated and unsaturated forms of Cd standard cells are briefly described, and statistical data on the constancy of commercial unsaturated cells are given. Methods employed at the Bureau of Standards for the construction of saturated (both neutral and acid types) cells are described. Traces of Pb, Ca, and Cr can be eliminated from Cd by two distillations under reduced pressure. The "conductivity" H_2O employed has a conductivity of $< 1 \times 10^{-6}$ ohm. The choice of glass for the cell is important, but in acid cells soft glass can be used. W. P. R.

Line-operated vacuum-tube voltmeter. R. L. GARMAN and M. E. DROZ (Ind. Eng. Chem. [Anal.], 1935, **7**, 341—342).—The apparatus is capable of operating on a.c. and d.c. lines and is designed to minimise the effects of line-voltage variations. E. S. H.

Conducting films in high vacua. C. L. HENSHAW (Rev. Sci. Instr., 1935, [ii], **6**, 287—288).—Connexion between the metal film and wire seal is made by means of a drop of Aquadag. C. W. G.

Non-metallic conducting films. S. BLOOMENTHAL (Physical Rev., 1934, [ii], **45**, 122).—Immutable conducting films, which adhere to any clean solid, have been prepared from synthetic resin solutions containing finely-powdered C in suspension. With a const. thickness, the resistivity depends chiefly on the proportion of binder and the type of C used. L. S. T.

Direct current in measurement of electrolytic conductance. J. N. BRÖNSTED and R. F. NIELSEN (Trans. Faraday Soc., 1935, **31**, 1478—1481).—A high degree of accuracy is attainable by the use of

d.c. instead of a.c. in measuring electrolytic conductance, using H electrodes. The procedure is described in detail. The chief advantage of the method, which is recommended, is simplicity.

F. L. U.

Electronic bridge balance indicator for conductance measurements. R. L. GARMAN and G. F. KINNEY (Ind. Eng. Chem. [Anal.], 1935, 7, 319—320).—The apparatus permits resistances to be determined with a precision of $\pm 0.01\%$. E. S. H.

Wilson cloud chambers with an increased time of sensitivity. J. A. BEARDEN (Rev. Sci. Instr., 1935, [ii], 6, 256—259).—By using H_2O for the floor of the expanding space and a slow rate of expansion, the time of sensitivity is increased to 2 sec. C. W. G.

Counter tubes with alkali [metal] cathodes. W. CHRISTOPH (Ann. Physik, 1935, [v], 23, 747—760).—The construction of a Geiger–Müller counter for the visible spectrum, employing alkali-metal cathodes (Na and K), is described. The behaviour of the counter could not, however, be stabilised.

A. J. M.

Geiger–Müller counter suitable for the measurement of diffracted Mo K X-rays. D. P. LE GALLEY (Rev. Sci. Instr., 1935, [ii], 6, 279—283).—The impulses are amplified and recorded mechanically by a thyratron circuit, at rates up to 600 per min.

C. W. G.

Investigation of an alternating-current [bridge] method of determining critical potentials [in a vapour]. R. W. HICKMAN (Physical Rev., 1934, [ii], 45, 287). L. S. T.

Electron microscope. C. J. CALBICK and C. J. DAVISSON (Physical Rev., 1934, [ii], 45, 764).—The images obtained reveal the crystal structure of the emitting surface together with activation and deactivation effects. L. S. T.

Improvement in precision potentiometers. D. C. GALL (J. Sci. Instr., 1935, 12, 284—285).—The residual potential is overcome, so that very small potentials, either positive or negative, can be measured.

C. W. G.

Apparatus for electron diffraction at high voltages. G. P. THOMSON (Trans. Faraday Soc., 1935, 31, 1049—1051).—The apparatus uses the principle of two-stage acceleration and works over the range 45,000—85,000 volts. E. S. H.

High-intensity discharge tube. D. S. STEVENS (Rev. Sci. Instr., 1935, [ii], 6, 260).—A tube previously described (this vol., 466) is improved.

C. W. G.

Silver–silver bromide electrode suitable for measurements in very dilute solutions. A. S. KESTON (J. Amer. Chem. Soc., 1935, 57, 1671—1673).—Reproducible Ag|AgBr electrodes are prepared by heating an intimate mixture of Ag_2O and $AgBrO_3$ at 650°. E.m.f. of the cell $H_2|HBr(m)|$ AgBr|Ag have been determined over a range of concns. The mol. electrode potential of the Ag|AgBr electrode is 0·0711 volt. E. S. H.

Germanium–germanium dioxide electrode. M. L. NICHOLS and S. R. COOPER (Ind. Eng. Chem. [Anal.], 1935, 7, 350—352).—The p.d. against the calomel electrode varies with p_H, but the Ge|GeO_2 electrode is unsatisfactory for p_H determinations.

E. S. H.

Potentiometric titrations with the germanium–germanium dioxide electrode. M. L. NICHOLS and S. R. COOPER (Ind. Eng. Chem. [Anal.], 1935, 7, 353—355).—The Ge|GeO_2 electrode is satisfactory for the potentiometric titration of many org. and inorg. acids, and NaOH; it is not satisfactory for weak bases and salts, except NH_2Ph and Na_2CO_3. It may be used in solutions of HNO_3, $HClO_4$, maleic and fumaric acids, where the H_2 electrode is unsatisfactory.

E. S. H.

Apparatus for determining magnetic constants of mineral powders. V. H. GOTTSCHALK and C. W. DAVIS (U.S. Bur. Mines, Rept. Invest., 1935, No. 3268, 51—65).—A modified isthmus permeameter having a spark-suppressed primary and a multiplier in the secondary circuit to regulate the effect of capsules of the mineral powder functioning as a twin isthmus is described, and normal induction and hysteresis curves obtained by means of the instrument with various magnetite and pyrrhotite samples are given and discussed. A. R. P.

Magnetometer for crystal ferromagnetism and its application to iron–cobalt alloy crystals. L. W. McKEEHAN and J. W. SHIH (Physical Rev., 1934, [ii], 45, 742; cf. A., 1934, 1061). L. S. T.

Apparatus for the study of liquid–vapour equilibrium compositions. R. M. WILEY and E. H. HARDER (Ind. Eng. Chem. [Anal.], 1935, 7, 349—350).—With $EtOH–H_2O$ mixtures the apparatus gives results in good agreement with published vals.

E. S. H.

Apparatus for decomposition of [mineral] specimens without admitting air. A. M. VASILIEV (Trans. Butlerov Inst. Chem. Tech. Kazan, 1934, No. 1, 133—135).—An apparatus for determining FeO after dissolution of the specimen in a CO_2 atm. is described. CH. ABS. (e)

Determination of combustible gases in the air of the uppermost strata of the earth by means of a new apparatus. A. GRAF (Oel u. Kohle, 1935, 11, 644—648).—A portable micro-calorimeter, comprising a bridge, galvanometer, and small metal gas holder, is used. Combustible gases burn at a Pt filament and current measurements are made.

C. C.

Apparatus for potentiometric determination of atmospheric carbon dioxide.—See B., 1935, 926.

Glass electrode for p_H measurements. K. SCHWABE (Z. Elektrochem., 1935, 41, 681—694).—A review of published work on apparatus, technique, and applications. E. S. H.

Absorption apparatus for micro-determination of volatile substances. III.—See this vol., 1436.

Detector for determination of low concentrations of hydrogen sulphide.—See B., 1935, 947.

Magneto-optic method of chemical analysis. F. G. Slack and J. A. Peoples, jun. (Physical Rev., 1934, [ii], **45**, 126; cf. A., 1934, 1321).　　L. S. T.

Device to compensate for magnetic field fluctuation in a mass spectrograph. A. O. Nier (Rev. Sci. Instr., 1935, [ii], **6**, 254—255).—By means of a vac.-tube rectifier the electric field is caused to vary as the magnetic field changes, so that the deflexion of an ion is unaltered.　　C. W. G.

Höppler viscosimeter versus Vogel–Ossag viscosimeter. J. J. Leendertse (Chem. Weekblad, 1935, **32**, 553—555). C. G. Verver (*Ibid.*, 1935, **32**, 555—556).—A reply to Cannegieter (this vol., 1098). The Höppler instrument is adversely criticised as being too empirical for a standard instrument.　　S. C.

Viscosity measurements by R. O. Herzog and collaborators. L. Ubbelohde (Cellulosechem., 1935, **16**, 64).—Polemical.　　A. G.

Precision viscosimeter. O. Fitzsimons (Ind. Eng. Chem. [Anal.], 1935, **7**, 345—347).—The Ubbelohde capillary viscosimeter is modified by using dual capillaries and mounting in a vapour bath.　　E. S. H.

Constant-flow orifice meters of low capacity. R. T. Page (Ind. Eng. Chem. [Anal.], 1935, **7**, 355—358).—The construction and calibration of the orifice are described.　　E. S. H.

Determination of specific gravity of gases. Improvements in the effusion method. L. C. Kemp, jun., J. F. Collins, jun., and W. E. Kuhn (Ind. Eng. Chem. [Anal.], 1935, **7**, 338—341).—Sources of error in the usual determination have been traced. With the technique described an accuracy of about 2·5% is obtained when d is $<1·30$. Stainless steel is recommended as a substitute for Pt in making the orifice plate.　　E. S. H.

Reflux regulator for laboratory stills. J. H. Bruun (Ind. Eng. Chem. [Anal.], 1935, **7**, 359—360).　　E. S. H.

Oxygen liquefier. G. Winchester and D. M. Hill (Rev. Sci. Instr., 1935, [ii], **6**, 288).—O_2 under pressure enters a Cu vessel through $\frac{1}{16}$-in. holes and condenses in a surface cooled by liquid air. 1 litre of the latter produces about 750 c.c. of liquid O_2.　　C. W. G.

Speed of divergent-nozzle pumps. M. J. Copley, O. C. Simpson, H. M. Tenney, and T. E. Phipps (Rev. Sci. Instr., 1935, [ii], **6**, 265—267).—Long divergent nozzles give greater speed factors than straight or short divergent ones.　　C. W. G.

Device for determining the surface tension of small amounts of liquid. S. Natelson and A. H. Pearl (J. Amer. Chem. Soc., 1935, **57**, 1520—1523).— γ of 0·1 c.c. of a liquid is determined by the rise in a very fine capillary tube (0·2—0·3 mm. diam.), sealed to a wider capillary.　　R. S. C.

Method of attaching a fluorite window to glass apparatus. F. Palmer, jun. (Physical Rev., 1934, [ii], **45**, 556—557).　　L. S. T.

Capillaroscopy. A new capillaroscope. E. L. Lederer (Kolloid-Z., 1935, **72**, 267—273).—Apparatus for determining the rate of spreading of liquids in capillary structures is described, and results are given for many org. liquids, aq. solutions, and natural oils. The results can be expressed in the form $s^2 = k'\sigma t/\eta$, where s is the distance penetrated in time t, σ the surface tension, and η the viscosity.　　E. S. H.

Ultracentrifuge. E. G. Pickels (Physical Rev., 1934, [ii], **45**, 748—749).—Further improvements are described (cf. A., 1934, 625).　　L. S. T.

Automatic recording mass spectrograph. P. T. Smith, W. W. Lozier, and W. Bleakney (Physical Rev., 1934, [ii], **45**, 761—762).　　L. S. T.

Micro-pyknometer method for density determinations. G. R. Clemo and A. McQuillen (J.C.S., 1935, 1220).—Dimensions of and method of using a micropyknometer and vals. obtained with C_6H_6 are given. The mean deviation from the mean of 29 weighings is 0·005 mg.　　P. G. C.

Method for studying the performance of continuous filters. G. Netzel (Chem.-Ztg., 1935, **59**, 701—704).—The performance of rotary filters of the " Imperial " type, fitted with cord devices for stripping the cake, can be accurately investigated by means of a model laboratory apparatus (described in detail), in which a small filter-plate (10 × 15 cm.), fitted with a cord-frame for removing the cake and connected to a manometer and filter-pump, is employed and the operations of dipping, washing, clearing, etc. are performed by hand and accurately timed.　　E. L.

Characteristics of mercury-vapour pumps. L. E. Pinney (Proc. Iowa Acad. Sci., 1933, **40**, 157).— Curves showing the relation between the fore pressure and the flow of Hg vapour required to produce a definite vac. are recorded.　　Ch. Abs. (*e*)

Technique of ultrafiltration with a Cellophane membrane. L. Brull (Compt. rend. Soc. Biol., 1935, **120**, 98—99).—An apparatus is described.　　R. N. C.

Fractional ultrafiltration. H. C. Allisbaugh and R. R. Hyde (Amer. J. Hyg., 1935, **21**, 64—93).— The prep. of collodion ultrafilter membranes is described. The particle size of *Staph. aureus* (I) was found to be practically the same by ultrafiltration and by direct measurement. That of filterable viruses falls between those of (I) and colloidal Au. Association with a protein carrier may cause their retention by relatively large pores.　　Ch. Abs. (*e*)

Use and regeneration of drierite [CaSO₄]. W. A. Hammond (J. Chem. Educ., 1935, **12**, 445—446).—Directions are given.　　L. S. T.

Methods of weighing by swings. H. L. Lochte (J. Chem. Educ., 1935, **12**, 414).—One set of 5 swings may introduce an error of approx. 0·1 mg. owing to poor reproducibility of the rest point; the average of 3 sets of 3 swings gives results practically as trustworthy as the average of 3 sets of 5 swings, whilst the average of 2 or 3 sets of deflexion data obtained by Pregl's method agrees well within 0·1 mg. with the average of 3 sets of 5 swings and is more rapidly and simply obtained.　　L. S. T.

Demonstration of rotating–vibrating diatomic molecules. T. H. Hazlehurst, jun. (J. Chem.

Educ., 1935, **12**, 353—355).—A device for illustrating the motions of atoms in a rotating-vibrating diat. mol. is described. L. S. T.

Simple mercury seal. T. RICHES and W. B. MANN (J. Sci. Instr., 1935, **12**, 298).—A Hg-operated ball-valve is made by pressing a steel ball against a shoulder in Pyrex tubing while the latter is soft. C. W. G.

Instrument for measuring evaporation from surfaces. J. S. OWENS (J. Sci. Instr., 1935, **12**, 291—293).—The evaporating pan is supplied with H_2O from a graduated tube. C. W. G.

Use of the McLeod gauge with non-permanent gases. M. FRANCIS (Trans. Faraday Soc., 1935, **31**, 1325—1331).—Deviations from the gas laws are insufficient to account for the supposed failure of the McLeod gauge to measure pressures of non-permanent gases, but good agreement between the readings taken at different points in the capillary does not prove that sorption errors are absent. The differences between measurements made with SO_2 and air were small at pressures > 0·004 mm. Vals. for the quantity of gas transferred calc. from observed pressure changes and known vols. are not trustworthy owing to movements of sorbed gas when the pressure is changed. J. G. A. G.

Humidity slide rule. E. G. BILHAM (J. Sci. Instr., 1935, **12**, 318—322).—V.p., dew point, R.H., and H_2O content can be found from readings of wet and dry bulb thermometers. C. W. G.

Gas-specific gravity balance. J. S. HALES and W. C. Moss (J. Sci. Instr., 1935, **12**, 309—313).—The upthrusts of different gases on a glass bulb are balanced by the adjustment of riders. C. W. G.

Modified Soxhlet extractor. E. W. BLANK (Cereal Chem., 1935, **12**, 543—544).—The difficulty of the preferential passage of the ether through the filter-paper is obviated by using a glass tube open at both ends and of such a diameter as to fit closely in the thimble. When the material is to be weighed before and after extraction, a cut-off test-tube, with holes blown in the round end and containing a layer of cotton at the bottom, is used as a thimble. E. A. F.

Chemistry in the Bucheum. J. R. PARTINGTON (Chem. and Ind., 1935, 884—886).

When and by whom was alcohol first prepared from ethylene? B. HERSTEIN (Chem. and Ind., 1935, 881—884).

Discovery of tellurium. M. E. WEEKS (J. Chem. Educ., 1935, **12**, 403—409).—Historical. L. S. T.

Geochemistry.

Hydrogen in the upper atmosphere. J. KAPLAN (Nature, 1935, **136**, 549—550).—The effect of H_2 on N afterglow is discussed in relation to the occurrence of H_2 in the upper atm. L. S. T.

Variability of nitrogen compounds (NO_2, NO_3, and NH_3) in Baltic sea-water. H. PILWAT (Angew. Chem., 1935, **48**, 590—591).—The NO_2' content of the H_2O decreases on keeping. Data for the variation of $[NH_3]$ and $[NO_3']$ on storage, and for seasonal variations in concns., are recorded. H. J. E.

Indian Hot Springs, Graham County, Arizona. M. M. KNECHTEL (J. Washington Acad. Sci., 1935, **25**, 409—413).—Analyses are given. C. W. G.

Presence of lithium in waters from the Turin hills. M. JARACH (Annali Chim. Appl., 1935, **25**, 385—388).—Certain of the waters of the hilly zone to the west of Turin show by spectroscopic tests ⪢ 9·5 mg. of Li per litre. T. H. P.

Iron in the sea and in marine plankton. L. H. N. COOPER (Proc. Roy. Soc., 1935, B, **118**, 419—438).—Fe in true solution in sea-H_2O is < 2 mg. per cu.m., $[Fe^{...}]$ ⪢ 10^{-12} mg. per cu.m., the solubility being controlled by that of a sparingly sol. basic salt. The Fe requirement of diatoms is > that of plankton, the Fe content of which is about 0·5 mg. per cu.m. $2:2':2''$-Tripyridyl is the most sensitive reagent for detection of Fe in sea-H_2O, 1 mg. per cu.m. being determined with certainty. H. G. R.

Springs of Fairmount Park. F. N. MOERK, D. C. A. BUTTS, F. C. LAWLER, and P. A. MATTIS (Amer. J. Pharm., 1935, **107**, 358—372).—21 springs

have been analysed chemically, microscopically, and biologically by standard methods. E. J. B.

Waters, magmatic and meteoric. W. LINDGREN (Econ. Geol., 1935, **30**, 463—477).—The quantity and distribution of meteoric waters are discussed, and the view that in permeable sedimentary rocks meteoric waters may reach a depth of 8000 and possible >10,000 ft. is advanced. In igneous and metamorphic rocks, cementation generally prevents active penetration by surface waters to > 3000 ft. The present distribution and composition may be entirely different from that prevailing at an earlier date and may have changed several times. Magmatic waters are discussed as a principal agent in the formation of mineral deposits. Hot springs are generally a mixture of meteoric waters and magmatic emanations. The " telemagmatic " Pb–Zn deposits of the Mississippi Valley and of Europe have been formed probably by mixtures of magmatic and meteoric waters at comparatively low temp. The deep waters in the Witwatersrand are also discussed. L. S. T.

Testing a theory of the earth's interior. R. A. DALY (J. Washington Acad. Sci., 1935, **25**, 389—399).—The author's views of an elastico-viscous interior are discussed. C. W. G.

Geochemical zone-like character of the distribution of metals in the Far East. M. N. IVANTISCHIN (Compt. rend. Acad. Sci. U.R.S.S., 1935, **2**, 572—580).—The distribution of metals in the Far East falls into various zones, the polymetal regions of the Küsten Province and Upper Seja, the As zone of Ussuri and Lower Amur, the Mo zone of Bureja, and

the Selemdsha Au zone. The distribution is discussed in terms of ionic radius and valency.
R. S. B.

Dielectric constant and specific resistance of rocks. B. DOSTOVALOV (Compt. rend. Acad. Sci. U.R.S.S., 1935, **3**, 87—90).—The dielectric const., ε, and sp. resistance of about 50 samples of rocks have been determined. No connexion could be traced between ε and composition, but texture affects ε.
A. J. M.

Identification of types of chalcocite by use of the carbon arc. M. M. STEPHENS (Econ. Geol., 1935, **30**, 604—629; cf. Amer. Min., 1931, **16**, 532).—Argentite (I), stromeyerite (VII), polybasite (II), stephanite (III), pyrargyrite, proustite, pearceite, andorite (IV), petzite (V), hessite (VI), coloradoite, etc. react characteristically when exposed to rays from a C arc conc. by suitable lenses. The rate of reaction varies with the orientation of the mineral and the aperture of the lens. (I)—(IV) yield a sublimate of S. Thermal rays speed up the actinic action, and (IV)—(VII) and chalcocite (VIII) react almost entirely to heat. The heat-etch pattern with (VIII) is produced by etch lines and fractures which develop along internal structures. The pattern is characteristic for certain types of (VIII) and much of the history of the specimens has been inferred from it. When replaced by (VIII) under certain conditions bornite transmits its etch pattern to (VIII). Covellite > a certain % in solid solution in (VIII) inhibits an etch reaction. Hypogene and supergene (VIII) can be distinguished by their reactions to acid and heat, and strains and distorting pressure are reflected in the etch lines.
L. S. T.

Geology of Castle-an-Dinas wolfram mine, Cornwall. E. H. DAVISON (Econ. Geol., 1935, **30**, 689—694).—The sequence of events which culminated in the formation of the lode described appears to have been a folding and cleaving of the Devonian slates, intrusion of the granite followed by the action of the granite volatiles, resulting in the deposition of cassiterite in the slate and the formation of greisen, kaolin, and tourmalinised slate, opening of the lode fissure and filling by magmatic solutions giving rise to a pegmatite which, near the surface of the granite, became a quartz wolfram lode.
L. S. T.

Martic overthrust and the age of the Glenarm series in S.E. Pennsylvania. J. H. MACKIN (J. Geol., 1935, **43**, 356—380).—Evidence for the view that the Glenarm series of metamorphic rocks of the Pennsylvania Piedmont region is Paleozoic rather than pre-Cambrian in age is presented.
L. S. T.

Colloidal primary copper ores at Cornwall mines, S.E. Missouri. G. W. RUST (J. Geol., 1935, **43**, 398—426).—The primary ore consists of the sulphides of Cu, Fe, and Zn with chalcopyrite as the most abundant mineral. Other primary minerals occurring in smaller but important amounts are quartz, pyrite, sphalerite, marcasite, bornite (I), calcite, and dolomite, and there are rare occurrences of primary enargite (II), famatinite (?) (III), chalcocite (IV), covellite (V), galena, and fluorite. Secondary minerals, with little or no enrichment, occur in considerable amounts. (I)—(V) indicate a hydrothermal

ancestry for the mineralising solutions, and lack of alteration of the wall indicates a moderate temp. Several unusual types of structure and texture suggest ore deposition from colloidal solutions, for which a deep-seated, magmatic source is postulated. The orders of introduction and flocculation of the minerals are discussed.
L. S. T.

Sudburite, a metamorphic rock near Sudbury, Ontario. R. THOMSON (J. Geol., 1935, **43**, 427—435).—Sudburite, essentially plagioclase + pyroxene, with hornfels texture, occurs in proximity to the Sudbury Ni intrusive. It is probably due to recrystallisation of greenstone and other rocks older than the Ni intrusive, which was the cause of its formation.
L. S. T.

" Offset dikes " of the nickel intrusive, Sudbury, Ontario. R. THOMSON (Amer. J. Sci., 1935, [v], **30**, 356—367).—Analyses are given. C. W. G.

Silicification of shale in the Mogul mine. G. M. SCHWARTZ (J. Geol., 1935, **43**, 524—529).—The exposed shale of the Mogul mine in the Black Hills of S. Dakota shows marked silicification. Petrographic examination reveals much chalcedony, opal, and residual, fine-grained kaolinitic material. Analyses show a large gain in SiO_2, and considerable losses of K_2O and Al_2O_3 partly by replacement.
L. S. T.

Thin-section mechanical analysis of indurated sediments. W. C. KRUMBEIN (J. Geol., 1935, **43**, 482—496).—A new method in which the data obtained from thin sections are utilised is described, and checked by analyses on St. Peter sandstone and a glacial sand. It has been applied to a pre-Cambrian quartzite in which secondary growth has completely cemented the grains.
L. S. T.

Granite-porphyries of Great Bear Lake, Northwest Territories, Canada. C. RILEY (J. Geol., 1935, **43**, 497—523).—A granite-porphyry mass, one of a no. of porphyries with complex relationships occurring in the pre-Cambrian of Great Bear Lake, is defined. The various phases of the formation, its contact phenomena, apophyses, form and origin, and post-intrusives of a pneumatolytic character are described.
L. S. T.

Age of allanite from Amherst County, Virginia, U.S.A. J. P. MARBLE (Amer. J. Sci., 1935, [v], **30**, 349—352).—The Pb ratio indicates an age of 8×10^8 years.
C. W. G.

Revision of data of the enstatite-hypersthene series. R. WALLS (Min. Mag., 1935, **24**, 165—172). —Four new analyses are given of hypersthene from Aberdeenshire, together with partial optical data. The results are plotted, together with selected data from the literature, showing an increase in γ and $2V$ with the Fe content.
L. J. S.

Anomalies in the determination of water in epidote. A. F. SMETHURST (Min. Mag., 1935, **24**, 173—179).—In analyses of epidote from the Malvern Hills, H_2O expelled at 1000° in a current of air amounted to only 0·06—0·35%. With prolonged blasting rather more was expelled, and two fusions with Na_2WO_4 gave 0·76—1·32%. Epidote from other localities gave 1·25—1·68%. The amount required by the

formula $HCa_2Al_3Si_3O_{13}$ is 2·0%. The analyses show F only 0·03—0·08%. Similar difficulties have been met with in expelling the H_2O from a few other refractory silicates. L. J. S.

Late Palæozoic quartz-dolerites and tholeiites of Scotland. F. WALKER (Min. Mag., 1935, **24**, 131—159).—These rocks, occurring in dikes and sills, are very similar both chemically and mineralogically to those of the Whin Sill (A., 1928, 1211). New analyses show SiO_2 47·39—49·36%, and in the residual glass of a tholeiite 66·80%. In the quartz-dolerites the silica-rich residuum is represented by micropegmatite. The origin of the rocks from an olivine-basalt magma is considered. L. J. S.

Zeolites. VIII. Theory of vapour pressure of the zeolites, and of diffusion of water or gases in a zeolite crystal. M. H. HEY (Min. Mag., 1935, **24**, 99—130; cf. A., 1934, 862).—With many assumptions, complex formulæ are deduced as a first approximation. Some new v.-p. data are given for edingtonite and mesolite. L. J. S.

Constitution of zeolites. L. PASSERINI (Gazzetta, 1935, **65**, 534—542).—Infra-red absorption spectra between 1·30 and 2·00 μ of the following zeolites have been measured : analcite, natrolite, heulandite, stilbite, chabasite, and skolezite. The H_2O bands of the first five zeolites are the same as those of pure H_2O, but with skolezite they are displaced towards higher λλ. O. J. W.

Occurrence of mendozite and tamarugite in Missouri. W. D. KELLER (Amer. Min., 1935, **20**, 537—539).—Efflorescences occurring on the Joachim dolomite near Eureka, Missouri, and on the basal Cherokee conglomerate at Fulton, Callaway Co., Missouri, are composed largely of mendozite with some tamarugite. Oxidising pyrite appears to be the source of the SO_4''. L. S. T.

Spectrographic analysis of tourmalines with correlation of colour and composition. T. W. WARNER, jun. (Amer. Min., 1935, **20**, 531—536).—Spectra of different specimens of tourmaline from Brazil and San Diego show that Li, Na, Mg, Ca, Al, B, Ga, Mn, and Si are always present, and V, K, Cu, Fe, Pb, Sn, Ti, and Be present in some samples but not in all. Ag, Ge, Re, As, Hf, Rh, Sb, Ru, Bi, Hg, Sc, Au, In, Ta, Ir, Te, Cb, La, Th, Cd, Mo, U, Ce, Ni, W, Co, P, Yt, Pd, Zn, and Pt were absent (< 0·0005%). The first 7 elements remain practically const. in amount in all the samples tested, but any variation does not coincide with differences in colour. Sn is slightly more pronounced in pink than in green specimens, and Cu is more common in green than in pink. The Fe content ∝ the depth of colour in the green and inversely ∝ the depth in the pink and red specimens, being either absent, or present only as minute traces, in the red. The natural colour of tourmaline is probably pink or red and is changed to green by Fe, which is probably the most important factor in gem coloration. L. S. T.

Evolution of the White Mountain magma series. R. W. CHAPMAN and C. R. WILLIAMS (Amer. Min., 1935, **20**, 502—530).—The chief characteristics of the volcanic and plutonic rocks of the series are described and chemical analyses of these and the dyke rocks and the minerals of the series are recorded. Theories of origin of rock types are discussed, and a theory which combines fractional crystallisation, pure melting, and assimilation for the evolution of the White Mountain magma series is advanced. L. S. T.

Lindgrenite, a new mineral. C. PALACHE (Amer. Min., 1935, **20**, 484—491).—Lindgrenite, monoclinic, holohedral, occurs as green, transparent crystals, cleavage perfect, $a : b : c = 0.5941 : 1 : 0.5124$, β 92° 12′, in veinlets in limonitic quartz from Chuquicamata, Chile. The mineral is biaxial, negative, with n_a 1·930 ± 0·003, $n_β$ 2·002 ± 0·003, $n_γ$ 2·020 ± 0·003, d 4·26, and hardness 4·5 ; sol. in HCl and HNO_3. The analysis [F. A. GONYER] CuO 40·62, MoO_3 50·97, H_2O 3·30, Fe_2O_3 1·43, insol. 3·34, total 99·66%, gives the formula $2CuMoO_4,Cu(OH)_2$. X-Ray measurements [BERMAN] give a 8·45, b 14·03, c 7·04 Å., β 92·5° for the unit cell $Cu_{12}(MoO_4)_8H_8O_8$. L. S. T.

Structural relationship of nontronites and montmorillonite. J. W. GRUNER (Amer. Min., 1935, **20**, 475—483).—X-Ray powder diagrams of nontronite (I), morencite, pinguite, faratsihite, chloropal, and stilpnochloran establish the structural identity of these so-called species. The structure is practically identical with that of montmorillonite (bentonite) (II). (I), (II), and beidellite form an isomorphous, completely-miscible series. As in (II), the H_2O content of nontronites may vary, and since they are layer structures and not zeolitic, it controls the distance between the layers, which may vary between 9·2 Å. at 575° and 15·8 Å. when the sample is moist. a and b average 5·23 and 9·06 Å., respectively. When dehydrated at 575°, (I) is similar in structure to pyrophyllite. The best formula for the series is $OH_8(Al,Fe^{III})_{8+n/3}[Si_{16-n}(Al,Fe^{III})_n]O_{40},mH_2O$, with n between 0 and 4. For (I), n is seldom < 2, and for (II), n is usually < 1. For air-dried material, m lies between 8 and 22. Hisingerite appears to be amorphous, but 4 or 5 indistinct bands in the X-ray spectrum agree with intense lines of (I). L. S. T.

Position of montmorillonite among the phylliteous silicates. J. DE LAPPARENT (Compt. rend., 1935, **201**, 527—529).—A discussion of the formula of montmorillonite. H. J. E.

Origin of barite in the Appalachian Valley. G. W. CRICKMAY (Econ. Geol., 1935, **30**, 563—564).—A criticism (cf. *ibid.*, 1931, **26**, 776). L. S. T.

Staining minerals for easier identification in quantitative mineragraphic problems. A. M. GAUDIN (Econ. Geol., 1935, **30**, 552—562).—The various methods available for changing the appearance of minerals to facilitate identification are reviewed and practical applications are described. L. S. T.

Relations of hydrothermal alteration of porphyries to ore deposition in the Alma district, Colorado. Q. D. SINGEWALD (Econ. Geol., 1935, **30**, 518—539).—The five different intrusive porphyries of early Tertiary age found among the wall rocks of many mesothermal veins in this district each appear to have undergone (i) an early, widespread, hydro-

thermal alteration, and (ii) a later, local alteration as an early stage of ore deposition. Details of these two types of alteration are given.   L. S. T.

Nature and occurrence of carbonates in veins. G. H. CHARLEWOOD (Econ. Geol., 1935, **30**, 502—517).—Carbonatisation is more typical of regions of Au-bearing veins of the hypothermal and meso-thermal types than of any others. This is especially the case in Ontario. Analysis are recorded and show a wide range of composition for vein carbonates (I). The composition of the wall rocks has little, if any, effect on that of (I) in the veins, the composition of which is controlled by the composition, temp., and pressure of the vein-forming solutions at the time of filling. Zoning of the (I) composition occurs in some veins. In the four representative deposits investigated the $FeCO_3$, and to a smaller extent the $CaCO_3$, in ankerite (II), siderite, and dolomite (III) increases with depth, whilst $MgCO_3$ decreases correspondingly. The development of carbonatised rocks along the vein zones and in regions of Au-bearing quartz veins is characteristic of a large part of the Canadian shield. (II) is almost invariably pre-ore, whilst carbonates of post-ore age are more commonly (III) or calcite.   L. S. T.

Origin of the gypsum deposits near Sandusky, Ohio. V. JONES (Econ. Geol., 1935, **30**, 493—501).—The general geology, the relations to gypsum areas of New York and Ontario, and the mineral relationships, dolomite (I)–anhydrite (II), (II)–gypsum (III), and (I)–(III), are described. The deposits probably represent surface hydration products formed from the deeper-lying anhydrite beds.   L. S. T.

Rock alteration at the Amulet mine, Noranda district, Quebec. M. E. WILSON (Econ. Geol., 1935, **30**, 478—492).—The ore deposits of the mine belong to the aggregates of sulphide ore masses of the Noranda type and occur chiefly in Abitibi lavas distributed in two groups, the older consisting of rhyolite and rhyolite breccia and the younger of andesite. They lie mainly in the rhyolite breccia and consist chiefly of pyrite (I), pyrrhotite, sphalerite (V), chalcopyrite (II), granular quartz, the minerals of the dalmatianite rock, and a small proportion of arsenopyrite (III), tetrahedrite (IV), and calcite. (I) and (III) carry Au and were deposited first, and (II), (IV), and galena carry Au, and with (V) were deposited last. The dalmatianite, a cordierite-bearing alteration rock, is the most unique feature of the mine. It has been formed by hydrothermal alteration effected by the emanations from which the ore was deposited. Analyses are recorded.   L. S. T.

Mineralogical constituents of clays, especially fuller's earth. H. LONGCHAMBON (Compt. rend., 1935, **201**, 483—485).—In the clays examined sepiolite could not be detected. The main constituent in those of the fuller's earth type has a composition similar to that of palygorskite or pilolite, and may be regarded as an isomorphous mixture of sepiolite ($2MgO,3SiO_2,4H_2O$) and paramontmorillonite ($Al_2O_3,4SiO_2,6H_2O$). It is suggested that these palygorskitic clays have been derived by the alteration

of pyroxenes and amphiboles, whilst kaolinic clays have been derived from felspars and micas.   L. J. S.

An essential constituent of fuller's earth. J. DE LAPPARENT (Compt. rend., 1935, **201**, 481—483).—Two analyses of fuller's earth from Attapulgus, Georgia, U.S.A. (and Mormoiron, Vaucluse, France), gave : SiO_2 53·7 (53·6), Al_2O_3 9·0 (10·6), Fe_2O_3 3·6 (6·5), FeO 0·2 (0·3), MgO 9·6 (4·6), CaO 1·2 (2·1), Na_2O 0·9 (0·8), K_2O 0·5 (0·5), H_2O+11·6 (9·4), H_2O- 9·7 (11·6). They are expressed as a mixture of $2MgO,3SiO_2,4H_2O$ and $Al_2O_3,4·5SiO_2,6H_2O$, and suggest palygorskite, but the new name attapulgite is proposed. This is regarded as a constituent of fuller's earth distinct from kaolin, halloysite, and montmorillonite.   L. J. S.

Bentonite. J. N. WILSON (Sands, Clays, and Min., 1934, **2**, 45—47).—A review of properties.   CH. ABS (e)

Pyrite nodules in coal measures, with special reference to the Yen Tai and Pen Hsi Hu coalfields, South Manchuria. T. OGURA and H. MATSUMOTO (Mem. Ryojun Coll. Eng., Inouye Comm. Vol., 1934, 243—255).—Analyses of pyrite, found in lenses in the Permian Seams, are given, and the mode of production is discussed.   CH. ABS. (e)

Carboniferous rocks. J. E. METCALFE (Sands, Clays, and Min., 1934, **2**, 27—31).—Carboniferous rocks of the British Isles are described.   CH. ABS. (e)

Emeralds, their occurrences and genesis. P. P. PIATNITZKI (Trans. Geol. Hyd. Geod. Trust Ukraine, 1934, 5—48).—The deposits north-east of Sverdlovsk are described.   CH. ABS. (e)

Lacustrine and bog-ores of the Kouch Lake and Sego Lake regions of the Karelian A.S.S.R. E. KOPTSCHENOVA (Trans. Sci. Inst. Geol. Min. U.S.S.R., 1934, **3**, 3—26).—Analyses are recorded.   CH. ABS. (e)

Dispersion of mullite. M. SAWATARI (Mem. Ryojun Coll. Eng., Inouye Comm. Vol., 1934, 41—47).—Mullite with $n > 1·67$ is most easily distinguished from sillimanite by measurement of the dispersion. Vals. are recorded for two samples of artificial mullite (0·80, 1·86% TiO_2).   CH. ABS. (e)

Physical studies of the manganous hydroxides, pyrochroite and bäckströmite. D. P. GRIGORIEV (Mém. Soc. Russe Min., 1934, **63**, 67—80).—Pyrochroite from Långban, Sweden, contained hausmannite. The lower the temp. of prep. of cryst. $Mn(OH)_2$ the more developed was the $\{1\bar{1}00\}$ form. Part of the pyrochroite–bäckströmite phase diagram was obtained.   CH. ABS. (e)

Pegmatites at Collins Hill, Connecticut. W. F. JENKS (Amer. J. Sci., 1935, [v], **30**, 177—197).—Three phases are distinguished. (1) Magmatic, with quartz, microcline, muscovite, and black tourmaline. (2) Transitional, mainly cleavelandite, with spodumene, lepidolite, coloured tourmaline, columbite, etc. (3) Hydrothermal, with a potash-bearing albite, tourmaline, cookeite, sulphides, phosphates of Li and Mn, apatite, etc. Analyses and optical data are given for some of these minerals.   L. J. S.

Weathering of volcanic rocks. I, II. Basalts. M. HARADA (J. Agric. Chem. Soc. Japan, 1935, **11**, 456—472).—Changes in the composition and nature of various types of basalts due to weathering were determined. F. O. H.

Relationship of mud to electrical coring. H. C. H. THOMAS (J. Inst. Petroleum Tech., 1935, **21**, 774—784).—The effects of mud on the resistivity and porosity of permeable rocks are discussed and the consequent effects of mud on electrical profiles are outlined. C. C.

Water in inorganic compounds. II. Water content of Odo acid clay at various temperatures in an air current at constant water vapour pressure. M. NAKAMOTO (Bull. Chem. Soc. Japan, 1935, **10**, 369—374; cf. B., 1933, 268).—Hydration and dehydration data are given for temp. $\Rightarrow 800°$. The monohydrate decomposes above 300°. R. S.

Genesis of agates. P. P. PILIPENKO (Bull. Soc. nat. Moscou, Sect. Geol., 1934, **12**, 279—299).—The formation cannot be accounted for solely by Liesegang's assumption of slow diffusion of SiO_2 gel. The banded structure and pigmentation are better explained by an intermittent deposition of chalcedony from H_2O solutions. CH. ABS. (e)

Thermal analysis of chrysotile asbestos. F. V. SUIROMATNIKOV (Bull. Soc. nat. Moscou, Sect. Geol., 1934, **12**, 137—149).—Many chrysotile samples showed, when heated, an endothermic reaction (70—100°) due to loss of adsorbed H_2O, an exothermic reaction (max. 400°) due to escape and combustion of C compounds, and oxidation of FeO, an endothermic reaction (max. 725°), due to separation of constitutional H_2O, and an exothermic reaction (600—800°) due to olivine formation. There was no evidence of a brucite stage near 400°. The probable formula was $(OH)_2Mg_{12}Si_8O_{27},7H_2O+aq.$ CH. ABS. (e)

Dependence of chemical composition of sedimentary iron ores on the conditions of their formation. A. D. ARCHANGELSKI and E. V. KOPTSCHENOVA (Bull. Soc. nat. Moscou, Sect. Geol., 1934, **12**, 262—278).—Ores formed in an oxidising medium have a much higher average content of P, As, and Cr than siderites or oxidised siderites formed in a reducing medium. V is always present in ores of the former type and absent in the latter. CH. ABS. (e)

Igneous rocks from the iron-producing district of Bilbao (Vizcaya), Spain. H. SERVICE (Bull. Inst. Min. Met., 1935, No. 372, 17 pp.).—The primary ore, chalybite, is a metasomatic replacement of limestone by Fe-bearing, carbonated, hydrothermal solutions. Later oxidation of this gave hæmatite and limonite. The associated igneous rocks are also carbonated. Descriptions are given of carbonated gabbro, olivine-dolerite, spilite, and trachyte. L. J. S.

Origin of iron ores in Singhbhum, India. J. A. DUNN (Econ. Geol., 1935, **30**, 643—654).—The associated banded quartzites are not sedimentary, but are due to secondary silicification of material now represented by ferruginous, chloritic or C shales or phyllites, many of which originated as tuffs. This silicification was probably in part contemporaneous with deposition of the beds, and resulted from thermal activity accompanying the formation of the volcanic series. The Fe was derived partly from oxidation of tuffs and flows *in situ*, and partly represents a wash from the latter. Later solutions rearranged the Fe content to give the massive Fe ores. L. S. T.

Fictitious occurrences of iron silicide (ferrosilicon). L. J. SPENCER (Min. Mag., 1935, **24**, 160—164).—Bright, steel-grey pellets and nodules of FeSi, very resistant to acids (except HF) and to weathering, are sometimes present in commercial CaC_2. These have been found at various times in strange situations, and have been described as new minerals or thought to be meteorites. Finds in the concentrates of gold dredgers in British Guiana and in the diamond fields of South Africa are readily explained by the use there of acetylene flares. Crystals of FeSi are tetrahedral-cubic. L. J. S.

Geological significance of magnetic properties of [iron] minerals. C. W. DAVIS (Econ. Geol., 1935, **30**, 655—662).—Lodestones are of variable composition and the manner and degree of their magnetisation are accidental. Their actual magnetic properties show little relation to their present state of magnetisation. If coercive forces and remanences are large enough, many natural and artificial magnetites will simulate lodestones after magnetisation. Fe oxides formed by regulated dehydration of $\gamma\text{-}Fe_2O_3,H_2O$ (lepidocrocoite) are strongly ferromagnetic and have high coercive force and remanence, whilst $\alpha\text{-}Fe_2O_3,H_2O$ (goethite) forms ordinary Fe_2O_3 on dehydration. The diagnostic possibilities of magnetites for ore genesis are discussed. L. S. T.

Porphyrins in coal. A. TREIBS (Annalen, 1935, **520**, 144—150).—Porphyrins were detected in the C_5H_5N extracts of 22 out of 30 samples of coal in quantities varying from 0.5 to 2000×10^{-6} g. per 30 g. of coal. Ætioporphyrins are most common, acid porphyrins only being detected in a few cases. Deoxyphyllerythro- and meso-ætioporphyrin are found only in one type (cannel and boghead coal). Deuteroætioporphyrin is common and was identified spectroscopically. The porphyrin content of other mineral materials is tabulated. J. W. B.

Resins in bituminous coals. H. WINTER (Angew. Chem., 1935, **48**, 610—614).—A review is given, with photomicrographs, of their composition, properties, and probable method of formation. S. M.

Fossil resins in brown coals. H. STEINBRECHER (Angew. Chem., 1935, **48**, 608—610).—Two classes are distinguished. (a) "Bituminous" resins which are intimately mixed with up to about 78% of a wax and are distributed throughout the coal so that they are extractable only by means of suitable solvents, e.g., C_6H_6-EtOH, after swelling in C_5H_5N. After removal of the wax they are sol. in C_6H_6, $COMe_2$, Et_2O, etc. They are dark reddish-brown and transparent in thin layers. (b) "Retinite" resins which occur less frequently in hard, brittle, wax-free pieces of varying size (origin, d, m.p., and C, H, and O contents of 9 samples are tabulated). They are only partly sol. in common org. solvents and have a

yellow to bright reddish-brown colour. Both types probably had their origin in the same class of tree (Conifers) as amber because (i) their acid and sap. vals. and elementary analyses (tabulated) are on the whole comparable, and in both cases (ii) free rosin acids have been detected, (iii) distillation yields small quantities of succinic acid. The (b) type exuded from the tree before submersion, and underwent oxidation and polymerisation, whereas the (a) type remained enclosed in the plant cells. The effect of these resins on the coal and some of their uses are discussed.

S. M.

Silurian petroleum in Central Asia. S. N. SIMAKOV, N. A. SCHVEMBERGER, and O. S. VIALOV (Compt. rend. Acad. Sci. U.R.S.S., 1935, 2, 567—

568).—Petroleum-bearing shales at the mouth of the Kschtut (112 km. east of Samarkand) are described, with evidence that they belong to the Silurian period.

R. S. B.

Silurian petroleum in Central Asia. N. A. SCHVEMBERGER (Compt. rend. Acad. Sci. U.R.S.S., 1935, 2, 569—571).—The petroleum-bearing shales of Kschtut contain 2% of org. compounds, and cover a layer of bituminous combustible shale. The origin of the petroleum is discussed.

R. S. B.

Basaltic soils in Fukuoka Prefecture. R. KAWASHIMA (Bull. Agric. Chem. Soc. Japan, 1935, 11, 108—109).—The soils are mainly sub-allitic in nature. Analyses are given.

P. G. M.

Organic Chemistry.

Classification of catalytic reactions in organic chemistry. II. Method of finding a complete system of doublet reactions and the calculations for the atoms H, C, N, O, S, Cl and the linkings from 0 to 4. A. A. BALANDIN (J. Phys. Chem. U.S.S.R., 1934, 5, 679—706).—By means of a matrix formulation a possible 810,000 compounds are classified in such a way that reactions can be generalised by means of classification symbols. The method is applied particularly to hydrogenation.

CH. ABS. (r)

Reaction of paraffins with olefines. V. N. IPATIEV and A. V. GROSSE (J. Amer. Chem. Soc., 1935, 57, 1616—1621).—In the presence of suitable catalysts paraffins and olefines react thus : $>$CH$+>$C:C$< \rightarrow$ $>$C·C·CH$<$. C_3H_6 and higher olefines are polymerised by BF_3 step by step at room temp., but C_2H_4 reacts only if finely-divided metals, e.g., Ni, are present. Paraffins are unaffected by BF_3 at 50°. Paraffins with a tert.-C are alkylated at 10—30°/5—20 atm. in presence of BF_3, finely-divided Ni, and H_2O (or anhyd. HF). CHMe$_3$ with C_2H_4 gives mixtures of hydrocarbons, C_5 to C_8, mostly C_6H_{14} and C_8H_{18}, and with isobutylene 32% of C_8H_{18} and 15% of $C_{12}H_{26}$. isoPentane and C_2H_4 give mostly C_7H_{16} and C_8H_{18}. ββδ-Trimethylpentane and C_2H_4 give a mixture of paraffins and high-boiling olefines. BF_3 reacts by formation of complexes with the olefine. R. S. C.

Thermal decomposition of n-pentane. J. J. MORGAN and J. C. MUNDAY (Ind. Eng. Chem., 1935, 27, 1082—1086).—The gaseous products from the pyrolysis of C_5H_{12} with and without steam (in a SiO_2 reactor without catalysts) were examined. At 600° the rate of decomp. is not changed by moderate dilution with steam (although at partial pressures < 50 mm., the rate falls); this indicates a reaction of the first order. The proportions of CH_4, C_3H_6, C_3H_8, and Δ^α-butene are not affected by decreases in partial pressure (< 1 atm.), but increasing the dilution decreases the C_2H_6 and increases the C_2H_4 and H_2. This change is also well marked at higher temp. This may be explained by applying the free radical hypothesis of Rice to the reaction $C_5H_{12} \rightarrow C_3H_6+C_2H_6$ (or

$C_2H_4+H_2$). C_2H_2 and $\Delta^{\alpha\gamma}$-butadiene were detected in the products of the pyrolysis at 700—800°, the formation of the former being favoured by dilution with steam. Slight evidence of the formation of aldehydes was obtained, but no significant formation of CO or CO_2 occurs up to 800° from any reaction between steam and hydrocarbon.

C. C.

Preparation of certain alkenes, alkadienes, and alkines. S. P. MULLIKEN, R. L. WAKEMAN, and H. T. GERRY (J. Amer. Chem. Soc., 1935, 57, 1605—1607).—Unsaturated hydrocarbons are prepared by the Grignard reaction. The following appear to be new. δ-Methyl-Δ^β-heptene, b.p. 113·8—114·1°, and -octene, b.p. 137·3—137·9°; δε-, b.p. 135—136·1°, and δζ-dimethyl-Δ^β-heptene, b.p. 129·5—130·1°; δεε-trimethyl-Δ^β-hexene, b.p. 128·7—129·5°; δ-methyl-$\Delta^{\alpha\epsilon}$-heptadiene, b.p. 110·5—110·9°; δε-dimethyl-$\Delta^{\beta\zeta}$-octadiene, b.p. 152·9—153·8°; $\Delta^{\beta\beta}$-octadiene, b.p. 133·5—134°; ββ-dimethyl-$\Delta^{\gamma\delta}$-hexadiene, b.p. 107·4—108°. Physical data for these and 24 other hydrocarbons are reported.

R. S. C.

Recovery of Δ^β-butene from air by silica gel. I. A. VOLSHINSKI, V. A. GLOBOV, and Z. A. CHRENOVA (Sintet. Kautschuk, 1934, No. 1, 1—12).—The SiO_2 gel was activated by heating in an electric furnace for 3·5—4 hr. at 270—280°. The average absorption was 4 wt.-% of (CHMe)$_2$ at 20° (max. 5%), with a speed of air passage of 0·0025—0·1295 m. per sec. The gas was recovered (75—94 wt.-%), and the gel regenerated, by heating to 200—225°, the regenerated gel being somewhat less adsorptive.

CH. ABS. (e)

Gadusene.—See this vol., 1264.

Preparation of alkyl bromides by the phosphorus tribromide method. II. Preparation of hexyl, cyclohexyl, and tert.-amyl bromides. C. L. TSENG, M. HSU, and M. HU (Sci. Quart. Nat. Univ. Peking, 1935, 5, 371—374).—PBr_3 is slowly added to the cold alcohol and the mixture gently refluxed. The product is separated, washed with conc. H_2SO_4, and distilled under ordinary pressure. On keeping, hexyl and tert.-amyl bromide lose HBr and become unsaturated. cycloHexyl bromide is comparatively stable.

H. G. H.

Preparation of *n*-butyl bromide. C. L. Tseng, T. S. Ho, and P. T. Chia (Sci. Quart. Nat. Univ. Peking, 1935, **5**, 375—381).—Of four methods for the prep. of Bu^aBr the most satisfactory was that involving the use of $HBr-H_2SO_4-Bu^aOH$ (Kamm and Marvel, " Org. Syntheses," coll. vol., 1932, I, 26, 33).
H. G. M.

Action of inorganic bases on (A) *isobutyl* bromide, (B) *tert*.-amyl halides. (A) H. E. French and W. H. Wade. (B) H. E. French and A. E. Schaefer (J. Amer. Chem. Soc., 1935, **57**, 1574—1576, 1576—1578).—(A) $Bu^{\beta}Br$ does not rearrange before reaction with aq. KOH, NaOH, or AgOH. Reaction is faster in more dil. solution, but H_2O does not react. Increase in temp. or concn. of alkali increases the proportion of olefine formed. In all circumstances alcohol formation predominates over that of olefine.

(B) Similar results are recorded for *tert*.-amyl chloride and bromide with various alkalis. The chloride gives slightly more olefine than does the bromide.
R. S. C.

Action of zinc dust and alcohol on the hydrochlorides of gutta-percha and balata. T. Hardie and J. A. Mair (J.C.S., 1935, 1239—1241).—Prolonged action of gutta-percha hydrochloride in boiling $C_2H_4Cl_2$ with Zn–EtOH gives *α-monocyclogutta-percha*, $(C_5H_8)_x$, m.p. 85—90° after softening at 70°, and some of the *β-isomeride*, m.p. 84—86° after softening at 65—68°. The unsaturation of both isomerides is half that of gutta-percha, which indicates that cyclisation has occurred (cf. A., 1926, 840). Similarly prepared, *α*- and *β-monocyclobalata* have m.p. 100—105° and about 100° (after softening at 85—90°), respectively. The cyclised products have a mol. wt. (Rast) of 2000—4000 depending on the concn. Neither *α*-isomeride distils even at 360°/2—3 mm., but poly*cyclo*-compounds are formed (cf. A., 1926, 841) which have an unsaturation of about 25% of the original hydrocarbon. Reduction (Pd–H_2) is not accomplished at atm. pressure and room temp., but the isomerides yield hydrochlorides and hydrobromides which have cyclic structures as indicated by their *d*.
J. L. D.

Electrolysis of organic substances in non-aqueous media. I. G. Giacomello (Gazzetta, 1935, **65**, 546—554).—Electrolysis of solutions of NaOMe in anhyd. MeOH gives, at the cathode, H_2, CH_4, CO, CO_2, and, at the anode, CH_2O and HCO_2H. Me_2SO_4 gives at the cathode H_2, CH_4, CO, and O_2. NaOAc gives at the cathode H_2, CH_4, CO_2, O_2, and CO, and at the anode, C_2H_6, CO_2, CH_4, H_2, O_2, CO, and unsaturated hydrocarbons; the solution contains CH_2O, $CHO \cdot CO_2H$, and HCO_2H. Proportions of products vary with conditions. The results are discussed on the hypothesis that MeOH ionises thus : $OH' + Me^{\cdot} \rightleftharpoons MeOH \rightleftharpoons MeO' + H^{\cdot}$. E. W. W.

Manganous ethoxide. Preparation and hydrolysis. B. Kandelaky, I. Setaschwili, and I. Tawberidge (Kolloid-Z., 1935, **73**, 47—49).—The prep. of $Mn(OEt)_2$ from $MnCl_2$ and NaOEt is described. Sols of $Mn(OH)_2$ are formed by hydrolysis of $Mn(OEt)_2$ and can be stabilised by addition of protective colloids.
E. S. H.

Equilibrium between *n*-propyl alcohol, propyl ether, and water at 190°. N. G. Gajendragad and S. K. K. Jatkar (J. Indian Chem. Soc., 1935, **12**, 486—493).—84% of Pr^aOH is converted into Pr_2O at 190°. Pr_2O is more stable at 230° than PrOH, whence it is inferred that Pr_2O is not an intermediate in the formation of C_3H_6. R. S.

Crystalline and gelatinous salts of phosphoglyceric acids. C. Neuberg and W. Schuchardt (Biochem. Z., 1935, **280**, 293—296 ; cf. A., 1934, 1202 ; this vol., 471).—*r*-β-Phosphoglyceric acid (I) has less tendency to yield gelatinous *salts* (Fe^{II}, Co^{II}, Cd, Mn^{II}, UO_2) than has the *d*(—)-acid, and of the *dl*-α-acid (II) only the UO_2 salt has been obtained as a jelly (the *Cd* salt is amorphous). The prep. of cryst. *Ba* and *benzidine* salts of (I) and (II) and of the gelatinous salts is described. W. McC.

Platinous complexes [with alkyl sulphides].—See this vol., 1335.

Vulcanisation reactions. K. H. Meyer and W. Hohenemser (Helv. Chim. Acta, 1935, **18**, 1061—1066).—Evidence in favour of the view that cold vulcanisation of caoutchouc proceeds according to $2 \cdot CMe:CH \cdot + S_2Cl_2 \rightarrow S(\cdot CH \cdot CMeCl \cdot)_2 + S$ is afforded by extraction of about 50% of the S from the product by Na_2S, but not by CS_2 or $COMe_2$, and by its reaction with MeI to yield a sulphonium iodide the I content of which corresponds with the presence of about 1% of sulphide-S ; under the conditions employed, SH does not react with MeI. Hot vulcanisation in the absence of accelerators gives products with 3% and 4% of sulphide-S. Experiments with *cyclo*hexene and S at 140—150° establish the formation of *cyclo*-hexyl mercaptan (I), b.p. 38—39°/12 mm. [*cyclo*-*hexyl* 2 : 4-*dinitrophenyl sulphide* (II), m.p. 147°], and *dicyclohexyl sulphide*, b.p. 130—132°/11 mm., m.p. —8° (*methiodide*, m.p. 110·5°). The requisite H is probably derived from (I), which is thus partly converted into (II). S + boiling styrene give exclusively 2 : 4-diphenylthiophen, m.p. 119—120°, whereas $CPh_2:CHPh$ and S scarcely react at 180°.
H. W.

Reaction between sulphur dioxide and olefines. II. Propylene. M. Hunt and C. S. Marvel (J. Amer. Chem. Soc., 1935, **57**, 1691—1696 ; cf. A., 1934, 1095).—Polypropylene sulphone (I) (from SO_2 and C_3H_6) is
$$H[\cdot CHMe \cdot CH_2 \cdot SO_2 \cdot CH_2 \cdot CHMe \cdot SO_2 \cdot CHMe \cdot CH_2 \cdot SO_2]_n \cdot OH$$
The C·S skeleton is proved by degradation by hot 5% Na_2CO_3 to the *ether-sulphone* (II), $O{\small\begin{smallmatrix} CHMe \cdot CH_2 \\ CHMe \cdot CH_2 \end{smallmatrix}}SO_2$, m.p. 101°, and by hot 10% aq. NaOH to MeCHO-resin (1 mol.) and $Me \cdot SO_2 \cdot CH_2 \cdot CHMe \cdot SO_2Na, + H_2O$ (III) (1 mol.), the structure of both these sulphones being proved by synthesis. Cold *N*-alkali gives a product, m.p. 320°, shown to be $SO_2{\small\begin{smallmatrix} CHMe \cdot CH_2 \\ CHMe \cdot CH_2 \end{smallmatrix}}SO_2$ (IV) (cf. this vol., 604). The terminal OH is proved by the solubility of (I) in alkali and its reaction with PCl_5 (with or without preliminary H_2O_2-oxidation) to give a *sulphonyl chloride*; the N content of the derived *anilide*, m.p. 240—255° (decomp.), shows that $n = 19$—

20. Linkage of the two *sec.*-C as a sulphinic ester is not excluded, but is improbable. (III) with aq. $HgCl_2$ at 90° gives the *substance*, $Me \cdot SO_2 \cdot CH_2 \cdot CHMe \cdot HgCl$, m.p. >200°, with Br–CCl_4 *Me β-bromo-β-sulphino-n-propyl sulphone*, m.p. 76°, and with H_2O_2 *Me β-sulphono-n-propyl sulphone* (V) (*Na* salt; *sulphonyl chloride*, m.p. 100°; *sulphonanilide*, m.p. 105°). *Na β-bromopropane-α-sulphonate* (from $Br \cdot [CH_2]_3 \cdot Br$ and Na_2SO_3 in aq. EtOH) and NaSMe give *Na β-methylthiolpropane-α-sulphonate*, oxidised by $KMnO_4$ to *Me α-sulphonopropyl sulphone* (*chloride*, m.p. 65°). *β-Methylthiolisopropyl alcohol* (from $Pr^\beta Br$ and NaSMe), b.p. 67°/20 mm., with $SOCl_2$ gives the *chloride*, b.p. 67°/37 mm., which with aq. Na_2SO_3 affords *Na α-methylthiolpropane-β-sulphonate*, oxidised by $KMnO_4$ to (V). (IV) and hot 10% NaOH give a product, converted by H_2O_2 into (V). Na_2S and $(CH_2Cl \cdot CHMe)_2O$ in hot EtOH give 2 : 6-*dimethyl-p-thioxan*, b.p. 172°, oxidised, best by CrO_3 in AcOH, to (II).   R. S. C.

Mechanism of three-carbon tautomerism. D. J. G. IVES and H. N. RYDON (Nature, 1935, **136**, 476—477).—Equilibration measurements of vinylacetic (I), crotonic, and butyric acids in presence of 1·05 mols. of NaOH in dil. D_2O at 100° show that substantial interchange occurs in the case of (I). The results indicate a parallelism between isotopic interchange and isomerisation, and that purely intramol. mechanisms for three-C tautomerism are unacceptable.   L. S. T.

Electroreduction of unsaturated acids.—See this vol., 1205.

Catalytic chlorination of acetic acid. L. D. LJUBARSKI (Ber. Ukrain. wiss. Forsch.-Inst. phys. Chem., 1934, **3**, 85—91; cf. Brückner, A., 1927, 959).—$CH_2Cl \cdot CO_2H$ (I) is prepared by passing dry Cl_2 (5 c.c. per sec. increasing to 10—12 c.c. per sec.) into AcOH containing 1% of I, 2% of red P, and 4% of PCl_5, and heated on the water-bath. The product is cooled and (I) filtered off; the filtrate may be further chlorinated.   CH. ABS. (*r*)

Compound of stannic chloride and acetic acid. —See this vol., 1333.

Fractional distillation in a vacuum as a method of purifying fats. I. Application to alkyl oleates. L. KEFFLER (Bull. Soc. chim. Belg., 1935, **44**, 425—434).—Single fractionation is insufficient to purify alkyl oleates, as is shown by heats of combustion; after repeated fractionation, the following vals. are found : Me, 9562; Et, 9632; Pr^α oleate, 9699 g.-cal. per g.   E. W. W.

Polymerisation of unsaturated fatty acids. J. K. CHOWDHURY, A. C. CHAKRABORTY, and A. MAJUMDER (J. Indian Chem. Soc., 1935, **12**, 441—454).—Oleic acid is polymerised at 100° by $SnCl_4$ in CO_2 with evolution of HCl and CO_2. The properties of the product depend on the amount of $SnCl_4$ used. The I and acid vals. diminish whilst *d* and *η* increase as polymerisation progresses. The highest average mol. wt. (determined cryoscopically) was 1610; Staudinger's method for the determination of the mol. wt. is inapplicable. Stearic acid was formed during the polymerisation. The properties (mol. wt., *d*, *n*, *η*, I and acid vals.) of the product when $ZnCl_2$, $AlCl_3$, $SbCl_3$, and $BiCl_3$ are used as catalysts are also tabulated. Polymerisation is diminished considerably when Me or glyceryl oleate is employed. Linoleic acid is polymerised differently by means of $SnCl_4$; the acid val. remains nearly const., whilst the I val. falls rapidly. When ricinoleic acid is polymerised by this method, the Ac val. falls, whilst the acid and I vals. remain const. (except when >20 vol.-% of $SnCl_4$ is used). Decarboxylation of these products gives viscous hydrocarbons similar to lubricating oils obtained from petroleum. The modes of polymerisation are discussed.   H. G. M.

(A) **Synthesis of esters of oleic and elaidic acids.** (B) **Relative velocities of hydrogenation of esters of oleic and elaidic acids.** A. K. PLISOV and V. P. GOLENDEEV (Rep. U.S.S.R. Fat and Margarine Inst., 1935, No. 2, 3—11, 12—21).—(A) The following esters are described : Pr^α, b.p. 216—220°/14 mm., Pr^β, b.p. 215—217°/14—15 mm., Bu^α, b.p. 223—227°/14—15 mm., Bu^β, b.p. 220—224°/12—13 mm., and *allyl oleate*, b.p. 218—221°/12—13 mm., Bu^α, b.p. 224—227°/14 mm., Bu^β, b.p. 222—226°/12—13 mm., and *allyl elaidate*, b.p. 215—220°/13—15 mm. Isomerisation of oleic to elaidic acid takes place in presence of oxides of N, but not of H_2SO_4.

(B) The velocity of hydrogenation (Pd-black) of the above esters of oleic acid is slightly > that of those of elaidic acid, whence it is concluded that oleic acid has the *cis*-configuration.   R. T.

Behaviour of iodostarin in light. E. BAUR (Helv. Chim. Acta, 1935, **18**, 1149—1156).—Irradiation of iodostarin in $CHCl_3$ causes dissociation into tariric acid and I, $Me \cdot [CH_2]_{10} \cdot CI \colon CI \cdot [CH_2]_4 \cdot CO_2H \rightleftharpoons Me \cdot [CH_2]_{10} \cdot C \colon C \cdot [CH_2]_4 \cdot CO_2H + I_2$; the change is reversible and follows the law of mass action at room temp., whereas at higher temp. deviations from this behaviour are observed. In so far as the equilibrium in light obeys the law of mass action, it is independent of the strength of the light. The rates of formation and decomp. directly $\propto$ strength of the light. Decomp. is caused by the rays absorbed by I, and photolysis must therefore be regarded as sensitised by I.   H. W.

Oiticica fat [oil] and its fundamental difference from Chinese wood oil. C. P. A. KAPPELMEIER (Fettchem. Umschau, 1935, **42**, 145—152).—The characteristic acid of oiticica oil, which corresponds with the " couepic acid " of van Loon and Steger (A., 1932, 498; 1931, 1034), now termed α-couepic acid (I), is converted by exposure to light in the presence of traces of I into the comparatively stable β-*couepic acid* (II), m.p. 101—102°, presumably a geometrical isomeride (stable cryst. *K*, m.p. > 200°, and NH_4, m.p. 127°, salts; unstable *Me* ester, m.p. 41°; *semicarbazone*, m.p. 134—137°), hydrogenated to a ketostearic acid (*hexahydrocouepic acid*, $C_{18}H_{34}O_3$, m.p. 96—97° (*semicarbazone*, m.p. 135·5°), which appears identical with the hexahydrolicanic acid of Brown and Farmer (this vol., 607). Hence (I) and (II) are probably identical with licanic and *iso*licanic acids, respectively; probably also the cryst. acid, of m.p. 94° (Wilborn and Löwa, B., 1930, 25), was (II). Acids of the elæostearic series may be present in oiticica oil as well as (I) and (II).   E. L.

Auto-esterification of lactic acid.—See this vol., 1328.

Polymembered heterocyclic compounds. VIII. Polymembered mono- and poly-lactone rings. M. STOLL and A. ROUVÉ (Helv. Chim. Acta, 1935, **18**, 1087—1125; cf. A., 1934, 1201).—The behaviour of $OH·[CH_2]_3·CO_2H$ (I) in boiling C_6H_6 shows that autocatalysis caused by H from (I) depends on the presence of H_2O, and that when the $[H_2O]$ has reached a min. (I) is relatively stable at 80°. Addition of $PhSO_2H$ causes immediate and complete formation of lactone. Extension of the observations to higher OH-acids shows that under the chosen conditions the final result of attempted lactonisation is not appreciably affected by hydrolytic, esterifying, or resinifying counter-reactions with rings containing > 8 members. The % composition of the reaction products therefore gives a complete picture of the course of the change in the prep. of the lactones. Conclusions as to the order of reaction cannot be based on volumetric determinations of the rate of change in those cases in which the reactions may be accompanied by simultaneous polymerisation and ring formation. Also deduction of the degree of polymerisation from the volumetrically determined reaction coeff. of the first order is inadmissible. Every apparently unimol. change must be controlled by gravimetric analysis of the products. The influence of the consecutive reactions caused by simultaneous polymerisation and ring formation on the volumetrically-determined rates of reaction is determined and discussed for rings of different size, and the influence of polymerisation on the mean velocity coeff. is elucidated. The cyclisation const. is more precisely defined; it may be directly ∝ the frequency of intramol. collisions. The physical consts. of mono- and poly-lactone rings are discussed in relationship with the spatial structure of the rings. Similarity in structure causes a close analogy between the properties of mono- and tri-lactones. The theory of min. ring formation is extended, more closely defined, and brought into harmony with observed data by involving energy relationships. The following compounds appear new : ε-*hydroxyhexo-mono-*, b.p. 98—100°/9 mm., and *-tri-*, b.p. 190—205°/0·3 mm., *-lactone*; ζ-*hydroxyhepto-mono-*, b.p. 97—117°/0·45 mm., *-di-*, m.p. 40—41°, and *-tri-*, b.p. 202—205°/0·3 mm., *-lactone*; η-*hydroxyocto-mono-* and *-di-*, b.p. 150—152°/0·3 mm., m.p. 92·5—93·5°, *-lactone*; θ-*hydroxynono-mono-*, b.p. 71—78°/0·5 mm., *-di-*, b.p. 155—158°/0·03 mm., m.p. 56—57°, and *-tri-*, m.p. 20°, *-lactone*; ι-*hydroxydeco-mono-*, b.p. 67—75°/0·3 mm., m.p. 4—5°, *-di-*, b.p. 190—192°/0·3 mm., m.p. 96—97°, and *-tri-*, m.p. 28—29°, *-lactone*; κ-*hydroxyundeco-mono-*, b.p. 58—60°/0·04 mm., m.p. < 0°, *-di-*, m.p. 71·5—72°, and *-tri-lactone*; λ-*hydroxydodeco-mono-*, b.p. 88—90°/0·25 mm., m.p. 0°, *-di-*, m.p. 100—101°, and *-tri-lactone*; μ-*hydroxytrideco-mono-*, b.p. 139—142°/10 mm., m.p. 20—21°, and *-di-*, m.p. 80—81°, *-lactone*; ν-*hydroxytetradeco-mono-*, b.p. 106—109°/0·2 mm., and *-di-*, m.p. 106—107°, *-lactone*; χ-*hydroxypentadeco-mono-*, b.p. 105—107°/0·01 mm., m.p. 34—35°, *-di-*, m.p. 103—107°, and *-tri-*, m.p. 70—72°, *-lactone*; π-*hydroxyheptadeco-mono-*, b.p. 135—138°/0·2 mm., m.p. 40—41°, and *-di-*, m.p. 96—97°, *-lactone*; ρ-*hydroxyoctadeco-mono-*, b.p. 136—138°/0·15 mm., m.p. 36—37°, *-di-*, m.p. 113—114°, and (?) *-tri-*, m.p. 80—90° *-lactone*; ψ-*hydroxytricoso-mono-*, b.p. 174—176°/0·2 mm., m.p. 35—36°, and *-di-*, m.p. 104—105°, *-lactone*; ν-*pentadeco-mono-*, b.p. 108—109°/12 mm., and *-di-*, m.p. 117·5—118°, *-lactone*. Diethylene glycol, Na, and $CH_2Br·[CH_2]_9·CO_2Me$ (II) yield after hydrolysis of the product, the *acid* $C_{15}H_{30}O_5$, m.p. 52—53°, whence the *mono-*, b.p. 120—125°/0·11 mm., and *di-*, m.p. 54·5—55°, *-lactone*. Similarly, trimethylene glycol and (II) give the *acid* $C_{14}H_{28}O_4$, m.p. 50—50·5° (*Et* ester, b.p. 164—167°/0·1 mm., m.p. 22—23°), whence the *mono-*, b.p. 88—90°/0·01 mm., m.p. 14—15°, and *di-*, m.p. 59—60°, *-lactone*. H. W.

Oxidation of oxalic acid by iodic acid.—See this vol., 1334.

Calcium, strontium, barium, and magnesium oxalates.—See this vol., 1338.

Oxalato-compounds.—See this vol., 1335.

Oxidation of ethyl hydrogen dimethylmalonate with potassium persulphate. F. FICHTER and J. HEER (Helv. Chim. Acta, 1935, **18**, 1276—1280).—Partial hydrolysis of $CMe_2(CO_2Et)_2$ with KOH in EtOH at room temp. gives *Et H dimethylmalonate* (I), b.p. 101—102°/0·5 mm., which is oxidised by $K_2S_2O_8$ in neutral solution at 100° to CO_2, Et_2 tetramethylsuccinate (II) (yield 23·9%), and by-products among which $Pr^β CO_2Et$ (III) and $CHMe:CH·CO_2Et$ are identified. Small amounts of (II) or $(·CMe_2·CO_2H)_2$ are obtained by oxidising $CH_2Pr^β·COEt$ or $CH_2Pr^β·CO_2H$, respectively, with $K_2S_2O_8$ in addition to C_3H_8, propylene, and CO. (III) is not regarded as an intermediate in the production of (I) from (II). H. W.

Polymorphism in the series of normal fatty dicarboxylic acids. F. D. LA TOUR (Compt. rend., 1935, **201**, 479—481; cf. A., 1932, 1192).—The α-form of pimelic acid is obtained when the molten acid is allowed to cool slowly in the absence of air. It is monoclinic and has a 22·20, b 9·59, c 45·4 Å., β 137° 14′, with 32 mols. in the unit cell, whilst that of the β- (stable) form has 4 mols. The transition temp. β→α is 74—75°. The reverse change does not occur on cooling to room temp., but takes place when the α-form is ground at this temp. The α-form of azelaic acid can be obtained by a similar method, and is identical with the form obtained by Caspari (A., 1930, 139) by allowing a warm solution to cool slowly. H. G. M.

Plant growth substances. XV. Synthesis of auxin-glutaric acid and of some isomerides. F. KÖGL and H. ERXLEBEN [with, in part, R. MICHAELIS and H. S. VISSER]. **XVI. Constitutional specificity of hetero-auxin.** F. KÖGL and D. G. F. R. KOSTERMANS (Z. physiol. Chem., 1935, **235**, 181—200, 201—216; cf. A., 1934, 1332, 1419; this vol., 418).—XV. (+)-α-Methylvaleric acid passed in CO_2 over MnO at 400—420° gives (+)-γη-dimethylnonan-ε-one, which with Na and $Et_2C_2O_4$ yields 2 : 5-disec.-butyl*cyclo*pentane-1 : 3 : 4-trione (I) (*dioxime*, m.p. 109°). (I) with H_2+Pt gives 2 : 5-disec.-butyl*cyclo*pentane-1 : 3 : 4-*triol*, m.p. 110—114°, $[α]_D^{20}$ −7·8° in EtOH, which is oxidised first with $Pb(OAc)_4$ and then with alkaline N-$KMnO_4$ to

β-*hydroxy*-αα'-*disec.*-*butylglutaric acid*, m.p. 97—100°, [α]$_D^{20}$ —6·5° in EtOH. This acid is converted into a mixture of isomeric αα-di*sec.*-butylglutaric acids (II), [α]$_D^{20}$ —6·9° in EtOH, on boiling with HI and red P. One of the fractions obtained during crystallisation of the brucine salts of (II) when further resolved by means of the *cinchonidine* salt, [α]$_D^{20}$ —98·7°, has m.p. 129°, [α]$_D^{20}$ —11·3° in EtOH, and is identical with the acid C$_{13}$H$_{24}$O$_4$ obtained from auxin-*a* and -*b* by oxidation with alkaline KMnO$_4$. Bu^{a}I boiled with Et$_2$ αα'-dicarbethoxyglutarate and NaOEt gives *Et$_2$ αα'-dicarbethoxy-αα'-dibutylglutarate*, b.p. 214—220°/11 mm., which yields *αα'-dicarboxy-αα'-dibutylglutaric acid*, m.p. 178° (decomp.) [*anhydride* (III), b.p. 187—189°/11 mm., obtained by boiling the acid with Ac$_2$O for 5 hr.], on alkaline hydrolysis. (III) boiled with H$_2$O gives *αα'-dibutylglutaric acid*, m.p. 93—94° [*meso*-acid, m.p. 95—96° (*brucine* salt, [α]$_D^{20}$ —12·73° in EtOH), *r*-acid, m.p. 53—56°]. The *r*-acid is partly resolved (*l*-acid, [α]$_D^{20}$ —5·49° in EtOH; *d*-acid, [α]$_D^{20}$ +2·77° in EtOH) by means of the brucine salts (*brucine* salt of *l*-acid has [α]$_D^{20}$ —30·66° in EtOH). Octyl iodide with CH$_2$Ac·CO$_2$Et and NaOEt gives *Et octylacetoacetate*, b.p. 159°/15 mm., which with CH$_2$I·CH$_2$·CO$_2$Et and NaOEt yields *Et$_2$ α-acetyl-α-octylglutarate* (IV), b.p. 166°/0·54 mm. Alkaline hydrolysis of (IV) gives r-*octylglutaric acid*, m.p. 48° [*l*-acid, m.p. 48°, [α]$_D^{20}$ —9° in EtOH (*strychnine* salt, [α]$_D^{20}$ —28°)].

XVI. The effect of alterations in the mol. of 3-indolylacetic acid (V) on its physiological activity was examined. As regards their activity the acid and its esters form the series (V)>Me>Et>Pr^a>Pr^β. The *picrates* of the Me, Et, Pr^a, and Pr^β esters have, respectively, m.p. 125°, 84°, 105°, 100—101°. 2 : 3-*Dihydroindolyl-3-acetic acid* (*picrate*, m.p. 168°)· and its *Me* ester (*picrate*, m.p. 178°) are inactive. 1-Methylindolyl-3-acetic acid (VI) has one thousandth of the activity of (V), but its Et ester is inactive. 2-Methylindolyl-3-acetic acid is 4 times as active as (V), its Me ester being inactive. 2-*Ethylindolyl-3-acetic acid*, m.p. 100—101°, obtained from the phenylhydrazone of homolævulic acid by the action of H$_2$SO$_4$, is inactive, but 5-*methylindolyl-3-acetic acid*, m.p. 151° (from Et formylpropionate and *p*-C$_6$H$_4$Me·NH·NH$_2$), has 50 times, and its *Me* ester (*picrate*, m.p. 122—123°) 40 times, the activity of (VI). 2 : 5-*Dimethylindolyl-3-acetic acid*, m.p. 172—173° [from lævulic acid and p-C$_6$H$_4$Me·NH·NH$_2$ (p-*tolylhydrazone*, m.p. 97°)], is inactive. Indolyl-3-α-propionic acid (*picrate*, m.p. 146—147°) has one fifth of the activity of (V). *l*- and *r*-β-Indolyl-lactic acids are inactive, but 3-indolylpyruvic acid (m.p. of *compound* with AcOH 210°) is about 7 times as active as (VI). W. McC.

Constitution of aleuritic acid. H. RAUDNITZ, H. SCHINDLER, and F. PETRU (Ber., 1935, 68, [*B*], 1675—1676).—Aleuritic acid (I), m.p. 102°, obtained by alkaline hydrolysis of technical unbleached shellac, is oxidised by Pb(OAc)$_4$ in AcOH to η-aldehydo-octoic acid. Although the expected ζ-hydroxyheptaldehyde could not be isolated, it is thereby established that (I) is OH·[CH$_2$]$_6$·[CH·OH]$_2$·[CH$_2$]$_7$·CO$_2$H. H. W.

*iso*Citric [α-**hydroxypropane**-αβγ-**tricarboxylic**] **acid from blackberries.** W. F. BRUCE (J. Amer. Chem. Soc., 1935, 57, 1725—1729).—*Me$_2$ isocitrolactone* (I) (prep. from blackberries), m.p. 106—107°, b.p. 204—206°/26 mm., [α]$_{5890}^{26}$ —65° in dioxan, with alkali rapidly becomes dextrorotatory and gives solutions of the β-*Me* ester *Na$_2$* salt, CO$_2$Na·CH(OH)·CH(CO$_2$Me)·CH$_2$·CO$_2$Na, and more slowly loses the second Me to give the Na$_3$ salt. With hot *N*-HCl it affords iso*citrolactone*, m.p. 153—154°, [α]$_{5400}^{26}$ —62° in H$_2$O [*Et$_2$* ester (II), b.p. 167—169·5°/2·5 mm., [α]$_{5890}^{26}$ —54·2°], which with NaOH becomes less lævorotatory to give the Na$_3$ salt. (I) yields the *amide*, decomp. 204°, [α]$_{5800}^{26}$ —5° in H$_2$O, and *hydrazide*, m.p. 208—209° (decomp.). (I) was const. in various preps., and the variation observed by Nelson (A., 1930, 1163) was probably due to varying decomp. of his Et$_3$ ester to (II). R. S. C.

Derivatives of glycuronic acid. V. Synthesis of glycuronides. W. F. GOEBEL and F. H. BABERS (J. Biol. Chem., 1935, 110, 707—717).—By condensation with dry MeOH–Ag$_2$CO$_3$ at 0°, 1-chlorodiacetylglycuron (I) (A., 1933, 808) affords *diacetylglycuron methylglycoside* (II), m.p. 110—111°, [α]$_D^{23}$ +112·5° in CHCl$_3$, and Me 1-chlorotriacetylglycuronate (III) gives the *methylglycoside* (IV), m.p. 118°, [α]$_D^{25}$ +54·0° in CHCl$_3$. Both (II) and (IV) possess an orthoacetate

structure [as (II)], since 1 Ac
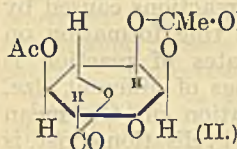
H   O–CMe·OMe is unaffected by titration with
AcO   O   a dil. base, and both are hydrolysed (unimol. *k*=0·054 and
|\ H O /| 0·025 min.$^{-1}$, respectively) with
H   O H (II.) loss of the glycosidic group by
CO   0·005*N*-HCl in aq. 95% dioxan.
Such hydrolysis of (II) affords an equimol. mixture of cryst., [α] +115° in 95% dioxan, and oily, [α] +143° in 95% dioxan, hydroxydiacetylglycuron ; (IV) similarly gives cryst., m.p. 126°, [α] +146·8° in 95% dioxan, and oily, [α] +76° in 95% dioxan, Me hydroxytriacetylglycuronate. Condensation of (I) and (III) with p-NO$_2$·C$_6$H$_4$·CH$_2$·OH–Ag$_2$CO$_3$ in CHCl$_3$ affords, respectively, the p-*nitrobenzylglycoside*, m.p. 133—134°, [α]$_D^{24}$ +39·9° in CHCl$_3$, of diacetylglycuron, and the p-*nitrobenzylglycoside*, m.p. 175—176°, [α]^{26} —57·8° in CHCl$_3$, of Me triacetylglycuronate, which, unlike (II) and (IV), are true glycosides. J. W. B.

Derivatives of *d*-galacturonic acid. II. Synthesis of methyl α-1-bromo-*d*-galacturonate triacetate and its conversion into β-methyl-*d*-galacturonide. S. MORELL, L. BAUR, and K. P. LINK (J. Biol. Chem., 1935, 110, 719—725)).—Me *d*-galactoronate 1 : 2 : 3 : 4-tetra-acetate (this vol., 608) is converted by HBr–Ac$_2$O at 0°, and then at room temp., into *Me* α-1-*bromo*-d-*galacturonate* 2 : 3 : 4-*triacetate*, m.p. 129·5—130·5°, [α]^{25} +248° in CHCl$_3$, converted by MeOH–Ag$_2$CO$_3$ into the corresponding β-1-*methylgalacturonide*, m.p. 118—120°, [α]$_D^{25}$ +15·3° in CHCl$_3$ (normal glycoside structure), hydrolysed by 0·242*N*-Ba(OH)$_2$ in aq. COMe$_2$ (N$_2$ stream) to β-1-methyl-*d*-galacturonic acid +H$_2$O, sinters (oily with rapid heating) 125—135°, m.p. 163—165° (from 95% EtOH), 159—161° (from COMe$_2$), [α]$_D^{25}$ —39·6° in H$_2$O [Ehrlich *et al.*, A., 1933, 258, give m.p. 134° (decomp.)], and anhyd., m.p. 163—165° (decomp.), [α]$_D^{25}$ —43·0° in

H_2O. Good yields are obtained in all the above stages. J. W. B.

Synthesis of *l*-ribo-γ-ketoheptonolactone (*l*-allo-ascorbic acid). M. STEIGER (Helv. Chim. Acta, 1935, **18**, 1252—1254).—Crude *l*-psicose is converted into *l*-allosazone, from which *l*-allosone (I) is obtained by means of PhCHO. Treatment of (I) with HCN and subsequent hydrolysis with HCl affords l-ribo-γ-ketoheptono-lactone (l-alloascorbic acid) (*A*), m.p. about 176—177° (decomp.), $[\alpha]_D^{21}$ +29·3° in 0·01*N*-HCl. H. W.

```
   ┌─CO
   │ Ċ·OH
 O │ Ċ·OH          (A.)
   │ ĊH
   └─ĊH
  OH·ĊH   (A.)
  OH·ĊH
     ĊH₂·OH
```

Argentometric determination of formaldehyde. J. A. FIALKOV and S. D. SCHARGORODSKI (Mem. Inst. Chem. All-Ukrain. Acad. Sci., 1934, **1**, 209—221).—CH_2O reduces $AgNO_3$ in a solution which is approx. 0·05*N* in NH_3. The Ag pptd. is dissolved in HNO_3 and determined (Volhard). CH. ABS. (*e*)

Aldol condensations. III. Formation of the chain of carotenoids by condensation of β-methyl-Δ^α-butenal. F. G. FISCHER and K. HULTZSCH (Ber., 1935, **68**, [*B*], 1726—1734; cf. A., 1931, 335).—The action of weak alkalis in H_2O on CMe_2:CH·CHO leads mainly to dehydrocitral [βζ-dimethyl-Δ^{αγε}-octatrienal] (I), which could not thus be obtained pure, whereas $NaNH_2$ in Et_2O causes synthesis along diene lines with production of 2 : 2 : 4-trimethyl-Δ^{4:6}-cyclohexadiene-aldehyde (II), b.p. 85—86°/9 mm. (*semicarbazone*, m.p. 213°). Under certain conditions (not described) linear condensation of CMe_2:CH·CHO proceeds smoothly; about 50% of the condensed material can be distilled directly in a high vac., of which about half consists of homogeneous (I), m.p. 40·5—41° [semicarbazone, m.p. 224—225° (decomp.); *phenylhydrazone*, m.p. 141—142°; p-*nitrophenylhydrazone*, m.p. 193—194°; *oxime*, m.p. 123°], and one fifth of βζκ-trimethyl-Δ^{αγεη}-*dodecapentaenal* (*farnesinal*) (III), m.p. 120—121° (*semicarbazone*, decomp. 236°; *oxime*, m.p. 192°); in addition, small amounts of red, non-volatile, more complex aldehydes are produced. Linear condensation predominates, but (II) and a monocyclic aldehyde $C_{15}H_{20}O$ of unknown structure are produced in small amount. The structure of (I) is established by catalytic hydrogenation to tetrahydrocitral, and by its oxidation by Ag_2O to dehydrogeranic acid. (I) is converted by $Al(OPr^\beta)_3$ in $Pr^\beta OH$ into γη-*dimethyl-Δ^{βδζ}-octatrienol* (*dehydrogeraniol*), m.p. 46—47°, which is very readily autoxidised. (III) cannot be oxidised by Ag_2O to the acid, the attempt to prepare which through the oxime failed on account of the stability of the cryst. *nitrile*. Hydrogenation of (III) leads to hexahydrofarnesal. Treatment of (III) with $Al(OPr^\beta)_3$ in $Pr^\beta OH$ affords γηλ-*trimethyl-Δ^{βδζθκ}-dodecapentaenol* (*farnesinol*), m.p. 136—137°. H. W.

Kinetics of oxidation of gaseous glyoxal.—See this vol., 1327.

Glyoxal. III. Syntheses with glyoxal semi-acetal; nitrolactaldehyde. H. O. L. FISCHER, E. BAER, and H. NIDECKER (Helv. Chim. Acta, 1935, **18**, 1079—1087).—Glyoxal semiacetal condenses with NO_2Me in presence of K_2CO_3 to *nitrolactaldehyde Et_2*

acetal (I), $NO_2\cdot CH_2\cdot CH(OH)\cdot CH(OEt)_2$, b.p. 136—138°/10 mm., m.p. 30°, which does not reduce boiling Fehling's solution and gives a transitory brownish-red colour with $FeCl_3$. It is hydrolysed by 0·1*N*-H_2SO_4 at 80—85° to (presumably dimeric) *nitrolactaldehyde* (II), decomp. about 160° when slowly heated or m.p. 181° (decomp.) when placed in a bath preheated to 175°. (II) reduces cold NH_3–Ag_2O and Fehling's solution if the concn. of alkali is low. It is gradually dissolved by warm H_2O to a unimol. solution. The aldehydic nature of (II) is established by the isolation of the 2 : 4-*dinitrophenylhydrazone*, m.p. 167—168°, 2 : 4-*dinitrophenylosazone*, m.p. 294—297° when rapidly heated, and the (anhydro)*dimedon* compound, $C_{19}H_{25}O_6N$, incipient decomp. 180° when slowly heated, m.p. about 190° when rapidly heated. (II) cannot be titrated (Willstätter–Schudel), but can be determined by Ripper's method. Catalytic hydrogenation (Pd–$BaSO_4$) of (I) in presence of $H_2C_2O_4$ affords *hydroxylaminolactaldehyde Et_2 acetal oxalate*, m.p. 113·5°, whereas reduction by activated Al in Et_2O gives *aminolactaldehyde Et_2 acetal*, b.p. 111—112°/10 mm. m.p. 41°, hydrolysed by fuming HCl to aminolactaldehyde hydrochloride, decomp. 143—145°. H. W.

Specific effect of zinc on the dismutation of methylglyoxal. C. NEUBERG and M. KOBEL (Biochem. Z., 1935, **280**, 297—306).—At p_H about 6·0 and 37° and 100° ZnO and $ZnCO_3$ convert AcCHO in 60 and 76% yield, respectively, into lactic acid (I), together with small amounts of reducing substances. The yield of (I) is higher (and that of reducing substances lower) with lower [AcCHO]. With $CaCO_3$ at p_H about 7·0 the yield of (I) is only 13—22% of that obtained with $ZnCO_3$. At p_H 6·4 and 100° the $NaHSO_3$ compound (II) of Ca dihydroxyacetone phosphate yields, by the action of $CaCO_3$, an amount of (I) corresponding with the AcCHO equiv. of (II), but by the action of $ZnCO_3$ it yields only 10·7% of the calc. amount of (I). W. McC.

Rate of alkaline chlorination of ketones. P. D. BARTLETT and J. R. VINCENT (J. Amer. Chem. Soc., 1935, **57**, 1596—1600).—The rates of chlorination of COPhMe, $COMe_2$, and COMeBu^γ are measured in aq. NaOH up to *M* concn. and are bimol. if the p_H is >11. They pass through a min. at a low [NaOH], but in >0·3*M*-NaOH $k \propto$ [OH']. Chlorination thus involves reaction of the enol and enolate ion with HOCl and OCl'. *k* decreases in the order of ketones given above and is more dependent on structure than is the rate of enolisation in acid solution. R. S. C.

Action of sodium or silver on ketals of symmetrical dichloro- or dibromo-acetone. N. D. PRIANISCHNIKOV and V. A. LEONTOVITSCH (Ber., 1935, **68**, [*B*], 1866—1869).—Treatment of $CO(CH_2Cl)_2$ with MeOH and HCl affords αγ-*dichloro*-ββ-*dimethoxy-propane* (I), m.p. 81·5°, less advantageously obtained by use of $CH(OAlk)_3$. αγ-*Dichloro*-ββ-*diethoxypropane* (II), m.p. 28°, and αγ-*dibromo*-ββ-*dimethoxy-propane* (III), m.p. 62·5°, are prepared analogously. (I) does not react with KI in warm MeOH. Treatment of (I), (II), or (III) with Na in xylene gives dark brown resins and a little oil which does not yield

CH$_2$:CH·CHO when warmed with H$_2$SO$_4$; with mol. Ag reaction is extremely slow, and here also there is no evidence of production of *cyclo*propanone ketals. (I), (II), and (III) are unusually stable to acid.

H. W.

Preparation of crystalline dihydroxyacetone. —See this vol., 1282.

Molecular structure of carbohydrates. W. N. HAWORTH (Chem. and Ind., 1935, 859—868).—A lecture.

H. W.

Degradation of *l*-arabinal to *l*-erythrose. G. E. FELTON and W. FREUDENBERG (J. Amer. Chem. Soc., 1935, **57**, 1637—1640).—This degradation is effected by O$_3$. Arabinose and HBr–AcOH give β-*acetobromoarabinose* (*bromoarabinose penta-acetate*), m.p. 132°, [α]$_D$ –134·8° in CHCl$_3$. Hydrogenation (Pd-black) of arabinal, m.p. 81—82°, [α]^{22} –199·5°, in EtOH gives *dihydroarabinal*, b.p. 83—85°/1 mm., [α] +48·2° in H$_2$O. Ozonisation of arabinal diacetate in AcOH gives a mixture (I) of *l*-erythrose (II), [α]$_D$ +11·5° → +30·5° in H$_2$O (isolated as 2:3-iso-*propylidenemethylerythroside*, b.p. 45—50°/2 mm., [α] +58° in CHCl$_3$, hydrolysed by 0·1N-H$_2$SO$_4$), and 4-*formyl*aldehydoerythrose (III), isolated as *Me$_2$ acetal*, [α]$_D^{23}$ +53·4° in H$_2$O. (I) and 0·75% HCl–MeOH give (III) and a *methyl-2-deoxyriboside*, m.p. 81—82°, [α] +218·5° in H$_2$O. (I) is not fermented by yeast.

R. S. C.

Determination of pentosans by reduction with furfuraldehyde. G. OSCHMAN (Brodil. Prom., 1934, **11**, No. 5, 26—28).—The sample is twice distilled with HCl (d 1·06), the second distillation serving to destroy any hydroxymethylfurfuraldehyde formed. Furfuraldehyde in the distillate is reduced with Fehling's solution, and the Cu titrated with KMnO$_4$.

CH. ABS. (*e*)

Oxidation of reducing sugars by oxygen. O. SPENGLER and A. PFANNENSTIEL (Z. Wirts. Zuckerind., 1935, **85**, 546—552).—Oxidation of glucose, fructose, and mannose in alkaline solution by O$_2$ instead of air as used by Nef (B., 1908, **31**; 1917, 1022) is accompanied by complete loss of reducing power without darkening, and in all cases the main product is arabonic acid (yield 70%), formed by fission of the terminal C atom as HCO$_2$H and oxidation of the adjacent group to ·CO$_2$H. A high yield of erythronic acid was obtained similarly from arabinose.

J. H. L.

Emil Fischer's assignment of configuration to *d*-glucose. Penta-acetates of *d*-arabitol and *d*-xylitol. R. C. HOCKETT and C. S. HUDSON (J. Amer. Chem. Soc., 1935, **57**, 1753).—The configuration of glucose is best demonstrated by the activity, [α]$_D^{20}$ +37·2° in CHCl$_3$, of d-*arabitol penta-acetate*, m.p. 74—75° (corr.), and inactivity of d-*xylitol penta-acetate*, m.p. 61·5—62·5° (corr.).

R. S. C.

Carbohydrates. V. Specificity of sugar hydroxyl groups. T. LIESER and R. SCHWEIZER. **VI. Xanthate reaction of glucose.** T. LIESER and E. LECHZYCK (Annalen, 1935, **519**, 271—278, 279—291).—V. α-Methylglucoside in C$_5$H$_5$N, even with small quantities of BzCl at low temp., gives the

2:6-*Bz$_2$* derivative, m.p. 144°, [α]$_D^{20}$ +80·37° in CHCl$_3$. Glucosemethylmercaptal forms the 6-*Bz*, m.p. 114°, glucosebenzylmercaptal the 6-*Bz*, [α]$_D$ –63·10° in COMe$_2$, thioethylglucoside the 6(?)-*Bz*, m.p. 144—145°, [α]$_D$ +67·27° in CHCl$_3$, galactose-ethylmercaptal the 6-*Bz*, m.p. 139°, [α]$_D^{22}$ +14·22° in COMe$_2$, 2-methyl-glucose-ethylmercaptal the 6-*Bz*, m.p. 134°, arabinose-ethylmercaptal the 5(?)-*Bz*, m.p. 119°, [α]$_D$ +49·48° in CHCl$_3$ [*phenylhydrazone*, m.p. 168° (decomp.)], β-phenylglucoside the 6-*Bz*, m.p. 166—167°, [α]$_D^{20}$ –31·68° in COMe$_2$, xylosebenzylmercaptal a *Bz$_2$*, m.p. 114°, and xylose a *Bz$_4$*, m.p. 178°, [α]$_D^{22}$ –47·45°, derivative.

VI. α-Methylglucoside with Ba(OH)$_2$ and CS$_2$, followed by CO$_2$ and AgNO$_3$, yields an *Ag* salt, with which MeI gives *Me α-methylglucosidyl xanthate* (I), [α]$_D^{22·5}$ +122·7° in EtOAc. This forms *Bz* (II), m.p. 125—126°, [α]$_D^{20·5}$ +61·24° in CHCl$_3$, *Bz$_3$*, m.p. 105—109°, and *Ac$_3$*, m.p. 75—76°, derivatives. Treated in H$_2$O with Ag$_2$CO$_3$, (I) liberates α-methylglucoside. With AgNO$_3$ in H$_2$O, (II) yields *benzoyl-α-methylglucosidyl methylmonothiocarbonate*, m.p. 104—105°, [α]$_D^{20}$ +77·66° in CHCl$_3$, and α-*methylglucoside 6-benzoate* (III), m.p. 174—175°, also obtained when (II) is treated in MeOH with Ag$_2$CO$_3$, and the resulting *benzoyl-α-methyl-glucosidyl Me$_2$ orthocarbonate*, m.p. 164—165°, is hydrolysed by MeOH–HCl. With BzCl–C$_5$H$_5$N, (III) yields α-methylglucoside 2:6-dibenzoate, and it is therefore regarded as α-*methylglucoside 6-benzoate*. *Me β-methylglucosidyl xanthate*, m.p. 158—159°, [α]$_D$ –5·01° in EtOH, forms *Bz*, m.p. 177—179°, and *Ac$_3$*, m.p. 112—113°, derivatives, which with Ag$_2$CO$_3$ in MeOH yield, respectively, *benzoyl*-, m.p. 187—188°, and *triacetyl*-, m.p. 108—109°, -β-*methylglucosidyl Me carbonate*. β-Phenylglucoside, Ba(OH)$_2$, and CS$_2$, followed by CO$_2$ and I, form the *compound*, C$_{26}$H$_{30}$O$_{12}$S$_4$, [α]$_D^{20}$ +150·8° in EtOH, which with Ag$_2$CO$_3$ in MeOH forms β-*phenylglucosidyl Me carbonate*, m.p. 152°, [α]$_D^{22}$ –64·97° in COMe$_2$ (*Ac$_3$*, m.p. 112—113°, [α]$_D$ –22·17° in CHCl$_3$, and *Bz*, m.p. 164—170°, derivatives). Treatment of *Ba β-phenylglucosidyl xanthate* with AgNO$_3$ gives β-*phenylglucosidyl Me xanthate*, m.p. 173—184°, [α]$_D^{20}$ –55·21° in EtOH.

E. W. W.

Fructose anhydrides. XVI. Identity of inulin from different plants. Problem of the terminal groups of inulin. H. H. SCHLUBACH and H. SCHMIDT (Annalen, 1935, **520**, 43—52).—Inulin from Jerusalem artichoke, when dried for 2 hr. at 60° in high vac., has [α]$_D^{20}$ –40·1°, and inulin from dahlia has a similar val. Inulin from chicory has a lower [α]; when the Ac derivative is fractionally pptd. and hydrolysed, only a small proportion of the product has [α]$_D^{20}$ –40·0°, the main product having [α]$_D^{20}$ –38·1°. Chicory inulin has also a shorter half-decomp. period (cf. infra). After mild hydrolysis, inulin from the above sources gives only 0·1—0·4% of aldohexose (method of Auerbach and Bodländer), and the reduction val. (Bertrand) is sometimes 0·1—0·3%, but often zero. This conflicts with the view that inulin consists of a chain of fructose units. Possible structures in which the " terminal " groups are bound are discussed.

E. W. W.

Half-decomposition period in acid hydrolysis as a constant for characterising sugar anhydrides

and glucosides. A new fructose [analysis] table. H. KNOOP (Annalen, 1935, **520**, 34—43).—The method of Schlubach and Knoop (A., 1933, 938) is modified; $1/100n$ g.-mols. of substance (n=no. of O-bridges) are treated with 100 c.c. of N-H_2SO_4 at 20°, 60°, or 100°, and the time (in min.) for 50% hydrolysis, as measured by reducing power, is compared with the following empirical vals.: inulin (Jerusalem artichoke) 389, (dahlia) 384, (chicory) 372; irisin (*Iris pseudacorus*) 225; graminin (rye) 214; sucrose 291 (all at 20°); trehalose 86 (at 100°); and other vals. previously determined. An empirical table for the determination of 10—100 mg. of fructose by the Bertrand method is given. The reducing power of fructose which has been kept for 6 hr. at 12 mm. and 20° is 100%; at 40°, 99·4%; at 60°, 97·8%; at 80°, 97·0%; at 100°, 87·1%, of the original val. E. W. W.

Rearrangement of sugar acetates by aluminium chloride. Neolactose and *d*-altrose. N. K. RICHTMYER and C. S. HUDSON (J. Amer. Chem. Soc., 1935, **57**, 1716—1721).—The discrepancy between the α recorded for altrose (A., 1926, 941; 1934, 759) is due to formation of the sugar anhydride by hot acid. α-Acetochloroneolactose (modified prep. in 45% yield from lactose octa-acetate by $AlCl_3$–PCl_5 in $CHCl_3$) with Ag_2CO_3 in aq. $COMe_2$ gives *neolactose β-hepta-acetate* (I), m.p. (+$COMe_2$) 53—54° and (anhyd.) 135—136°, [α] +10° in $CHCl_3 \rightarrow$ +21° in 3—4 days, and "α"-hepta-acetate (II), m.p. 85—95°, [α] +23·3° in $CHCl_3 \rightarrow$ +21°. (I) in Ac_2O–C_5H_5N at $-10°$ gives neolactose β-octa-acetate, m.p. 148—149°, [α] $-6·3°$ in $CHCl_3$, also obtained with 47·7% of α-octa-acetate from (II). (II) is thus a mixture of about equal parts of (I) and the true α-hepta-acetate. (I) or (II) with $Ba(OMe)_2$ in dry, cold MeOH yields neolactose, m.p. 190° (decomp.) (lit. a syrup), [α]^{20} +34·6° in $H_2O \rightarrow$ +35·5° in 20 min., which with hot N-HCl affords *d*-galactose (removed by fermentation) and a syrup (III), [α] $-91°$ in H_2O (cf. *loc. cit.*). (III) and $CH_2Ph\cdot SH$ in conc. HCl give *benzylthiol*-d-*altrose*, m.p. 121—122°, [α] +39·4° in C_5H_5N [the l-*form*, from *l*-altrose (IV), had m.p. 121—122°, and [α] $-39·2°$ in C_5H_5N], which with $CaCO_3$ and $HgCl_2$ in H_2O at 50° affords d-*altrose* (V), m.p. 103—105°, [α] +32·6° in H_2O (no mutarotation). Both (V) and (IV) in hot conc. HCl give an equilibrium mixture (VI), [α] 98°, with 57% of a non-reducing anhydride, for which [α] $-220°$ is calc. (III) is thus (VI). R. S. C.

Cardiac glucosides. XIII. Empirical formula of scillaridin *A* and its derivatives. A. STOLL, A. HOFMANN, and J. PEYER (Helv. Chim. Acta, 1935, **18**, 1247—1251).—Determinations of the equiv. of *iso*scillardic acid *A* by titration with NaOH in presence of phenolphthalein in conjunction with similar determinations with several bile acids establish the formula $C_{24}H_{30}O_3$ (not $C_{25}H_{32}O_3$) for scillaridin *A*. The formulæ of its derivatives require corresponding alteration. H. W.

Digitalis glucosides. A. STOLL (Chem.-Ztg., 1935, **59**, 773—776).—A review.

Digitalis glucosides. V. Constitution of digoxigenin. S. SMITH (J.C.S., 1935, 1305—1309).—Digoxigenin with CrO_3 in 80% AcOH at room temp.

gives a diketone, *digoxigenone*, m.p. 265° (decomp.) [*monoxime*, m.p. 235° (decomp.); *monosemicarbazone*, m.p. 268° (decomp.)]. Similarly, *iso*digoxigenin affords a *diketone*, m.p. 335° [*monoxime*, m.p. 305° (decomp.); *monosemicarbazone*, m.p. 295° (decomp.)], as does dihydrodigoxigenin to give a *diketone*, m.p. 243° (*monoxime*, m.p. 250°; *monosemicarbazone*, m.p. 260°), and anhydrodigoxigenin, a *diketone*, m.p. 260° (*dioxime*, m.p. 270° (decomp.); semicarbazone (mono- + di-), decomp. at about 260°] (also obtained from digoxigenone with warm conc. HCl). *iso*Digoxigeninic acid (A., 1931, 74) with CH_2N_2 in Et_2O gives the *Me* ester, m.p. 145° (+$MeOH$, m.p. 156°), oxidised (Kiliani's reagent) to *Me* iso*digoxigenonate*, m.p. 248°, as a result of the oxidation of two CH·OH groups. *iso*Digoxigenin with boiling EtOH–10% NaOH, followed by treatment with NaOBr, gives iso*digoxigenic acid*, m.p. 235° (decomp.) (*pyridine* salt, m.p. 260°; *Me* ester, m.p. 208°), oxidised to iso*digoxigonic acid*, m.p. 260° (*Me* ester, m.p. 253°). Digoxigenone with warm 10% MeOH–KOH gives *iso*digoxigenone. The reaction is accomplished by participation of the *tert.*-OH (cf. A., 1931, 74) (moreover, *iso*digoxigenin gives a Ac_2 derivative and forms no anhydro-compound). The *tert.*-OH is assigned position 14 in the digitoxigenin skeleton, this being the nearest position available to the lactone group, which is probably at C17 by analogy with the close similarity in properties and interrelationships in this series with those of the digitoxigenin series (cf. A., 1934, 1355; this vol., 497). One CH·OH is probably in position 3. J. L. D.

Molecular sizes of methylated oligosaccharides. Significance of molecular weights by Hess and collaborators. F. KLAGES (Annalen, 1935, **520**, 71—87).—The chain theory of cellulose structure is supported. Low vals. of mol. wts. (M) determined cryoscopically are due to non-applicability of Raoult's law. The dialysis coeff. (D) of MeOH, EtOH, glycerol, glucose, sucrose, lactose, raffinose, two tetramethylglucoses, β-pentamethylglucose (I), β-octamethylcellobiose (II), β-hendecamethylcellotriose (III), and hendecamethylraffinose (IV) are determined by a modification of Brintzinger's apparatus (A., 1931, 416), using a Cellophane membrane. The constancy of $DM^{\frac{1}{3}}$ (cf. *loc. cit.*) does not hold for higher vals. of M, for which DM is more nearly const.; in the same class, substances of equal M have, however, equal D. Thus D of (IV) and (V) are approx. equal, indicating that (IV) has M 658. Velocity of partial hydrolysis of (I), (II), and (III) is measured; α agrees with the calc. vals. From (III), 2 : 3 : 6-trimethyl-β-methylglucoside and *heptamethylcellobiose*, m.p. 81—83°, b.p. 190—195°/0·3 mm., are obtained. The mol. wt. of (III) as determined cryoscopically by the method of Karagunis (A., 1931, 169) shows apparent dissociation, but (IV) gives similar results, the apparent mol. wt. decreasing in each case with increasing dilution. Possible reasons for this are discussed. E. W. W.

Polysaccharides. XXII. Constitution and molecular structure of α-amylodextrin. W. N. HAWORTH, E. L. HIRST, and A. C. WAINE (J.C.S., 1935, 1299—1303).—Amylose (this vol., 1226) with barley amylase in H_2O at 55° affords α-amylodextrin

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(I), which is sol. when fresh in cold H_2O, and gives a characteristic reddish-violet colour with I. (I) with Ac_2O in AcOH containing Cl_2 and SO_2 at 50° affords an acetate, mol. wt. 12,000 (about 40 glucose units), whereas with Ac_2O–C_5H_5N at room temp., two Ac derivatives are formed; one (II), sol. in $COMe_2$, is similar to the above, but has mol. wt. 22,000 (about 80 glucose units), and the other, insol. in $COMe_2$, resembles an amylopectin. The acetate of mol. wt. 12,000 with Me_2SO_4 in $COMe_2$–30% NaOH gives a OMe-derivative, mol. wt. 8000, determined viscosimetrically (about 40 glucose units), which indicates the absence of mol. disaggregation as a result of methylation, but gravimetric assay of the end group shows 7·1% of tetramethylglucose, equiv. to a chain-length of 16—17 glucose units (mol. wt. 3500) (*loc. cit.*). The OMe-derivative with saturated HCl at 0° affords a product which is converted by 1% MeOH–HCl into a mixture of tetramethylmethylglucoside (corresponding with a chain-length of 16—17 glucose units; mol. wt. about 3500) and trimethylmethylglucoside. The P content of (I) is very high, but there is no correlation between it and the tendency towards aggregation. The P appears to be combined chemically. (II) with Me_2SO_4 in $COMe_2$–30% NaOH gives a OMe-derivative, the formation of which is accompanied by irregular variations in OMe content of the product (the phenomenon is probably connected with progressive disaggregation during methylation) finally to yield one of mol. wt. 6500, indistinguishable from the OMe-derivative described above. J. L. D.

Starch polysaccharide from woody tissue of the apple tree.—See this vol., 1290.

X-Ray investigation of cellotriose and derivatives.—See this vol., 1308.

Preparation of trimethylcellulose. K. Hess, G. Abel, W. Schön, and W. Komarewsky (Cellulosechem., 1935, **16**, 69—77).—Me_2SO_4 decomposes more slowly in 45% NaOH than in more dil. solution. Rate of methylation of ramie increases with increasing rate of stirring and increasing [NaOH]. More conc. NaOH gives a better yield and less disintegration, and 35% is recommended. 41—43% OMe can be attained at 0°. Disintegration is diminished by low temp., and by the use of spun and unchemicked fibre. When the conditions of prep. and the % OMe are the same, spun fibre yields more viscous solutions than loose fibre. Too prolonged methylation results in diminished OMe content. Details are given of three methods of methylation. A. G.

Fractionation of trimethylcellulose. G. Abel and K. Hess (Cellulosechem., 1935, **16**, 78—79).—By appropriate methods trimethylcellulose (44·5% OMe) can be separated into fractions insol. and sol. in C_6H_6, respectively; both have the same OMe content. Trimethylcellulose can be dissolved in H_2O if first dissolved in $CHCl_3$ and repptd. with light petroleum. A. G.

Fusion of methylcellulose. II. Characterisation of methylcellulose. K. Hess, C. Trogus, and G. Abel (Cellulosechem., 1935, **16**, 79—84).—Numerical data and photographs are given of X-ray diagrams of various preps. of trimethylcellulose after heating above the m.p. for various times. The diagrams pass through the sequence methylcellulose I → III' → III → X at different rates, and photographs taken after a fixed time of heating can be used to differentiate the specimens. A. G.

Preparation of dibromoamine and its reactions with Grignard reagents.—See this vol., 1334.

Determination of hexamethylenetetramine. R. Gros (J. Pharm. Chim., 1935, [viii], **22**, 241—244).—The $(CH_2)_6N_4$ is decomposed by dil. H_2SO_4 and the CH_2O formed is titrated by a special Nessler reagent in the presence of $BaSO_4$, using the vac. pipette (A., 1934, 384). The NH_3 is separately determined. R. S.

Phosphocholine from ox liver.—See this vol., 1265.

Nature of the reaction which takes place between certain amino-acids and formaldehyde. T. Tomiyama (J. Biol. Chem., 1935, **111**, 51—59).—The variation of p_H of NH_2-acid solutions on addition of CH_2O is determined and the equilibrium consts. of the reactions are calc. It is deduced that 1 mol. of NH_2-acid combines with 1 mol. of CH_2O between p_H 10 and 8. It is suggested that the reaction occurs by a co-ordinate linking with N as donor and the C of CH_2O as acceptor. H. D.

Aminolysis of leucine. E. Baur and G. Schindler (Helv. Chim. Acta, 1935, **18**, 1147—1149).—The isolation of fermentation amyl alcohol by the action of bone-C on leucine in absence of air shows that hydrolysis occurs, $CH_2Pr^\beta \cdot CH(NH_2) \cdot CO_2H + 2H_2O = CH_2Pr^\beta \cdot CH_2 \cdot OH + NH_4^{\cdot} + HCO_3'$. *iso*Valeraldehyde appears also to be formed. H. W.

Reactions of δ-aminovaleric acid and its derivatives. L. E. Schniepp and C. S. Marvel (J. Amer. Chem. Soc., 1935, **57**, 1557—1558).—δ-Benzamidovaleric acid (modified prep. from *cyclo*pentanoneoxime) and Br–red P give α-bromo-δ-benzamidovaleric acid and ββ-*dibromo*-N-*benzoyl-α-piperidone*, m.p. 115—116° (also obtained from N-benzoyl-α-piperidone). δ-*Carbomethoxyaminovaleric acid*, m.p. 71—72°, and Br give ββ-dibromo-α-piperidone. δ-*Ureidovaleric acid*, m.p. 176°, and Br give a *substance*, m.p. 195—215° (decomp.). R. S. C.

Proteolytic enzymes. VI. Specificity of papain.—See this vol., 1416.

Precipitation of l-, dl-, and m-cystine by phospho-12-tungstic acid. G. Toennies and M. Elliott (J. Biol. Chem., 1935, **111**, 61—74).—The curves of cystine (I) against phosphotungstic acid (II) concns. under the conditions for the pptn. of (I) are plotted for the three isomerides. The (I) : (II) ratio in the ppt. varies with the relative concns. of the reactants from 1·10 to 1·75. Titration curves of (I) indicate a total of 6 completely dissociated acid groups. Max. pptn. of *m*-, *dl*-, and *l*-cystine was obtained at concns. of (II) of 0·02*M*, 0·04*M*, and 0·01*M*, respectively. H. D.

Synthesis of asterubin. D. Ackermann and E. Müller (Z. physiol. Chem., 1935, **235**, 233—234; cf. this vol., 1004).—Improved yield (42·6%) is obtained by oxidation of tetramethyldiguanylcystamine (this

vol., 1265) with H_2O_2 in presence of Fe^{II} NH_4 sulphate. W. McC.

Preparation of ethyl α-cyanobutyrate from butyric acid and its conversion into veronal. T. Nishikawa (Mem. Ryojun Coll. Eng. Inouye Commem. Vol., 1934, 389—393).—A 72% yield of Et α-cyanobutyrate (I) is obtained by refluxing 50 g. of $CHBrEt \cdot CO_2Et$ (II) with 50 c.c. of 50% aq. EtOH and 24 g. of KCN for 80 min., adding 10 g. KCN and refluxing for a further 80 min., heating in an open dish to 105°, treating the residue with 30 c.c. of EtOH and 40 c.c. of conc. H_2SO_4, and refluxing for 4 hr. A smaller yield of (I) is obtained from $CHBrEt \cdot CO_2H$. $CN \cdot CHEt \cdot CO_2H$ is also prepared from (II). The esterification of (II) and the hydrolysis of (I) are unimol. (I) condenses (NaOEt) with $CO(NH_2)_2$ to yield 4-imino-5-ethyluracil. (I), with EtI and $CO(NH_2)_2$, affords 4-imino-5 : 5-diethyluracil (III), which yields veronal with dil. HCl. The prep. of $CN \cdot CMe_2 \cdot CO_2Et$ and its condensation with $CO(NH_2)_2$ to yield (III) are described. Ch. Abs. (r)

Action of magnesium phenyl bromide on α-bromobutyrdimethylamide. P. T. Sou (Bull. fac. sci. univ. franco-chin. Peiping, 1934, No. 1, 1—40). —The products of the reaction are described and a mechanism is advanced to explain their formation. Ch. Abs. (r)

Synthesis of carbamide from carbon dioxide and ammonia. I. M. Tokuoka (J. Agric. Chem. Soc. Japan, 1934, 10, 1333—1344).—A detailed study of the conditions necessary for the production of NH_4 carbamate (I) from CO_2 and NH_3. Vals. for the remarkably high dissociation pressure of (I) between 72° and 120° are given. Ch. Abs. (r)

Relative anæsthetic effects of [alkylated] carbamides.—See this vol., 1155.

Physiological action of asterubin and of other sulphur-containing derivatives of guanidine.— See this vol., 1265.

Action of diazomethane on imides. II. L. Irrera (Gazzetta, 1935, 65, 464—466).—Glutarimide and CH_2N_2 yield glutarmethylimide (A., 1933, 512); from diphenimide, *diphenmethylimide*, m.p. 168°, is obtained, with substances of m.p. 183° and 150°. E. W. W.

Ultra-violet absorption spectra of the α-ethylenic nitriles.—See this vol., 1299.

Geometrical isomerides of undecenonitrile. R. van Caillie (Bull. Soc. chim. Belg., 1935, 44, 438—440).—α-Bromoundeconitrile (A., 1933, 1281) is converted by C_5H_5N into a mixture of cis-, b.p. 119·7—119·9°/10 mm., and trans-Δ^a-*undecenonitrile*, b.p. 127·9—128·1°/10 mm. (separated by way of the *amides*, m.p. 76—77° and 114—115°, respectively). Vals. of d^{20}, n^{20}, and R^{20} for the nitriles are given. E. W. W.

Geometrical isomerides of heptenonitrile. C. de Hoffmann (Bull. Soc. chim. Belg., 1935, 44, 435— 437).—From $Me \cdot [CH_2]_5 \cdot Br$, by way of $Me \cdot [CH_2]_5 \cdot CN$ and $Me \cdot [CH_2]_4 \cdot CHBr \cdot CN$ (treated with C_5H_5N), a mixture of *cis*-, b.p. 60·2—60·4°/12·5 mm., and *trans*-Δ^a-heptenonitrile, b.p. 67·8°/15 mm. (cf. A., 1932, 1119), is prepared, and separated by fractionation,

and through the amides, new m.p. 61—61·4° and 122·8°, respectively. Vals. of d, n, and R for the nitriles at 15° and 30° are given. E. W. W.

Organic compounds of selenium. I. W. E. Bradt (J. Chem. Educ., 1935, 12, 363—366).—The known classes are listed and a few of the simpler types discussed. L. S. T.

Monomagnesium acetylene. F. K. Chéou (Contr. Inst. Chem., Natl. Acad. Peiping, 1934, 1, 127—149).—$(:CMgBr)_2$ is prepared by passing C_2H_2 into MgEtBr; subsequent passage of C_2H_2 (under pressure) produces $CH:C \cdot MgBr$, which yields propiolic acid with CO_2. With alkyl halides it affords substituted acetylenes, $CH:CBu$ (61% from BuBr) and $CH:C \cdot CH_2Ph$ (70% from $CH_2Ph \cdot Br$) being so obtained. EtBr affords only $(:CEt)_2$ (20% yield). Ch. Abs. (r)

Metallic uranium in organic synthesis. I. J. B. Lal and S. Dutt (J. Indian Chem. Soc., 1935, 12, 389—394).—U powder may be used in the Friedel–Crafts (Ph_2, $CHPh_3$, CPh_3Cl, CPh_2Cl_2, $COPhMe$, $COPh_2$), Ullmann [Ph_2, $(\cdot CH_2 \cdot CO_2Et)_2$, adipic acid, Ph_2O, $(\cdot CH_2 \cdot CO_2H)_2$], Zincke [$CH_2Ph_2$ (40% yield), $CH_2Ph \cdot CHPh_2$, and o- and p-$C_6H_4(CH_2Ph)_2$ (all from C_6H_6 and CH_2PhCl), p-$OMe \cdot C_6H_4 \cdot CH_2Ph$, p-$OEt \cdot C_6H_4 \cdot CH_2Ph$, and (?) *dibenzylanisole*, b.p. 376— 382°], and Reformatsky reactions ($OH \cdot CPhMe \cdot CH_2 \cdot CO_2Et$), but the yields are poor. The prep. of the substances in parentheses by this method is described. J. W. B.

Hydrogenation of the simplest homologues of *cyclo*pentane with fission of the ring and transformation into hydrocarbons of the paraffin series. N. D. Zelinski, B. A. Kasanski, and A. F. Plate (Ber., 1935, 68, [B], 1869—1872).—Ring fission cannot be ascribed mainly to strain, since it occurs only in the presence of H_2 and under conditions under which in its absence the ring is unchanged by the temp. and catalyst employed. Methyl*cyclo*pentane at Pt–C (20%) at 305—310° gives mainly β-methylpentane. Ethyl- and propyl-*cyclo*pentane yield mainly *iso*-hydrocarbons, but a more profound decomp. is evidenced in the case of the latter. H. W.

Reaction of naphthenic hydrocarbons with olefines. V. N. Ipatiev, V. I. Komarewsky, and A. V. Grosse (J. Amer. Chem. Soc., 1935, 57, 1722—1724).—With $AlCl_3$ at 50—75°/1—15 atm. *cyclo*hexane (I) and C_2H_4 give 1 : 3-dimethyl- (II), (? 1 : 2 : 3 : 4- and 1 : 2 : 3 : 5-)tetramethyl-*cyclo*hexane (III), and some C_6Et_6 (IV). (II) probably arises by isomerisation of ethyl*cyclo*hexane, (III) by that of the 1 : 3-Et_2-hydrocarbon, and (IV) by dehydrogenation of hexaethyl*cyclo*hexane, as some C_2H_6 is also formed. The structure of (II) is proved by dehydrogenation to *m*-xylene [Br_4-derivative, m.p. 243°; oxidised to m-$C_6H_4(CO_2H)_2$]. Methyl- and methyl*iso*propyl-*cyclo*hexane also give only *cyclo*paraffins. (I) does not react with C_2H_4 in presence of BF_3, but at 20—30°/5—15 atm. methyl-*cyclo*-hexane and -pentane give much substituted *cyclo*paraffin, some paraffin, and some polymerisation product from the C_2H_4. R. S. C.

Isomerisation phenomena in the cracking of *cyclo***hexane derivatives by aluminium chloride.** M. B. TUROVA-POLLAK (Ber., 1935, 68, [*B*], 1781—1785).—Treatment of methyl*cyclo*hexane with AlCl₃ at 120—130° followed by examination of the product by catalytic dehydrogenation and then by the NH₂Ph point method establishes the production of hexa- (I) and penta-methylenes (II) and paraffins (III) in the ratio 78·57 : 20·40 : 1·03. Similar treatment of dimethyl*cyclo*hexane gives fractions in which (I) : (II) : (III) = 68·89—84·62 : 19·40—11·47 : 11·71—4·00. Isomerisation during the cracking of ethyl*cyclo*hexane leads mainly to 1 : 3-dimethyl*cyclo*-hexane. H. W.

Properties of α- and β-carotene.—See this vol., 1434.

Raman spectrum and symmetry of the benzene molecule.—See this vol., 1301.

Organic reactions with boron fluoride. X. Condensation of propylene with aromatic hydrocarbons. S. J. SLANINA, F. J. SOWA, and J. A. NIEUWLAND. **XI. Condensation of propylene with *m*- and *p*-hydroxybenzoic acids.** W. J. CROXALL, F. J. SOWA, and J. A. NIEUWLAND (J. Amer. Chem. Soc., 1935, 57, 1547—1549, 1549—1551; cf. this vol., 744).—X. Et₂O and EtOAc do not catalyse condensation of C₃H₆ and C₆H₆ by BF₃, but CCl₃·CO₂H > CH₂Cl·CO₂H > AcOH do so. H₂SO₄ is most effective (? because it is the strongest acid), the ratio of Prᵝ to Prᵝ₂ derivatives depending on the H₂SO₄ : BF₃ ratio. Temp. (0—80°) is without effect. The catalyst deactivates rapidly, very little C₆H₃Prᵝ₃ being formed from C₆H₆, although C₆H₄Prᵝ readily gives the Prᵝ₃ and Prᵝ₄ derivatives. PhOH–BF₃ gives all derivatives up to C₆H₂Prᵝ₄. C₆H₆ and C₆H₄Prᵝ₂ do not react in presence of BF₃–H₂SO₄. 98% of *p*-, 2% of *o*-, and no *m*-C₆H₄Prᵝ₂ are formed. C₄H₈ condenses readily, but not C₂H₄. PhMe reacts (to give *p*-cymene) rather more readily with H₂SO₄–BF₃ than does C₆H₆. C₁₀H₈ gives (?) 2-C₁₀H₇Prᵝ. The following and other physical data are recorded. PhPrᵝ, b.p. 151°/740 mm.; *p*-C₆H₄Prᵝ₂, b.p. 204·5°/736 mm.; 1 : 2 : 4-C₆H₃Prᵝ₃, b.p. 237°/736 mm.; 1 : 2 : 4 : 5-C₆H₂Prᵝ₄, m.p. 119°.

XI. *p*-OH·C₆H₄·CO₂H (I), C₃H₆, and BF₃ in CCl₄ give *p*-OPrᵝ·C₆H₄·CO₂H (II) and its Prᵝ ester and 4-*iso*propoxy-3-*iso*propylbenzoic acid. *m*-OH·C₆H₄·CO₂H (III) affords *m*-OPrᵝ·C₆H₄·CO₂H (IV) and its Prᵝ ester, Prᵝ 3-*iso*propoxy-4-*iso*propylbenzoate, b.p. 155—156°/10 mm., and a little *m*-OH·C₆H₄·CO₂Prᵝ. Reaction of (I) is thus primarily etherification, but in that of (III) esterification occurs simultaneously. (II) and BF₃ give mainly 4-hydroxy-3-*iso*propylbenzoic acid and its Prᵝ ester gives first (II), but both (IV) and its Prᵝ ester give mainly 3-hydroxy-4-*iso*propylbenzoic acid. R. S. C.

Absorption spectra of free radicals.—See this vol., 1299.

Constitution of tetrahydrodiphenyl.—See this vol., 1299.

Di-*p*-alkylphenyldidiphenylene-ethanes. Effect of the *p*-alkyl group on the dissociation of the ethane. L. E. SCHNIEPP and C. S. MARVEL (J. Amer. Chem. Soc., 1935, 57, 1635—1636; cf. this vol., 1115).—Introduction of *p*-alkyl groups into the Ph of *s*-diphenyldidiphenylene-ethane greatly increases the ease of oxidation, and the ethanes could not be obtained pure. Fluorenone and Grignard reagents from *p*-tolyl-, *p*-ethyl-, *n*-propyl-, and *cyclo*hexyl-phenyl bromide give oily carbinols, whence are obtained 9-*chloro*-9-*p*-*alkylphenylfluorenes*, in which the alkyl is Me, m.p. 96—97°, Et, m.p. 56—57°, Pr and *cyclo*hexyl, oils. These with hot MeOH or EtOH afford 9-*methoxy*-9-*p*-*n*-*propyl*-, m.p. 82—83°, and -*cyclohexyl*-, m.p. 119—120°, and 9-*ethoxy*-9-*p*-*ethyl-phenylfluorene*, m.p. 103°, and 9-*ethoxy*-9-*p*-*tolylfluorene*, m.p. 123°. The chlorides with Cu-bronze in C₆H₆ (the Pr derivative only by the Me ether with Na–Hg and Br·[CH₂]₄·Br) give the hexa-arylethane, obtained only as coloured solutions, which with air give 9-*p*-*tolyl*-, m.p. 200—201°, 9-*p*-*ethylphenyl*-, m.p. 186—187°, and 9-*p*-*n*-*propylphenyl-fluorenyl* 9-*peroxide*, m.p. 127—128°. R. S. C.

Asymmetric synthesis. II. Addition of chlorine to trinitrostilbene. T. L. DAVIS and R. HEGGIE (J. Amer. Chem. Soc., 1935, 57, 1622—1624; cf. this vol., 480).—Trinitrostilbene (I) in PhNO₂ does not absorb light of λ 5890—5896 Å., and in circularly polarised light of this λ does not give an active product with Br. In circularly polarised light of λ 3600—4500 Å. it reacts with Cl₂ more rapidly than with Br, giving an active dichloride (II) (max. α 0·034° after 45 min.), racemised on keeping or faster on further irradiation (particularly with green light). The absorption spectra of (I), (II), and the dibromide are measured. R. S. C.

Octadeuteronaphthalene. G. R. CLEMO and A. McQUILLEN (J.C.S., 1935, 1325).—EtOH separates the mixture of picrates obtained in the prep. of hexa-deuterobenzene (cf. this vol., 967) into a *picrate*, m.p. 205° (*hydrocarbon*, C₁₈D₁₂, m.p. 135°), and a mixture, from which *octadeuteronaphthalene*, m.p. 77·5°, and liquid hydrocarbons are isolated. J. L. D.

Phenanthrene synthesis. L. F. FIESER and E. B. HERSHBERG (J. Amer. Chem. Soc., 1935, 57, 1508—1509).—3 : 4-Dihydronaphthalene-1 : 2-dicarboxylic anhydride (I) adds dimethylmaleic anhydride (II) at the 1 : 2-ethylenic linking to give the *adduct*, m.p. 75·5—76·5°, hydrogenated (Adams) to the H₂-adduct, m.p. 117—118°, which by fusion with KOH at 320—400° and subsequent distillation affords 1 : 2 : 3 : 4-*tetrahydro*-2 : 3-*dimethylphenanthrene* (70%), b.p. 194—197°/19 mm., dehydrogenated by Se in good yield to 2 : 3-dimethylphenanthrene, m.p. 78—78·5°. Butadiene gives similarly phenanthrene. Et γ-1-naphthylbutyrate and Et₂C₂O₄ lead to 3 : 4-*dihydrophenanthrene*-1 : 2-*dicarboxylic anhydride*, m.p. 263·5—264·5° [*adduct* with (II), m.p. 196—196·5°], dehydrogenated by S to *phenanthrene*-1 : 2-*dicarboxylic anhydride*, m.p. 311—312°. Naphthalene-1 : 2-dicarboxylic anhydride is obtained in 76% yield from (I) by dehydrogenation with S. R. S. C.

Triphenylene as companion of chrysene in coal tar. H. KAFFER (Ber., 1935, 68, [*B*], 1812—1813).—Extraction of the chrysene fraction with solvent benzene at 15—20° yields 1 : 2-3 : 4-dibenznaphthalene, m.p. 196·5°. H. W.

1′ : 9-Methylene-1 : 2 : 5 : 6-dibenzanthracene.
L. F. FIESER and E. B. HERSHBERG (J. Amer. Chem.
Soc., 1935, **57**, 1681—1683).—1′ : 9-*Methylene-
1 : 2 : 5 : 6-dibenzanthracene* (I) resembles 1 : 2 : 5 : 6-
dibenzanthracene closely in absorption spectrum and
is less carcinogenic (if at all) to mice than cholanthrene
and methylcholanthrene. 1-Iodoacenaphthene (prep.
described), m.p. 86—87°, b.p. 189—193°/8·5 mm.,
gives a good yield of unreactive Grignard reagent. The
1-Li-derivative with α-$C_{10}H_7$·COCl (II) gives (21%
yield) 1-α-*naphthoylacenaphthene*, m.p. 107—108° or
102—104°, converted (32% yield) at 400—415° (15
min.) into (I), m.p. 266—267° (corr.) [*dipicrate*, m.p.
201—201·5° (corr.)], also obtained in very poor yield
with 76% of 3-α-*naphthoylacenaphthene*, m.p. 159—
160° (corr.), from acenaphthene, (II), and $AlCl_3$ in
$C_2H_2Cl_4$.   R. S. C.

**Polycyclic aromatic hydrocarbons. XIII.
Condensed fluorene derivatives.** J. W. COOK, A.
DANSI, C. L. HEWETT, J. IBALL, W. V. MAYNEORD,
and (MISS) E. ROE (J.C.S., 1935, 1319—1325).—
2-$C_{10}H_7$·CH_2·MgBr with 2-methyl*cyclo*hexanone in
Et_2O at room temp. affords αβ-di-2-naphthylethane
(cf. A., 1922, i, 740) and a *hydrocarbon*, b.p. 178—185°/
6 mm., which reacts with Br, and is cyclised ($AlCl_3$–
CS_2) to *methylhexahydro*-3 : 4-*benzfluorene* (?), b.p.
200—205°/7 mm. (*picrate*, m.p. 114—118°). The K
derivative of Et *cyclo*hexanone-2-carboxylate with
2-$C_{10}H_7$·CH_2·Br in boiling C_6H_6 gives *Et 2-β-naphthyl-
methylcyclohexanone-2-carboxylate*, m.p. 69—71°, con-
verted by boiling aq. H_2SO_4, followed by Se at 300—
320°, into 3 : 4-*benzfluorene*, m.p. 124—125° (*picrate*,
m.p. 130—131°), which is oxidised ($Na_2Cr_2O_7$–AcOH)
to 3 : 4-benzfluorenone (cf. A., 1916, i, 731) [*semi-
carbazone*, m.p. 235° (decomp.)]. Et 2-benzyl- and
Et 2-β-phenylethyl-*cyclo*hexanone-2-carboxylate are
not cyclised by boiling aq. H_2SO_4 (A., 1933, 820; this
vol., 968). Phenanthrene with 40% CH_2O in conc.
HCl containing dry HCl at 90° gives 9-*chloromethyl-
phenanthrene*, m.p. 101—101·5° (*picrate*, m.p. 99·5—
100·5°), oxidised to 9-phenanthroic acid, the chloride
(A., 1930, 1438) of which is converted (Pt–H_2–
EtOH) through 3-phenanthraldehyde (this vol., 622)
into a carbinol which affords 3-bromomethylphen-
anthrene (I) (A., 1933, 951). The K derivative of Et
*cyclo*hexanone-2-carboxylate with (I) in boiling PhMe
gives *Et 2-(3′-phenanthrylmethyl)cyclohexanone-2-carb-
oxylate*, m.p. 98—98·5°, which with boiling 65%
H_2SO_4, followed by Pt-black at 320°, affords 1′ : 2′-
naphtha-2 : 3-*fluorene* (II), m.p. 226—226·5° (confirmed
by crystallographic measurements), oxidised
($Na_2Cr_2O_7$–boiling AcOH) to 1′ : 2′-*naphtha*-2 : 3-
fluorenone, m.p. 214·5—215°, which with conc. H_2SO_4
gives a magenta colour in contrast to the intense
purple colour given by the oxidation product of Diels′
hydrocarbon. The ultra-violet absorption spectrum
of (II) when compared with those of 2′ : 1′-naphtha-
1 : 2-fluorene (III) (this vol., 74) and of Diels′ hydro-
carbon, $C_{25}H_{24}$, from cholesterol indicate that (III) is
the parent hydrocarbon of the sterol and bile acid
dehydrogenation products. (II) is different from the
hydrocarbon " $C_{21}H_{16}$ " (cf. A., 1933, 278; 1934, 398)
[believed (this vol., 286) to have 22 C], which may be
a Me derivative of (III). 2-$C_{10}H_7$·CH_2·Br with

CNaMe(CO_2Et)$_2$ in boiling C_6H_6 gives an ester, hydro-
lysed to *methyl-2-naphthylmethylmalonic acid*, m.p.
166—168°, which is decarboxylated at 170° to give
β-2-*naphthyl-α-methylpropionic acid*, m.p. 90°, con-
verted by anhyd. $SnCl_4$ at 120° into 2-*methyl*-6 : 7-
benzhydrindone, m.p. 51—52°. The last named with
CH_2Ph·CH_2·MgCl in dry Et_2O at room temp. affords a
carbinol, dehydrated ($KHSO_4$) to 3-β-*phenylethyl-2-
methyl-4 : 5-benzindene*, a viscous oil (*dipicrate*, m.p.
132°), which is cyclised ($AlCl_3$–CS_2 at 0°) to *methyl-
tetrahydro*-1 : 2 : 5 : 6-*dibenzfluorene*, a viscous oil
(*picrate*, m.p. 155°), further dehydrogenated (Se at
310—320°) to 1 : 2 : 5 : 6-*dibenzfluorene*, m.p. 171—
172°.   J. L. D.

Molecular rearrangement of *N*-thiolanilides.
I. M. L. MOORE and T. B. JOHNSON (J. Amer.
Chem. Soc., 1935, **57**, 1517—1519).—o-NO_2·C_6H_4·SCl
(I) and o-C_6H_4Me·NH_2 in Et_2O give N-o′-*nitrophenyl-
thiol-o-toluidide*, o-C_6H_4Me·NH·S·C_6H_4·NO_2 (o-), m.p.
119·5—120°, which is hydrolysed by dil. HCl to
o-C_6H_4Me·NH_2,HCl (II), or long heating in AcOH to
(II) and (o-NO_2·C_6H_4·S·)$_2$, but, when heated alone at
150—160°, gives a poor, or in o-C_6H_4Me·NH_2 at 180—
190° a 70%, yield of 2-*nitro-4′-amino-3′-methyldi-
phenyl sulphide*, m.p. 103° (*hydrochloride*, m.p. 235°).
o-, m.p. 95°, and *p*-Nitrophenylthiolanilide, m.p. 75°,
and o-nitrophenylthiol-*p*-toluidine, m.p. 135° (simi-
larly prepared), give similarly 2-*nitro-4′-amino-* (III),
m.p. 70—76° (*hydrochloride*, m.p. 225°), 4-*nitro-4′-
amino-* (IV), m.p. 140—141° (*hydrochloride*, m.p.
200°), and 2-*nitro-2′-amino-5′-methyldiphenyl sulphide*,
m.p. 88—90° (*hydrochloride*, m.p. 190°), thus confirm-
ing the hypothesis (this vol., 1118) that thiolanilides
are intermediate products in the reaction of amines, S,
and PbO. 2-Nitro-4′-hydroxydiphenyl sulphide, m.p.
130°, is prepared from *p*-NO_2·C_6H_4·SCl and PhOH in
Et_2O and by diazotisation of (IV); the 4-NO_2-4′-OH-
compound is similarly prepared from (I) and from
(III).   R. S. C.

**[Action of thionyl chloride on certain anilides,
carbamides, and urethanes.]** H. STEPHEN and
O. G. BACKEBERG (Ber., 1935, **68**, [*B*], 1891).—A
comment on the publication of Warren *et al.* (this vol.,
855).   H. W.

Nitration of s-diarylcarbamides. E. HARRISON
(J.S.C.I., 1935, **54**, 282—284T).—Bis-o- and -m-tolyl-
carbamide and bis-o- and -m-chlorophenylcarbamide
are dinitrated in AcOH suspension to mixtures of
o- and *p*-substitution products from which the
4 : 4′-(NO_2)$_2$-derivatives are separated by crystall-
isation. Hydrolysis of the mixture by boiling
moist C_5H_5N or AcOH yields the corresponding
bases. *Bis-6-nitro-m-tolyl-*, m.p. 276°, *bis-2-chloro-4-
nitrophenyl-*, m.p. 255°, *bis-3-chloro-6-nitrophenyl-*,
m.p. 230°, and *bis-3-chloro-4-nitrophenyl-carbamide*,
m.p. 275°, are also obtained by passing $COCl_2$ into
the PhMe solution of the corresponding base in
$NPhMe_2$. *Bis-4 : 6-dinitro-o-tolyl-*, m.p. 265°, *bis-2-
chloro-4 : 6-dinitrophenyl-*, m.p. 240°, and *bis-3-chloro-
4 : 6-dinitrophenyl-carbamide*, m.p. 245—250°, are
obtained by the action of fuming HNO_3 on the corre-
sponding un-nitrated compounds. Bis-*p*-chloro-
phenylcarbamide nitrated in AcOH suspension gives
bis-4-chloro-2-nitrophenylcarbamide, m.p. 228°, also

obtained from 4-chloro-2-nitroaniline and $COCl_2$. Nitration with fuming HNO_3 gives 4-*chloro*-2 : 6-*dinitrophenylcarbamide*, m.p. 255—260° (decomp.). Bis-*m*-xylylcarbamide nitrated in AcOH gives bis-5-nitro-*m*-xylylcarbamide, m.p. 290° (decomp.), also obtained from 5-nitro-*m*-xylidine and $COCl_2$. Bis-*p*-xylylcarbamide nitrated in AcOH solution gives *bis*-4-*nitro*-2 : 5-*dimethylphenylcarbamide*, m.p. 280°, and by further action of HNO_3 *bis*-4 : 6-*dinitro*-2 : 5-*dimethylphenylcarbamide*, m.p. 262°. Nitration of bis-*o*-tolyl-*N*-ethylcarbamide gives 75% of *bis*-5-*nitro*-*o*-*tolyl*-N-*ethylcarbamide*, m.p. 120°.

Effect of substituents on the formation of thiocarbanilides by various methods. L. C. RAIFORD and G. M. McNULTY (Proc. Iowa Acad. Sci., 1933, **40**, 114; cf. A., 1934, 520).—Br when *o*- to an NH_2 of a primary amine hinders the reaction > a Cl similarly placed. *o*-NO_2 inhibits the reaction. Alkyl or Ph as an *o*- or *p*-nuclear substituent has little effect.   CH. ABS. (*e*)

Naphthalenesulphonic acids. I. Hydrolysis of naphthsultamdisulphonic acid. A. VOLODARSKI and I. KOLOSOVA (Anilinokras. Prom., 1935, **5**, 260—265).—Naphthsultamdisulphonic acid is quantitatively hydrolysed by boiling with excess of 60% H_2SO_4. Using 27% H_2SO_4, the chief product is 1 : 8-NH_2·$C_{10}H_6$·SO_3H, further hydrolysed to α-$C_{10}H_7$·NH_2.   R. T.

Constitution of thiohydrazides. H. WUYTS and (MLLE.) A. LACOURT (Bull. Soc. chim. Belg., 1935, **44**, 395—410; cf. A., 1933, 498, 821).—The following are prepared by the usual methods: β-*thio*-*o*- (I) and -*p*-*tolu*-α-*o*-*tolyl*- (II), m.p. 110° and 93°, and -*p*-*tolu*-α-*p*-*tolyl*- (III), m.p. 98°, -*hydrazides*; β-*thioacet*-α-*phenyl*-α-*methyl*- (IV), m.p. 59°, and -α-*phenyl*-α-*benzyl*- (V), m.p. 143·5°, -*hydrazides*; and β-*thio*-*m*-*tolylacet*-α-*phenyl*-α-*methylhydrazide* (VI), m.p. 91°. Dithiophenylacetic acid and NHMe·NHPh yield β-*thiophenylacet*-α-*phenyl*-β-*methylhydrazide* (VII), m.p. 99°. The S-*Me* derivatives of (I)—(III), prepared by action of Me_2SO_4 or of MeI and Na, have m.p. 107°, 62°, and 63°, respectively; of (IV), b.p. 115—125°/2 mm.; of (V), m.p. 78°, and of (VI), m.p. 59°. β-Thio*cyclo*hexylcarboxy- (VIII) and β-thiophenylacet-α-phenyl-α-methylhydrazide (IX) form S-*Me* derivatives, b.p. 150°/1 mm., and m.p. 76°, respectively. That in these compounds Me is attached to the S is shown by their insolubility in alkali. The following are obtained by action of BzCl etc. on the hydrazides in C_5H_5N. α-*Benz*-β-*thiobenz*-α-*phenyl*-, m.p. 160°, -β-1-*thionaphth*-α-*phenyl*-, m.p. 181°, -β-*o*-*thiotolu*-α-*o*'-*tolyl*-, m.p. 182°, and -β-*phenylacet*-α-*phenyl*-, m.p. 171°; α-*p*-*nitrobenz*-β-*thiophenylacet*-α-*phenyl*-, m.p. 182°, -β-S-*methylthiobenz*-α-*phenyl*- (X), m.p. 188°, and -β-S-*methyl*-1-*thionaphth*-α-*phenyl*- (XI), m.p. 151°; α-*benz*-β-S-*methyl*-*p*-*thiotolu*-α-*p*-*tolyl*- (XII), m.p 143·5°, and -β-*thiophenylacet*-α-*phenyl*-β-*methyl*-, m.p. 122°, -*hydrazide*. Action of Ac_2O on the corresponding hydrazide gives β-*thiobenz*-α-*acet*-α-*phenylhydrazide*, m.p. 161°. 10% aq. NaOH converts (IV) into the *Na* derivative, m.p. 148° (decomp.). HgO in EtOH converts (I) into the *Hg* derivative, m.p. 154°. MgEtBr in Et_2O or $Pr^a{}_2O$ liberates MeSH from

S-methylated thiohydrazides, giving bases. Thus the *S*-Me derivative of (IX) gives MeSH and a *base* (CH_2Ph·$COEt$ *phenylmethylhydrazone* ?), m.p. 138° (*hydrochloride*, m.p. 235°); those of (I) and (III), MeSH and bases; (VII), however, liberates H_2S, and yields a base, m.p. 182° (*hydrochloride*, m.p. 240°; *Ac* derivative), which may be α-*phenyl*-β-(β'-*phenylethyl*)-β-*methylhydrazine*. MeOH–HCl converts the *S*-Me derivative of (VIII) into NPhMe·NH_2, MeSH, β-*cyclo*hexylcarboxy-α-phenyl-α-methylhydrazide, m.p. 138°, and Me *cyclo*hexanecarboxylate. HI-Ac_2O does not demethylate (IV), (VI), (VIII), or (IX) at 325°; (VII) is partly demethylated. The *S*-Me derivatives of·(I)—(VI), and of (VIII) and (IX), and the substances (X)—(XII) lose 1 Me at 180—190°.   E. W. W.

Azo-dyes. A. ROLLETT, N. KUNZELMANN, and M. BALOG (Monatsh., 1935, **66**, 193—196).—The qual. effect of *p*-substituents on the colour of 2-benzeneazodyes from naphthionic, Laurent's, and H-acid, and α-naphthol-4- and -5-sulphonic acid is noted.   R. S. C.

Sulphide analogues of azo-dyes having bactericidal properties. W. BRAKER and W. G. CHRISTIANSEN (J. Amer. Pharm. Assoc., 1935, **24**, 607—609).—*p*-OEt·C_6H_4·N_2Cl and *p*-OH·C_6H_4·SPh give 2-*hydroxy*-5-*phenylthiol*-4'-*ethoxyazobenzene* (I). $S(C_6H_4$·N_2Cl-*p*$)_2$ and 2 : 6-diaminopyridine (II) give pp'-*bis*-(2 : 6-*diaminopyridine*-3-*azo*)*diphenyl sulphide* (III). *p*-NH_2·C_6H_4·S·C_6H_4·N_2Cl-*p* and (II) give 2 : 6-*diamino*-3 : 5-*di*-pp'-*anilinothiolbenzeneazopyridine* (IV). Tested by the " cup " method (I) and (III) are quite inactive and (IV) is only slightly active against *Staph. aureus*.   R. S. C.

Preparation and properties of *m*- and *p*-aminoazo-derivatives of β-naphthol and of β-hydroxynaphthoic arylamides. F. M. ROWE and R. L. M. ALLEN (J. Soc. Dyers and Col., 1935, **51**, 314—318).—The following aminoazobenzeneazo-β-naphthols and -β-hydroxynaphthoic anilides (respective m.p. in parentheses) are obtained by reducing the corresponding NO_2-derivatives with Na_2S or NaHS in aq. suspension. 3-*NH_2*- (179°; —) [6-*Me* (173—174°; 246·5°); 6-*OMe*- (187·5°; 215°)]; 4-*NH_2*- (159°; 265°) [6-*Me* (170°; 255°); 6-*OMe* (217—218°; 262°) (β-hydroxynaphthoic *p*-anisidide, 248°)]. They are of no interest as dyes for cellulose acetate or as diazo-components for azoics. β-*Hydroxynaphthamidobenzeneazo*-β-*hydroxynaphthoic anilide*, m.p. 291°, is also described.   S. C.

Phenol-2 : 4-sulphonates. J. ŠIRŮČEK (Chem. Listy, 1935, **29**, 243—245).—The following *salts* are described [R = OH·$C_6H_3(SO_3)_2$]: $Li_2R,3H_2O$, Na_2R,H_2O, K_2R,H_2O, $BeR,4H_2O$, $MgR,8H_2O$, $ZnR,7H_2O$, $CdR,3H_2O$, $CaR,2H_2O$, $SrR,3\frac{1}{2}H_2O$, $BaR,4H_2O$, $CuR,6H_2O$, $MnR,4H_2O$, $NiR,7H_2O$, $CoR,7H_2O$, and $Al_2R_3,12H_2O$.   R. T.

Ring fission of *o*-nitrophenols by sulphuric acid. II. O. NEUNHOEFFER (Ber., 1935, **68**, [*B*], 1774—1781; cf. this vol., 484).—A trustworthy method for the prep. of saturated and unsaturated dicarboxylic acids can be based on the fission of *o*-nitrophenols by 100% H_2SO_4 if the temp. is carefully regulated and the initial material is as pure as possible.

p-Chloro-o-nitrophenol is added gradually to 100% H_2SO_4 at 110°, and the temp. is raised to 125°; the product is poured on ice, whereupon a small amount of the *pyrrolone* derivative, $\frac{CH\text{:}CCl}{CO\cdot NH}\text{>}C\text{:}CH\cdot CO_2H$, m.p. 250° (decomp.) (*Me* ester, m.p. 133°), separates. Extraction of the filtrate with Et_2O (free from EtOH) yields β-*chloromuconolactone* (I), $\frac{CH\text{:}CCl}{CO\text{—}O}\text{>}CH\cdot CH_2\cdot CO_2H$, m.p. 123° (*Me* ester, m.p. 40°). Reduction of (I) by Na–Hg in strongly alkaline solution gives Δ^{β}-hydromuconic acid, m.p. 195°, better obtained by use of Zn–Cu in dil. H_2SO_4, whilst moderated reduction (Na–Hg–Na_2CO_3) yields muconic acid with much by-product. In one instance β-hydroxymuconic acid, m.p. 198° (decomp.), was isolated.

Addition of $NaNO_2$ to a solution of 5-amino-hydrindene (II), KNO_3, and H_2SO_4 in H_2O and heating of the product to 40—60° leads to 6-*nitro*-5-*hydroxyhydrindene* (III), m.p. 66° [*Me* ether, m.p. 77°, oxidised by $KMnO_4$ to 5-nitro-4-methoxy-o-phthalic acid (*Me* ester, m.p. 118°)]. 5-Hydroxyhydrindene, prepared by diazotising (II), is converted by HNO_3 into a mixture of (III) and 4-*nitro*-5-*hydroxyhydrind-ene*, m.p. 74° (*Me* ether, m.p. 94°). (III) and 100% H_2SO_4 at 65° yield the *acid* $C_9H_{11}O_4N$, m.p. 169°, transformed by boiling MeOH–HCl into $NH_3\cdot OMe$ and the Me_2 ester, b.p. 165°/15 mm., of a doubly unsaturated cyclo*pentanediacetic acid*, m.p. 220° (decomp.), which is hydrogenated (PtO_2 in EtOH) to cyclo-pentanediacetic acid (*cis*-form, m.p. 171°). H. W.

Preparation of acyl and benzenesulphonyl derivatives of o-aminophenol.
L. H. AMUNDSEN and C. B. POLLARD (J. Amer. Chem. Soc., 1935, 57, 1536—1537).—o-$PhSO_2\cdot NH\cdot C_6H_4\cdot O\cdot SO_2Ph$ (*K* salt, m.p. about 220°) and the appropriate acid chloride in dioxan give o-(NN-*dibenzenesulphon*)-, m.p. 164—164·5°, N-*benzenesulphon*-N-*acet*-, m.p. 115—116°, -N-*benz*-, m.p. 125·5—126°, and -N-*benzyl-amidophenyl benzenesulphonate*, m.p. 144·5—145·5°. o-NHBz·C_6H_4·OBz and BzCl in hot PhNO₂ give o-NN-*dibenzamidophenyl benzoate*, m.p. 170·5—171·5°. o-*Amino*-p-anisoylphenol, m.p. 171·5—172° (O-*PhSO₂*-derivative, m.p. 113·5—114·5°), and o-*benzenesulphon-amidophenyl benzoate*, m.p. 143·5—144·5°, are prepared. o-β-Phenylpropionamidophenyl *iso*valerate has m.p. 113·5—114·5° (lit. 92—93°). R. S. C.

Carboaryloxy-radical in the migration of acyl from nitrogen to oxygen in o-aminophenol derivatives.
L. C. RAIFORD and G. O. INMAN (Proc. Iowa Acad. Sci., 1933, 40, 109).—In general, only one acetylbenzoyl derivative of o-aminophenols can be prepared, regardless of the order in which the acyl groups are introduced. In this product the Bz is always attached to N. CH. ABS. (*e*)

Diphenyl series. I. Synthesis of unsymmetrical derivatives of diphenyl. II. Synthesis of 9-hydroxyphenanthrene.
N. CHATTER-JEE (J. Indian Chem. Soc., 1935, 12, 410—417, 418—420).—I. Addition of the appropriate diazonium salt as cold aq. solution to the cresol at 95° and steam-distillation of the product affords a mixture of the diphenyl ether and the diphenyl derivative. Orient-

ation of the latter is established by methylation followed by oxidation to the carboxylic acid and decarboxylation to 2- or 4-methoxydiphenyl. The following are new : 4-*hydroxy*-2-, b.p. 180°/15 mm. (*Me ether*, b.p. 164°/12 mm.; *Ac* derivative, b.p. 168°/12 mm.), and -3-*methyl*-, m.p. 114° (*Me ether*, m.p. 76°; *Ac* derivative, m.p. 83°), -3 : 2'-, b.p. 160°/10 mm. (*Me ether*, b.p. 125°/10 mm.; *Ac* derivative, b.p. 130°/10 mm.), -3 : 3'-, b.p. 175°/9 mm. (*Me ether*, b.p. 150°/10 mm.; *Ac* derivative, b.p. 158°/10 mm.), -3 : 4'-, m.p. 136° (*Me ether*, m.p. 80°; *Ac* derivative, m.p. 74°), -2 : 2'-, b.p. 185°/15 mm. (*Me ether*, b.p. 170°/15 mm.; *Ac* derivative, b.p. 175°/12 mm.), -2 : 3'-, b.p. 195°/15 mm. (*Me ether*, b.p. 185°/15 mm.; *Ac* derivative, b.p. 186°/15 mm.), and -2 : 4'-*dimethyl*-, b.p. 225°/15 mm. (*Me ether*, b.p. 205°/13 mm.; *Ac* derivative, b.p. 210°/15 mm.); 2-*hydroxy*-2' : 5-, b.p. 195°/14 mm. (*Me ether*, b.p. 185°/13 mm.; *Ac* derivative, b.p. 186°/10 mm.), -5 : 3'-, b.p. 210°/14 mm. (*Me ether*, b.p. 200°/13 mm.; *Ac* derivative, b.p. 204°/15 mm.), and -5 : 4'-*dimethyl*-, b.p. 225°/15 mm. (*Me ether*, b.p. 205°/42 mm.; *Ac* derivative, b.p. 215°/15 mm.), -*diphenyl*; 2 : 3'-, b.p. 170°/17 mm., 3 : 4'-, b.p. 175°/17 mm., and 2 : 4'-, b.p. 180°/17 mm., -*dimethyldiphenyl ether*. By oxidation of the OMe-derivatives are obtained 4-*methoxydiphenyl*-3-, m.p. 172°, and -2-*carboxylic acid*, m.p. 135°; 4-*methoxy-diphenyl*-3 : 2'-, m.p. 210°, -3 : 3'-, m.p. 232°, -3 : 4'-, m.p. 275°, -2 : 2'-, m.p. 210°, -2 : 3'-, m.p. 240°, and -2 : 4'-, m.p. 280°, -*dicarboxylic acid*; 2-*methoxydi-phenyl*-5 : 2'-, -5 : 3'-, and -5 : 4'-*dicarboxylic acid*, all not melting below 300°.

II. Reduction of the anhydride of diphenic acid with 5% Na–Hg–EtOH affords (together with the Me H ester) the lactone of 2-hydroxymethyldiphenyl-2'-carboxylic acid, converted by heating with KCN into 2-*cyanomethyldiphenyl-2-carboxylic acid*, m.p. 240°, hydrolysed by boiling 30% KOH to 2'-*carboxy-diphenyl-2-acetic acid*, m.p. 295°. Distillation of the Ca salt of this affords 9-hydroxyphenanthrene. J. W. B.

Preparation of o-, m-, and p-hydroxyphenoxy-alkylamines.
J. DRUEY (Bull. Soc. chim., 1935, [v], 2, 1737—1741).—o-$OH\cdot C_6H_4\cdot O\cdot CH_2Ph$ heated with $(CH_2Br)_2$ and KOH in EtOH gives 1-*benzyloxy*-2-β-*bromoethoxybenzene* (I), m.p. 45—46°, and bis-2-*benzyl-oxyphenyl ethylene ether*, m.p. 88—89°. (I) with 3 mols. of $NHMe_2$ in C_6H_6 (sealed tube) gives 1-*benzyloxy-2-β-dimethylaminoethoxybenzene*, b.p. 153—156°/0·4 mm. (*hydrochloride*, m.p. 142—144°), which when heated with 6N-HCl in EtOH yields 2-β-*dimethyl-aminoethoxyphenol hydrochloride*, m.p. 215·5—216·5°. The following are prepared from the appropriate phenols and bases : 1-*benzyloxy*-2-β-*diethylaminoeth-oxybenzene*, b.p. 170—172°/0·65 mm. (*hydrochloride*, cryst.), 2-β-*diethylaminoethoxyphenol hydrochloride*, m.p. 162—163°, 1-*benzyloxy*-2-β-*methylaminoethoxy-benzene*, b.p. 152—155°/0·5—0·6 mm. (*hydrochloride*, m.p. 102—103°), 1-*benzyloxy*-3-β-*bromoethoxybenzene*, b.p. 180—185°/0·4 mm., 1-*benzyloxy*-3-β-*dimethyl-aminoethoxybenzene*, b.p. 166—169°/0·4 mm. (*hydro-chloride*, m.p. 125—130°), 3-β-*dimethylaminoethoxy-phenol hydrochloride*, 1-*benzyloxy*-4-β-*bromoethoxybenz-ene*, m.p. 84—85°, bis-4-*benzyloxyphenyl ethylene ether*, m.p. 172—172·5°, 1-*benzyloxy*-4-β-*dimethylaminoeth*-

oxybenzene hydrochloride, m.p. 171—172°, 4-β-*dimethyl-aminoethoxyphenol hydrochloride*, m.p. 174—176°.

F. R. G.

Condensing power of pyrocatechol derivatives. P. DREYFUSS (Gazzetta, 1935, **65**, 498—501).—A discussion of work previously published (Diss., Bonn, 1933). Guaiacol combines with PhCHO to form, according to the proportions of the reactants, 2:3:6:7-tetramethoxy-9:10-diphenyldihydroanthracene or 3:4:3′:4′-tetramethoxytriphenylmethane; with CH₂O, the last combines

OMe ⟋⟍ ⟋⟍ OMe to a 6:6′-dihydroxy-
OMe ⟍⟋‖⟍⟋ OMe methyl derivative. With
(I.) Ph Ph PhCHO, αα-3:4:3′:4′-tetramethoxydiphenyl-

ethylene yields tetramethoxydiphenylindenoindene (I). Other examples of *p*-condensation to OH or OMe groups in pyrocatechol derivatives are quoted.
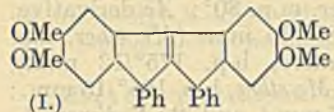
E. W. W.

Mechanism of chemical reactions. VI. Significance of molecular compounds in catalytic hydrogenations. II. K. KINDLER and W. PESCHKE (Annalen, 1935, **519**, 291—296).—β-Methoxy-β-3:4-dimethoxy- and -methylenedioxy-phenylnitroethane are reduced catalytically (Pd in AcOH) to the corresponding -ethylamines. When, however, conc. H₂SO₄ is also present, β-OMe is removed during the reduction, β-3:4-dimethoxy- and -methylenedioxy-phenylethylamine being formed. Since H₂SO₄ has practically no action on the starting material in absence of Pd and H₂, it is assumed that it forms a mol. compound (at the N) in which the β-C becomes unsaturated and attracts H, after which MeOH is eliminated. Action of Pd–H₂ on 3:4-dimethoxyoximinoacetophenone yields, in absence of H₂SO₄, first ω-amino-3:4-dimethoxyacetophenone, then β-hydroxy-3:4-dimethoxyphenylethylamine; in presence of H₂SO₄ the product is β-3:4-dimethoxyphenylethylamine.

E. W. W.

Unsaturated ethers of pyrogallol. C. H. HURD and C. I. PARRISH (J. Amer. Chem. Soc., 1935, **57**, 1731—1734).—Pyrogallol (I), CH₂:CH·CH₂Br, and K₂CO₃ in COMe₂ give, according to the proportion of (I), *pyrogallol triallyl*, m.p. 3·5—4°, *diallyl* {two *isomerides* [*Me* ethers (II)]}, and *allyl ether*, m.p. 68—70° [mixture of 3- (*Pb* salt) and 2-ethers (4 : 1); mixed *Me₂ ether*, m.p. 160—164°]. Both isomerides (II) rearrange at 190°, but one also decomposes. The prep. of α-bromo-Δ²-hexene, b.p. 44—46°/14 mm. (from CH₂:CH·CHPrᵃ·OH), and -Δ²-heptene, b.p. 71—73°/17 mm., are modified. These with (I) and NaOEt–EtOH afford *pyrogallol* tri- and *di-hexenyl* [two *isomerides* (III)], *heptenyl* (*Et₂* ether), and *diheptenyl ether*. Most of the products must be distilled in a mol. still, but even at this vac. (III) rearrange to *dihexenylpyrogallols* (IV). (IV) had a PhOH coeff. 20 and 250 against *Staph. aureus* and 110 and 325 against *Strept. hæmolyticus*, respectively, but < 11 against *B. typhosus*. *Heptenylpyrogallol*, m.p. 52—53°, has a coeff. of 120 against *Staph. aureus*, but the other products have low coeffs.

R. S. C.

Heterogeneous equilibria in two-component systems with thymol as one component.—See this vol., 1322.

Production of substituted phenols.—See B., 1935, 841.

Preparation of salts of pyrocatechol borate.—See B., 1935, 841.

Phenolic derivatives of diaryl sulphides.—See B., 1935, 841.

Preparation of *p*-sec.-alkylaminophenols.—See B., 1935, 894.

Preparation of ethers of hydroxy-aldehydes by the oxidation of α-ethers of glycerol by lead tetra-acetate. (MME.) S. SABETAY (Bull. Soc. chim., 1935, [v], **2**, 1744—1746).—The Na derivative of glycerol with CH₂PhCl yields chiefly CH₂Ph·O·CH₂·CH(OH)·CH₂·OH, which with Pb(OAc)₄ in C₆H₆ gives CH₂Ph·O·CH₂·CHO (cf. A., 1932, 384).

F. R. G.

Use of ψ-nitrosites of propenylphenyl ethers for the synthesis of α-aryl-β-hydroxylamino- and -β-amino-propyl alcohols. Migration of acyl groups. II. *iso*Eugenol derivatives. V. BRÜCKNER and A. KRÁMLI (J. pr. Chem., 1935, [ii], **143**, 287—297; cf. this vol., 971, 972).—The *dimeride* (I), m.p. 128° (decomp.), of *acetylisoeugenol ψ-nitrosite* is merely isomerised by MeOH, but behaves as expected on electrolytic reduction, and the NH₂- and NH·OH-derivatives have the expected properties. (I) and Ac₂O with a little H₂SO₄ give β-*nitro-α-p-acetoxy-m-methoxyphenylpropyl acetate* (II), m.p. 120°, which with 10% KOH–aq. MeOH at room temp. gives β-*nitroisoeugenol*, m.p. 100°, also obtained directly from (I). Electrolytic reduction of (II) gives according to the conditions β-N-*acetylhydroxylamino-*, m.p. 178° (decomp.), or β-*acetamido-α-p-acetoxy-m-methoxyphenylpropyl alcohol* (III), m.p. 165°, which with HCl–MeOH and HCl–COMe₂ at room temp. give β-*hydroxylamino-* (IV) and β-*amino-α-p-acetoxy-m-methoxyphenylpropyl alcohol hydrochloride*, m.p. 165—166° (decomp.) and +2H₂O, m.p. 192°, respectively; the reverse (O → N) migration occurs with saturated aq. Na₂CO₃ at room temp., but this change is not instantaneous, since (IV) with Na₂CO₃ and the aldehyde affords *nitrones* with CH₂O, m.p. 161—162°, PhCHO, m.p. 144°, and *m*-NO₂·C₆H₄·CHO, m.p. 204°. (III) and 2N-HCl at room temp. give slowly β-*amino-α-p-hydroxy-m-methoxyphenylpropyl alcohol hydrochloride*, m.p. 176°. (I) and hot MeOH give by monomerisation and isomerisation *p*-*acetoxy-m-methoxyphenyl α-nitroethyl ketoxime*, m.p. 134—136° (decomp.), converted by alkali into the *glyoxime peroxide*, m.p. 179°, also obtained from (I) and 1·5% HCl–MeOH at 50°.

R. S. C.

Amino-alcohols having a secondary alcoholic function. J. MATTI and E. BARMAN (Bull. Soc. chim., 1935, [v], **2**, 1742—1744).—NEt₂·CH₂·CMe₂·CHO with MgPhBr yields *diethyl-γ-hydroxy-γ-phenyl-ββ-dimethylpropylamine*, b.p. 123·5°/0·4 mm. [*hydrochloride*, m.p. 196° (*benzoate*, m.p. 180°)]. NMe₂·CH₂·CMe₂·CHO with MgPhBr, MgEtI, and MgBuᵃBr yields, respectively, *dimethyl-γ-hydroxy-γ-phenyl-ββ-dimethylpropylamine*, b.p. 115°/0·4 mm. [*hydrochloride*, m.p. 181° (*benzoate*, m.p. 208°)], *dimethyl-γ-hydroxy-ββ-dimethylamylamine*, b.p. 83°/17 mm. (*benzoate hydrochloride*, m.p. 163·5°; m-*amino-*

benzoate hydrochloride, m.p. 184·5°; p-*aminobenzoate hydrochloride*, m.p. 194°; p-*nitrobenzoate hydrochloride*, m.p. 185°; *cinnamate hydrochloride*, m.p. 177°), *dimethyl-γ-hydroxy-ββ-dimethylheptylamine*, b.p. 119·5°/27 mm. [*benzoate hydrochloride*, m.p. 115° (hygroscopic); p-*nitrobenzoate hydrochloride*, m.p. 174°; p-*aminobenzoate hydrochloride*, m.p. 182°]. Vals. of n_D and d are given for the free bases. The esters possess anæsthetic properties. F. R. G.

Production of diamino-alcohols of the aromatic series.—See B., 1935, 840.

Metacholesterol and its separation from cholesterol. V. I. LIFSCHÜTZ (Biochem. Z., 1935, **280**, 65—71).—The separation of metacholesterol (I) (A., 1922, i, 541) from cholesterol (II) is described, advantage being taken of the fact that (I) but not (II) remains in colloidal aq. solution in presence of protein, fat, etc. P. W. C.

7-Dehydrocholesterol. A. WINDAUS, H. LETTRÉ, and F. SCHENCK (Annalen, 1935, **520**, 98—106).— 7 : 8-*Dehydrocholesterol* (I) differs from 22 : 23-dihydroergosterol (II) in having a side-chain of 8 instead of 9 C; like (II), it becomes strongly antirachitic when irradiated. 7-Ketocholesteryl acetate (improved prep.) is reduced by $Al(OPr^β)_3$ in $Pr^βOH$ to 7-*hydroxycholesterol* (*bis-3 : 5-dinitrobenzoate*, m.p. 196—197°, $[α]_D^{20}$ +77·4° in $CHCl_3$), of which the *dibenzoate*, m.p. 171·5—172°, $[α]_D^{20}$ +94·1° in $CHCl_3$, is converted by heating at 200° in vac. into 7 : 8-*dehydrocholesteryl benzoate*, m.p. 139—140° (to a cloudy liquid, clearing at 183°), $[α]_D^{20}$ −53·2° in $CHCl_3$. The last is hydrolysed (KOH–EtOH) to 7 : 8-*dehydrocholesterol* (I) m.p. 142—143·5°, $[α]_D^{20}$ −113·6° in $CHCl_3$ (3 : 5-*dinitrobenzoate*, m.p. 207°, $[α]_D^{20}$ −45·7° in $CHCl_3$; *digitonin* compound), which has the same spectrum as ergosterol, and approaches it in antirachitic power; after irradiation it contains 8000 antirachitic units per mg. E. W. W.

Local anæsthetic action of dialkylamino-ethoxyethyl p-aminobenzoates. L. A. RUBERG and R. L. SHRINER (J. Amer. Chem. Soc., 1935, **57**, 1581—1583).—*sec.*-Amines and $(CH_2)_2O$ at < 60° in MeOH give mixtures of alcohols, $NR_2·[CH_2]_2·OH$ (I) and $NR_2·[CH_2·CH_2·O]_n·H$ (II). (I) and $(CH_2)_2O$ give also (II). Thus are obtained β-(β'-*di-methyl-*, b.p. 78—79°/3·5 mm. (*hydrochloride*, m.p. 104—105·5°), -*ethyl-*, -*n-propyl-*, b.p. 102—103°/2·5 mm., and -*n-butyl-aminoethoxy*)-*ethyl alcohol*, b.p. 117—121°/1 mm., converted by $p-NO_2·C_6H_4·COCl$ in hot C_6H_6 into the p-*nitrobenzoates*, m.p. 97—99° (not obtained pure), 106—108°, and 99—101°, respectively, which are hydrogenated to yield the corresponding p-*aminobenzoate hydrochlorides*, m.p. 150—152°, 150—152°, 128·5—130°, and 134—136°, respectively. The toxicity and local anæsthetic action of the NH_2-esters increase with increasing mol. wt. of the *N*-substituent. R. S. C.

Xylic acids obtained in the oxidation of 5-bromo- and 5-nitro-ψ-cumene. C. H. FISHER and C. T. WALLING (J. Amer. Chem. Soc., 1935, **57**, 1700—1702).—The acid, m.p. 173—174° (lit. 172—173°), from 5-bromo-ψ-cumene and HNO_3, previously considered to be 5-bromo-2 : 4-xylic acid

(I), is shown to be a const.-melting mixture of (I) and 4-*bromo-2 : 5-xylic acid* (II). 5-Nitro-ψ-cumene and HNO_3 give 5-nitro-2 : 4-xylic acid (III), m.p. 197·5—198·5°. 4-*Bromo-2 : 5-xylonitrile* (from the amide), m.p. 103—104°, gives (II), m.p. 171·5—172·5° (*amide*, m.p. 209—210°). Acet-p-xylidide and fuming HNO_3 give mainly the 3 : 5-dinitro-derivative, but conc. HNO_3–H_2SO_4 gives 5-nitro- (IV), m.p. 168—169°, and 3-nitro-acet-p-xylidide. Hydrolysis of (IV) gives the amine, m.p. 144—145°, which yields 4-*nitro-2 : 5-xylonitrile*, m.p. 160—161°, and 4-*nitro-2 : 5-xylic acid*, m.p. 165·5—166·5°. 2 : 4-Dimethylacetophenone gives the 5-NO_2-ketone, converted by NaOBr into (III). R. S. C.

cis-**Cinnamic acids.** J. MEYER (Z. physikal. Chem., 1935, **174**, 77—78).—The view that the three forms are not chemical isomerides, but merely polymorphic modifications, is defended (cf. this vol., 916). R. C.

Resolution of an allenic compound. E. P. KOHLER, J. T. WALKER, and M. TISHLER (J. Amer. Chem. Soc., 1935, **57**, 1743—1745).—The structure of αγ-diphenyl-γ-naphthylallenecarboxylic acid (I) is proved by conversion into and prep. from the ester, oxidation of the ester by $KMnO_4$ to $COPh·CO_2H$ and $COPh·C_{10}H_7$, and hydrogenation (Pd–$CaCO_3$) to *Et αγ-diphenyl-γ-naphthylbutyrate*, m.p. 124—125° (corresponding *acid*, m.p. 147°). The *chloride* of (I), m.p. 122° (stable in air), gives the *Me* ester (also prep. from the Ag salt), m.p. 110°, and with $OH·CH_2·CO_2H$ and C_5H_5N in dry Et_2O, *carboxymethyl αγ-diphenyl-γ-naphthylallene-α-carboxylate*, m.p. 195°, resolved by brucine to the l-*acid*, m.p. 145—146°, $[α]_D$ +29·5° in EtOAc (*brucine* salt, m.p. 145°). R. S. C.

Constituent of Bæomyces roseus.—See this vol., 1432.

Catalytic hydrogenation of benzoylmandelonitrile and of amygdalin. H. RUPE and K. ENGEL (Helv. Chim. Acta, 1935, **18**, 1190—1203).—Catalytic hydrogenation of $OH·CHPh·CN$ in presence of Ni proceeds rapidly at first, but stops suddenly owing to poisoning of the catalyst by liberated HCN. Similar treatment of $OBz·CHPh·CN$ affords β-phenylethylamine (I), *di-β-phenylethylamine* (II), b.p. 190°/10 mm. (*hydrochloride*, m.p. 259—260°), and benz-β-hydroxy-β-phenylethylamide, m.p. 149°, thus : $OBz·CHPh·CN + 3H_2 = CH_2Ph·CH_2·NH_2 + BzOH$. Hydrogenation of amygdalin proceeds readily when a large excess of Ni is used and ceases after absorption of $2H_2$. (I) and (II) are formed with a brown amorphous material from which, after acetylation, β-*acetamido-α-phenylethylgentiobioside hepta-acetate* (III), m.p. 178°, $[α]_D$ −51·47° in C_6H_6, is isolated; the residues from (III) on hydrolysis yield lævulic acid and largely racemised β-hydroxy-β-phenylethylamine (IV). The yields of the base are small, showing that the sugar residue is largely eliminated in the initial stages, thus leading to much (I) and (II). In hepta-acetylamygdalin the sugar residue is more firmly attached, and hydrogenation gives, after hydrolysis, β-*amino-α-phenylethylgentiobioside* (V), decomp. 231—233°, $[α]_D^{20}$ −103·22° in H_2O [whence (III)], and an amorphous material which affords

BzOH when hydrolysed with HCl. Hydrolysis of (V) gives partly racemised (IV). Repetition of the work of Read *et al.* (A., 1931, 218) leads to the vals. $[\alpha]_D^{20}$ —44·30° and $[\alpha]_D^{20}$ +53·58° in H_2O for homogeneous (IV) and its tartrate, respectively. H. W.

α-Aldehydotropic ester. H. GAULT and M. COGAN (Compt. rend., 1935, **201**, 477—479).— $CHO \cdot CHPh \cdot CO_2Et$, CH_2O, and K_2CO_3 at room temp. yield *Et α-aldehydotropate*, m.p. 92—93° (*Ac* derivative, m.p. 76°, b.p. 212—213°/15 mm.), which gives the usual reactions for an aldehyde and regenerates the original reactants when heated above 100°. It is saponified to a mixture of $CH_2Ph \cdot CO_2H$, tropic acid, and a little atropic acid, the relative proportions of which depend on the temp. and the alkali concn. H. G. M.

Stereochemistry of diphenyls. XL. Effect of temperature and solvent on the rate of racemisation of 2-nitro-6-carboxy-2′-alkoxydiphenyls. C. C. LI and R. ADAMS. **XLI. Effect of 4′-substitution on the rate of racemisation of 2-nitro-6-carboxy-2′-methoxydiphenyl.** W. E. HANFORD and R. ADAMS (J. Amer. Chem. Soc., 1935, **57**, 1565—1569, 1592—1595; cf. this vol., 742).—XL. The rates of racemisation of 2-*nitro*-2′-*methoxy*- (I), -*ethoxy*- (II), and -*propoxy*-*diphenyl*-6-*carboxylic acid* (III) in C_5H_5N, $COMe_2$, AcOH, MeOH, EtOAc, and dioxan are determined at about 25° and in EtOH, at 0—35°, and of the brucine salts in $CHCl_3$, and Na salts in H_2O and EtOH. In all cases these rates are in the approx. ratio 1 : 5 : 7; a rise in temp. increases the rate. There is no connexion between the rate of racemisation and the nature of the solvent. The van 't Hoff–Arrhenius equation applies. The heat of activation is about 20,000 g.-cal. for all the acids. o-*Nitro*-ethoxy-, b.p. 146—148°/15 mm., -*propoxy*-, b.p. 155—156·5°/15 mm., -*butoxy*-, b.p. 171—172°/19 mm., and -*amyloxy*-benzene, b.p. 177—178°/15·5 mm., give by Fe and H_2O o-ethoxy-, b.p. 224—229°, o-*propoxy*-, b.p. 120—130°/14—15 mm. (*Bz* derivative, m.p. 49—51°), -*butoxy*-, b.p. 135—139°/15·5 mm. (p-$C_6H_4Me \cdot SO_2$ derivative, m.p. 85—88°, insol. in alkali), and -*amyloxy*-aniline, b.p. 152·5—153·5°/16 mm. (p-*$C_6H_4Me \cdot SO_2$* derivative, m.p. 88—90°, insol. in alkali), converted (diazoreaction) into o-iodo-ethoxy-, b.p. 121—131°/17—18 mm., o-*iodo*-propoxy-, b.p. 138—139°/15 mm., -*butoxy*-, b.p. 152—154°/18 mm., and -*amyloxy*-benzene, b.p. 126—129°/1—1·5 mm., which, when condensed with Me 2-bromo-3-nitrobenzoate and Cu at 210—260° and subsequently hydrolysed, afford (II), m.p. 153—155° [l-*form*, racemised at m.p. 153—155°, $[\alpha]_D^{18}$ —145·6° in EtOH (*brucine* salt, m.p. 167—176° (decomp.), $[\alpha]_D^{25}$ —220·2° in $CHCl_3$)], (III), m.p. 133—135° [l-*form*, double m.p. 95—97° and 132·5—133·5°, $[\alpha]_D^{18}$ —110·6° in EtOH (*brucine* salt, m.p. 157—162° (decomp.), $[\alpha]_D^{24}$ —182·9° in $CHCl_3$)], 2-*nitro*-2′-*butoxy*-, m.p. 117—119°, and -*amyloxy*-diphenyl-6-*carboxylic acid*, m.p. 89—92°. (I), m.p. 196—197°, gives the d-form, m.p. (with racemisation) 195—197°, $[\alpha]_D^{18}$ +26·9° in EtOH (*brucine* salt, +H_2O, m.p. 219—220°, $[\alpha]_D^{24}$ +97·9 in $CHCl_3$). The salts of the second forms could not be isolated.

XLI. The half-life periods at 25° of 4′-derivatives

of (I) in $COMe_2$ are NO_2 115, Br 25, Cl 12, Me 2·6, and OMe 3·6 min. The rates of racemisation of the acids in EtOH, the cinchonine salts in $CHCl_3$, and the Na salts in H_2O and EtOH are determined. The stability in the 4′-series (except for the NO_2-derivative) is less than in the 5′-series, and in the 3′-, 4′-, and 5′-series increases with the negativity of the substituent. The following are described. 2-*Bromo*-5-*nitroanisole* (from the 2-NH_2-compound), m.p. 104°. 2-*Iodo*-5-*methylanisole* (from the 2-NO_2-compound), b.p. 109·5—110°/3 mm. 5-Nitro-, m.p. 156—157° (lit. 153—154°), and 5-amino-2-acetamidoanisole, m.p. 119—120° (lit. 72°). 5-*Bromo*-2-*amino*-, m.p. 61—62°, and -2-*iodo*-anisole, m.p. 37°, b.p. 161—162°/8 mm. 5-*Chloro*-2-*iodoanisole*, b.p. 135°/10 mm., m.p. about 20°. 2-*Nitro*-2′ : 4′-*dimethoxy*-, m.p. 213—214° (*cinchonine* salt of l-*form*, m.p. 198—205°), 2 : 4′-*dinitro*-2′-*methoxy*-, m.p. 203·5—206° (*cinchonine* salt of d-*form*, m.p. 188—189°), 2-*nitro*-4′-*chloro*-2′-*methoxy*-, m.p. 160—160·5° (*cinchonine* salt of l-*form*, m.p. 192—193·5°), 2-*nitro*-4′-*bromo*-2′-*methoxy*-, m.p. 160—161° [*cinchonine* salt of l-*form*, m.p. 193—195° (decomp.)], and 2-*nitro*-2′-*methoxy*-4′-*methyl*-*diphenyl*-6-*carboxylic acid*, m.p. 171—172° (*cinchonine* salt of l-*form*, m.p. 201—204°). R. S. C.

Bromination of 3-ketobisnorcholanic acid and 3-ketobisnor*allo*cholanic acid ; Δ⁴-3-ketobisnorcholenic acid and Δ¹-3-ketobisnor*allo*cholenic acid. A. BUTENANDT and L. MAMOLI (Ber., 1935, **68**, [B], 1854—1859).—3-Hydroxybisnorcholenic acid is transformed by the successive action of Br and CrO_3 in AcOH into Δ⁴-3-*ketobisnorcholenic acid* (I), m.p. 268° (decomp.), $[\alpha]_D^{20}$ +60° in $CHCl_3$, reduced (Pd-black in Et_2O) to 3-ketobisnor*allo*cholanic acid (II), m.p. 244°, and 3-*ketobisnorcholanic acid* (III), m.p. 184°, $[\alpha]_D^{20}$ +4·55° in $CHCl_3$. (III) is readily brominated to 4-*bromo*-3-*ketobisnorcholanic acid*, m.p. 221°, which loses HBr in boiling C_5H_5N with formation of (I). (II) is similarly converted into 2-*bromo*-3-*ketobisnorallocholanic acid*, m.p. 230° (decomp.), from which HBr is eliminated with difficulty (KOAc-AcOH at 175—185°) giving Δ¹-3-*hydroxybisnorallo*cholenic acid, m.p. 235° (decomp.). The changes are therefore similar to those observed with pregnandione and *allo*pregnandione (this vol., 1370). H. W.

Germicidal properties and mercuration of alkylresorcinolcarboxylic acids. S. C. OVERBAUGH and R. B. SANDIN (J. Amer. Chem. Soc., 1935, **57**, 1658—1659).—5-Ethyl-, m.p. 166—170°, -*propyl*-, m.p. 177—182°, -*butyl*-, m.p. 115—116°, and -*hexyl*-β-resorcylic acid have Rideal–Walker coeff. < 0·7, < 0·7, 0·9, and 1·6, respectively, and afford 3-*hydroxymercuri*-5-*ethyl*-, anhydro-3-hydroxymercuri-5-*propyl*-, yellow, -n-*butyl*-, and -*hexyl*-β-resorcylic acid, yellow, all sol. in dil. aq. NaOH, but decomposed thereby with pptn. of Hg. R. S. C.

Constitution of the aromatic rearrangement products of picrotoxin. K. TETTWEILER and I. DRISHAUS (Annalen, 1935, **520**, 163—184; cf. Mercer *et al.*, this vol., 1236).—Oxidation ($KMnO_4$-1·5*N*-NaOH) of the lactone-dicarboxylic acid (I) [*A* ; R= CO_2H, X=[·CH_2]$_3$·CO_2H], m.p. 188°, obtained by oxidation of picrotic acid (II) (Angelico, A., 1910, i, 404) gives a *keto-dicarboxylic acid* (*A* ; R=CO_2H,

X=·CO·CO$_2$H), m.p. 194° (decomp.), converted by KOH at 250° into isophthalic acid, H$_2$C$_2$O$_4$, and COMe$_2$, and further oxidised by KMnO$_4$–dil. H$_2$SO$_4$ to αα-*dimethylphthalide*-3 : 4-*dicarboxylic acid* (III) (A ; R=X=CO$_2$H), m.p. 284°, identical with that obtained by oxidation of the hydrolysis product of picrotoxin ketone (IV) (A ; R=Me, X=CH$_2$Ac; Angelico, A., 1913, i, 69), decarboxylated by "natur-kupfer-C " in boiling quinoline to αα-dimethylphthal-ide, and giving hemimellitic acid by fusion with KOH. Oxidation of the tricarboxylic acid C$_{12}$H$_{12}$O$_6$ (2-γ-carboxy-n-butyl*iso*phthalic acid; Angelico et al., A., 1924, i, 183) with KMnO$_4$–NaOH gives 2 : 6-di-carboxyphenylglyoxylic acid (Graebe et al., A., 1893, i, 593). When distilled with Ac$_2$O (I) gives the

(A.) (B.)
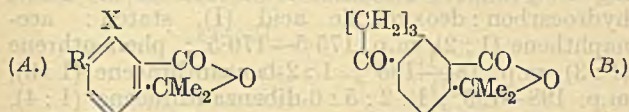
ketone (B), m.p. 154° (*semicarbazone*, sinters 270°, decomp. 315°), and the dicarboxylic acid C$_{12}$H$_{14}$O$_4$ (2-γ-carboxy-n-butyl-m-toluic acid; A., 1924, i, 183) by distillation with Ac$_2$O, or of its Ca salt, affords 5-keto-1-methyl-5 : 6 : 7 : 8-tetrahydronaphthalene, identical with a synthetic specimen (Harvey et al., A., 1930, 593), showing that the side-chain is a n-butyric acid. The oximino-derivative of (IV) is converted by a Beckmann change (SOCl$_2$) into the *nitrile*, m.p. 208°, hydrolysed to the *lactone-monocarboxylic acid* (A ; R=Me, X=CO$_2$H), m.p. 149°, oxidised to (III), and converted by 50% KOH at 260° into 3-methyl-phthalic acid. Angelico's α-chloroketone, m.p. 114—115° (A ; R=Me, X=CH$_2$·CO·CH$_2$Cl), obtained either by the action of NaOCl–NaOH on (IV) or of HCl–AcOH at 100° on picrotinketol (A ; R=Me, X=CH$_2$·CO·CH$_2$·OH) (Horrmann et al., A., 1921, i, 347), is converted by hot MeOH–KOH into αα : 3 : 4-tetra-methylphthalide, similarly obtained (loc. cit.) from (IV). The structure A (R=Me, X=[CH$_2$]$_3$·CO$_2$H) is thus established for (I), whence the above structures of its derivatives are deduced. J. W. B.

Condensation of benzoylformanilide with cyano-activated methylene compounds. J. V. SCUDI and H. G. LINDWALL (J. Amer. Chem. Soc., 1935, **57**, 1646—1648).—COBz·NHPh (I), CH$_2$(CN)$_2$, and a little NHEt$_2$ in EtOH at 0° give α-cyano-β-phenylcarbamylcinnamonitrile (II), NHPh·CO·CPh:C(CN)$_2$, m.p. 206—207°, which with HCl gives α-carbamyl-β-phenylcarbamylcinnamamide (III), m.p. 216°, and with Na$_2$S$_2$O$_4$ in aq. EtOH gives α-cyano-β-phenylcarbamyl-β-phenylpropionitrile (IV), m.p. 215° (decomp.), reconverted into (II) by long boiling in EtOH. (II) is reduced by aq. Na$_2$S$_2$O$_4$ at 50° to α-carbamyl-β-phenylcarbamyl-β-phenyl-propionamide, m.p. 164—165°, which is hydrolysed by 10% NaOH to CO$_2$H·CHPh·CH$_2$·CO$_2$H (V), also obtained similarly from (IV). (I), CN·CH$_2$·CO·NH$_2$, and a little NHEt$_2$ in cold aq. EtOH give 3-hydroxy-5-imino-4-carbamyl-3-phenyl-2-pyrrolidone (VI), m.p. 209—210° (decomp.), hydrolysed by HCl to α-carbamyl-α'-phenylmaleinanil, m.p. 207°, which with P$_2$O$_5$ gives the α-cyano-anil (VII), m.p. 118—119°, is reduced by Na$_2$S$_2$O$_4$ in cold aq. EtOH to α-carbamyl-

α'-phenylsuccinanil (VIII), m.p. 193—194°, and with NHEt$_2$ forms a *compound*, C$_{21}$H$_{23}$O$_3$N$_3$,+H$_2$O, m.p. 163—164° (decomp.), from which it is regenerated by hot conc. HCl. (VII) is converted by NH$_3$–EtOH into (VI) and by Na$_2$S$_2$O$_4$ in hot aq. EtOH into α-cyano-α'-phenylsuccinanil (IX), m.p. 135—136°. (IX) or (VIII) .with 10% NaOH gives α-carbamyl-α'-phenylsuccinic acid, m.p. 156—157° (Ag$_2$ salt), which yields phenylsuccinanil with hot HCl or when heated above the m.p. (I) (1 mol.), CN·CH$_2$·CO·NH$_2$ (1 mol.), and (a) NHEt$_2$, (b) piperidine, or (c) NaOH (1 mol.) in EtOH at 0° give *compounds*, (a) C$_{21}$H$_{23}$O$_3$N$_3$ (X), m.p. 156—158° (decomp.), (b) C$_{22}$H$_{23}$O$_3$N$_3$, decomp. 124—126°, and (c) C$_{17}$H$_{15}$O$_5$N$_2$Na, decomp. 225—226° (corresponding Ag salt), respectively, which with cold dry HCl–EtOH or hot EtOH, H$_2$O, COMe$_2$, or 10% NaOH give (VII). (X) is also ob-tained from (VII) by NHEt$_2$ in EtOH at 0°.

R. S. C.

Quinic acid and its derivatives. VI. Degrad-ation of shikimic acid to aconitic acid. VII. Configuration of shikimic acid. H. O. L. FISCHER and G. DANGSCHAT (Helv. Chim. Acta, 1935, **18**, 1204—1206, 1206—1213; cf. A., 1935, 1222).—VI. In very dil. solution shikimic acid (I) (or its Me ester) is converted by successive oxidations with HIO$_4$ and perpropionic acid into trans-aconitic acid, m.p. 184—191°, hydrogenated (Pd) to tri-carballylic acid. If the process is interrupted when the action of HIO$_4$ is complete the dialdehyde of aconitic acid is obtained, isolated as the di-2 : 4-dinitrophenylhydrazone, m.p. 169°, of the Me ester.

VII. (I) is hydrogenated (Pd–BaSO$_4$–EtOH) to dihydroshikimic [3 : 4 : 5-trihydroxyhexahydro-benzoic] acid (II), m.p. 180° (decomp.), [α]$_D^{25}$ —13·6° in H$_2$O, which consumes 2 mols. of HIO$_4$ in H$_2$O and 3 mols. of Pb(OAc)$_4$ in AcOH; it is transformed by Ac$_2$O–ZnCl$_2$ into triacetyldihydroshikimic anhydride, m.p. 171—173°, whence triacetyldihydroshikimic acid, b.p. 200°/0·3 mm., m.p. 78—80° (corresponding cryst. chloride and anilide, m.p. 145—147°). When heated at 190—220°/0·2 mm., (II) passes into di-hydroshikimolactone (III), m.p. 146—147° after soften-ing, [α]$_D^{20}$ —145·2° in H$_2$O, which is indifferent to Pb(OAc)$_4$, thus showing that OH at 4 is involved in lactone formation and that 4-OH and CO$_2$H have cis-relationship. (II) and boiling Ac$_2$O or (III) and Ac$_2$O–C$_5$H$_5$N afford diacetyldihydroshikimolactone, m.p. 145—146°, [α]$_D^{20}$ —138·3° in CHCl$_3$. (I) or its Me ester is converted by HCl–COMe$_2$ into isopropyl-ideneshikimic acid, m.p. 184° (decomp.), and Me iso-propylideneshikimate, b.p. (bath) 150°/0·3 mm., re-spectively. The latter is transformed by p-C$_6$H$_4$Me·SO$_2$Cl in C$_5$H$_5$N into Me p-toluenesulphonyl-isopropylideneshikimate, m.p. 66—68°, whence Me p-toluenesulphonylshikimate, m.p 137—138°, which consumes 1 mol. of Pb(OAc)$_4$ in AcOH. Similarly, Me benzoylisopropylideneshikimate, b.p. 180° (bath)/0·1 mm. (acid, m.p. 121°), affords Me benzoylshikimate, m.p. 136°. isoPropylideneshikimamide, m.p. 150°, is hydrogenated to the non-cryst. H$_2$-derivative, whence monoacetylisopropylidenedihydroshikimamide, m.p. 125°, and monobenzoylisopropylidenedihydro-shikimonitrile, m.p. 168—169°. (I) and Ac$_2$O–C$_5$H$_5$N at room temp. yield triacetylshikimic acid, b.p. 200—

210° (bath)/0·1 mm., which does not add Br in CHCl₃ and is unaffected by Pb(OAc)₄;

$$
\begin{array}{c}
CO_2H\text{-}C\text{-}H\\
H\text{-}C\text{-}H \quad H\text{-}C\text{-}H\\
OH\text{-}C\text{-}H \quad H\text{-}C\text{-}OH\\
OH\text{-}C\text{-}H \quad (A.)
\end{array}
$$

distillation in presence of a trace of acid converts it into m-OAc·C₆H₄·CO₂H, m.p. 130°. The courses of lactonisation and the action of COMe₂ allow the configuration A to be assigned to (II); a similar arrangement of the 3 OH groups persists in (I), but CO₂H lies in the plane of the ring. The position of the double linking remains undecided.   H. W.

β-Arylglutaconic acids. II. Condensations with phenolic ethers. G. R. GOGTE (Proc. Indian Acad. Sci., 1935, **2**, A, 185—198; cf. A., 1934, 1352).— Acetonedicarboxylic acid and p-C₆H₄Me·OEt condense (H₂SO₄) to a mixture of β-6-*ethoxy-m-tolylglutaconic acid* (I), m.p. 153° (decomp.) (*hydroxyanhydride*, m.p. 112°; *semi-anilide*, m.p. 136°; *hydroxyanil*, m.p. 163°), the *monolactone* of ββ'-6 : 6'-*diethoxy-m-tolylglutaric acid* (II), m.p. 205° (*Et* ester, m.p. 124°), and 2 : 2'-*diethoxy-5 : 5'-dimethylchalkone-α-acetic acid* (III), m.p. 232° [*semicarbazone*, m.p. 264° (decomp.); *Et* ester, m.p. 133°, and its *semicarbazone*, m.p. 171° (decomp.)]. (II) and (III) are also obtained from (I) and p-C₆H₄Me·OEt. (III) with 80% H₂SO₄ forms 7-*ethoxy-3-keto-4-methylindoneacetic acid*, m.p. 216° (decomp.) [*semicarbazone*, m.p. 247° (decomp.), *Et* ester, m.p. 169°, and its *semicarbazone*, m.p. 208° (decomp.)], and with H₂SO₄ at 60° forms a neutral *substance*, m.p. 165° [*semicarbazone*, m.p. 245° (decomp.)]. (II) and H₂SO₄ give 6-methylcoumarin-4-acetic acid and the *dilactone* of ββ'-6 : 6'-*diethoxy-m-tolylglutaric acid*, m.p. 184°, hydrolysed to the *acid*, m.p. 219° (decomp.) [*Et₂* ester, m.p. 82°; *Me₂* ester, m.p. 105°; *anhydride*, m.p. 189°; *acid-anilide*, m.p. 193° (decomp.); *anil*, m.p. 216°]. Hydrolysis of this glutaric acid followed by methylation gives ββ'-6 : 6'-*dimethoxy-m-tolylglutaric acid* (IV), m.p. 192° (decomp.).

p-C₆H₄Me·OMe and acetonedicarboxylic acid yield β-6-methoxy-m-tolylglutaconic acid and 2 : 2'-*dimethoxy-5 : 5'-dimethylchalkone-α-acetic acid*, m.p. 252° [*semicarbazone*, m.p. 277° (decomp.); *Et* ester, m.p. 122°, and its *semicarbazone*, m.p. 219° (decomp.)], but no (IV) is formed. The chalkone acid and H₂SO₄ lead to the corresponding indone-acetic acid and a neutral *substance*, m.p. 214° [*semicarbazone*, m.p. 263° (decomp.); *benzylidene* derivative, m.p. 174°]. The reactions indicate that there is restricted rotation around the linking joining the β-C to the phenolic ether in (I) and in the chalkone-acetic acids.   F. R. S.

Condensation of ethyl chloroformylcholate with amines and phenols. A. VERDINO and E. SCHADENDORFF (Monatsh., 1935, **66**, 169—175).— The following are prepared from Et chloroformylcholate and the requisite base or phenol under the conditions stated in parentheses. They are difficult to purify. *Et cholate-3-urethane* (NH₃–Et₂O), m.p. 155°, and -p-*phenyl-* (Et₂O), amorphous, sinters from about 80°, -o-*tolyl-* (Et₂O, slowly), -o- (hot COMe₂; NHPh₂ catalyst), -m- (hot COMe₂; NHPh₂), m.p. 118°

after sintering from 100°, and -p-*nitrophenyl-* (hot COMe₂), amorphous, sinters from 94°, -o-*carboxyphenyl-* (cold COMe₂, slowly), m.p. 220° after sintering from 217°, α-*naphthyl-*, +EtOH or EtOAc, m.p. 141° after sintering from 136°, and -*anilino-urethane* (Et₂O), m.p. 192° after sintering from 156°. *Et cholate 3-phenyl-* (Et₂O, Na), m.p. 120°, and 3-β-*naphthyl-carbonate* (C₆H₆, C₅H₅N), m.p. 163°. *Resorcinol*, m.p. 203° after sintering at 189°, and *quinol di-*(*Et cholate-3-carbonate*) (both in C₆H₆, C₅H₅N), m.p. 217° after sintering at 213°.   R. S. C.
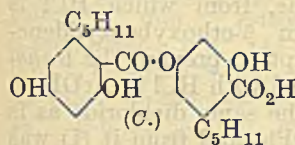
Choleic acids of certain carcinogenic hydrocarbons. L. F. FIESER and M. S. NEWMAN (J. Amer. Chem. Soc., 1935, **57**, 1602—1604).—The following *compounds* are formed in EtOH in the ratio, hydrocarbon : deoxycholic acid (I), stated : acenaphthene (1 : 2), m.p. 175·5—176·5°; phenanthrene (1 : 3), m.p. 184—185°; 1 : 2-benzanthracene (1 : 3), m.p. 198—199°; 1 : 2 : 5 : 6-dibenzanthracene (1 : 4), form A (from EtOH), m.p. 223—224°, and B (from dioxan; more readily formed), m.p. 221·5—222·5°; methylcholanthrene (II) (1 : 4), m.p. 193·5—194·5°; hexahydromethylcholanthrene (1 : 4), m.p. 191·5—192·5°; dioxan, m.p. 173·5—174·5°; hexadecane, m.p. 192—193°; and dodecane, m.p. 186—187°. Absorption spectra indicate complete or nearly complete dissociation in EtOH or Et₂O. The compound from (II) is about as carcinogenic to mice as (II) itself, but is much less toxic than free (I). Compounds could not be obtained from anthracene, naphthacene, chrysene, pyrene, fluoranthene, triphenylene, perylene, 1 : 2-benzpyrene (m.p. 178·8—179·3°), 4'-methyl-1 : 2-benzpyrene (m.p. 219·5—220°), or 1' : 2'-dihydro-4'-methyl-1 : 2-benzpyrene (m.p. 162—163°), but this may be connected with relative solubilities and degrees of dissociation rather than with inability to combine, as, even when compounds are obtained, other solvents (except dioxan in one case) proved useless. The no. of mols. of (I) combined increases with the mol. wt. of the hydrocarbon. M.p. are corr. and (for the new compounds) preceded by sintering.   R. S. C.

Lichen substances. LVI. Constitution of lobaric acid. I. Y. ASAHINA and S. NONOMURA. **LVII. New depside (anziaic) acid and the components of certain Anzia types. LVIII. Components of Thamnolia vernicularis, Schaer, var. Faurica, Schaer.** Y. ASAHINA and M. HIRAIWA (Ber., 1935, **68**, [B], 1698—1704, 1705—1708, 1708—1710; cf. this vol. 749, 1238).—VI. Exhaustive extraction with warm Et₂O of the thalli of Stereocaulon paschale, Ach., S. exutum, Nyl, or S. sorediiferum, Hue, affords atranorin and lobaric acid (I), m.p. 192°, [α]_D ±0°, identical with the stereocaulic acid of Zopf. (I) is C₂₅H₂₆O₈ and yields a *Me* ester, m.p. 122°, *Me* ester *Me* ether (II), m.p. 102°, *Ac* derivative, m.p. 186°, and a *monoxime*, m.p. 193°. Mild hydrolysis with alkali transforms (I) into *lobariolcarboxylic acid*, C₂₅H₃₀O₉, m.p. 193° [*Me₂* ether *Me₂* ester, m.p. 104°, also obtained by treating (II) with KOH–MeOH and the product with CH₂N₂]. (I) with boiling Ba(OH)₂ gives lobariol (III) (usnetol), C₂₄H₃₀O₇, m.p. 168° (*Me* ester, m.p. 140°; *Me* ester *Me₂* ether, b.p. about 130°/1 mm.; *monoxime*, m.p. 173°; *anhydrosemi-*

carbazone, $C_{25}H_{31}O_6N_2$, m.p. 128°, which does not undergo Wolff's reduction; *anhydrohydrazone*, $C_{24}H_{30}O_5N_2$, m.p. 158—159°). (I) is converted by molten KOH into $Bu^\alpha CO_2H$ and $m\text{-}C_6H_4(OH)_2$. Reduction of (III) with HI (d 1·7) and red P leads to *norlobariolide*, $C_{23}H_{28}O_6$, m.p. 210° (*tribromide*, m.p. 211°), a phthalide-like lactone formed with loss of Me; this, when treated with CH_2N_2 and then oxidised with $Na_2Cr_2O_7$, gives a yellow *product*, $C_{25}H_{30}O_7$, m.p. 138—139°. Treatment of (III) with hot conc. KOH followed by reduction with Na and boiling abs. EtOH gives after methylation a non-cryst. *product* (?), $C_{25}H_{36}O_4$, oxidised by CrO_3 to 6-methoxy-1-*n*-amyl-*p*-benzoquinone. For (I) and (III) the structures *A* and *B*, respectively, are tentatively advanced.

(*A*.)

CO·C_4H_9
CO·O
OMe
O
C_5H_{11}
OH
CO_2H

(*B*.)

CO·C_4H_9
CO_2H OH
OMe
O
C_5H_{11}
OH
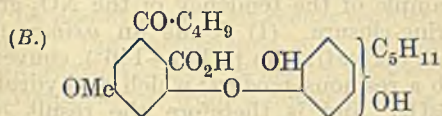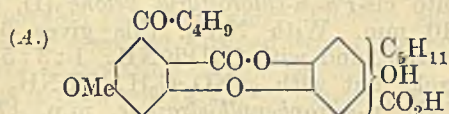
LVII. Extraction of the air-dried thalli of *Anzia gracilis*, Y. Asahina, with purified Et_2O at 15—20° yields atranorin and *anziaic acid* (V), $C_{24}H_{30}O_7$,0·5H_2O, m.p. 124° (decomp.) (*Me* ester, m.p. 102°). Since (V) is hydrolysed to olivetolcarboxylic acid and Me

C_5H_{11}
CO·O
OH
OH
OH
CO_2H
(*C*.)
C_5H_{11}

olivetolcarboxylate (*Me₂ ether*, m.p. 52—53°) and converted by CH_2N_2 into Me perlatolate Me_2 ether, it has the structure *C*. Extraction of *A.japonica*,Müll. Arg, with Et_2O gives atronorin and divaricatic acid, whereas (I) is obtained from *A. hypoleucoides*, Müll. Arg.

LVIII. Extraction of *Thamnolia vermicularis*, var. *taurica* (Japan), with hot $COMe_2$ gives squamatic acid, m.p. about 220° (decomp.) (best identified as the Me_2 ester Me_2 ether, m.p. 132°), and thamnolic acid (*anil*, m.p. 207°). H. W.

Basic properties of hydrazones. IX. R. Ciusa and G. Ottolino (Gazzetta, 1935, 65, 542—545).—*pp′*-Bis-(α-methyl-β-benzylidenehydrazino)triphenylmethane (I) exists in two modifications, one, m.p. 136° (cf. A., 1932, 1132), obtained by crystallisation from PhMe, and the other, m.p. 163° (cf. A., 1934, 408), by adding light petroleum to the PhMe solution. When the condensation product of PhCHO and its phenylmethylhydrazone is boiled with 10% H_2SO_4, the sulphate of m.p. 205° (cf. A., 1934, 408) filtered off, and the liquid treated with aq. NH_3, the *triphenylcarbinol* corresponding with (I) is pptd. This is converted by dil. H_2SO_4 into *pp′-bis-α-methyl-hydrazinotriphenylmethyl H sulphate*, $NH_2\cdot NMe\cdot C_6H_4\cdot CPh\dot{:}C_6H_4\dot{:}NMe(NH_2)\cdot HSO_4,2H_2O$, and by HCl into the compound of m.p. 170° (A., 1932, 51). The H_2SO_4 solution of the hydrolysis product gives an immediate green reaction with aldehydes (32 examples), except pyrrole-aldehyde and aldehydic sugars, but not with ketones (12 examples); this new reagent for aldehydes is more sensitive than Schiff's reagent. E. W. W.

Condensation of vanillin substitution products with methylene derivatives. L. C. Raiford and D. E. Fox (Proc. Iowa Acad. Sci., 1933, 40, 111; cf. this vol., 214).—In condensing vanillin substitution products with $MeNO_2$, NH_4OAc in glacial AcOH is a suitable condensing agent. On replacing $MeNO_2$ by $2:4\text{-}C_6H_3Me(NO_2)_2$, piperidine was most suitable. Ch. Abs. (*e*)

Ozonisation of anisaldehyde, vanillin, and piperonal.—See this vol., 1328.

Alicyclic compounds. I. Synthesis of β-ketoamines. F. Pirrone (Atti R. Accad. Lincei, 1935, [vi], 21, 521—524).—Interaction of PhCHO, NH_3, and *cyclo*hexanone in the cold yields: (1) 2-ω-*benzylideneaminobenzylcyclo*hexanone (I), m.p. 181—183°, which forms a *semicarbazone*, m.p. 199—200°, an *oxime*, m.p. 182—184°, and a *hydroxylaminooxime*, m.p. 199—200°, and on treatment with HCl gives 2 : 6-dibenzylidene*cyclo*hexanone : (2) 2-ω-(ω-*aminobenzyl*)*aminobenzylcyclo*hexanone, m.p. 188—189°, and (3) the 6-*benzylidene* derivative of (I), m.p. 170—171°. T. H. P.

Kinetics of the Friedel–Crafts ketone and hydrocarbon synthesis.—See this vol., 1207.

Influence of nuclear substituents on side-chain reactions. II. Acid-catalysed prototropy of nuclear-substituted acetophenones. III. Base-controlled phototropy of substituted acetophenones.—See this vol., 1209.

Reaction of ωω-dihalogenoacetophenones with alkali. C. H. Fisher and C. T. Walling (J. Amer. Chem. Soc., 1935, 57, 1562—1564).—ωω-Dihalogenoacetophenones dissolve unchanged in aq. alkalis if substituted by Me in the 2- and 6-positions, but the 2-Me compounds give the mandelic acids. $m\text{-}NO_2$-groups enhance the acidity, and 3 : 5-*dinitro*-2 : 4 : 6-*trimethylphenyl CHBr₂ ketone* (I) may be titrated with alkali. ωω-Di-chloro- and -bromo-acetylmesitylene (II) dissolve in 10% KOH at room temp., the former much the more rapidly, and are pptd. unchanged. $2:4\text{-}C_6H_3Me_2\cdot CO\cdot CHBr_2$ (from $2:4\text{-}C_6H_3Me_2\cdot COMe$ or its ω-Cl-derivative) and $2:4:5\text{-}C_6H_2Me_3\cdot CO\cdot CHBr_2$ [from $2:4:5\text{-}C_6H_2Me_3\cdot CO\cdot CH_2Cl$ (obtained from ψ-cumene with a *substance*, m.p. 55—56°)] with 10% KOH give 2 : 4-dimethyl- and 2 : 4 : 5-trimethyl-mandelic acid, respectively. The latter acid yields $2:4:5\text{-}C_6H_2Me_3\cdot CO_2H$, m.p. 149—150° (lit. 148—149°). (II) and $HNO_3\text{-}H_2SO_4$ give (I), m.p. 168—169·5°, also obtained by NaOH from ωωω-tribromo-3 : 5-dinitroacetylmesitylene, into which it is converted by NaOBr. R. S. C.

Biochemical hydrogenations. II. Hydrogenation of unsaturated ketones by fermenting yeast. F. G. Fischer and O. Wiedemann (Annalen, 1935, 520, 52—70; cf. this vol., 123).—Unsaturated ketones in which the C:C and C:O linkings are co-ordinated are reduced when dissolved or emulsified in H_2O and dropped on to actively fermenting yeast. Thus $CHPh\dot{:}CH\cdot COMe$ yields $CH_2Ph\cdot CH_2\cdot CHMe\cdot OH$,

CHPh:CH·CHMe·OH, and CH₂Ph·CH₂·COMe. From C₄H₃O·CH:CH·COMe, the products are 2-γ-hydroxy-butylfuran, b.p. 96—98°/13 mm., and furylethyl Me ketone. CMe₂:CH·COMe gives very small quantities of CHMeBuᵝ·OH. 1-Methyl-Δ¹-cyclohexen-3-one yields 1-methylcyclohexan-3-ol and -3-one, with probably the -Δ¹-cyclohexen-3-ol. Pulegone and carvone apparently give the saturated ketones; yields in each case are poor. CHMe:CH·CH:CH·COMe yields, comparatively readily, Δᵝ-hepten-ζ-ol, b.p. 62—64°, and -ζ-one (A., 1928, 740) (semicarbazone, m.p. 108°). CHPh:CH·CH:CH·COMe gives Δᵅ-α-phenylhexen-ε-ol and -ε-one (semicarbazone, m.p. 132°). Δᵝ-Hexen-δ-ol and Δᵅ-buten-δ-ol (3 : 5-di-nitrobenzoate, m.p. 50°) are unchanged. Δᵅ-Hexen-ε-one yields the -ε-ol. Unsaturated ketones are hydrogenated by yeast more slowly than unsaturated aldehydes or primary alcohols. The action of yeast in converting an unsaturated ketone into an unsaturated alcohol is the first example of this type of reduction. The mechanism of the reactions is discussed.   E. W. W.

Reactions catalysed by aluminium chloride. XII. Migration of halogen in carbon chains and rings. C. D. NENITZESCU and I. G. GAVĂT (Annalen, 1935, **519**, 260—271).—AlCl₃ promotes the migration of Cl in chloro-ketones or -acids to a more remote position in the chain or ring, but not to a terminal Me. Thus cyclohexene, AcCl, and AlCl₃ in CS₂, followed by C₆H₆, give, not 2-, but 4-acetyl-1-phenylcyclohexane, b.p. 161—164°/11 mm. (semicarbazone, m.p. 190—191°). This is oxidised (NaOBr) to 1-phenylcyclohexane-4-carboxylic acid, m.p. 204° (of which the Me ester, m.p. 28°, b.p. 172—173°/15 mm., is reduced to 1-phenylcyclohexyl-4-carbinol, m.p. 49°, b.p. 177—178°/15 mm.), and is dehydrogenated (Pt at 300°) to 4-ethyldiphenyl. Similarly, cyclopentene, AcCl, and AlCl₃, followed by C₆H₆, give, not 2-, but 3-acetyl-1-phenylcyclopentane, b.p. 163—165°/16 mm. (semicarbazone, m.p. 170—171°), oxidised (NaOBr) to 1-phenylcyclopentane-3-carboxylic acid, b.p. 196—198°/5 mm. (chloride, b.p. 159—162°/15 mm.; amide, m.p. 149°; anilide, m.p. 107°), which is synthesised from αδ-dibromo-β-phenylbutane and Et malonate. Using C₂H₄, under the same conditions, CH₂Ph·CH₂·COMe is formed by way of CH₂Cl·CH₂·COMe. With CHMe:CH₂, the product is β-phenylpropyl Me ketone, b.p. 113—115°/13 mm. (semicarbazone, m.p. 137°), also obtained from CH₂:CH·CH₂·COMe, C₆H₆, and AlCl₃. Similarly CHMe:CHMe gives β-phenyl-isobutyl Me ketone, b.p. 239—240° (semicarbazone, m.p. 176°); in neither of these cases is there migration of Cl. From CHEt:CH₂, however, the product is not β-, but γ-phenyl-n-butyl Me ketone, b.p. 122—125°/9 mm. (semicarbazone, m.p. 147°), also obtained from propylideneacetone. Butylideneacetone, C₆H₆, and AlCl₃ yield not β-, but δ-phenylamyl Me ketone, b.p. 136—140°/13 mm. (p-nitrophenylhydrazone, m.p. 117°), which is oxidised to δ-phenylhexoic acid, b.p. 173—175°/11 mm. (chloride, b.p. 134—136°/13 mm.), and is synthesised by condensing γ-phenylbutyl bromide with the Na₂ derivative of CH₂(CO₂Et)₂ to form Et γ-phenylbutylmalonate, b.p. 143—145°/0·5 mm., converting this into δ-phenylhexoic acid, and

passing this with excess of AcOH over ThO₂ at 400°. Δ¹-cyclohexene-1-carboxylic acid with C₆H₆ and AlCl₃ yields 1-phenylcyclohexane-4-carboxylic acid. Migration of Cl is considered to explain the failure of AlCl₃ to convert 1-phenylacetyl-Δ¹-cyclohexane into a tricyclic compound.   E. W. W.

Chlorinated benzylideneacetophenones and hydrindones. K. VON AUWERS and R. HÜGEL (J. pr. Chem., 1935, [ii], **143**, 157—173).—Compounds prepared in an attempt to compare the Beckmann rearrangement of oximes of cis- and trans-forms of α- and β-chlorobenzylideneacetophenone are described. CHPh:CH·COPh is treated in CHCl₃ with Cl₂, and the resulting dichloride converted by KOAc in EtOH into cis-Ph α-chlorostyryl ketone (I), b.p. 204—205°/10 mm. With N₂H₄, this gives 3 : 5-diphenylpyrazole, and with NHPh·NH₂, 1 : 3 : 5-triphenylpyrazole, but with p-NO₂·C₆H₄·NH·NH₂ the product is the p-nitrophenylhydrazone, m.p. 177—179°, an example of the tendency of the NO₂-group to hinder ring-closure. (I) forms an oxime, m.p. 156—157° (Bz derivative, m.p. 145—146°), converted by PCl₅ into a resinous product, which on hydrolysis furnishes BzOH, and is therefore the result of a Beckmann transformation into the substance CHPh:CCl·NHBz. The oxime is converted by KOH–EtOH into 3 : 5-diphenylisooxazole, readily prepared by treating (I) with NH₂OH and NaOH in excess. The action of NaOEt on (I) gives rise to α-chloro-β-ethoxy-α-benzoyl-β-phenylethane, from which HCl is lost (KOH–EtOH) to form β-ethoxybenzylideneacetophenone. In an attempt to prepare the trans-isomeride of (I), it was treated with HCl in AcOH at 100°, but the product was the same dichloride as is obtained from CHPh:CH·COPh, and from it (I) was regenerated. Another attempt was made, combining α-chlorotrans-cinnamoyl chloride with C₆H₆ (AlCl₃), but the product was 2-chloro-3-phenyl-1-hydrindone (II), m.p. 94—96°, b.p. 198—202°/9 mm., which is free from chlorobenzylideneacetophenone, since no trace of 3 : 5-diphenylisooxazole was obtained by treating it with NH₂OH–NaOH. (II) forms an oxime, m.p. 80—90° (impure), containing Cl, but with N₂H₄ the product is 3-phenylindonehydrazone, m.p. 140—141°; similarly, 3-phenylindone-p-nitrophenylhydrazone, m.p. 266—267°, is obtained. β-Chlorotrans-cinnamoyl chloride and C₆H₆ (AlCl₃) yield 3 : 3-diphenyl-1-hydrindone, new m.p. 132° (p-nitrophenyl-hydrazone, new m.p. 248—250°). It was hoped that Me groups would hinder condensation to the hydrindone. 2 : 4-Dimethylbenzylideneacetophenone was converted into the dichloride, and thence into cis-Ph α-chloro-2 : 4-dimethylstyryl ketone (III), b.p. 226—228°/12 mm., oxidised to methylterephthalic acid and BzOH. (III) forms an oxime, m.p. 183—186°, which is not hydrolysed when heated with conc. HCl for 24 hr., but with 67% H₂SO₄ yields a Cl-free and N-free substance, m.p. 70—71°; with PCl₅ the oxime gives an oil which on hydrolysis furnishes NH₃ and m-xylylic acid, and thus contains the amide CHPh:CCl·NH·CO·C₆H₃Me₂. Combination of α-chlorotrans-cinnamoyl chloride with m-xylene (AlCl₃) yields 2-chloro-3-phenyl-5 : 7-dimethyl-1-hydrindone, m.p. 127—129° (oxime, m.p. 172°), which gives rise

to 3-*phenyl*-5 : 7-*dimethylindone*-p-*nitrophenylhydr-azone*, m.p. > 280°, and is oxidised (KMnO₄ in COMe₂) to 6-*benzoyl*-2 : 4-*dimethylbenzoic acid*, m.p. 125° (p-*nitrophenylhydrazone*, m.p. 125—126°). The α-Cl thus neutralises the hindrance to ring-closure offered by the Me groups. E. W. W.

Chemical morphology in homologous series. C. WEYGAND and L. MENSDORF [with F. STROBELT] (Ber., 1935, 68, [B], 1825—1838).—Between immediate neighbours in the different homologous series (normal chains, terminal Prᵝ, etc.) up to octyl-chalkone, morphologically comparable pairs of polymorphic forms invariably exist. With a single exception (Buᵅ–n-C₅H₁₁) seeding relationship exists between neighbours with respect to certain of such comparable pairs of forms. Further, such relationships are observed between isomerides, but a certain degree of variation cannot be exceeded; for normal series it does not appear to extend beyond the next but one member. Between immediate neighbours it may be non-existent, but recurs with the succeeding member; the phenomenon may be connected with the alternation of m.p. in homologous series.

n-*Nonylbenzene*, from n-nonyl bromide, PhBr, and Na, has b.p. 98—100°/1 mm. The following substituted *acetophenones* are obtained by gradual addition of AcCl and benzenoid hydrocarbons to AlCl₃ covered with CS₂ or light petroleum : p-n-*butyl*-, b.p. 140—141°/14 mm. (*semicarbazone*, m.p. 185°); p-iso*butyl*-, b.p. 135°/16 mm.; p-n-*amyl*-, b.p. 159·5°/17 mm.; p-iso*amyl*-, b.p. 153°/16 mm.; p-tert.-*amyl*-, b.p. 144—146°/13 mm.; p-n-*hexyl*-, b.p. 171—172°/18 mm.; p-n-*heptyl*-, b.p. 176—179°/13 mm.; p-n-*octyl*-, b.p. 184—188°/13 mm., m.p. 18°; p-n-*nonyl*-, b.p. 165°/3 mm. The ketones are condensed with PhCHO at 0° in presence of NaOMe or KOH, thus giving the following Ph styryl ketones; the m.p. of the various forms of each member are given in order of stability at room temp. : chalkone, m.p. 59°, 57°, 48°, 49°, 28°, 18°; p'-*methyl-chalkone* (p-*tolyl styryl ketone*), m.p. 75°, 57°, 56°, 55°, 46°, 48°, 45°; p'-*ethyl*-, m.p. 63°, 47°; p'-n-*propyl*-, m.p. 47°, 33°; p'-iso*propyl*-, m.p. 65°, 45°, 18°; p'-n-*butyl*-, m.p. 35°, 33°, 28°; p'-iso*butyl*-, m.p. 71°, 69°; p'-tert.-*butyl*-, m.p. 98°, 62°; p'-n-*amyl*, m.p. 51°, 33°; p'-iso*amyl*-, m.p. 50°, 46°, 45°, 44·5°, 36°; p'-tert.-*amyl*, m.p. 121°; p'-n-*hexyl*-, m.p. 52°, 46°, 44°; p'-n-*heptyl*-, m.p. 43°, 35°, 33°; p'-n-*octyl*-, m.p. 38°, 40°, 35°; p'-n-*nonyl*-, m.p. 43°. The seeding relationships of the various types are recorded. H. W.

Addition to conjugated systems in the anthracene series. II. Behaviour of certain anthranols. P. L. JULIAN and W. COLE (J. Amer. Chem. Soc., 1935, 57, 1607—1611).—1 : 6-Addition of Grignard reagents to 10-methyleneanthrone (I) (A., 1934, 1356) is confirmed. The structure and anticipated great lability (1 : 5-OH migration) of 10-benzylidene-9-phenyl-9 : 10-dihydroanthranol (II) (not fluorescent) are proved. Hydrogenation (Pd) of benzylidene-anthrone (III) in EtOH and treatment of the resulting solution with O₂ gives the peroxide (IV), which is obtained by acting with O₂ on the solution obtained from (I) and MgPhBr. If, however, peroxide formation is prevented in these reactions, the

product is 10-benzylanthrone, m.p. 143—144° (lit. 133—134°) [a *substance*, m.p. 221—222°, is also obtained from (I)], the structure of which is proved by conversion by MgPhBr into 9-phenyl-10-benzyl-anthrone. The production of CH₂Ph·OH by pyrolysis of (IV) is confirmed by its isolation as 3 : 5-*dinitro-benzoate*, m.p. 114°. (I) and MgMeI or MgEtI give 10-*ethyl*-, m.p. 164°, and -*propyl-anthranol peroxide*, m.p. 122°, respectively, giving EtOH or PrOH on pyrolysis. (II) and Br–CHCl₃ give 9-bromo-10-phenylanthracene by way of 10-bromo-9-phenyl-10-α-bromobenzyl-9 : 10-dihydroanthranol, which appears to be stable at low temp., but loses HBr and PhCHO at room temp. (II) with CrO₃ gives 9-phenyl-oxanthrone, and with hot AcOH or Ac₂O fluorescent 9-*phenyl*-10-α-*acetoxybenzylanthracene*, m.p. 160°. With dry HCl or SOCl₂ (II) gives fluorescent 9-*phenyl*-10-α-*chlorobenzylanthracene*, m.p. 189°, and with dry HBr the 10-α-*bromobenzyl* compound (V), m.p. 188°, also obtained from 9-phenyl-10-benzylanthracene and Br in warm CS₂. (II) is isomerised by a little H₂SO₄ in warm COMe₂ to fluorescent 9-*phenyl*-10-α-*hydroxy-benzylanthracene* (VI), +xEtOH or COMe₂ and anhyd., m.p. 187°, which with CrO₃, Ac₂O, HCl, HBr, or Br gives the same products as does (II); the reaction with Br is probably preceded by isomerisation to (II), a small amount of which probably exists in equilibrium with (VI) in solution. (V) and Ag in C₆H₆ give αβ-*diphenyl*-αβ-*di*-9-*phenylanthracenyl*-10-*ethane*, m.p. 252—253°. R. S. C.

Carvacrol. IV. Acylmethyl*iso*propylphenols. H. JOHN and P. BEETZ (J. pr. Chem., 1935, [ii], 143, 342—346).—Synthetic carvacrol gives (Friedel-Crafts; PhNO₂) 2-*hydroxy*-5-*propionyl*-, m.p. 76°, -n-*butyryl*-, m.p. 66°, -iso-*valeryl*-, m.p. 86°, and -*benzoyl*-1-*methyl*-4-iso*propylbenzene*, m.p. 126°, in poor yields. R. S. C.

Inhibition in the benzoin reaction.—See this vol., 1329.

Autoxidation phenomena in the indene series. P. PFEIFFER and H. L. DE WAAL (Annalen, 1935, 520, 185—200).—ββ-Diphenylpropionyl chloride is converted by AlCl₃ into 3-phenyl-α-hydrindone (I) (cf. Kohler, A., 1904, 595) [2-*benzylidene*, m.p. 158°, 2-*anisylidene*, m.p. 174°, and 2-(3' : 4'-*dimethoxybenzyl-idene*), m.p. 174°, derivatives], the 2-*oximino*-deriv-ative, decomp. 201—202°, of which with NH₂·OH,HCl–NaOAc affords the *dioxime*, decomp. 196—196·5°, of (III) [below : also from NH₂·OH and (III)]. (I) condenses with PhNO in aq. EtOH–NaOH to give 2-*anilo*-3-*phenyl*-α-*hydrindone* (II), m.p. 149—150°, hydrolysed (cold conc. H₂SO₄) to 1 : 2-*diketo*-3-*phenyl-hydrindene* (III), m.p. 137—138° [*semicarbazone*, m.p. 252° (decomp.); *quinoxaline*, m.p. 173°]. Oxidation of (II) with boiling 30% H₂O₂ affords a *compound*, m.p. 160°, which is either C₆H₄<CHPh·C:NPh / CO——O or

C₆H₄<CHPh·CO / CO——NPh, hydrolysed by boiling 20% KOH to an α-*phenylhomophthalanilic acid*, m.p. 192°, converted by warm AcOH–dil. H₂SO₄ into α-*phenylhomo-phthalic acid*, m.p. 157—158°. Similarly (I) condenses (N₂) with p-NO·C₆H₄·NMe₂ to give its 2-p-*dimethyl-aminoanilo*-derivative, m.p. 148—150°, oxidised in air

to 4-*hydroxy*-1 : 3-*diketo*-4-*phenyl*-2-p-*dimethylamino-phenyl*-1 : 2 : 3 : 4-*tetrahydro*isoquinoline, m.p. 214·5°, converted by hot 20% KOH into 1-*keto*-3-*phenyl*-2-p-*dimethylaminophenyl*-1 : 3-*dihydro*isoindole (IV), m.p. 270° (decomp.) [*H sulphate*, m.p. 223—224° (decomp.)], which is hydrolysed to α-phenylphthalide (V) by 48% H_2SO_4, and is identical with a specimen synthesised from (V) and *as*-dimethyl-p-phenylene-diamine (VI). An attempt to synthesise the 3-OH-derivative of (IV) by condensation of (VI) with o-benzoylbenzoic acid gave *benzophenone*-p-*dimethyl-aminoanil*-2-*carboxy*-p-*dimethylaminoanilide*, m.p. 245°. Similarly the 2-p-*methoxyanilo*-derivative, m.p. 118°, of (I) is autoxidised to 4-*hydroxy*-1 : 3-*diketo*-4-*phenyl*-2-p-*anisyl*-1 : 2 : 3 : 4-*tetrahydro*isoquinoline, m.p. 168°, whence 1-*keto*-3-*phenyl*-2-p-*anisyl*-1 : 3-*di-hydro*isoindole, m.p. 201° (also synthesised), is obtained. Many of the above are halochromic. J. W. B.

Magnetochemical investigations of organic substances. III. Deeply coloured dimeric keten of W. Langenbeck. E. MÜLLER (Ber., 1935, **68**, [*B*], 1883—1885 ; cf. this vol., 1116).—The magnetochemical behaviour of Langenbeck's 3 : 3 : 4 : 4-tetraphenyl*cyclo*butane-1 : 2-dione (A., 1928, 762) affords no evidence of the presence of the diradical ···CPh_2·CO·CO·CPh_2···. The uncertainty as to the influence of a 4-membered ring is removed by examination of Et_2 *cyclo*butane-1 : 1-dicarboxylate. H. W.

Perylene and its derivatives. XLIV. A. PON-GRATZ and G. MARKGRAF (Monatsh., 1935, **66**, 176—180 ; cf. A., 1934, 1359).—3 : 9-*Di*-p-*toluoylperylene*, m.p. 317·5—318·5°, is obtained from perylene (I) and p-C_6H_4Me·COCl (II) or perylene-3 : 9-dicarboxyl chloride and PhMe in CS_2 with AlCl$_3$, thus proving p-condensation in the latter reaction. (I), (II), and AlCl$_3$ without a solvent give, however, 3 : 4-*di*-p-*toluoylperylene* (III), m.p. 351—352°. (I), p-C_6H_4Cl·COCl, and AlCl$_3$ without a solvent give similarly 3 : 4-*di*-p-*chlorobenzoylperylene* (IV), m.p. 346—347°. Clemmensen reduction of (III) and (IV) gives 1 : 2-*di*-p-*tolyl*-(V ; R=C_6H_4Me), m.p. 326·5—327·5°, and -*chlorophenyl-azeperylene*, m.p. 317—318°. M.p. are corr. R. S. C.

Isomeric *allo*pregnan-3-ol-20-one. A. BUTE-NANDT and L. MAMOLI (Ber., 1935, **68**, [*B*], 1847—1850).—Hydrolysis of *allo*pregnanolone acetate (I) with KOH–EtOH affords *allo*pregnanolone (II) and isoallo*pregnanolone* (III), m.p. 148°, [α]$_D^{19}$ +6·05° in EtOH (*acetate*, m.p. 101°). Both substances immediately yield sparingly sol. additive *products* with digitonin. (III) is largely isomerised to (II) by EtOH–KOH. (II) is oxidised by CrO_3 to *allo*pregnandione (IV), also formed with isoallo*pregnandione*, m.p. 134—135°, [α]$_D^{20}$ −14·56° in EtOH, when (III) is oxidised. (I) and (II) therefore differ only in the steric arrangement around C17. The ability of (I) and (IV) to give sparingly sol. products with digitonin shows that the presence of OH at C3 is not essential for this reaction. H. W.

Δ^1-*allo*Pregnen-3 : 20-dione. **Specificity of the corpus luteum action.** A. BUTENANDT and L. MAMOLI (Ber., 1935, **68**, [*B*], 1850—1854).—*allo*-Pregnandione is smoothly transformed by Br in AcOH into the *Br$_1$*-derivative (I), m.p. 199° (decomp.), converted by KOBz in BzOH at 205° into 2-*hydroxy-pregnan*-3 : 20-*dione benzoate*, m.p. 235°. (I) loses HBr with difficulty, but is transformed by KOAc in AcOH at 175—185° into a singly unsaturated αβ-*diketone*, m.p. 140°, [α]$_D^{13}$ +68·6°, not identical with progesterone, and regarded as Δ^1-*allo*pregnen-3 : 20-*dione* ; it is physiologically inactive. H. W.

Transformation of dehydroandrosterone into Δ^4-androsten-17-ol-3-one (testosterone) ; method of preparing testosterone from cholesterol. A. BUTENANDT and G. HANISCH (Ber., 1935, **68**, [*B*], 1859—1862).—The physiological activity of andro-stendione, m.p. 169°, [α]$_D^{18}$ +185°, towards rodents exceeds that of any other member of the androsterone group. Reduction of dehydroandrosterone with Na and PrOH gives an *androstendiol*, $C_{19}H_{30}O_2$, m.p. 177—178°, [α]$_D^{18}$ −55·5°, which has little physiological activity. It is converted by boiling Ac_2O into the *di-acetate*, m.p. 158·5°, [α]$_D^{18}$ −56·5°, partly hydrolysed to *androstendiol* 17-*monoacetate* (I), m.p. 146°. Bromination of (I) followed by oxidation with cold CrO_3 and debromination of the product with Zn dust and NaI affords Δ^4-*androsten*-17-*ol*-3-*one acetate*, m.p. 138°, [α]$_D^{20}$ +87·5°, hydrolysed to Δ^4-androsten-17-ol-3-one, m.p. 151°, [α]$_D^{18}$ +104° (oxime, m.p. 215°), which is highly active physiologically and probably identical with testosterone. H. W.

Androsterone. R. E. MARKER (J. Amer. Chem. Soc., 1935, **57**, 1755—1756).—Androsterone (I) is conveniently synthesised by one of the following series of reactions. Cholesteryl chloride (prep. by PCl$_5$ or SOCl$_2$) gives cholesterol when hydrolysed, but, when hydrogenated (PtO$_2$) in Et$_2$O, gives rapidly α-chol-estyl chloride (II). β-Cholestanol with PCl$_5$ gives β-cholestyl chloride (III), but with SOCl$_2$ gives (II). Similarly *epi*cholestanol (IV) gives (II) with PCl$_5$, but (III) with SOCl$_2$. Hydrolysis of (II) gives (IV). Walden inversion thus occurs at unidentified points. Oxidation of (II) gives α-chloroandrosterone, whence (I) is obtained by KOAc. R. S. C.

Systematic degradation of 3-hydroxy*allo*-cholanic acid to androsterone. O. DALMER, F. VON WERDER, H. HONIGMANN, and K. HEYNS (Ber., 1935, **68**, [*B*], 1814—1825).—Me 3-hydroxy*allo*-cholanate is transformed by MgPhBr in Et$_2$O–C_6H_6 into *diphenyl*-3-*hydroxynor*allo*cholylcarbinol*, m.p. 150°, [α]$_D^{22}$ +20° in EtOH, acetylated and then oxidised by CrO_3 in AcOH to 3-*acetoxynorallocholanic acid* (I), m.p. 235°, [α]$_D^{22}$ +26° in CHCl$_3$ [*Me* ester (II), m.p. 189—190°, [α]$_D^{22}$ +26° in CHCl$_3$]. (I) is hydrolysed to 3-*hydroxynorallocholanic acid*, m.p. 205—207°, [α]$_D^{22}$ +21° in EtOH, converted by CH_2N_2 into the *Me* ester, m.p. 169—170°, [α]$_D^{22}$ +21° in CHCl$_3$. Treatment of (II) with MgPhBr followed by hydrolysis leads to *diphenylbisnorallocholylcarbinol*, a yellow resin, which is acetylated and then oxidised to 3-*acetoxybisnorallocholanic acid*, m.p. 225—227°, [α]$_D$ +2° in CHCl$_3$ [*Me* ester (III), m.p. 128—129°, [α]$_D^{22}$ +10° in CHCl$_3$]; 3-*hydroxybisnorallocholanic acid*,

m.p. 220°, $[\alpha]_D^{22}$ +17° in EtOH, and its *Me* ester, m.p. 162—163°, $[\alpha]_D^{22}$ +12° in CHCl$_3$, are described. (III) is transformed successively into *diphenyl-3-hydroxytrinoralllocholylcarbinol* and *3-acetoxyœtioallocholanic acid* [*Me* ester (IV), m.p. 201—202°, $[\alpha]_D^{22}$ +56° in CHCl$_3$]. (IV) and MgPhBr followed by hydrolysis yield *diphenyl-3-hydroxyœtioallocholylcarbinol*, dehydrated at 150—200°/1 mm., acetylated, and then ozonised in CHCl$_3$ to 3-*epi*acetoxyœtio-allocholan-17-one [semicarbazone, m.p. 272—273° (decomp.)], whence androsterone (V). The possibility of converting a native bile acid into (V) is thereby established. In the hope of shortening the course of operations the possibility of obtaining acids with abbreviated side-chains by suitable oxidation of hydrogenated and epimerised sterols is examined. Thus, sitostanone is hydrogenated (PtO$_2$ in AcOH–48% HBr) to epi*sitostanol*, m.p. 203°, $[\alpha]_D$ +26° in CHCl$_3$, the *acetate*, m.p. 88°, $[\alpha]_D^{23}$ +28° in CHCl$_3$, of which is oxidised by CrO$_3$ in AcOH to (I). Similarly, stigmastanol (VI) is oxidised to *stigmastanone hydrate*, C$_{29}$H$_{50}$O,H$_2$O, m.p. 81—82°, $[\alpha]_D^{19}$ +23° in CHCl$_3$ (*oxime*, m.p. 219°, $[\alpha]_D^{23}$ +30° in CHCl$_3$), transformed by BzCl in C$_5$H$_5$N into *stigmastanone*, m.p. 157°, $[\alpha]_D^{19}$ +42° in CHCl$_3$. Catalytic reduction of (VI) gives epi*stigmastanol*, m.p. 200°, $[\alpha]_D$ +25° in CHCl$_3$, the *acetate*, m.p. 85°, $[\alpha]_D^{21}$ +27° in CHCl$_3$, of which likewise affords (I). *epi*Cholestanyl acetate yields 3-hydroxy*allo*cholanic acid [*Me* ester, m.p. 164—165°, and its *acetate*, m.p. 147—148°, $[\alpha]_D^{21}$ +21° in CHCl$_3$) in 11% yield. The C$_{10}$H$_{21}$ side-chain of sitostanol can be partly resolved into ·CHMe·[CH$_2$]$_2$·C$_6$H$_{13}$.

H. W.

Sexual hormones. VII. Synthetic preparation of the testicular hormone, testosterone (androsten-17-ol-3-one). L. RUZICKA and A. WETTSTEIN (Helv. Chim. Acta, 1935, **18**, 1264—1275).—*trans*-Dehydroandrosterone is reduced by Na and Pr^{a}OH or catalytically in presence of Ni to *trans*-Δ^5-*androsten*-3 : 17-*diol* (I), m.p. 182—183° (corr.); trans-Δ^5-*androsten*-3 : 17-*diol* 3-*monoacetate* (II), m.p. 147—148° (corr.), is obtained catalytically from *trans*-Δ^5-3-acetoxyandrosten-17-one. Mild treatment of (I) with Ac$_2$O affords the corresponding *diacetate*, m.p. 165—166°, which decolorises Br in AcOH and gives a yellow colour with C(NO$_2$)$_4$; it is transformed by cautious treatment with KOH in MeOH at 15° into trans-Δ^5-*androsten*-3 : 17-*diol* 17-*monoacetate* (III), m.p. 146·5—148·5°, which depresses the m.p. of (II). Addition of Br followed by oxidation with CrO$_3$ and debromination of the product with Zn and AcOH or NaI in EtOH leads to Δ^4-17-*acetoxyandro-sten-3-one*, m.p. 139—141°, hydrolysed to Δ^4-*androsten-17-ol-3-one* (*A*), m.p. 154·5—155·5°, $[\alpha]_D^{24}$ +109° in abs. EtOH (oxime, m.p. 222—223°), chemically and biologically identical with testosterone. A. W.

(*A*.)
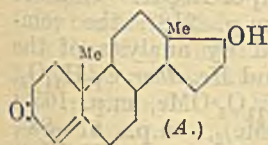
Effect of the ketodivinyl chain on the colour of metallic salts of hydroxyvinyl ketones. I. Salts of disalicylideneacetone. (Unsaturated chromophores. II.) A. MANGINI (Gazzetta, 1935, **65**, 474—486).—Disalicylideneacetone forms three

4 Y

series of salts : (*A*), stable red ; (*B*), stable yellow ; and (*C*), salts pptd. in an unstable red form, passing into a yellow form. In each case the mol. combines with two equivs. of the metal. The following are described. (*A*) : *Mg* (+4H$_2$O), *Ca* (+6H$_2$O), *Sr* (+7H$_2$O), *Ba* (+5H$_2$O), *Cd* (+2H$_2$O), *Pb* (+2H$_2$O), *cuprammonium*, *Ag* (greyish-black), *Tl*˙ (blackish-red), and *NH$_4$*; (*B*) : *Cu* (+H$_2$O), *Zn* (+2H$_2$O), *Hg*˙˙ (+H$_2$O), *Fe*˙˙˙ (+6H$_2$O), *Al* (+6H$_2$O), *Be*, and *Cr*; (*C*) : *Mn* (+H$_2$O), *Fe*˙˙ (+3H$_2$O), *Ni* (+3H$_2$O), *Co* (+2H$_2$O), and *Hg*˙ (+6H$_2$O) salts. The structure of these salts is discussed : it is suggested that (*B*) are simple co-ordinated compounds, and that in (*A*) the mol. has become ionised into a dipole.

E. W. W.

4 : 4′-Dibenzyldiphenylmethane. E. CONNERADE (Bull. Soc. chim. Belg., 1935, **44**, 411—424).—CH$_2$Ph$_2$ with CH$_2$O in AcOH in presence of H$_2$SO$_4$ gives a 2 to 3% yield of *4 : 4′-dibenzyldiphenyl-methane* (I), m.p. 91·5°, with resinous products. 4 : 4′-Dichloromethyldiphenylmethane (II) with AlCl$_3$ in C$_6$H$_6$ yields CH$_2$Ph$_2$ and resinous products, without (I). MgPhBr has no action on (II), which is converted by LiPh into an amorphous *polymeride*, with much Ph$_2$; the mechanism of the last reaction is discussed. 4 : 4′-Di(chloromethyl)benzophenone with AlCl$_3$ in C$_6$H$_6$ gives a quant. yield of *4 : 4′-dibenzylbenzophenone*, m.p. 85—87° (*oxime*, m.p. 130—131°), which is reduced by Na–Hg to 4 : 4′-*dibenzyl-diphenylcarbinol*, and oxidised (CrO$_3$) to 4 : 4′-*dibenzoyldibenzophenone* (III), m.p. 227·5° (*trioxime*). Benzophenone-4 : 4′-dicarboxyl chloride with AlCl$_3$ in C$_6$H$_6$ yields (III), with 4-*benzoylbenzophenone*-4′-*carboxylic acid*, m.p. 268°. (III) is reduced by Na–Hg in EtOH to 4 : 4′-*di-ω-hydroxybenzyldiphenylcarbinol* (IV), m.p. 176·5°, with a *substance* (V), m.p. 105—110°. (IV) is converted by HCl in C$_6$H$_6$ into 4 : 4′-*di-ω-chlorobenzyldiphenylmethyl chloride* (VI), m.p. 73°, and (V) into an amorphous compound (VII). (IV) and (V) are regarded as stereoisomeric, as are (VI) and (VII).

E. W. W.

Condensation of resorcinol with α-chloroiso-butyl cyanide and isobutyldehyde cyanohydrin. M. YAMASHITA (Sci. Rep. Tôhoku, 1935, **24**, 205—207).—Resorcinol with CHPr$^\beta$Cl·CN gives (Hoesch) 5-*hydroxy-1-isopropylbenzfuran-2-one*, m.p. 174—176°, and with OH·CHPr$^\beta$·CN 2 : 4-*dihydroxyphenyl* α-*hydroxyisobutyl ketone*, m.p. 124—126°, but neither product could be converted into oreoselone.

R. S. C.

Steric hindrance as a factor in the hydrolytic stability of aromatic ketimines. J. B. CULBERTSON, R. ALBRIGHT, D. BAKER, and P. SWEITZER (Proc. Iowa Acad. Sci., 1933, **40**, 113).—2-Methyldiphenylketimine hydrochloride is hydrolysed much more slowly than the 3- and 4-Me isomerides ; this may be due to steric hindrance. The very slow hydrolysis of 2 : 4 : 6-trihydroxydiphenylketimine hydrochloride is ascribed to the occurrence of tautomerism with the enamine forms ; the much slower hydrolysis of 4 : 6-dihydroxy-2-methyldiphenylketimine hydrochloride may be a steric effect. CH. ABS. (*r*)

Formoins. II. P. KARRER and C. MUSANTE (Helv. Chim. Acta, 1935, **18**, 1140—1143; cf. this

vol., 623).—Introduction of p-Cl or p-Br into benzoyl-formoin greatly increases the tendency towards enolisation. p-C$_6$H$_4$Cl·COMe is oxidised by SeO$_2$ in boiling EtOH to p-*chlorophenylglyoxal*, m.p. 122°, converted by KCN in 50% EtOH at room temp. into pp'-*dichlorobenzoylformoin* [β-*hydroxy*-αγδ-*triketo*-αδ-*di*-p-*chlorophenyl*-n-*butane*], m.p. 190°. Similarly, p-*bromophenylglyoxal monohydrate*, m.p. 125°, is transformed into pp'-*dibromobenzoylformoin*, m.p. 196°. H. W.

Condensation of glutar- and adip-dinitriles with resorcinol and phloroglucinol. M. YAMASHITA (Sci. Rep. Tôhoku, 1935, **24**, 192—196).—CN·[CH$_2$]$_3$·CN with resorcinol (I) gives by the Hoesch reaction only γ-2 : 4-*dihydroxybenzoylbutyric acid*, m.p. 175—178°, but with phloroglucinol (II) gives γ-2 : 4 : 6-*trihydroxybenzoylbutyric acid*, m.p. 286—286·5°, and αε-*di*-2 : 4 : 6-*trihydroxyphenylpenta*-αε-*dione*, m.p. 247—249°. CN·[CH$_2$]$_4$·CN with (I) yields αζ-*di*-2 : 4-*dihydroxyphenylhexa*-αζ-*dione*, m.p. 285—288°, and δ-2 : 4-*dihydroxybenzoylvaleronitrile*, m.p. 157—159°, whilst with (II) only αζ-*di*-2 : 4 : 6-*trihydroxyphenylhexa*-αζ-*dione*, decomp. 265°, could be obtained.
R. S. C.

Condensation of dienes with alkylated quinones. L. F. FIESER and A. M. SELIGMAN (Ber., 1935, **68**, [B], 1747—1751).—Contrary to Chuang et al. (this vol., 863), hydroaromatic compounds with " angular " Me groups can be obtained from butadiene and alkylated quinones ; the Me hamper but do not inhibit the reaction. Treatment of p-xyloquinone (I) with butadiene in EtOH containing a little AcOH for 62 hr. at 100—105° affords 12 : 14-dimethyl-1 : 4 : 5 : 8 : 11 : 12 : 13 : 14-octahydroanthraquinone, m.p. 171°, in 2% yield (cf. Adler, this vol., 983) and *butadiene*-p-*xyloquinone*, b.p. 124—125°/9·5 mm. (*semicarbazone*, m.p. 200—201°), in 75% yield. Similarly, (I) and CH$_2$:CMe·CMe:CH$_2$ afford 2 : 3-*dimethylbutadiene*-p-*xyloquinone*, b.p. 135—136°/9 mm. (*monosemicarbazone*, m.p. 205—207°), and di-2 : 3-*dimethylbutadiene*-p-*xyloquinone*, m.p. 208—209°, in similar yield. C$_6$H$_6$ may replace EtOH as solvent, but the use of higher temp. appears to encourage side reactions. The use of pure materials appears essential, and the stability of the products at a given temp. depends somewhat on the solvent employed. Piperylene and 2 : 6-dimethyl-1 : 4-naphthaquinone in EtOH–AcOH at 100—105° give *piperylene*-2 : 6-*dimethyl*-1 : 4-*naphthaquinone* as a viscous oil ; *piperylenethymoquinone*, b.p. 126—128°/2·5 mm., is obtained similarly.

[With J. L. HARTWELL.] The elimination of a loosely-united substituent during the condensation is illustrated by the production of 2 : 3-dimethylanthraquinone when 2-hydroxy-1 : 4-naphthaquinone is heated with CH$_2$:CMe·CMe:CH$_2$ and air is drawn through the alkaline solution of the product ; it is also produced by protracted action from 2-methoxy-1 : 4-naphthaquinone, whereas *iso*naphthazarin is recovered unchanged. H. W.

Diene synthesis of anthraquinones. L. F. FIESER and (MRS.) M. FIESER (J. Amer. Chem. Soc., 1935, **57**, 1679—1681).—β-Aroylacrylic acids condense with butadiene or (CMe:CH$_2$)$_2$ to aroyl-Δ^4-tetrahydrobenzoic acids, the esters of which are smoothly dehydrogenated and, after hydrolysis, readily yield

anthraquinones. Dehydrogenation or ring-closure of the H$_4$-acids is not feasible. The β-aroylacrylic acids are prepared in 70—75% yield from the C$_6$H$_6$ derivative (0·2 mol.), maleic anhydride (0·21 mol.), and AlCl$_3$ (0·45 mol.) in C$_2$H$_2$Cl$_4$ at room temp. and by " diene "-addition in dry EtOH at 100—105° give usually > 95% yields of 2-p-*toluoyl*-Δ^4-*tetrahydrobenzoic acid* (I), m.p. 151·5°, 2-*benzoyl*-, m.p. 143° (and a little of an *isomeride*, m.p. 189°), 2-p-*toluoyl*-, m.p. 167·5°, 2-2' : 4'-, m.p. 150·5° (and a little of an *isomeride*, m.p. 165·5°), and 2-2 ' : 5'-*dimethylbenzoyl*-, m.p. 151°, and p-*anisoyl*-, m.p. 149°, -4 : 5-*dimethyl*-Δ^4-*tetrahydrobenzoic acid*. The Me esters thereof, all oils, with S at 240—245° (30 min.) give *Me* 2-*benzoyl*-, m.p. 123·5°, 2-p-*toluoyl*-, m.p. 121°, 2-2' : 4'-, m.p. 103·5°, and 2-2' : 5'-*dimethylbenzoyl*-, m.p. 110°, and 2-p-*anisoyl*-*benzoate* (II), an oil, whence the corresponding *acids*, m.p. 197·5°, 194·5°, 204·5°, 230°, and 195·5°, respectively, are obtained. These acids, except (II), with conc. H$_2$SO$_4$ at 100° give 2 : 3-dimethyl-, 2 : 3 : 6-trimethyl-, and 2 : 3 : 6 : 8-, m.p. 196°, and 2 : 3 : 5 : 8-*tetramethyl-anthraquinone*, m.p. 178°. Reduction (Zn dust–NaOH) of (II) gives 2-p-*methoxybenzyl*-4 : 5-*dimethylbenzoic acid*, m.p. 142°, dehydrated to 6-*methoxy*-2 : 3-*dimethylanthr*-10-*one*, m.p. 151·5°, which yields 6-*methoxy*-2 : 3-*dimethylanthraquinone*, m.p. 212°. (I) could not be successfully dehydrogenated as acid or ester and gave only a small yield of 2-methylanthraquinone.
R. S. C.

Derivatives of phenanthraquinone. A. J. JAKUBOVITSCH and E. VOROBJOVA (J. pr. Chem., 1935, [ii], **143**, 281—286).—The prep. of phenanthraquinone is modified. The 2- and 4-NH$_2$-quinones give (Sandmeyer) 2-, m.p. 243—244°, and 4-*chlorophenanthraquinone*, m.p. 162—163°, reduced by SO$_2$ to the corresponding unstable *quinols*, m.p. 147—149° and 171—172°, respectively. 2-Nitrophenanthraquinone and hot NHPh·NH$_2$ in C$_5$H$_{11}$·OH yield the quinol, which with CH$_2$N$_2$ gives 2-*nitro*-9 : 10-*dimethoxyphenanthrene*, m.p. 126—127°, reduced by 4% Na–Hg and EtOH (not by SnCl$_2$) to the unstable 2-*NH$_2$-compound*, m.p. 257—258° (decomp.). R. S. C.

Santal, pterocarpin, and homopterocarpin, the colourless companions of santalin. II. H. RAUDNITZ and G. PERLMANN (Ber., 1935, **68**, [B], 1862—1866 ; cf. A., 1934, 900).—Sandal wood is extracted with Et$_2$O and the dried extract is treated with EtOAc ; after removal of santalin, the filtrate slowly deposits a mixture of crystals, which is separated into its components by CCl$_4$ or EtOH. Thus are isolated : santal, C$_{13}$H$_{10}$O$_5$, m.p. 218°, the composition of which is supported by analysis of the *diacetate*, C$_{17}$H$_{14}$O$_7$, m.p. 152°, and *Me$_2$ ether*, C$_{15}$H$_{14}$O$_5$, m.p. 141° ; pterocarpin, C$_{16}$H$_{11}$O$_4$·OMe, m.p. 165° ; homopterocarpin, C$_{15}$H$_{10}$O$_2$(OMe)$_2$, m.p. 87—88°, which is possibly not homogeneous. H. W.

The original acids in American pine resin. K. KRAFT (Annalen, 1935, **520**, 133—143).—Sapic acid (I) (Vocke, A., 1934, 193) is separated by fractional crystallisation from COMe$_2$ into mixture-*A*, m.p. 141—144°, [α]$_D$ −60° to −80°, and -*B*, m.p. 140—142°, [α]^{17} −126·2°, and d-pimaric acid (II). When boiled with AcOH only 80% of A isomerises to abietic acid [from (II)]. In the H$_2$–PtO$_2$–EtOH reduction of A

the mother-liquor, after separation of the H_2-derivative, m.p. 195—198° (*loc. cit.*), affords dihydro-*d*-pimaric acid, separated through the NH_4 and Na salts. Ozonolysis of the Me esters gives an acid product from which is isolated the Me ester of the keto-dibasic acid, $C_{15}H_{22}O_5$, similarly obtained from abietic acid (Ruzicka *et al.*, A., 1933, 279). From the cryst. NH_4 salt of *B* (1% aq. NH_3 < 60°, exclusion of O_2 and light) both *l*- (III) and *d*-pimaric acid are isolated by fractional crystallisation of the Na salts. (I) contains (II) and (III) and, probably, a rearrangement product (IV) of (III). The absorption spectrum of *A* (flat max. at 250 mμ) is probably due to (III) (sharp max. at 272·5 mμ) and (IV). J. W. B.

Cerin and friedelin. I. Their mol. wts. and empirical formulæ. N. L. DRAKE and R. P. JACOBSEN (J. Amer. Chem. Soc., 1935, **57**, 1570—1574).—Cork yields to EtOAc cerin (I), $C_{30}H_{50}O_2$, m.p. 247—251° (decomp.), $[\alpha]_{5461}^{23}$ −44·5°, and friedelin (II), $C_{30}H_{50}O$, m.p. 255—261°, $[\alpha]_{5461}^{20}$ −29·4° (enol *acetate*, *benzoate*, m.p. 255—262°, $[\alpha]_{5461}^{25}$ +66·2°, *phenylacetate*, m.p. 244—251°, $[\alpha]_{5461}^{26}$ +57·1°, β-*phenylpropionate*, m.p. 229—233°, $[\alpha]_{5461}^{23}$ +52·8°, and p-*iodobenzoate*, m.p. 271—274°, $[\alpha]_{5461}^{25}$ +61·2°), and a trace of a *sterol*, ?$C_{27}H_{50}O_2$. (II) is a ketone, (I) a OH-ketone. Both are reduced (Clemmensen) to a *hydrocarbon*, $C_{30}H_{52}$, m.p. 245—249°. (II) is probably [*n* and $C(NO_2)_4$-colour] tetracyclic with one unreactive ethylenic linking. R. S. C.

Lignin and related compounds. XII. Methanol-lignin. F. BRAUNS and H. HIBBERT. **XII. Structure and properties of glycol-lignin.** K. R. GRAY, E. G. KING, F. BRAUNS, and H. HIBBERT. **XIV. Action of lead tetra-acetate and of mercuric acetate on glycol-lignin.** K. R. GRAY, F. BRAUNS, and H. HIBBERT. **XV. Phenol-lignin.** F. BRAUNS and H. HIBBERT (Canad. J. Res., 1935, **13**, B, 28—34, 35—47, 48—54, 55—60; cf. this vol., 623).—XII. Methanol-lignin (I) (prep. from spruce wood meal, MeOH, and 2% of HCl at 90—100°) (OMe 21·5%) is sol. in NaOH, from which it is pptd. by CO_2 or acids, gives with Ac_2O–C_5H_5N an *Ac* derivative (OMe : OAc=6 : 4 mols.), insol. in NaOH, and with CH_2N_2 in dioxan a *Me* derivative (II) (OMe 24·1%), insol. in NaOH; (II) gives an *Ac* derivative (OMe : OAc =7 : 3 mols.), which with Me_2SO_4–NaOH in aq. $COMe_2$ at 40° affords a *product* (III) (OMe 32·3, OAc 0%). If (I) is homogeneous, native lignin (IV) is $C_{42}H_{32}O_6(OH)_5(OMe)_5$. (I) is the Me_6, (II) the Me_7, and (III) the Me_{10} ether.

XIII. (IV) contains three primary OH. Glycol-lignin (V), prepared by extraction with glycol and HCl, is probably $C_{42}H_{32}O_6(OH)_4(OMe)_5 \cdot O \cdot [CH_2]_2 \cdot OH$. Glycol compounds give apparent OMe vals. in the Zeisel determination; the necessary correction is determined. (V) is shown to contain $O \cdot [CH_2]_2 \cdot OH$ by the fact that extraction with $OH \cdot [CH_2]_2 \cdot OMe$ gives a product with higher OMe content (20%). (V) is a mixture of $CHCl_3$-insol. (75%; OMe, 17, C 62·6%) and $CHCl_3$-sol. (25%; OMe 17, C 63·15%) portions, both of which give the same Ac_5 (VI), Bz_5, (p-$C_6H_4Br \cdot CO)_5$, (p-$NO_2 \cdot C_6H_4 \cdot CO)_5$, (p-$C_6H_4Me \cdot SO_2)_5$, and $(CPh_3)_4$ (*Ac* derivative) derivatives, and with CH_2N_2 the

$(OMe)_6$-compound (VII). (VII) gives a $(CPh_3)_3$ (*Ac* derivative), Ac_4, Bz_4, and (p-$C_6H_4Me \cdot SO_2)_4$ derivative and with Me_2SO_4 a $(OMe)_{10}$-derivative (VIII) (OMe 31·4%), also obtained similarly from (VI). (V) with HBr–Ac_2O–AcOH at 120° gives a *product* (OMe : OAc = 4 : 6 mols.), but with HI–PhOH a PhOH condensation product. The mother-liquors from the prep. of (V) contain a lignin–carbohydrate *compound*.

XIV. (VIII) and $Hg(OAc)_2$ in MeOH–dioxan–AcOH (10 : 1 : 1·5) at 100° give a *product*, $C_{42}H_{32}O_6(OMe)_9(\cdot HgOAc)_5 \cdot O \cdot [CH_2]_2 \cdot OMe$, sol. in dioxan, indicating the absence of ethylenic linkings and the presence of 5 C_6H_6 or (possibly fewer) heterocyclic rings; previous work is inconclusive in this respect. $Pb(OAc)_4$ in dioxan gives a product containing Pb, which after removal of Pb by cold Ac_2O–C_5H_5N has Ac 8·35 and OMe (corr.) 25·9%, but reaction was possibly incomplete.

XV. Condensation of (IV) with PhOH during extraction is confirmed by union of (V) and its derivatives with 3PhOH in presence of HCl without loss of H_2O, etc. (V), PhOH, and dry HCl (5%) at 100° give a *product*, $C_{42}H_{32}O_6(OH)_4(OMe)_x \cdot O \cdot [CH_2]_2 \cdot OH, 3PhOH$ (*A*; *x*=5), giving Bz_8 and Ac_8 derivatives and with CH_2N_2 the *compound* (IX), $C_{42}H_{32}O_6(OH)_3(OMe)_6 \cdot O \cdot [CH_2]_2 \cdot OMe, 3PhOMe$. (VII) gives the *compound* (*A*; *x*=6) (Bz_7 derivative); (VIII) gives according to the conditions the *compound*, $C_{42}H_{32}O_6(OH)_2(OMe)_9 \cdot O \cdot [CH_2]_2 \cdot OMe, 3PhOH$, or, by loss of 2Me, the *compound*, $C_{42}H_{32}O_6(OH)_2(OMe)_7 \cdot O \cdot [CH_2]_2 \cdot OMe, 3PhOH$, affording with CH_2N_2 the $(OMe)_{11}$-compound, which loses another Me to give the *compound*, $C_{42}H_{32}O_6(OMe)_6(OBz)_3 \cdot O \cdot [CH_2]_2 \cdot OMe, 3PhOMe$. (IX) and Me_2SO_4 give the Me_{13} *ether*, $C_{42}H_{32}O_6(OMe)_9 \cdot O \cdot [CH_2]_2 \cdot OMe, 3PhOMe$. Quercitin does not condense with PhOH, indicating that flavone groupings are not responsible for the reaction.
R. S. C.

Lignin and related compounds. XVI. Phenol-lignin from spruce wood, from Freudenberg spruce lignin, and Willstätter spruce lignin. I. K. BUCKLAND, F. BRAUNS, and H. HIBBERT. **XVII. Methylation of Willstätter and Freudenberg lignins.** F. BRAUNS and H. HIBBERT. **XVIII. Ligninsulphonic acid—its isolation and structure.** E. G. KING, F. BRAUNS, and H. HIBBERT. **XIX. Alkali-lignin.** H. B. MARSHALL, F. BRAUNS, and H. HIBBERT (Canad. J. Res., 1935, **13**, B, 61—77, 78—87, 88—102, 103—113).—XVI. Crude phenol-lignin (OMe 6·4%) which contains one fewer OMe group than the original lignin (cf. B., 1926, 146; A., 1931, 941) is separated by dioxan–Et_2O into lignins $C_{42}H_{32}O_6(OMe)_4(OH)_5(OPh), 3PhOH$ (I) (OMe 10·3%) and $C_{42}H_{32}O_6(OMe)_5(OH)(OPh), 15PhOH$ (II) (OMe 5·3%). (I) with Ac_2O–C_5H_5N at room temp. gives an Ac_8 derivative (OMe 7·9%) and with CH_2N_2 a $(OMe)_5$-derivative (OMe 21·6%), probably $C_{42}H_{32}O_6(OMe)_6(OH)_3(OPh), 3PhOH$, which is further acetylated to a Ac_3 derivative (OMe 19·1%). The latter or the octa-acetate with Me_2SO_4–30% NaOH at 40—42° is completely methylated to an $(OMe)_8$-derivative (OMe 28·2%), probably $C_{42}H_{32}O_6(OMe)_9(OPh), 3PhOMe$. The analytical data from these compounds and the application of the

Brauns–Hibbert hypothesis (A., 1934, 74) indicate that in phenol-lignin, four phenolic residues are associated with the lignin mol., one in the form of an ether (and accounts for the loss of one OMe) and three so as to give free OH-groups. (II) affords a similar series of products [Ac_8 (OMe 4·4%), $(OMe)_5$- (OMe 22·8%) which with Ac_2O gives a Ac_3 derivative (OMe 21·5%), and $(OMe)_8$- (OMe 27·3%) -derivatives]. Calculations based on the analytical figures indicate that 1 mol. of lignin has reacted probably with 15 mols. of PhOH, which are firmly bound to the lignin and are not merely adsorbed. Willstätter lignin (III) (cf. A., 1928, 743) and Freudenberg lignin (IV) (cf. A., 1929, 1046) similarly afford phenol-lignins (OMe 12·3 and 11·5%, respectively) which resemble (I), but which have not lost 1 OMe in their formation. The former affords an Ac_8 (OMe 9·6%), a $(OMe)_5$- (OMe 23·9%) [Ac_3 derivative (OMe 21·6%)], and an $(OMe)_8$- (OMe 30·0%) -derivative. The latter affords corresponding derivatives with 9·2, 23·5, 21·6, and 29·1% OMe, respectively, somewhat lower than in the above series because they contain the methylene oxide group (see below). The CH_2N_2 and fully methylated products above have a higher OMe content (corresponding with one additional OH capable of methylation) than the analogous derivatives of (I).

XVII. (III) and (IV) (see above) are methylated (CH_2N_2) to compounds (OMe 21·3 and 20·4%, respectively) which with PhOH containing dry HCl at 80° afford sol. phenol-lignins which have one more OMe group than the phenol derivatives of (III) and (IV). Complete methylation of the above four phenol-lignins gives two pairs of compounds (OMe 30·4, 30·0; 28·2, 29·1%, respectively) having the same OMe content, those from (IV) having a lower OMe content probably because of the persistence of a methylene oxide group (cf. A., 1927, 342; 1928, 1227; 1931, 1278). The acetylated and completely methylated phenol-lignins prepared from (III) and (IV), premethylated with CH_2N_2, are similar to those described previously (see above). (III) and (IV), premethylated with CH_2N_2, when heated with anhyd. MeOH containing dry HCl under pressure afford methanol-lignins (OMe 24·4 and 22·6%, respectively), different from those obtained by interaction of (III) and (IV) with MeOH. Me_2SO_4–NaOH at room temp. with (III) and (IV) affords fully methylated lignins, the latter being unchanged by heating with MeOH–HCl under pressure.

XVIII. Ligninsulphonic acid (V) [isolation by a modification of Freudenberg's method (A., 1933, 276) described] with CH_2N_2 in MeOH gives a product (OMe 18·4%) insol. in hot and cold NaOH [with Me_2SO_4 a fully methylated product (OMe 27·7%) is obtained], as does reaction with Ac_2O–C_5H_5N, which probably indicates that a structural change involving ·SO_3H accompanies methylation, whereas with MeOH–dry HCl at 80° under pressure it affords a compound, sol. in H_2O and MeOH, which contains one OMe more than the original acid. The neutral Na salt of (V) (prepared by pptn. from a solution containing NaOAc with EtOH, by dialysis of a solution containing excess of $NaHCO_3$, and electrometrically) in H_2O at 0° with CH_2N_2 affords a OMe-derivative (OMe 19·4%) [the Ag salt of which with MeI and CH_2PhCl in MeOH

at 80° affords a *Me* (OMe 22·0%) and *benzyl* ester (OMe 18·1%), respectively, in poor yield] sol. in MeOH and H_2O, and with Me_2SO_4—30% NaOH in $COMe_2$ at 25° gives a fully methylated derivative (OMe 27·7%; cf. A., 1933, 276). Theoretical considerations and analytical figures suggest that formation of (V) is preceded by removal of 1 mol. of H_2O, and support the empirical formula for lignin proposed by Brauns and Hibbert (A., 1934, 74).

XIX. Alkali-lignin, prepared by Mehta's method (A., 1926, 209), is separated into fractions (*A*) and (*B*) (OMe 14·9 and 14·0%, respectively), which are insol. and sol. in dioxan–Et_2O, respectively. (*A*), $C_{61}H_{46}O_{10}(OMe)_6(OH)_7$, with CH_2N_2 in dioxan gives a *product* (OMe 22·2%), insol. in NaOH, which with Ac_2O gives an Ac derivative (OMe 19·5%) converted after de-acetylation into a fully methylated *substance* (OMe 31·5%) (fully acetylated analogue has OMe 12·0%). The OMe content of (*A*) after treatment with MeOH–dry HCl is raised to 20·4% (which indicates the presence of a reactive OH); treatment with CH_2N_2 gives a compound with OMe 28·6%. (*A*) reacts with PhOH–dry HCl to give a condensation product (OMe 12·9%) of 1 mol. of (*A*) with 2 mols. of PhOH [Ac_9 (OMe 10·3%), $(OMe)_6$- (with CH_2N_2) (OMe 25·7%), which with Ac_2O–C_5H_5N gives a Ac_3 derivative (OMe 23·9%), and $(OMe)_9$- (OMe 30·4%) -derivatives with Me_2SO_4–KOH, or by simultaneous methylation and de-acetylation of the Ac_9 derivative]. 1 Mol. of (*A*) condenses with *o*- or *p*-C_6H_4Br·OH (1 mol.) to give products of const. composition (OMe 13·4 and 13·6%, respectively) (cf. Part XVI). (*B*), $C_{99}H_{69}O_{17}(OMe)_9(OH)_{11}$, affords ($Ac_2O$–$C_5H_5N$) an Ac_{11} derivative (OMe 11·7%), an $(OMe)_8$-derivative (OMe 24·8%) with CH_2N_2, which with Ac_2O gives an Ac_3 derivative (OMe 22·3%), and the latter with Me_2SO_4–NaOH gives an $(OMe)_{11}$-derivative (OMe 28·7%). (*B*) with PhOH–dry HCl gives two products in which 1 mol. of (*B*) reacts with 3 mols. and 5 mols. of PhOH, respectively; in each case, one PhOH group is linked through its O atom.   J. L. D.

Jute-lignin. VII. Behaviour of organic compounds towards ClO_2 and its significance for the constitution of lignin. P. B. SARKAR (J. Indian Chem. Soc., 1935, **12**, 470—475).—The action of ClO_2 on numerous aromatic and aliphatic substances has been examined. Phenols are readily oxidised, especially when >1 OH is present. Phenols become more resistant to oxidation when acetylated or methylated, or when Br, Cl, or NO_2 is present as substituent. Aliphatic OH is attacked by ClO_2, but not when methylated or acetylated. The CH_2O_2 and CO_2H attached directly to the ring are unattacked by ClO_2, but side-chains are oxidised to carboxylic acids. That lignin is slowly attacked by ClO_2 is no proof of the existence of a phenolic OH. Pectin in jute is unattacked by ClO_2 and is therefore considered to be aliphatic (cf. A., 1926, 441). From a comparison of the above results with those obtained with various lignins, it is concluded that chloro-, bromo-, and nitro-lignin contain Cl, Br, and NO_2 at least partly in the benzene ring, and that jute-lignin is less highly polymerised than wood-lignins (cf. A., 1933, 1050). The chlorolignin obtained from ClO_2 and lignin is

almost identical with that obtained in the usual way with Cl_2.
H. G. M.

Constitution of abrin. T. HOSHINO (Annalen, 1935, **520**, 31—34).—A detailed account of work already noted (this vol., 1131).
E. W. W.

Columbin.—See this vol., 1432.

Chemical composition of sundew. II. W. R. WITANOWSKI (Wiadom. Farm., 1935, **62**, 1—3; cf. this vol., 420).—Droserone (from *Drosera rotundifolia*, L.) is almost identical with plumbagin. In both the OMe and OH are attached to the benzene, not the quinone, ring. The red colouring matter of *D. rotundifolia* is a pelargonidin pentoside.
CH. ABS. (*r*)

Constituents of *Cuscuta reflexa*, Roxb.—See this vol., 1432.

Constituents of hsi-hsin.—See this vol., 1433.

Essential oil of *Aristolochia indica*, Linn.—See this vol., 1433.

Catalytic action of active carbon on terpenes and related compounds. S. KIMURA (Bull. Chem. Soc. Japan, 1935, **10**, 330—340).—*l*-Menthone and piperitone when heated with active C at 220° give *m*-cresol (I) and thymol, which with C gives (I) and 2 : 5-dimethylcoumarone. *d*- and *l*-α-Terpineol give dipentene (II). *l*-Menthol and *d*-borneol yield Δ^3-*p*-menthene and camphene, respectively. Geraniol and linalool give (II), myrcene, and α-camphorene. Citral yields *p*-cymene, whilst citronellal yields *iso*pulegol and di*iso*pulegol ether. Safrole and *iso*safrole yield dihydrosafrole, 1 : 3 : 4-$C_6H_3Pr^a(OH)_2$, and *p*-cresol. Similarly methyl-eugenol and -*iso*eugenol yield 1 : 3 : 4-$C_6H_3Pr(OMe)_2$ and 4 : 1 : 3-OH·C_6H_3Pr·OMe.
F. R. G.

Slow combustion of liquid pinane. D. SHOCHET (Bull. Soc. chim. Belg., 1935, **44**, 387—394).—When *d*-pinane (99 g.) is oxidised by air at 110°, O_2 (12 litres in 3 weeks) is rapidly absorbed after a short induction period, the residual gas contains O_2 0·6, CO_2 33·3—35·6, CO 8·8—10·1, H_2 23·8—26, and CH_4 0·95%, and the liquid products contain 4-*acetyl*-1 : 1-*dimethyl*-2-*ethylcyclobutane* (less probably 1 : 1-dimethyl-2-γ-keto-n-butylcyclobutane) (I), b.p. 80—82°/16 mm., $[\alpha]_{5461}^{20}$ +74·74° (*semicarbazone*, m.p. 196·1°; gives CHI_3 with NaOI), a small amount of a ketone (*semicarbazone*, m.p. 228°), a mixture, b.p. 92—102°/10 mm. (about $C_{10}H_{18}O$), of neutral substances (including an alcohol), acids, and more highly oxygenated neutral substances. (I) is shown to differ from tetrahydrocarvone, prep. from carvone by H_2–Pd-black in Et_2O.
R. S. C.

Transformation of camphene into *iso*bornyl esters. G. BRUS and J. VÉBRA (Bull. Inst. Pin, 1935, 109—120, 187—192).—Camphene (I) and AcOH or HCO_2H with or without catalysts give optimum yields of about 92 and 98%, respectively, of *iso*bornyl esters and some unchanged (I). The esters decompose into (I) and some diterpene in presence of the catalyst. The existence of an equilibrium is thus proved; it is believed to be ionic in nature, since the speed with which it is attained increases with the *k* of the acid. The following *complexes* (*X*=*iso*bornyl

acetate) are isolated; they are probably intermediates in and catalysts for the formation and decomp. of the esters. X,H_3PO_4, m.p. 64—66°; $X,SbCl_3$, m.p. 72—73°; $X,ZnCl_2$; $2X,H_4P_2O_7$. Similar complexes are formed by bornyl acetate, but not by the formates.
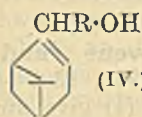R. S. C.

Alkaloid salts of camphorsulphonic acid. D. FUSCO (Boll. Chim. farm., 1935, **76**, 585—587).—The hydrochlorides of optochin (*M*) and of quinine (*N*) react with the Ca salt of camphorsulphonic acid (HX) to form the *camphorsulphonates*, *M*,2HX and *N*,HX,9H_2O. The latter is sufficiently sol. to be employed therapeutically in aq. solution.
E. W. W.

Caryophyllene series. IV. **Clovene and clovenic acid.** R. D. BLAIR (J.C.S., 1935, 1297—1298).—MgMeI and clovenic anhydride (I) give an acid *product*, $C_{16}H_{23}O_3$, m.p. 195°, reduced (Na) to an acid substance, m.p. 137—138°. (I) and MgPhBr yield a neutral *product* (II), $C_{27}H_{32}O_2$, m.p. 212°, and an acid *product*, $C_{21}H_{28}O_3$, m.p. 269°; (II) is oxidised (CrO_3–AcOH) to a neutral *substance*, $C_{27}H_{28}O_3$, m.p. 244°, and an unsaturated *acid*, $C_{23}H_{27}O_3$, m.p. 185—186°. Clovenic acid and anhydride give the same $(NH_4)_2$ salt, m.p. 168—170° (decomp.). The structure of clovenic acid is discussed.
F. R. S.

Synthese in the myrtenol series. W. S. ZACHAREWICZ (Bull. Inst. Pin, 1935, 143—167).—*dl*-, *d*-, and *l*-Pinene with SeO_2 at 60—70° give myrtenal (I) 14·3, myrtenol (II) 32·8, and hydrocarbons (III) 25·8%. The following are described. *d*-, b.p. 106—107°/11 mm., [α] +44·11° (*H phthalate*, m.p. 114—115°, $[\alpha]_D$ +21·25° in EtOH; *benzoate*, b.p. 102·5—104°/9 mm., $[\alpha]_D$ +45·32°), *l*-, b.p. 111—112°/11 mm., $[\alpha]_D$ −42·73° (*acetate*, b.p. 134·5—135·5°/38 mm.), and dl-*myrtenol*, b.p. 106·5—107°/13 mm. (*H phthalate*, m.p. 120—120·5°). 1-*Myrtenyl chloride* (prep. by PCl_5 in ligroin), b.p. 112°/45 mm., $[\alpha]_D$ −29·2°. *d*-, b.p. 99—100°/15 mm., $[\alpha]_D$ +14·75° [obtained with $[\alpha]_D$ +17·02° from (II) and CrO_3], l-, b.p. 115·5—117°/31 mm., $[\alpha]_D$ −16·72°, and dl-*myrtenal*, b.p. 94—95°/11 mm. (*d*-, two forms, m.p. 225° and 217°, respectively, and dl-*semicarbazone*, m.p. 200·5°; *d*-, m.p. 70·5—71·5°, $[\alpha]_D$ +16·25° in EtOH, and dl-*oxime*, m.p. 101°). *d*-Myrtenonitrile, b.p. 106°/12 mm., $[\alpha]_D$ +54·89°. *d*-Myrtenic acid (from the nitrile or aldehyde), m.p. 53—54°, $[\alpha]_D$ +51·13° in EtOH. (I) and $KMnO_4$ give an active *pinic acid*, m.p. 80—81°, and the *dl*-form, m.p. 101—102·5°. The Cannizzaro reaction proceeds anomalously. (I), COMe₂, and aq. Ba(OH)₂ give d-*myrtenylideneacetone*, b.p. 158—159°/20 mm., $[\alpha]_D$ −28·42° (*oxime*, an oil; *semicarbazone*, m.p. 209—209·5°, $[\alpha]_D$ −23° in EtOH), hydrogenated (PtO_2) in AcOH with absorption of 6H to a mixture, b.p. about 142·5—143·5°/15 mm., $[\alpha]_D$ +26·18°. By aërial oxidation of *d*-pinene in presence of Co abietate are prepared *d*-verbenol, b.p. 99—100°/11 mm., $[\alpha]_D$ +103·35°, and *d*-verbenone, b.p. 104—105°/15 mm., +237·4° [*semicarbazone*, m.p. 206—207° (decomp.), $[\alpha]_D$ +77·6° in EtOH; hydroxylamino-oxime, m.p. 163° (decomp.); oxidised by $KMnO_4$ to pinonic acid, m.p. 130—131°]. The H phthalates of (II) with Na in xylene give l-, b.p. 126·5—127·5°/22 mm., $[\alpha]_D$ −26·06° (*H phthalate*, m.p. 108·5—109°,

$[\alpha]_D$ —15° in EtOH ; *acetate*, b.p. 127·5—128·5°/18 mm., $[\alpha]_D$ —21·51°), and dl-*trans-myrtanol*, b.p. 122—123°/19 mm. (*H phthalate*, m.p. 114·5—116°), oxidised by CrO_3 to dl-trans-*myrtanal*, b.p. 100—112°/14 mm. (*semicarbazone*, m.p. 169—170°). Hydrogenation (PtO_2) of (I) or (II) in AcOH gives d-, b.p. 122°/20 mm., $[\alpha]_D$ +20·67°, l-, b.p. 127·5—128·5°/26 mm., $[\alpha]_D$ —24·48° (*H phthalate*, m.p. 124·5—125·5°, $[\alpha]_D$ +3·75°, —4·6° in EtOH ; d-*acetate*, b.p. 132·5—133·5°/26 mm.), and dl-cis-(iso)*myrtanol*, b.p. 125—126°/21 mm. (*H phthalate*, m.p. 126·5—127·5°; *chloride*, unstable, b.p. about 87—97°/22 mm.), oxidised to dl-cis-(iso)*myrtanal* (*semicarbazone*, m.p. 194—195°). *l*-Myrtenal gives by the Grignard reaction " l-*methyl-* " (IV ; R=Me), b.p. 108—109°/13 mm., $[\alpha]_D$ —40·14°, " l-*ethyl-*," b.p. 117·5—119°/18 mm., $[\alpha]_D$ —31·72°, and " l-*phenyl-myrtenyl alcohol*," b.p. 180—182°/13 mm., $[\alpha]_D$ —10·03° (*H phthalate*, an oil). Hydrogenation (PtO_2) of (IV; R=Me) in AcOH gives an *alcohol*, b.p. 114—115°/12 mm., $[\alpha]_D$ —22·19° (*acetate*, b.p. 122·5—123·5°/15 mm., $[\alpha]_D$ —22·56°), whereas Na in xylene gives an *alcohol*, b.p. 121—122°/16 mm., $[\alpha]_D$ —19·28° (*acetate*, b.p. 126—127°/18 mm., $[\alpha]_D$ —16·75°). (IV ; R=Et) gives similarly *alcohols*, b.p. 119—120°/12 mm. and 130—131°/14 mm., $[\alpha]_D$ —27·44° and —23·87°, respectively (*acetate* of the second, b.p. 136—137°/19 mm., $[\alpha]$ —27·72°), and with CrO_3 gives a *substance*, b.p. 130—133°/12 mm. [*semicarbazone*, m.p. 192—193° (decomp.) ; *oxime*, an oil]. (III) consists mostly of nopinene (V) (l- from d- and d- from l-pinene) and small amounts of a diethylenic (conjugated) *hydrocarbon* (VI) (of opposite α to that of the pinene used). Hydrogenation of the first fractions of (III) gives a mixture of pinane [from the (V)] and pinene [from the (VI)]. Oxidation gives nopinic acid, a neutral *substance*, m.p. 126—126·5°, $H_2C_2O_4$, and an *acid*, possibly δε-*diketo-β-carboxy-γγ-dimethylheptoic acid*, m.p. 226—227°. (VII) is thus probably $\Delta^{1:5}$-*pinadiene*. Physical data and Raman spectra are given, the latter being much used for identification.   R. S. C.

Constitution of cedrene. W. F. SHORT (Chem. and Ind., 1935, 874).—The annexed suggested structure reconciles that proposed by Ruzicka and van Melsen (A., 1929, 932) with the formation of camphoronic acid on oxidation (this vol., 983).   E. C. S.

Elucidation of the constitution of sesquiterpenes by powerful oxidative degradation. II. α-Gurjunene and gurjun-azulene. W. TREIBS (Ber., 1935, 68, [B], 1751—1756).—The proportion of α-gurjunene (I) in an oil of balsam, α_D —75°, could be increased to about 90% by fractional distillation in a vac., whilst β-gurjunene (II) could be isolated from a second oil, α_D +12°, by destruction of (I) by oxidation. A partial separation of (I) and (II) can be achieved by fractional extraction with EtOH, in which (II) is more freely sol. Catalytic hydrogenation (Pd-sponge) of (I) and (II) affords α- (III), α_D —18°, and β-, α_D —42°, -gurjunane, the physical consts. of which show the sesquiterpenes to

belong to different ring systems. Contrary to Deussen *et al.* (A., 1915, i, 273), the regenerated product from α-gurjugene hydrochloride differs from (I) in α_D according to the temp. at which the hydrochloride is produced ; since on hydrogenation it yields essentially (III), the operations are not accompanied by ring fission and formation of a new double linking, but by transposition of an existing linking. A hydrochloride could not be isolated from (II) and HCl ; isomerisation occurs with production of iso-β-*gurjunene*, α_D —36°, hydrogenated to a *tetrahydride*, α_D —15°, thus establishing the conversion of a tricyclic sesquiterpene with a double linking into a dicyclic system with two double linkings. A similar isomerisation is observed in the action of hot AcOH-H_2SO_4 on (I), whereby iso-α-*gurjunene* (IV), α_D —135° (*tetrahydride*, α_D —10°), which does not add HCl, is produced. (I) is oxidised by hot aq. $KMnO_4$ to $H_2C_2O_4$ and AcOH, whereas CH_2O or $COMe_2$ is not produced. More powerful oxidation by $KMnO_4$ in $COMe_2$ affords $H_2C_2O_4$ and much ($CH_2 \cdot CO_2H)_2$, but not $CMe_2(CO_2H)_2$, thus establishing the absence of :CMe_2. Still more drastic action of $KMnO_4$ succeeded by prolonged treatment of the product with hot, dil. HNO_3 gives a liquid tricarboxylic *acid* $C_9H_{14}O_6$, which yields a Me_3 ester, b.p. 165—167°/20 mm., α_D ±0° ; 0·1*N*-KOH hydrolyses two ester groups of the latter, whereas *N*-KOH is required for hydrolysis of the third group. The formulæ *A* and *B* are therefore suggested for (I) and (IV), respectively :

(*A*.)   (*B*.)
                         H. W.

Essential oil of black tea.—See this vol., 1289.

Decarboxylation of furantetracarboxylic acid. H. GILMAN, H. OATFIELD, and W. H. KIRKPATRICK (Proc. Iowa Acad. Sci., 1933, 40, 112).—Et furantetracarboxylate is prepared by the self-condensation of Et oxalacetate and may be progressively decarboxylated. Of the products, *furan*-3 : 4-*dicarboxylic acid* is of interest for purposes of abs. orientation ; the method is the best available for the prep. of 3-furoic acid.   CH. ABS. (*r*)

Optical absorption and double linking.—See this vol., 1300.

Substances analogous to graphite.—See this vol., 1333.

Synthesis of 6-hydroxy-7-methoxycoumarin-5-acrylolactone. M. YAMASHITA (Sci. Rep. Tôhoku, 1935, 24, 202—204).—Pyrogallol and $CH_2Cl \cdot CN$ yield (Hoesch) ω-chlorogallacetophenone, which with malic acid and conc. H_2SO_4 gives a poor yield of 7 : 8-*dihydroxy-6-chloroacetylcoumarin*, m.p. 228—229°, converted by warm aq. $NaHCO_3$ into 6-*hydroxy-7-methoxy-coumarin-5-acrylolactone*, m.p. 229—230·5°.   R. S. C.

Pyrylium derivatives by condensation of saturated ketones. T. L. DAVIS and (MISS) C. B. ARMSTRONG (J. Amer. Chem. Soc., 1935, 57, 1583—1585).—*p*-OMe·C_6H_4·COMe and H_2SO_4 yield *s*-trianisylbenzene (11% ; cf. A., 1913, i, 172) and
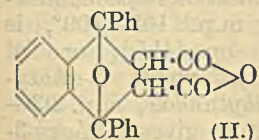
2 : 4 : 6-*trianisylpyrylium H sulphate* [corresponding *picrate*, m.p. 283—284°, and *platinichloride*, m.p. 261·5—263·5° (decomp.)]. COPhMe yields similarly a 2 : 4 : 6-triphenylpyrylium salt. Anisylidene-*p*-methoxyacetophenone gives by Dilthey's method 2 : 4 : 6-*trianisyl-3-methylpyrylium picrate*, m.p. 190·4—195° [*platinichloride*, m.p. 239—240° (decomp.)], thus confirming the loss of Me in the above reactions. R. S. C.

Reactions of *o*-hydroxybenzylidenediaceto-phenones. IV. Unsymmetrical 1 : 5-diketones. D. W. HILL. **V. Functional group reactions of salicylidenediacetophenone.** A. S. GOMM and D. W. HILL (J.C.S., 1115—1118, 1118—1120).—IV. *αγ-Dibenzoyl-α-phenyl-β-o-hydroxyphenylpropane*, m.p. 198° [from Ph styryl ketone (I) and deoxybenzoin (II)], is incompletely converted by AcOH into a mixture of 4-(*α-phenylphenacyl*)*flavene* (III), m.p. 135—136°, and 4-(*α-phenylphenacylidene*)*flavene*, m.p. 162—163°, and by HCl–AcOH–FeCl₃ into flavylium ferrichloride (IV). (III) with HCl and FeCl₃ affords 4-(*α-phenyl-phenacyl*)*flavylium ferrichloride*, m.p. 196°. 2-(β-*Benzoyl-α-o-hydroxyphenylethyl*)*cyclohexanone* (V), m.p. 157—158° [from (I) and *cyclo*hexanone], with AcOH gives 11-*hydroxy-9-phenacyl*-1 : 2 : 3 : 4 : 10 : 11-*hexahydroxanthen* (VI), m.p. 123°, and with HCl–AcOH followed by FeCl₃ affords 1 : 2 : 3 : 4-*tetra-hydroxanthylium ferrichloride*, m.p. 127°, also prepared from (VI). 2-(β-*Benzoyl-α-o-hydroxyphenyl-ethyl*)*cyclopentanone*, m.p. 195° [from (I), *cyclo*-pentanone, and NHEt₂], is converted into (IV) by HCl–AcOH–FeCl₃. A by-product formed in the reaction between (I) and (II) is shown to be identical with a condensation product of (II) with COPhMe.

V. Salicylidenediacetophenone (VII) has been treated with various reagents to decide whether the *o*-hydroxybenzylideneacetophenones which are insol. in alkali and give no colour with FeCl₃ have the diketone or chromanol structure. (VII) with Ac₂O gives an Ac derivative, and with CH₂N₂ *o*-methoxy-benzylidenediacetophenone. The products from (VII) and MgPhBr depend on the conditions; in C₆H₆, 2 : 2 : 4-*triphenylchroman* (VIII), m.p. 216—217°, is obtained, but in Et₂O the product is probably *ααγ-triphenyl-γ-(o-hydroxyphenyl)*-n-*propyl alcohol* (IX), m.p. 185°. 4-Phenacylflavene and MgPhBr give 4-(β-*hydroxy-ββ-diphenylethyl*)*flavene*, m.p. 194°. Formation of (VIII) and (IX) is accounted for by elimination of one of the COPh·CH₂ groups of (VII). 4-Phenacylideneflavene and MgPhBr do not interact. It is suggested that the diketone and chromanol forms are tautomeric. P. G. C.

Constitution of the anthocyanins. L. F. LEVY (J. S. African Chem. Inst., 1935, **18**, 27—35).—A review.

Action of maleic anhydride on diphenyl*iso*-benzfuran. E. DE B. BARNETT (J.C.S., 1935, 1326). —Maleic anhydride and 1 : 2-diphenyl*iso*benzfuran (I) in C₂H₄Cl₂ give an *adject* (II), m.p. 279° (decomp.), which decomposes easily in solution. Benzo-quinone and (I) similarly form a *product*, m.p. 203° (decomp.). F. R. S.

Chemical morphology in the benzene, thio-phen, and furan series. C. WEYGAND and F. STROBELT (Ber., 1935, **68**, [B], 1839—1847).—The seeding relationships and morphology of a series of compounds obtained by replacing the Ph of Ph styryl ketone by thiophen or furan residues are described in detail. The following are described : 2-*thienylidene-acetophenone*, $\begin{smallmatrix} CH \cdot CH \\ CH\!-\!S \end{smallmatrix}\!\!>\!C \cdot CH\!\!:\!\!CHBz$, *forms*, m.p. 59°, 58°, from thiophen-2-aldehyde (I) and COPhMe ; *benzylidene-2-acetothienone*, $CHPh\!:\!CH \cdot CO \cdot C\!\!<\!\!\begin{smallmatrix} CH \cdot CH \\ S\!-\!CH \end{smallmatrix}$, *forms*, m.p. 82°, 74° ; 2-*thienylidene-2-acetothienone*, *varieties*, m.p. 99°, 91°, 85°, 83°, 79°, 75°, 66°, 43°, from (I) and 2-acetyl-thiophen ; 2-*furfurylideneacetophenone*, *forms*, m.p. 46°, 36°, 29° ; 2-*benzylideneacetofurone*, *forms*, m.p. 88°, 45°, 41° ; 2-*furfurylidene-2-acetofurone*, *forms*, m.p. 89°, 61°, 57° ; 2-*furfurylidene-2-acetothienone*, *forms*, m.p. 71°, 54°, 53° ; 2-*thienylidene-2-acetofurone*, *forms*, m.p. 80°, 72°, 48°. H. W.

New method in the penthiophen (thiopyran) group. E. PHILIPPI, HANS MOSER, and HEIMO MOSER (Ber., 1935, **68**, [B], 1810—1812).—Treatment of COMe₂ or mesityl oxide with SOCl₂ at −15° and then at 15—20° and subsequent distillation at the lowest possible temp. gives the *compound* C₆H₇OSCl, decomp. 125° after softening at 80°, transformed by dil. alkali into 5-*keto-3-methylpenthiophen* (I), $CH\!\!<\!\!\begin{smallmatrix} CO\!-\!CH \\ CMe \cdot CH \end{smallmatrix}\!\!>\!S$, m.p. 182° (decomp.) (*phenylhydr-azone*, m.p. 141°). (I) is very stable towards acids ; when warmed with alkali and then acidified it affords H₂S and resinous material. H. W.

Comparison of heterocyclic systems with benzene. IV. Thionaphthenquinones. L. F. FIESER and R. G. KENNELLY (J. Amer. Chem. Soc., 1935, **57**, 1611—1616 ; cf. A., 1932, 170).—Thio-naphthenquinones are synthesised and found to have a reduction potential about 75 mv. > the correspond-ing naphthaquinones, indicating that the thiophen ring is less aromatic than the C₆H₆ ring ; other con-siderations indicate a still greater difference, and the S may be responsible for the relatively small difference in reduction potential. 4-Nitrothionaphthen-1-carb-oxylic acid, m.p. 239—241° (modified prep. from *o*-C₆H₄Cl·CHO by way of 3-chloro-6-nitrobenzaldehyde, m.p. 72—77°), with Cu in quinoline at 180—190° gives CO₂ and 4-*nitrothionaphthen*, m.p. 149—150°, reduced by SnCl₂ to the 4-NH₂-compound, which yields 51% of pure 4-hydroxythionaphthen, m.p. 103—104°. This with NaNO₂ and ZnCl₂ in EtOH gives the Zn salt of its 3-NO-derivative, which on reduction by SO₂ and subsequent sulphonation gives 3-*amino-4-hydroxy-thionaphthen-6-sulphonic acid*, cryst. This is oxidised by 33% HNO₃ at 30° to 3 : 4-*thionaphthenquinone-6-sulphonic acid* (K salt, +H₂O), which with H₂SO₄–MeOH gives 4-*methoxy-3 : 6-thionaphthenquinone* (I), m.p. 205—206°. Thiophen and (CH₂·CO)₂O with AlCl₃ in PhNO₂ yield *γ-keto-γ-1-thienyl*-n-*butyric acid*, m.p. 119—120°, reduced (Clemmensen, cold, not hot) to *γ-1-thienyl*-n-*butyric acid*, m.p. 13·5—15°, b.p. 130—134°/1·5 mm., the acid chloride (prep. by SOCl₂), b.p. 104—110°/2 mm., of which with SnCl₄ in CS₂

gives 3-*keto*-3 : 4 : 5 : 6-*tetrahydrothionaphthen*, b.p. 102—110°/2 mm., m.p. 35·5—37°; this is dehydrogenated by S (badly by Se) to give a 46% yield of 3-hydroxythionaphthen (II), m.p. 80—81° (lit., 72°). With $CH_2Cl\cdot CO_2H$ this phenol yields 4-*thionaphthoxyacetic acid*, m.p. 152—153°. 6-*Amino*-3-*hydroxythionaphthen hydrochloride*, cryst., prepared from (II) by way of the p-$SO_3H\cdot C_6H_4\cdot N_2$-compound, with $K_2Cr_2O_7$–H_2SO_4 gives 3 : 6-*thionaphthenquinone*, m.p. 130—131° [*monosemicarbazone*, probably a mixture, m.p. 235° (decomp.)], which with H_2SO_4–Ac_2O at 40° yields 3 : 4 : 6-*triacetoxythionaphthen*, m.p. 151—153°, converted by hydrolysis, $FeCl_3$-oxidation, and methylation into (I). R. S. C.

Thiophen series. XXIX. Flavophen. W. STEINKOPF (Annalen, 1935, **519**, 297—300).—When tetraphenylthiophen is heated with $AlCl_3$ at 115—120°, 2 : 5-*diphenyl*-3 : 4-*phenanthrenothiophen* (I), m.p. 260°, and *flavophen* (II), m.p. 391—392° (2 : 5 : 7 : 8 : 10 : 13-*hexanitro*-derivative), are formed.
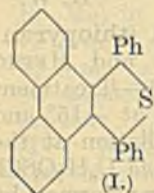
(I.)   (II.)
E. W. W.

Reactions of diphenylethyleneimines and attempts to prepare aminoethenes. G. H. COLEMAN and G. P. WAUGH (Proc. Iowa Acad. Sci., 1933, **40**, 115).—Diphenylethyleneimine (I) is unaffected by O_3; BzCl in C_5H_5N yields the Bz derivative, but in dil. NaOH αβ-diphenyl-β-chloroethylamine is formed, which yields benzoyldiphenylethyleneimine with NaOEt. (I) rearranges to benzylidenebenzylamine on heating to 225°. CH. ABS. (*r*)

Electrolytic reduction of succinimide. B. SAKURAI (Bull. Chem. Soc. Japan, 1935, **10**, 311—313). —Electrolytic reduction at 38—40° of the imide in 50% H_2SO_4 using a Zn–Hg cathode with c.d. 100 amp. per sq. dm. gives 28% of pyrrolidine.
F. R. G.

Synthesis of pyrrole alcohols. Q. MINGOIA (Gazzetta, 1935, **65**, 459—461).—The main product of the action of CH_2O on Mg-pyrrole is the di-ether described by the author (A., 1932, 1261); the 1-pyrrylcarbinol obtained by Taggart and Richter (A., 1934, 901) is regarded as a secondary product formed at low temp. E. W. W.

Reactivity of the carbonyl group in γ-pyrones and in γ-pyridones. D. N. BEDEKAR, R. P. KAUSHAL, and S. S. DESHAPANDE (J. Indian Chem. Soc., 1935, **12**, 465—469).—γ-Pyrones and γ-pyridones manifest carbonyl-reactivity when a sufficiently reactive phenylhydrazine is used. Thus, Et chelidonate, when heated with p-$NO_2\cdot C_6H_4\cdot NH\cdot NH_2$ (I) in EtOH, yields its p-*nitrophenylhydrazone*, m.p. 216°, which with AcOH–HCl regenerates the pyrone. *Et* 3 : 5-*dibromochelidonate* p-*nitrophenylhydrazone*, similarly prepared, has m.p. 120°. $CO[CH\dot{:}C(OH)\cdot CO_2Et]_2$ when boiled for a short time with (I) in EtOH affords *Et* 1-p-*nitroanilino*-4-*pyridone*-2 : 6-*dicarboxylate*, m.p.

146°, and some of its p-*nitrophenylhydrazone*, m.p. 210°. This last is the chief product when heating is continued for 1 hr. (I) when refluxed with diacetylacetone and EtOH during 10 min. yields 1-p-*nitroanilino*-2 : 6-*dimethyl*-4-*pyridone*, m.p. 136° (p-*nitrophenylhydrazone*, m.p. 215°). No reaction occurs with (I) and dimethyl-, diethyl-, or dipropyl-pyrone, but with pyrone and hot AcOH 1-p-*nitroanilino*-4-*pyridone*-p-*nitrophenylhydrazone*, m.p. 242°, is obtained. Similarly (I) when heated with chelidonic acid in dil. AcOH yields 1-p-*nitroanilino*-4-*pyridone*-2 : 6-*dicarboxylic acid* p-*nitrophenylhydrazone*, m.p. 210°, and (I) with Et comanate in EtOH yields *Et* 1-p-*nitroanilino*-4-*pyridone*-2-*carboxylate* p-*nitrophenylhydrazone*, m.p. 220°. H. G. M.

Production of 3 : 6-diamino-2-alkylpyridines. —See B., 1935, 894.

Preparation of substituted indoles by catalytic decomposition of phenylhydrazones. A. E. ARBUSOV, J. A. SAIZEV, and A. J. RASUMOV (Ber., 1935, **68**, [*B*], 1792—1794).—Catalytic decomp. of $CEtPr^a\dot{:}N\cdot NHPh$ in presence of CuCl at 200—250° yields 2 : 3-*diethyl*- or 3-*methyl*-2-n-*propyl-indole*, b.p. 167°/15 mm. (*picrate*, m.p. 144°). $CMeBu^a\dot{:}N\cdot NHPh$ similarly affords NH_3, NH_2Ph, and 2-*methyl*-3-n-*propylindole*, b.p. 159—161°/11 mm. (*picrate*, m.p. 134°), whilst 2-*phenyl*-3-*methylindole*, m.p. 112·5° (*picrate*, m.p. 138·5—139°), is derived from *Ph Et ketone phenylhydrazone*, m.p. 47°. H. W.

Synthesis in the indole group. XIII. Synthetical experiments with eserine. IV. Synthesis of dl-eserethole. T. HOSHINO and T. KOBAYASHI. **XIV. Synthesis of bufotenin. 3-β-Hydroxyethylindolenine.** T. HOSHINO and K. SHIMODAIRA (Annalen, 1935, **520**, 11—19, 19—30).— XIII. When *l*-eserethole methiodide is heated with AgCl in EtOH and the product distilled in vac., physostigmol Et ether is obtained. By action of p-$C_6H_4Me\cdot SO_2Cl$ on tryptamine, or of $NHPh\cdot NH_2$ and $ZnCl_2$ in EtOH on γ-p-*toluenesulphonamidobutaldehyde* Et_2 *acetal* (I) (obtained from the amine), p-*toluenesulphonyltryptamine* [3-(β-p-*toluenesulphonamidoethyl*)*indole*] (II), m.p. 113—114° (*Bz₂ derivative*, m.p. 176—177°), is obtained. Action of MeI–NaOH on (II) or of $NHPh\cdot NH_2$ on γ-p-*toluenesulphonmethylamidobutaldehyde* Et_2 *acetal* (III) [from (I) and MeI] yields 3-(β-p-*toluenesulphonmethylamidoethyl*)*indole*, m.p. 116—117°. The last is converted by NH_2Ph, NH_2Ph,HCl, and EtOH into N-*methyltryptamine* [3-β-*indolylethylamine*], m.p. 89—90° (*picrate*, m.p. 190—191°; *Bz* derivative, m.p. 144—145°), which with MgEtI, followed by MeI, yields isodeoxynoreseroline (IV), m.p. 111—112°. Using 5-ethoxy-tryptamine and p-$C_6H_4Me\cdot SO_2Cl$, or p-$OEt\cdot C_6H_4\cdot NH\cdot NH_2$ and (I), 5-*ethoxy*-3-(β-*toluenesulphonamidoethyl*)*indole*, m.p. 108—109°, is obtained. Action of MeI on this, or of p-$OEt\cdot C_6H_4\cdot NH\cdot NH_2$ on (III), yields 5-*ethoxy*-3-(β-*toluenesulphonmethylamidoethyl*)*indole*, m.p. 93—94°, which when treated as before gives 5-*ethoxy*-3-β-*methylaminoethylindole* (V), m.p. 99—100°, b.p. 179—184°/2—3 mm. (*picrate*, m.p. 209—210°; *Bz₂*
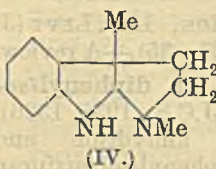
Me
—CH₂
—CH₂
NH NMe
(IV.)

derivative, m.p. 119—120°; *flavianate*, m.p. 217—219°). With MgEtI followed by MeI, this furnishes isonoreserethole (VI), m.p. 71—72° (*Bz* derivative; *H oxalate*, m.p. 152—153°), of which the *hydrochloride* is converted by MeI into *dl*-eserethole (cf. this vol., 227, 499, 765).

(VI.)
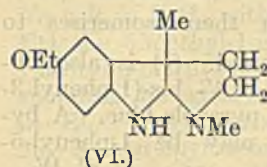
XIV. The following experiments were with the object of preparing (V) (above) from 5-ethoxy-3-β-hydroxyethylindole. The *Et* ester, b.p. 195—196° (*picrate*, m.p. 120°), of 2-methyl-3-indolylacetic acid is converted (Na in EtOH) into 2-*methyl*-3-β-*hydroxyethylindole*, m.p. 55—56° (*picrate*, m.p. 134·5°; *Ac₂* derivative, m.p. 96—97°). This with PBr₃ forms 2-*methyl*-3-β-*bromoethylindole*, which with NHMe₂ in MeOH at 100° yields 2-*methyl*-3-β-*dimethylaminoethylindole*, m.p. 97—98° (*picrate*, m.p. 174—175°; *methiodide*, m.p. 238—239°), with NH₂Me yields the -3-β-*methylaminoindole*, m.p. 82—83° (*picrate*, m.p. 193—194°), and with aq. NH₃ and MeOH at 100° forms β-2-methylindolylethylamine (A., 1933, 164). From *Et* 3-indolylacetate, tryptophol is prepared, new m.p. 58—59° (cf. A., 1931, 97), and converted (PBr₃) into β-3-*indolylethyl bromide*, m.p. 98—99°, and thence, by use of NHMe₂, NH₂Me, or NH₃, into NN-*dimethyltryptamine*, m.p. 49—50°, b.p. 165—168°/3·5 mm. (*picrate*, m.p. 170—171°; *methiodide*, m.p. 210—211°), *N*-methyltryptamine (see above), or tryptamine. 5-*Ethoxy*-3-*indolylacetic acid*, m.p. 91—92°, is prepared from the nitrile, and its *Et* ester, m.p. 89—90°, is reduced to 5-*ethoxy*-3-β-*hydroxyethylindole*, m.p. 75°. The 3-β-*bromoethyl* compound when treated with NHMe₂ in MeOH yields 5-*ethoxy*-NN-*dimethyltryptamine* (*bufotenin Et ether*) (VII), b.p. 230—232°/5 mm. (*dipicrate*, m.p. 124—125°, which when cryst. from C₆H₆ gives the *picrate*, m.p. 144—145°), with a *substance*, m.p. 145° (decomp.), regarded as *dimethylbis*-β-5-*ethoxy*-3-*indolylethyl-ammonium bromide* (*picrate*, m.p. 120°). (V) and 5-ethoxytryptamine are similarly prepared. AlCl₃ in C₆H₆ converts (VII) into bufotenin (cf. A., 1934, 1232) (*mono*- and *di-picrates*, each m.p. 177—178°; mixed m.p. 164°). Tryptophol treated with MgEtI, followed by MeI, gives 3-*methyl*-3-p-*hydroxyethyl-indolenine*, m.p. 42—43°, b.p. 110—112°/2 mm. (*Ac* derivative, m.p. 74—75°, without basic properties; *Bz*, m.p. 151—152°, and *NO*-, m.p. 63—64°, derivatives), which is considered to exist in the furan form :
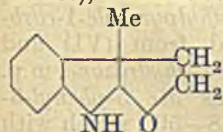
E. W. W.

Synthesis of sulphur derivatives of indole. H. Wuyts and (Mlle.) A. Lacourt (Bull. Acad. roy. Belg., 1935, [v], **21**, 736—743).—When heated with 10% MeOH–HCl β-phenylthioacetyl- and β-*m*-tolyl-thioacetyl-α-phenyl-α-S-dimethylhydrazine (this vol., 1119) are converted with loss of NH₃ into 2-*methyl-thiol-3-phenyl-*, m.p. 96°, and 2-*methylthiol*-3-m-tolyl- (*picrate*, m.p. 84°) -1-*methylindole*, respectively. β-Phenylthioacetyl-α- phenyl - α -methylphenylhydraz-ine is similarly converted into 2-*thion*-3-*phenyl*-1-

methyl-2 : 3-*dihydroindole*, b.p. 200°/1 mm., m.p. 57° (*picrate*, m.p. 141°), but CH₂Ph·C(SH)ːN·NHPh gives mainly hydrolysis products and a small amount of a yellow oil which is probably the indole.

J. W. B.

Synthesis of amino-acids. III. Tryptophan. W. J. Boyd and W. Robson (Biochem. J., 1935, **29**, 2256—2258).—By using piperidine for condensation of indole-3-aldehyde with hydantoin, and (NH₄)₂S as a reducing and hydrolytic agent, a 60—70% yield of tryptophan can be obtained, and pptn. with HgSO₄ is avoided. The method is applicable to the prep. of small quantities of the NH₂-acid.

J. N. A

Action of acetylsalicoyl chloride on mag-nesylindoles. II. C. Toffoli (Gazzetta, 1935, **65**, 487—497; cf. A., 1934, 1110).—Acetylsalicoyl chloride and Mg indolyl bromide in Et₂O yield o-*hydroxyphenyl*-3-*indolyl ketone*, m.p. 171° (*hydro-chloride*, m.p. 170°; *Ac₂*, m.p. 60°, and *Bz₂*, m.p. 152°, derivatives; *phenylhydrazone*, m.p. 166°), with some 3-acetylindole, and small amounts of o-*hydroxyphenyl 2-indolyl ketone*, m.p. 142°, of o-*hydroxyphenyl 1-acetyl-2-indolyl ketone*, m.p. 148° (to a red liquid, perhaps with isomerisation to the 3-Ac compound), and of a *phenylenetri-indolyl-methane*, m.p. 145—150° (*picrate*, m.p. 150—155°). From Mg 3-methylindolyl bromide, o-*hydroxyphenyl 3-methyl-1-indolyl ketone*, m.p. 151° (*Bz* derivative, m.p. 89°), and 1-acetyl-3-methylindole are obtained, or, at higher temp., o-*hydroxyphenyl 3-methyl-2-indolyl ketone*, m.p. 124°, with a substance, m.p. about 200°.

E. W. W.

Manufacture of aminoalkylated pyridines and quinolines.—See B., 1935, 940.

Condensation of quinaldine ethiodide and formaldehyde. K. Lauer and M. Horio (J. pr. Chem., 1935, [ii], **143**, 305—324).—The purity of pinacyanol (I), m.p. between 286° and 296° according to rate of heating (cf. lit.), is determined spectro-photometrically. The effect on the yield of pure dye of varying the conditions, proportions of reactants and the solvent, and of adding various substances is investigated. Max. yields (40% of pure dye) are obtained with 2 mols. of quinaldine ethiodide, 2 of NaOH (or KOH), and 1 of CH₂O in H₂O without any addition. Excess of CH₂O leads to formation of 2-ethylquinoline, probably formed by way of (II). 2-β-Hydroxyethylquinoline does not yield (I). Koenig's mech-anism for the formation of (I) is thus probably correct, (II) acting as H acceptor. The sensitisation of plates is unaffected by <50% of impurity in (I).
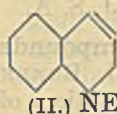
(II.) NEt

R. S. C.

[β-**Hydroxyphenylethylamines and their trans-formations. III. Synthesis of benzyl*iso*quinol-ines under physiological conditions.**] E. Spāth and F. Kuffner (Ber., 1935, **68**, [*B*], 1744—1746).—A reply to Hahn *et al.* (this vol., 357). H. W.

Synthesis of 8-hydroxy-5-benzylquinoline. Antiseptic activity of its sulphate. L. Mc-Master and W. M. Bruner (J. Amer. Chem. Soc., 1935, **57**, 1697—1698).—2-Nitro-4-benzylphenol and

Fe–HCl give 2-*amino*-4-*benzylphenol* [3-*amino*-4-*hydroxydiphenylmethane*], m.p. 133° [*hydrochloride*, m.p. about 200° (decomp.)], converted (Skraup) into 8-hydroxy-5-benzylquinoline (86% yield), m.p. 111° (*hydrochloride*, m.p. 244°), the *sulphate*, m.p. 216—217°, of which is at least as toxic to *B. coli* as, and less irritant than, the free base.　　　　　R. S. C.

Sulphonation of acridone. K. MATSUMURA (J. Amer. Chem. Soc., 1935, **57**, 1533—1536).—Acridone is obtained in poor yield by heating o-NHPh·C$_6$H$_4$·CO$_2$H with H$_2$SO$_4$ at 80° for 30 min., but further heating gives much *acridone*-2- (I), +H$_2$O, m.p. 318° (decomp.) (*Ba* salt, +4H$_2$O, m.p. >360°), and a little -4-*sulphonic acid* (II), +H$_2$O, m.p. 268° (*Ba* salt, +3H$_2$O, m.p. >360°), converted into the corresponding hydroxyacridones by KOH-fusion. Attempts to prepare 9-aminoacridone-2-sulphonic acid failed, the 9-NH$_2$-group having exceptional mobility owing to the negative substituent in position 2. 2-Methoxyacridone has m.p. 274—276° (lit. 263—265°). (I) and Na–Hg in H$_2$O at 80° give *acridine*-2-*sulphonic acid*, +H$_2$O, m.p. >360° {*Ba* salt, +6H$_2$O, m.p. >360; *amide*, m.p. 258° [*hydrochloride*, m.p. 278° (decomp.)]; *chloride*, m.p. >357°}. 9-*Chloroacridine*-2-*sulphonyl chloride*, m.p. 165—167°, with aq. NH$_3$ and Cu(OAc)$_2$ at 135° gives the *chlorosulphonamide*, decomp. 353—360°, and 9-*aminoacridine*-2-*sulphonamide*, m.p. 298° (decomp.) [*hydrochloride*, m.p. 318 (decomp.)], with EtOH the *Et* ester, m.p. 254—255° (decomp.), and with KOH–EtOH at room temp. *Et acridone*-2-*sulphonate*, decomp. 255°. (I) leads also to *diacridyl* 2 : 2′-*disulphide*, m.p. 245—246° [*dihydrochloride*, m.p. 255° (decomp.)], and 2-*thiolacridine*, m.p. 120—130° (*Bz* derivative, m.p. 178—179°).
　　　　　　　　　　　　　　R. S. C.

New synthesis of glyoxaline derivatives. R. WEIDENHAGEN and R. HERRMANN (Angew. Chem., 1935, **48**, 596—597).—α-Hydroxyketones are rapidly oxidised by NH$_3$–Cu·· solutions to α-diketones (I). In presence of aldehydes (I) condense with the NH$_3$ and aldehyde to the corresponding glyoxalines (II), which are pptd. as insol. Cu· complexes. (II) are liberated from these by treatment with H$_2$S. Condensation of (II) with NH$_3$ without aldehyde leads to formation of 2 : 4-disubstituted glyoxalines, and of 1 : 4-disubstituted 3-hydroxypyrazines as by-products. The condensation may be applied to dihydroxyacetone and reducing sugars.　　J. S. A.

Degradation of nitrogenous cyclic compounds by animal charcoal. F. LIEBEN and J. BENEK (Biochem. Z., 1935, **280**, 88—91).—When solutions of glyoxaline, uracil, and guanine are heated for a long time with animal charcoal, only slight degradation occurs, but with histidine (I), uric acid, and allantoin the effect is considerable, both NH$_3$ and new NH$_2$ groups arising. With (I), more NH$_3$ is formed than corresponds with the decrease in the Van Slyke val.
　　　　　　　　　　　　　　P. W. C.

Action of hydrogen peroxide on 1-phenyl-3-methyl-5-pyrazolone. G. PERRONCITO (Gazzetta, 1935, **65**, 554—558).—This substance is converted by H$_2$O$_2$ in AcOH at the b.p. into 4-benzeneazo-1-phenyl-3-methyl-5-pyrazolone (I), probably by the

formation of phenylnitrosoamine and the condensation of this to the phenylhydrazone NHPh·N:C$<^{\text{CMe:N}}_{\text{CO—NPh}}$, which then isomerises to the hydroxybenzeneazo-compound. (I) is also obtained by action of H$_2$O$_2$ on 4 : 4′- bis-(1-phenyl-3-methyl-5-pyrazolone), and on pyrazole-blue. A by-product of m.p. 248—250° may be 1-phenyl-5-pyrazolone-3-carboxylic acid.　　E. W. W.

Manufacture of 5-pyrazolone derivatives.—See B., 1935, 974.

Alkylation and acylation of pyrazoles. K. VON AUWERS and T. BREYHAN (J. pr. Chem., 1935, [ii], **143**, 259—280; cf. A., 1934, 305).—No regularities exist for the alkylation of pyrazoles by CH$_2$N$_2$, MeBr, or MeI–Na. Acylation of pyrazoles and their salts proceeds similarly. 3-Chloro-5-methylpyrazole with CH$_2$N$_2$ in Et$_2$O gives mainly the 1 : 3- (I) and a little 1 : 5-Me$_2$ (II) derivative, but almost entirely (I) with MeBr at 100°. 3-Phenylpyrazole (III) with MeBr at 100° gives mostly the 3- and a little 5-phenyl-1-methyl derivative, but the Na salt with MeI affords only the latter; with ClCO$_2$Me it gives *Me* 3-*phenylpyrazole*-1-*carboxylate* (IV), m.p. 76°. γ - *Keto*- γ - *phenylpropaldehydecarbomethoxyhydrazone*, m.p. 152° (prep. from COPh·CH:CH·ONa and NH$_2$·NH·CO$_2$Me at room temp.), with POCl$_3$ in CHCl$_3$ gives *Me* 5-*phenylpyrazole*-1-*carboxylate*, m.p. 63—64°, which is partly isomerised to (IV) and partly decarboxylated by boiling in vac. for 1 hr. (no change in 15 min.). (III) with Cl$_2$ or S$_2$Cl$_2$ in AcOH etc. gives 4-*chloro*-5-*phenylpyrazole* (V), m.p. 102°, b.p. 193°/11 mm., which with MeI–NaOMe in absence of H$_2$O or Me$_2$SO$_4$–NaOH gives about equal amounts of 4-*chloro*-3- (VI), b.p. 163—165°/9 mm. [*hydrobromide*, m.p. 83°; *hydrochloride*, m.p. 79°: also obtained from (I) and S$_2$Cl$_2$ in AcOH], and -5-*phenylpyrazole*, b.p. 153—156°/12 mm. [*hydrochloride*, m.p. 54°; *perchlorate*, an oil; also obtained from (II)], but MeBr yields mostly the former, whereas CH$_2$N$_2$ does not react. Chlorination of the appropriate esters affords *Me* 4-*chloro*-3-, m.p. 89—90° [also obtained from (V) and ClCO$_2$Me], and -5-*phenylpyrazole*-1-*carboxylate*, m.p. 113—115°. 5-Phenyl-3-methylpyrazole with MeBr at 100° or MeI–Na gives mostly the 1 : 5-dimethyl-3-phenyl with a little 1 : 3-dimethyl-5-phenyl derivative, and with ClCO$_2$Me yields *Me* 3-*phenyl*-5-*methylpyrazole*-1-*carboxylate*, m.p. 74—75° (unchanged by MeBr), which with S$_2$Cl$_2$ affords *Me* 4-*chloro*-3-*phenyl*-5-*methylpyrazole*-1-*carboxylate*, m.p. 107°, also obtained from (VI) and ClCO$_2$Me. *Benzoylacetonecarbomethoxyhydrazone*, m.p. 121—122°, with cold POCl$_3$ gives *Me* 5-*phenyl*-3-*methylpyrazole*-1-*carboxylate*, m.p. 58—59°, which with S$_2$Cl$_2$ forms the 4-*Cl*-derivative, m.p. 97°. *Me pyrazole*-3-*carboxylate*, m.p. 139—140° (prep. by MeOH–H$_2$SO$_4$), with MeBr or CH$_2$N$_2$ gives mainly *Me* 1-*methylpyrazole*-5- (VII), b.p. 70—76°/9 mm., and a trace of -3-*carboxylate*, b.p. 120—126°/9 mm. (VII) and CH$_2$N$_2$ give much *Me* 1 : 3-*dimethylpyrazole*-5-*carboxylate*, b.p. 90—92°/9 mm., and a little *Me* 1 : 5-*dimethylpyrazole*-3-*carboxylate*, b.p. 140—144°/9 mm. The Et ester corresponding to (VII) does not react with MeBr at 100°, but with CH$_2$N$_2$ gives

much 1 : 3-Me$_2$ (VIII) and a little 1 : 5-Me$_2$ derivative (IX), whilst (IX) is the sole product with MeI; the *Na* salt in C$_6$H$_6$ with MeI gives mainly (VIII), with EtI the 5-methyl-1-ethyl compound, with AcCl the 1-acetyl-5-methyl derivative, m.p. 68·5—69·5° (corresponding *Me* ester, m.p. 67—68°), and with ClCO$_2$Me in Et$_2$O the 1-carbomethoxy-5-methyl compound. Me 3-phenylpyrazole-5-carboxylate does not react with MeBr at 130—140°, with MeI at 100° or MeI–Na in C$_6$H$_6$ gives *Me 3-phenyl-1-methylpyrazole-5-carboxylate*, m.p. 62° [previously (A., 1927, 1088) considered to be the Et ester], and with ClCO$_2$Me alone or in Et$_2$O a *CO$_2$Me*-derivative, m.p. 93°. Et 3-phenylpyrazole-5-carboxylate is unchanged by EtBr; the Na salt with EtI at 100° gives the 1-Et ester, but does not react with AcCl in C$_6$H$_6$. 3-Phenylpyrazole-5-carboxylic acid (X) with ClCO$_2$Me gives a *CO$_2$Me*-derivative, m.p. 126—126·5°, which is hydrolysed but not chlorinated by S$_2$Cl$_2$ in AcOH. (X) and S$_2$Cl$_2$ in AcOH gives the 4-Cl-derivative, m.p. 258—261°, unchanged by boiling ClCO$_2$Me, but decomposed thereby at 130°. R. S. C.

Compounds with condensed pyrrole nuclei, having behaviour analogous to that of urobilin. II. G. ILLARI (Gazzetta, 1935, 65, 453—459).— Action of K$_2$Cr$_2$O$_7$–H$_2$SO$_4$ on the substances (I) and (II) obtained by action of SO$_2$ on pyrrole (this vol., 364) gives succinic acid and Me vinyl ketone, indicating the presence of pyrrolidine rings and of unsaturated side-chains respectively. Conductometric titration of (I) with aq. NH$_3$ shows that it is a weak acid, consistent with the annexed formula. (II) may

CH$_2$ CH$_2$
CH·C(CH$_2$)· ——— ·C(CH$_2$)·CH CH$_2$ ——— CH$_2$
       ——— CO ——— CH   CH·CO$_2$H
    NH   NH
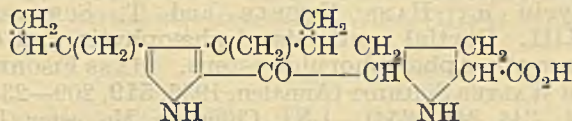
be regarded as a bimol. anhydro-derivative of (I).
E. W. W.

Pyrimidines. II. R. ROBINSON and (MISS) M. L. TOMLINSON (J.C.S., 1935, 1283—1284).— 6-*Ethyl-2-thiouracil*, m.p. 228°, obtained from Et propionylacetate, CS(NH$_2$)$_2$, and Na, is converted by HNO$_3$ into ethyluracil and by HNO$_3$–H$_2$SO$_4$ into 5-*nitro-6-ethyluracil*, m.p. 230° (decomp.). This compound and POCl$_3$ yield 2 : 4-*dichloro-5-nitro-6-ethylpyrimidine*, m.p. 31°, which with aq. NH$_3$ forms 2-*chloro-5-nitro-4-amino-*, m.p. 140—141°, reduced (SnCl$_2$–HCl) to the -4 : 5-*diamino*-compound, m.p. 203°; this condenses with benzil to 7-*chloro*-2 : 3-*diphenyl-5-ethylpyrimidazine*, m.p. 179—181°, which shows bluish-green fluorescence in aq. EtOH solution, and with palladised SrCO$_3$, 4 : 5-*diamino-6-ethylpyrimidine*, m.p. 159—160°, is obtained. The analogy between these substances and those derived from vitamin-*B*, is discussed. F. R. S.
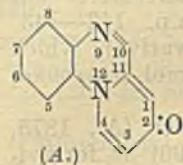
Synthesis of *C*-**substituted pyridylpyrrole derivatives. II.** E. OCHIAI, K. TSUDA, and S. IKUMA (Ber., 1935, 68, [*B*], 1710—1716; cf. this vol., 1253).—Catalytic reduction (Pd–C) of a mixture of CH$_2$Ac·CO$_2$Et and Et oximinoacetoacetate in AcOH, EtOAc, and 5% KOH affords Et$_2$ 2 : 4-dimethylpyrrole-3 : 5-dicarboxylate, m.p. 136°, in 83%, 47%,

and 67% yield, respectively. The less reactive CMeAc:N·OH similarly gives Et 2 : 3 : 5-trimethylpyrrole-4-carboxylate, m.p. 105°, in 41% yield (in AcOH). The method is simpler, more easily regulated, and gives better yields of purer products than reduction with Zn. Et nicotinate and EtOAc in presence of NaOEt afford *Et nicotoylacetate*, b.p. 144—146°/4 mm. (whence 1-phenyl-3 : 3′-pyridylpyrazolone, m.p. 188—189°), converted by NaNO$_2$ in AcOH into *Et oximinonicotoylacetate* (I), m.p. 152°. Reduction of (I) and CH$_2$Ac·CO$_2$Et with Zn dust in AcOH or catalytically (Pd–C) in AcOH leads to *Et$_2$ 4-3′-pyridyl-2-methylpyrrole-3 : 5-dicarboxylate* (II), m.p. 139—140° (*picrate*, m.p. 211°). (I) and CH$_2$Ac$_2$ are hydrogenated to *Et 4-3′-pyridyl-3-acetyl-2-methylpyrrole-5-carboxylate*, m.p. 131° (*picrate*, m.p. 204—206°; *semicarbazone*, decomp. 245°; *perchlorate*, m.p. 135—136°), hydrolysed to 4-3′-*pyridyl-3-acetyl-2-methylpyrrole-5-carboxylic acid*, decomp. 239°, decarboxylated at about 250° to 4-3′-*pyridyl-3-acetyl-2-methylpyrrole*, m.p. 142—144° (*perchlorate*, m.p. 198°; *picrate*, decomp. 229—230°). Partial hydrolysis of (II) followed by decarboxylation affords *Et 4-3′-pyridyl-2-methylpyrrole-3-carboxylate*, m.p. 126—127° (*picrate*, m.p. 192—193°; *perchlorate*, m.p. 167°), whence 4-3′-*pyridyl-2-methylpyrrole*, m.p. 166—167° (*picrate*, decomp. 194°; *perchlorate*, decomp. 202°). H. W.

Application of carbohydrates to the synthesis of heterocyclic compounds. Glucazidone, hydroxyglucazidone, and their chemical behaviour. K. MAURER, B. SCHIEDT, and H. SCHROETER (Ber., 1935, 68, [*B*], 1716—1726; cf. this vol., 224).—The ability to condense with o-C$_6$H$_4$(NH$_2$)$_2$ to tetrahydroxybutylquinazoline appears to be restricted to glucose, fructose, and mannose. Galactose or pentoses afford benziminazole derivatives. Substitution in the C$_6$ nucleus also affects the course of condensation. Tolylenediamine and C$_6$H$_3$(NH$_2$)$_2$·CO$_2$H yield benziminazoles; the difficulty can be partly overcome by using partly oxidised sugar derivatives. Condensation of the substituted quinazolines to glucazidones (cf. *A*) can be effected with 60—100% acid; addition of condensing agents does not affect the yield. The structure assigned to glucazidone (I) (*loc. cit.*) is confirmed by its oxidation by KMnO$_4$ in COMe$_2$ to quinazoline-2-carboxylic acid, m.p. 210° (decomp.) (*Me* ester, m.p. 113°), decarboxylated to quinazoline (*platinichloride*) and by the formation of a *NO$_2$*-derivative C$_{12}$H$_7$O$_3$N$_3$, m.p. 215°. The compound obtained by the action of MgPhBr on (I) is now regarded as 10-*phenyl-9 : 10-dihydroglucazidone*, since it is converted by very cautious treatment with NaNO$_2$ in AcOH into a *NO*-derivative, m.p. 138° (decomp.), loses 2H when heated or boiled with tetrahydronaphthalene giving 10-*phenylglucazidone*, m.p. 125° (*platinichloride*; *Br*-, m.p. 170°, and *NO$_2$*-, m.p. 235°, -derivatives), and is oxidised by KMnO$_4$ in COMe$_2$ to 3-*phenylquinoxaline-2-carboxylic acid*, m.p. 153° (decomp.) (*Na* salt), which is decarboxylated to 3-phenylquinoxaline. Similarly 10-*benzyl-9 : 10-dihydroglucazidone* is readily dehydrogenated to 10-*benzylglucazidone*, m.p. 94°,

and 10-*methyl*-9 : 10-*dihydroglucazidone* affords 10-*methylglucazidone*, m.p. 98° (*platinichloride*; *aurichloride*). 3-*Hydroxyglucazidone* (II), m.p. 159° (*K* and *Hg* salts; *hydrochloride*, m.p. 203° after softening), obtained as by product in the prep. of (I), affords an *Ac*, m.p. 103°, and *Bz*, m.p. 128°, derivative and is converted by CH_2N_2 in C_6H_6–Et_2O into 3-*methoxyglucazidone*, m.p. 139°, transformed by MgPhBr into 3-*methoxy*-10-*phenyl*-9 : 10-*dihydroglucazidone*, m.p. 178° [*picrate*, m.p. 167° (decomp.); *hydrochloride*, m.p. 139° (decomp.); *NO*-derivative, m.p. 153° (decomp.) which is decomposed in warm AcOH into 3-*methoxy*-10-*phenylglucazidone*, m.p. 98°]. (II) and MgPhBr gave a *compound*, m.p. 147° [non-cryst. *picrate*; *hydrochloride*, m.p. 158° (decomp.); *diacetate* $C_{22}H_{18}O_4N_2$, m.p. 150°]. *Methoxyglucazidone methiodide*, m.p. 241° (decomp.), is oxidised by alkaline $K_3Fe(CN)_6$ to 10-*keto*-3-*methoxy*-9-*methylglucazidone*, m.p. 131°. Treatment of 3-hydroxy-2-tetrahydroxy-butylquinazoline with conc. H_2SO_4 at 100° affords 10-*hydroxyglucazidone*, m.p. 264°, which cannot be acylated and does not react with Grignard reagents. H. W.

γ-Triazines. XXIV. Melamine. A. OSTROGOVICH (*Gazzetta*, 1935, **65**, 566—588).—Melamine, new m.p. 347° (354°, corr.), forms a *picrate*, m.p. 316—317° (decomp.); with HCO_2H, a *triformate* (I), also obtained from the monoformate; a *triacetate*, also obtained from the monoacetate; an *aurichloride*, m.p. 265—266°, and *bisaurichloride*, (+ 4H_2O), m.p. 290—291° (decomp.), (+2H_2O), m.p. 281—282°; a *mono-oxalate*, and a *dioxalate*, the last existing in two cryst. forms. With $HCO·NH_2$, melamine gives an 80% yield of a *formyl* derivative (II), also obtained, in small yield, when HCO_2Et is used; with HCO_2H, (II) yields (I). With Ac_2O, a Ac_2 derivative, m.p. 305—306° (decomp.), is formed [*picrate*, m.p. 209—210° (decomp.); *aurichloride*; Ag_2 derivative], also obtained from melamine and thioacetic acid; with Ac_2O and AcOH, or on prolonged heating with Ac_2O, the Ac_3 derivative, m.p. 298—300°, is formed. BzCl–C_5H_5N does not give a Bz derivative, but Bz_2O yields the Bz_3 derivative, m.p. 142—143° (*picrate*, m.p. 228—229°; Ag_2 derivative), which crystallises with 2Pr^nOH, and forms a mol. *compound*, m.p. 182—183°, with PhOH.

The substances regarded by Mulder (A., 1875, 445) and by Gerlich (A., 1876, ii, 196) as formyl-and tribenzoyl-melamine, respectively, have not these structures. The tetracyclic structure for melamine proposed by Barnett (A., 1930, 1193) is criticised, the structure $N{<}^{C(NH_2)·NH}_{C(:NH)·NH}{>}C:NH$ being preferred. E. W. W.

Synthesis of lactoflavin (vitamin-B_2). R. KUHN, K. REINEMUND, F. WEYGAND, and R. STRÖBELE (*Ber.*, 1925, **68**, [*B*], 1765—1774).—Condensation of 4-amino-5-*d*-1'-ribitylamino-*o*-xylene (I) with alloxan in AcOH containing $B(OH)_3$ at 15—20° gives 6 : 7-dimethyl-9-*d*-riboflavin (II) (90—95% yield), chemically and physiologically identical with lactoflavin from milk. The synthesis of (I) is effected by three methods of which the last is most satisfactory. Ca *d*-gluconate is transformed through *d*-arabinose,

acetobromo-*d*-arabinose, *d*-arabinal diacetate, and *d*-arabinal into *d*(−)-ribose, m.p. 87°, $[\alpha]_D^{23}$ − 23·7° (equilibrium val.) in H_2O. *d-Riboseoxime*, m.p. 141°, $[\alpha]_D^{20}$ + 54° to + 6·3° (equilibrium in H_2O), is reduced by Na–Hg to *d*-ribamine, which is condensed with 4 : 5-dinitro-*o*-xylene in 80% EtOH at 130° to 4-*nitro*-5-*d*-1'-*ribitylamino-o-xylene*, m.p. 127°, reduced (PtO_2 in 80% EtOH) and directly condensed with alloxan to (II). 3-*Methyl-lactoflavin*, m.p. 272° (decomp.), analogously obtained from methylalloxan, is physiologically inactive. 4 : 5-Dinitro-*o*-xylene is transformed by NH_3 into 4-nitro-5-amino-*o*-xylene, which with $COCl_2$ in C_6H_6–PhMe affords 4-*nitro*-5-*carbimido-o-xylene*, m.p. 87·5°, converted by hot EtOH into 4-nitro-5-carbethoxylamido-*o*-xylene, m.p. 58°. This is hydrogenated to the corresponding NH_2-urethane, which is condensed with *d*-ribose (Pd–H_2) to 4-carbethoxylamido-5-*d*-1'-ribitylamino-*o*-xylene, m.p. 169°, whence (II). 4-Nitro-5-amino-*o*-xylene (III) is condensed with *d*-ribose in hot EtOH to the mixture of isomerides, $NO_2·C_6H_2Me_2·N{:}CH·[CH(OH)]_3·CH_2·OH$, which is catalytically reduced. The condensation of *o*-nitroanilines with pentoses or hexoses is an equilibrium change. The yield of product is therefore increased by use of an excess of base, which is readily removed from the product by chromatographic treatment with Al_2O_3. (III) and *l*-arabinose give the *substance* $C_{13}H_{18}O_6N_2$, m.p. 166°. H. W.

Chlorophyll. LXI. *iso*Chlorin e_4 and phyllochlorin. HANS FISCHER and H. KELLERMANN. **LXII. Some derivatives of hydroxyphæoporphyrin a_5.** HANS FISCHER and T. SCHERER. **LXIII. Partial synthesis of phæophytin and of some other phæophorbide esters.** HANS FISCHER and WALTER SCHMIDT (*Annalen*, 1935, **519**, 209—234, 234—244, 244—254).—LXI. Chlorin e_6 Me_2 ester (I), m.p. 212° (*Na* salt; *Cu* salt, m.p. 198°), obtained from chlorin e_6 and cold MeOH–HCl, was formerly thought to contain $·CH_2·CH_2·CO_2H$ in position 6. Reduction of (I) by HI–AcOH gives, however, a porphyrin which is insol. in alkali, contains 2 OMe, and is identified with chloroporphyrin e_7 lactone ester (II), m.p. 284° [partial structure (*A*)], oxidation at position 10

$(A.)$
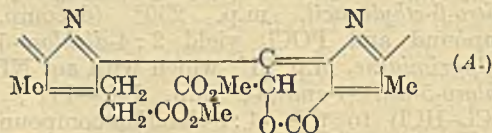
having been effected by I set free. Reduction of (I) under N_2 yields chloroporphyrin e_6 Me_2 ester, which with CH_2N_2 gives phæoporphyrin a_5, and is oxidised in Et_2O by I–AcOH (or by C_5H_5N–NaOH and air) to (II). Chlorin e_6 similarly treated with I–AcOH yields chloroporphyrin e_5, by oxidation, loss of CO_2, and ring-closure. The same product is obtained by action of C_5H_5N–NaOH in presence of air, but in absence of air chloroporphyrin e_4 is formed. The last is unchanged by I–AcOH in Et_2O. BzCl–C_5H_5N converts (I), or its Na salt, into *chlorin* e_6 Me_2 *ester–benzoic anhydride*, $C_{43}H_{44}O_7N_4$, m.p. 205°, $[\alpha]$ −125°, unstable, regenerating (I) when treated with AcOH or C_5H_5N; with HI, it yields (II). With $(CH_2·OH)_2$, the anhydride forms

chlorin e$_6$ *Me$_2$ monoglycol ester*, C$_{38}$H$_{44}$O$_7$N$_4$, m.p. 172° (*Cu* salt, m.p. 185°), converted by HI in COMe$_2$ into a *chloroporphyrin*, m.p. 249°, decomp. 253°, spectroscopically identical with chloroporphyrin e$_6$ Me$_3$ ester, and by C$_5$H$_5$N–NaOH into pyrophæophorbide *a* Me ester, which is isomerised by HI to phylloerythrin ester.

Decarboxylation of (I) at 212—220°, or of its Cu salt at 210°, gives, with much phylloporphyrin, the alkali-insol. iso*chlorin* e$_4$ *Me$_2$ ester* (III), C$_{35}$H$_{40}$O$_4$N$_4$, m.p. 170° (*Cu* salt, m.p. 162°), of which the spectrum is displaced towards the blue. With MeOH–KOH in C$_5$H$_5$N at 150°, (III) yields phylloporphyrin, without rhodoporphyrin, which accompanies the former when chlorin e$_4$ Me$_2$ ester is similarly treated. iso*Chlorin* e$_4$, [α] −515°, is accordingly represented as (*B*); (III) is

Me⌐⌐CH:CH$_2$ Me⌐⌐Et
  —CH—
 NH   NH
CH N   N CH
Me⌐⌐CH$_2$ CH$_2$ H⌐⌐Me   (*B.*)
  CH$_2$·CO$_2$H CO$_2$H   H H
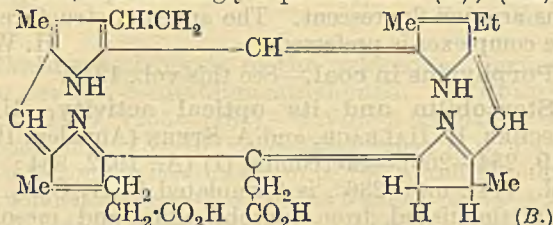
remarkably stable towards AcOH–I, and only after $\frac{1}{2}$ hr. yields porphyrins; the main product is *dihydro*-iso*chlorin* e$_4$, H$_2$ having been added at the ·CH:CH$_2$ [the presence of which in (III) is shown by reaction with CHN$_2$·CO$_2$Et]. Hydrogenation to the *leuco*-compound, and re-oxidation, gives a *porphyrin*, m.p. 230°, spectroscopically identical with phylloporphyrin, with which, however, there is depression of m.p. The new product is therefore probably an iso*chloroporphyrin* e$_4$ *ester*, of partial structure (*C*). When (III) is hydro-

N   N
Me⌐⌐CH$_2$·CH$_2$ CH$_2$ H⌐⌐Me   (*C.*)
  CO$_2$H CO$_2$Me
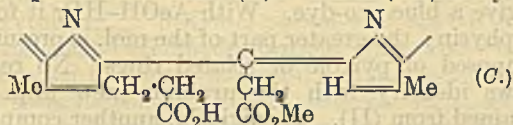
lysed (MeOH–KOH) and heated with C$_5$H$_5$N, and the product esterified (CH$_2$N$_2$), *phyllochlorin Me ester* (IV), m.p. 189°, [α] −425° (*Cu* salt, m.p. 140°), is obtained. That this retains ·CH:CH$_2$ is shown by its reaction with CHN$_2$·CO$_2$Et. With MeOH–KOH at 140°, (IV) yields mainly phylloporphyrin, which is also obtained when (IV) is hydrogenated, through the *H$_2$*-compound, to the *leuco*-compound, and this re-oxidised. (IV) thus has the structure (*B*), in which *tert.*-CH$_2$·CO$_2$H has been replaced by Me, and is probably identical with Conant's pyrrochlorin (A., 1931, 368). Free *phyllochlorin* is obtained readily from free chlorin e$_6$, which is heated above its m.p.; the esterified product is identical with (IV). Gentle oxidation (2—3 sec.) of methylphæophorbide *a* yields a mixture containing phyllochlorin ester, but no *iso*chlorin e$_4$. The phyllochlorin now described is not identical with that prepared from phylloporphyrin and NaOEt (A., 1929, 941).

From formula (*B*) above, it will be seen that a new formulation for chlorophyll has been adopted, in which two additional H atoms are attached in the β-positions in the pyrrole ring III. This is because rhodochlorin (Conant's chlorin *f*), prepared from phæopurpurin 7, has [α] −453°, which optical activity

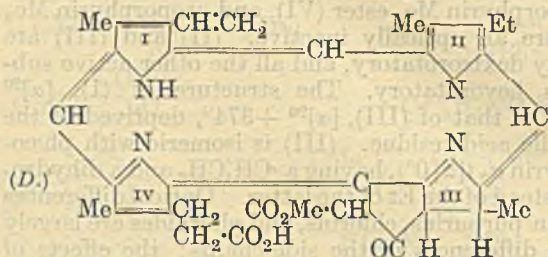can be explained only by a reduced ring. Phæophorbide then has the structure (*D*):

Me⌐I⌐CH:CH$_2$ Me⌐II⌐Et
         —CH—
 NH   N
CH   HC
 N   N
(*D.*)
Me⌐IV⌐CH$_2$ CO$_2$Me·CH⌐III⌐Mc
  CH$_2$·CO$_2$H   OC H H

LXII. Phæoporphyrin *a$_5$* Me ester, obtained by hydrogenation of methylphæophorbide, is converted by Pr^{α}OH and I into 10-*propoxyphæoporphyrin* a$_5$, m.p. 245°; the 10-iso*amyl ether*, m.p. 257°, is similarly prepared. Phylloerythrin with EtOH and I gives 10-*ethoxyphylloerythrin*, m.p. 263° (*Cu* salt, m.p. 272°; *oxime*, m.p. 258°) (10-*propoxy*-, m.p. 257°, 10-iso-*amyloxy*-, m.p. 248°, and 10-*benzyloxy*-, m.p. 256°, analogues), which is hydrolysed (H$_2$SO$_4$) to 10-hydroxyphylloerythrin, m.p. 262° (cf. A., 1934, 421) (*Bz* derivative, m.p. 252°). The last is converted by HI–AcOH, followed by a stream of air, into chloroporphyrin e$_5$, presumably with intermediate formation of hydroxymethylrhodoporphyrin lactone. 10-Ethoxyphylloerythrin with MeOH–KOH readily gives rhodoporphyrin-γ-carboxylic acid.

LXIII. Phæophorbide *a* in C$_5$H$_5$N combines with higher alcohols under the influence of COCl$_2$, to form waxy esters. Thus geraniol yields *phæophorbide* a *geranyl ester*, m.p. 138°; this when treated with MeOH and fractionally adsorbed gives a *substance*, m.p. 214°, and can be hydrolysed by a chlorophyll-free prep. of chlorophyllase. With phytol, phæophorbide *a* phytyl ester, m.p. 129°, is formed, identical with natural phæophytin, which is hydrolysed by chlorophyllase, and is converted into chlorin e$_6$ Me$_3$ ester (showing that the phytyl group is truly attached to the propionic acid residue). *Phæophorbide* a *cetyl ester*, m.p. 141°, is similarly prepared and hydrolysed. *Phæophorbide* a (*l*-)*menthyl ester*, m.p. 186° (sinters at 160°), [α]^{20} −210°, and (*d*-)*bornyl ester*, m.p. 229° (sinters at 188°), [α]^{20} −217°, and *mesoporphyrin di*-(*l*-)*menthyl ester*, m.p. 166°, [α]^{20} −83·2°, and *dicetyl ester*, m.p. 126°, are not hydrolysed by chlorophyllase. E. W. W.

Chlorophyll. LXIV. Fine structure of chlorophyll. HANS FISCHER and A. STERN (Annalen, 1935, 520, 88—97; cf. this vol., 1135).—Vals. of [α]^{20}, in COMe$_2$, C$_5$H$_5$N, or C$_6$H$_6$, are given for 10-acetoxymethylphæophorbide *a*, chlorin e$_6$ Me$_2$ ester–benzoic anhydride, dihydroethylphæophorbide *a*, iso-chlorin e$_4$ Me ester, rhodochlorin (chlorin *f*) (I), dihydrochlorin e$_6$ Me$_3$ ester, dihydromethylphæophorbide *a*, Zn salts of methylphæophorbide *a* and pyrophæophorbide *a*, pyrophæophorbide *b*, dihydromethylphæophorbide *b* Me ester, phæophorbide *a*+*b*, rhodin *g$_7$* Me$_3$ ester and its Cu salt, dihydrorhodin *g$_7$* Me$_3$ ester, rhodin *g$_5$* Me$_2$ ester and its Cu salt, the Cu salt of rhodin *g$_5$* Me$_2$ ester nitrile, rhodin *g$_3$* Me ester, dihydropurpurin 7 (two sources) (II), purpurin 7 Me$_3$ ester (III), and pseudochlorin *p$_6$* Me$_3$ ester (IV). Hæmin, hæmatoporphyrin, coproporphyrin Me ester, uro-

porphyrin, glaucobilin, pseudoverdoporphyrin Me_2 ester (V), phylloerythrin, dihydrophæophorbide a, verdoporphyrin Me_2 ester (VI), and uroporphyrin Me_3 ester are all optically inactive. (II) and (III) are strongly dextrorotatory, and all the other active substances lævorotatory. The structure of (I), $[\alpha]^{20}$ $-453°$, is that of (III), $[\alpha]^{20}$ $+374°$, deprived of the glyoxylic acid residue. (III) is isomeric with phæoporphyrin a_7 ($[\alpha]$ $0°$), having a $\cdot CH\colon CH_2$ and a dihydroring instead of the Et of the latter. Optical differences between purpurins, chlorins, and phorbides are largely due to differences in the side-chains; the effects of these are discussed. The conversion of (III) into (V) (which contains $\cdot CH\colon CH_2$) consists in loss of the glyoxylic acid residue and dehydration. (VI) is probably :
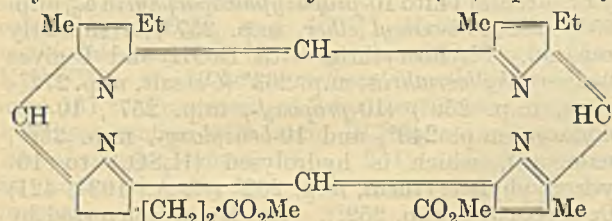
(II) can give rise to rhodoporphyrin. The γ-C in (I) cannot be asymmetric; the former structure is therefore modified, and chlorophyll-a (VII) now formulated :
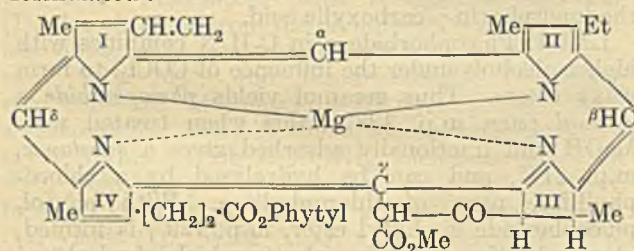
Optical inactivation of chlorophyll and its derivatives is discussed. It is suggested that (IV) may be the optical antipode of chlorin p_6 and that chlorophyll-b has the structure of (VII) in which Me in pyrrole ring II is replaced by CHO. E. W. W.

Properties of porphyrin–metal complexes and their dependence on the valency and susceptibility of their metallic atoms. F. HAUROWITZ [with E. CLAR, Z. HERMANN, H. KITTEL, and F. K. MÜNZBERG] (Ber., 1935, 68, [B], 1795—1806).—The mol. vols. of porphyrin–metal complexes (I) depend little on the nature of the metal and are only 4—7% > that of porphyrin (II). Since also the Debye–Scherrer diagrams of (I) and (II) are closely similar, the lattice of (II) undergoes no essential change on introduction of the metal. The latter appears to occupy the " empty " space of the porphyrin ring and always the same central position in the mol., thus explaining its slight influence on the solubility of the complex. The complex nature of the metallic union follows from the resistance of the compounds towards acids, their peculiar absorption spectra and electrochemical behaviour. Complexes with univalent metals are very labile. Those with bivalent metals (Ag, Co, Sn, Tl, Pb) are pink and characterised by two intense green bands; they are stable towards H_2O and dil. acids, sometimes towards

conc. acid. Those with tervalent metals are reddish-brown in solution and sharply distinguished in absorption spectra from those with bivalent metals. A negative residue is attached to the third valency. The absorption spectra of (II) and (I) differ only at

the visible end and show no important differences in the ultra-violet. The at. groups of (I) and not the metallic ions are chromphores in (II). With increasing paramagnetic susceptibility of the metallic atom the max. of the absorption spectra are displaced towards the ultra-violet. The complexes with diamagnetic metal ions show orange-yellow fluorescence, whereas those with paramagnetic ions are non-fluorescent. The annexed structure for the complexes is preferred. H. W.

Porphyrins in coal.—See this vol., 1347.

Stercobilin and its optical activity. HANS FISCHER, H. HALBACH, and A. STERN (Annalen, 1935, 519, 254—260).—Stercobilin (I) (A., 1932, 864; this vol., 774), m.p. 236°, is formulated $C_{33}H_{46}O_6N_4$. It is distinguished from mesobilirubin and mesobilirubinogen (II) (optically inactive) by having $[\alpha]^{20}_{5891}$ $-863°$ and $[\alpha]^{20}_{6560}$ $-824°$, in AcOH; its hydrochloride has $[\alpha]^{20}_{5891}$ $-1586°$ to $-1874°$, $[\alpha]^{20}_{6560}$ $-850°$ to $-1091°$, in AcOH. When (I) is hydrogenated, reduced by Na–Hg, re-oxidised, or its hydrochloride treated with $Zn(OAc)_2$ or with $(NH_4)_2CO_3$ and $UO_2(NO_3)_2$, the optical activity is lost. (I) is oxidised by CrO_3–H_2SO_4 to $(CH_2\cdot CO_2H)_2$, and is reduced by HI–AcOH to basic and acidic pyrrole compounds; it does not couple with PhN_2Cl, but its leuco-compound does so, to give a blue azo-dye. With AcOH–HBr it forms a porphyrin; the greater part of the mol. is presumably composed of pyrrole or related rings. No reaction shows identity with the urobilin (new m.p. 190°) obtained from (II). Prodigiosin, another comparable substance, is optically inactive. E. W. W.

Complex pyrrylo- and indylo-salts.—See this vol., 1335.

Blue-fluorescing substance from corpus luteum.—See this vol., 1265.

Structure of sulphur-black. II. I. CHMELNITZKAJA and V. VERCHOVSKAJA (Anilinokras. Prom., 1935, 5, 67—75).—Nigrosulphine (I), $[C_{24}H_4O_{12}N_6S_{10}Na_4,5H_2O]_n$, cannot be diazotised or acetylated, and yields sulphur-black (II), $C_{24}H_6O_6N_6S_6$, on hydrolysis with acids. The following structures are assigned to (I) and (II) :

(I.)

(II.) R. T.
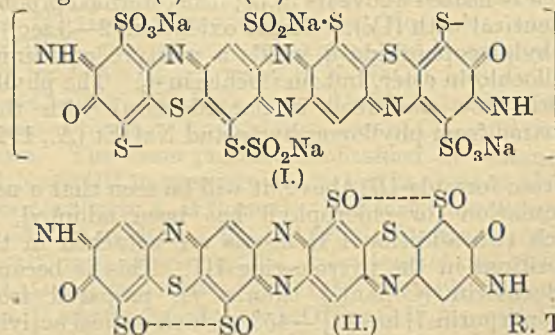
Action of benzoyl chloride and of hydrogen sulphide on cyclic methyleneamines. J. GRAY-MORE (J.C.S., 1935, 865—866).—These bases form amorphous additive compounds with BzCl, decomp. in H_2O to give amine, amide, and CH_2O, thus : $2(NR{:}CH_2)_3 + 3BzCl + 6H_2O \longrightarrow 3NHRBz + 3NH_3RCl + 6CH_2O$. Thus trimethyl- (I) and triethyl-trimethyl-eneamine form additive *compounds*, decomp. to NHMeBz and NHEtBz, with the amines; *tris-β-phenylethyltrimethyleneamine*, b.p. 255°, obtained from $CH_2Ph{\cdot}CH_2{\cdot}NH_2$ and CH_2O, forms an additive *compound*, decomp. similarly. With H_2S in aq. solution at 0°, (I) gives the substance C_3H_7NS (A., 1932, 627); at higher temp., NH_2Me and methylthioformaldin (II) (*hydrochloride*, m.p. 170°) are obtained. In Et_2O, the product is a *hydrosulphide*, decomposed by H_2O to give (II). E. W. W.

Alkaline hydrolysis of the azlactones derived from certain o-nitrobenzaldehydes. H. BURTON (J.C.S., 1935, 1265—1267).—2-*Nitro-5-benzyloxybenz-aldehyde*, m.p. 75—76° (*phenylhydrazone*, m.p. 180°; 2 : 4-*dinitrophenylhydrazone*, m.p. 199°), and hippuric acid condense (Ac_2O–NaOAc) to 5-*keto-2-phenyl*-4(2′-*nitro-5′-benzyloxybenzylidene*)-4 : 5-*dihydro-oxazole* (I), m.p. 157°, hydrolysed to 2-*nitro-α-benzamido-5-benzyl-oxycinnamic acid*, m.p. 219—220° (decomp.). 6-Nitro-*m*-cresol, CH_2PhCl, and NaOH give 2-*nitro-5-benzyloxytoluene*, m.p. 73—74°, which is formed, along with BzOH and $H_2C_2O_4$, by boiling (I) with NaOH for 0·5 hr. 5-*Keto-2-phenyl*-4-(2′-*nitro-5′-methoxy-benzylidene*)-4 : 5-*dihydro-oxazole*, m.p. 218—219°, is hydrolysed on short treatment with NaOH, to 2-*nitro-α-benzamido-5-methoxycinnamic acid*, m.p. 222—223° (decomp.), and on prolonged boiling to 2-*nitro-5-methoxytoluene*. 5-*Keto-2-phenyl*-4-(2′-*nitro-5′-acet-oxybenzylidene*)-4 : 5-*dihydro-oxazole*, m.p. 165—166°, is hydrolysed to 6-nitro-*m*-cresol, and 5-*keto-2-phenyl*-4-*o*-*nitrobenzylidene*-4 : 5-*dihydro-oxazole*, m.p. 167—168°, is hydrolysed on short boiling to *o*-*nitro-α-benz-amidocinnamic acid*, m.p. 181—182°, and on prolonged treatment to $o\text{-}C_6H_4Me{\cdot}NO_2$. 5-Keto-2-phenyl-4-*m*- and -*p*-nitrobenzylidene-4 : 5-dihydro-oxazoles are not hydrolysed to the nitrotoluene (cf. Douglas and Gulland, A., 1932, 69); the *p*-azlactone yields p-*nitro-α-benzamidocinnamic acid*, m.p. 243° (decomp.). The $o\text{-}NO_2$ is the controlling factor in the hydrolysis.
F. R. S.

Action of ammonia on the fluoran from 1-phenyl-3-methyl-5-pyrazolone. G. ROHDE [with H. MÜLLER, M. BAUER, H. SCHENKENBERGER, W. SIMON, J. EDERER, W. NICOLAUS, H. LUFTSCHITZ, and M. KOLB] (J. pr. Chem., 1935, [ii], 143, 325—341).—The fluoran, S_{III}, from 1-phenyl-3-methyl-5-pyrazolone (I) (prep. from S_I and Ac_2O–H_2SO_4), with 10% NH_3–EtOH (2·5 mols.) at 110° gives the red *acid*, R_I, $o\text{-}CO_2H{\cdot}C_6H_4{\cdot}CX{\cdot}C{<}^{CMe\overline{=\!=}N}_{\ C(NH_2){\cdot}NPh}$, *forms*, +EtOH, m.p. about 172—173°, and anhyd., m.p. 190—224° and about 209°; and a little of a colourless, fluorescent, dimorphic *acid*, W_I, $C_{28}H_{21}O_2N_5$, m.p. 277—278°, and an orange *acid*, m.p. 268°, probably $o\text{-}CO_2H{\cdot}C_6H_4{\cdot}CX{\cdot}C{<}^{C(XH){\cdot}NPh}_{\ CMe\overline{=\!=}N}$ [also obtained as as by-product if the temp. is too high in the prep. of

S_I from $o\text{-}C_6H_4(CO)_2O$ and (I), and nearly quantit-atively from S_{III} and (I) at 175°]. The *lactone*, S_{II},

$$CX(XH){\cdot}C_6H_4{\cdot}CO_2H(o) \qquad X{=}N{<}^{CMe{\cdot}C{:}}_{NPh{\cdot}CO}$$
$(S_I.)$

$(S_{III}.)$ $(W_I.)$
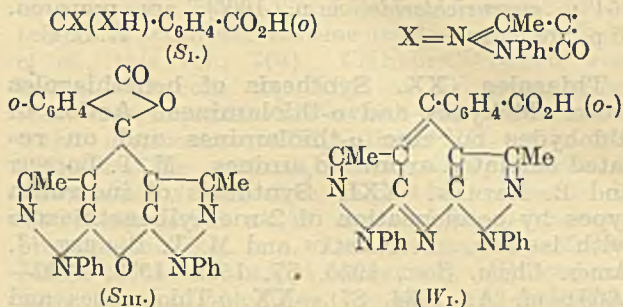
$C_6H_4{<}^{CX}_{CO}{>}O$ (1 mol.) and (I) (1 mol.) at 125° give R_I and the *acid*, R_g, $o\text{-}CO_2H{\cdot}C_6H_4{\cdot}CX{\cdot}NH{\cdot}C{<}^{CH\overline{-\!-}CMe}_{NPh{\cdot}N}$, m.p. 242° (decomp.). If R_I is heated with $PhNO_2$ and then treated with EtOH it gives S_{II} (25%) and probably (I). R_I in hot $PhNO_2$ (without EtOH treatment) gives R_g, which, when further heated in $PhNO_2$ or, better, in Ac_2O with a few drops of H_2SO_4, gives S_{II} and probably (I). R_g and MeOH–H_2SO_4 give the *ester*, $o\text{-}CO_2Me{\cdot}C_6H_4{\cdot}CO{\cdot}XH$, and prob-ably (I). R_I, when melted, decomposes into R_b, a trace of W_I, and varying amounts of the *imide*, $C_6H_4{<}^{CX}_{CX}{>}NH$, m.p. 278° [also obtained (a) from S_{II} or $o\text{-}C_6H_4(CO)_2NH$ and (I) and (b) from S_I and $CO(NH_2)_2$]. R_I and 33% KOH–EtOH at 100° or, less well, conc. aq. NaOH give W_I [Na salt; *Me* ester, m.p. 226·5° (unstable *hydrochloride*), prepared by HCl–MeOH], which with boiling Ac_2O reacts in the lactone *form* (II) to give the *Ac* derivative thereof, $C_{30}H_{23}O_3N_5$, m.p. about 300°, stable to Na_2CO_3 and dil. aq. NaOH. R_I with SO_2Cl_2 followed by MeOH gives its red *Me* ester, m.p. 203° (gives W_I with hot alkali), an orange *substance*, m.p. 240°, and the Me ester of W_I, but with H_2SO_4–MeOH there are formed mainly a colourless *substance*, R_{III}, $C_{28}H_{21}O_2N_5$, m.p. 314° (*Ac* derivative, m.p. 218—219°, regenerates R_{III} with hot KOH–EtOH), and a little of the Me ester of S_I. R. S. C.

Crystalline vitamin-B_1. IX. Action of con-centrated hydrochloric acid. E. R. BUCHMAN and R. R. WILLIAMS (J. Amer. Chem. Soc., 1935, 57, 1751—1752; cf. this vol., 1035).—Vitamin-B_1 (I) and conc. HCl at 150° give 60% of a "*chloro-oxyvitamin*," $[C_{12}H_{16}ON_3SCl]Cl_2$+MeOH, decomp. 150°, which re-sembles (I) so closely in reactions (and fairly closely in absorption spectrum) that rearrangement is im-probable. (I) thus contains an aliphatic OH. In the prep. of Smakula's product (this vol., 261), $C_{12}H_{15}O_2N_3S$, this OH probably remains intact, but the aminopyrimidine grouping is hydrolysed. R. S. C.

2-Methyl- and -ethyl-4-p-fluorophenylthiazoles and their derivatives. J. P. WETHERILL and R. M. HANN (J. Amer. Chem. Soc., 1935, 57, 1752—1753).—2-*Methyl*-, m.p. 81° (*hydrochloride*, m.p. 131°; *picrate*,

m.p. 161°; *mercurichloride*, m.p. 160°), and 2-*ethyl*-4-p-*fluorophenylthiazole*, m.p. 15—16° (*picrate*, m.p. 154°; *mercurichloride*, m.p. 160°), are prepared. M.p. are corr. R. S. C.

Thiazoles. XX. Synthesis of benzthiazoles from aldehydes and *o*-thiolamines. Action of aldehydes on zinc *o*-thiolamines and on related thiolated aromatic amines. M. T. BOGERT and B. NAIMAN. **XXI. Synthesis of indirubin types by condensation of 2-methylbenzthiazole with isatins.** B. NAIMAN and M. T. BOGERT (J. Amer. Chem. Soc., 1935, **57**, 1529—1533, 1660—1663; cf. A., 1934, 87).—XX. *o*-Thiolamines and aldehydes condense to give successively an aldol-condensation product, anil, benzthiazoline, and benzthiazole. Existence of the first product is made probable by dissolution of the reactants, that of the second and last by isolation. Neither the thiazoline nor products formed by its oxidation could be isolated when o-NH$_2$·C$_6$H$_4$·SH and PhCHO react. (o-NH$_2$·C$_6$H$_4$·S·)$_2$Zn and PhCHO give *Zn o-benzylideneaminothiophenol*, m.p. 230—232°, converted by short heating in AcOH or more slowly in EtOH, Et$_2$O, or COMe$_2$ into 2-phenylbenzthiazole (I). *Zn salicylidene-*, decomp. 250°, *piperonylidene-*, decomp. 245—250°, and 2-*furfurylidene-aminothiophenol*, decomp. 232—240°, are similarly prepared and give the benzthiazoles in hot AcOH. (o-NH$_2$·C$_6$H$_4$·S)$_2$ and PhCHO, when heated alone or in xylene, give (I), but in hot EtOH *o-benzylideneaminophenyl disulphide*, m.p. 140°, is obtained; this anil is hydrolysed by hot AcOH or aq. EtOH, with PhCHO alone or in xylene gives (I), and resists reduction by Na or Na–Hg. *o-Salicylidene-*, m.p. 171°, and *o-2-furfurylidene-aminophenyl disulphide*, m.p. 134·5°, similarly prepared, have similar properties. Zn 4-chloro-2-aminothiophenol (from the disulphide and Zn dust in AcOH) with PhCHO gives *Zn 4-chloro-2-benzylideneaminothiophenol*, m.p. 207—208° (corr.), which, when further heated alone, in AcOH, EtOH, or ligroin gives 5-chloro-2-phenylbenzthiazole, m.p. 138·5—139° (lit. 127°).

XXI. Indirubin-type dyes are prepared from 2-methylbenzthiazole (II) (modified prep.) (6-*Br*-derivative, decomp. 190—220°, prep. in AcOH at 100°). (II) and isatin with or without ZnCl$_2$ at 150° give 3-(2'-*benzthiazolylmethylene*)*oxindole* (III), m.p. 262—263° (*SO$_3$H*-derivative, dyes wool yellow, fast to light but not to washing), which with 40% KOH at 100° gives (o-NH$_2$·C$_6$H$_4$·S)$_2$ and other products, and is reduced by Zn dust and AcOH to 2-*hydroxy-3-(2'-benzthiazolyl)methylindole*, m.p. 171°. (III) is also obtained from (II) and isatin α-chloride at 110°, but in hot C$_6$H$_6$ with 2 drops of piperidine 2-(2'-*benzthiazolyl)methylene-ψ-indoxyl*, m.p. 223·5—224°, is obtained, which gives a similarly unstable leucobase. Similarly are prepared 3-(2'-*benzthiazolyl)-methylene-5-bromo-*, m.p. 315—317°, -5 : 7-*dibromo-*, m.p. 300—304°, and -5-*nitro-oxindole*, m.p. 316—320°, 3-(2'-*benzthiazolyl)methyl-5-bromo-2-indolol*, m.p. 210°; and 3-(6'-*bromo-2'-benzthiazolyl)methyleneoxindole*, m.p. 320—324°. o-NH$_2$·C$_6$H$_4$·SH and pyrrole-2-carboxyl chloride give 2-(2'-*pyrryl)benzthiazole*, m.p. 130—133°. M.p. are corr. R. S. C.

Retene [derivatives]. IV. Synthesis of 6-thiolretene and of related and derived compounds. T. HASSELSTROM and M. T. BOGERT (J. Amer. Chem. Soc., 1935, **57**, 1579—1581; cf. A., 1934, 646).—Retene-6-sulphonyl chloride is reduced by Zn and H$_2$SO$_4$ to 6-*thiolretene* (I), an oil (*Bz* derivative, m.p. 115·5—116·5°), oxidised by FeCl$_3$ or air to the *disulphide*, m.p. 226·5—227·5°. Reduction by Zn and H$_2$O gives, however, the *disulphoxide*, m.p. 142·5—143·5°. (I) and CH$_2$Cl·CO$_2$H give 6-*retylthiolacetic acid*, m.p. 138·5—139·5°, converted by ClSO$_3$H into 8-iso*propyl-7''-methylnaphtho-3'' : 2''-5 : 6-thioindoxyl* (II), solid, and the *disulphonic acid* of the corresponding indigo. (II) condenses with isatin and aldehydes to give dyes which could not be purified. M.p. are corr. R. S. C.

Production of compounds containing an ethylenic linking or a polymethine chain [quinolines and benzthiazoles].—See B., 1935, 894.

Condensation of ω-bromoacetophenone with s-phenyl-*o*-aminophenylthiocarbamide. K. B. PATHAK (J. Indian Chem. Soc., 1935, **12**, 463—465).—The structure advanced by Ghosh (A., 1931, 854) for the compound, m.p. 223° (decomp.) [Ghosh gives m.p. 230° (decomp.)], obtained from COPh·CH$_2$Br and o-NH$_2$·C$_6$H$_4$·NH·CS·NHPh in 95% AcOH is invalid. The compound is shown to be the hydrobromide of a *base*, m.p. 164°, for which the structure
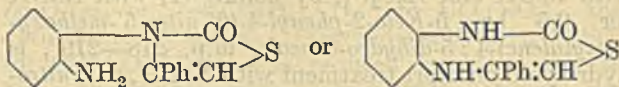
is proposed. The mechanism of the reaction is discussed. H. G. M.

Gramine from Swedish strains of barley. H. VON EULER and H. ERDTMAN (Annalen, 1935, **520**, 1—10).—Gramine (cf. A., 1933, 877; 1934, 1419; this vol., 1040), m.p. 132·5—133·5° (picrate, m.p. 142—144°; methiodide, m.p. 175—176°), now obtained in larger quantity from the mutant Primus I, is identical in properties with donaxine (this vol., 634); from its behaviour, before and after decomp., towards Ehrlich's reagent, it is now regarded as 2-dimethylamino-3-methylindole. For comparison, 2-(*dimethylaminomethyl)indole*, b.p. 180—183°/20 mm. (*picrate*, m.p. 184—185°; *hydrochloride*, m.p. 189—190°), is prepared (NaOMe at 300° in H$_2$) from *dimethylaminoacet-o-toluidide*, m.p. 62—64° (*hydrochloride*, m.p. 212—213°). The last is obtained by action of NHMe$_2$ in C$_6$H$_6$ on chloroacet-o-toluidide; with NH$_2$Me this yields *methylaminoacet-o-toluidide*, b.p. 198—201°/15 mm. (*hydrochloride*, m.p. 235—237°; *Bz$_2$* derivative, m.p. 130—131°), which does not condense to an indole. β-*Chloropropion-o-toluidide*, m.p. 84—85°, obtained from the acyl chloride, reacts with NHMe$_2$ to form β-*dimethylaminopropion-o-toluidide* (*hydrochloride*, m.p. 148—150°); distillation in vac. of the crude reaction product yields *acryl-o-toluidide*, m.p. 110°. With NH$_2$Me, ββ'-*methylimino-dipropion-o-toluidide*, m.p. 145°, and β-*methylaminopropion-o-toluidide* (*hydrochloride*, m.p. 143—145°) are formed. β-*Iodopropion-o-toluidide*, m.p. 112—113°, reacts similarly. E. W. W.

Effect of electrolysis on nicotine. G. S. ILJIN (Sborn. Rabot Chim. Tabak. Bull., 1935, No. 125, 67—74).—After electrolysis of neutralised nicotine, the picrate has a m.p. different from that of the nicotine picrate. E. P.

Tobacco bases. III. *l*-Nornicotine. E. SPÄTH and E. ZAJIC (Ber., 1935, **68**, [*B*], 1667—1670; cf. this vol., 1136).—The residues from a Kentucky tobacco are rendered strongly alkaline and extracted with Et$_2$O. The residue from the extract is distilled under diminished pressure and the distillate, dissolved in Et$_2$O, is fractionally extracted with HCl–NaCl. The acid solutions are basified and distilled with steam in vac., whereby nicotine is removed. The non-volatile base is purified by means of picric acid followed by HClO$_4$, thus leading to l-*nornicotine*, $[\alpha]_D^{23}$ —88·8° [*dipicrate*, m.p. 191—192° (vac.); *diperchlorate*], converted by HCO$_2$H and CH$_2$O into *l*-nicotine. H. W.

Senecio alkaloids. II. Platyphylline. A. OREKHOV and R. KONOVALOVA [with W. TIEDEBEL] (Ber., 1935, **68**, [*B*], 1186—1190; cf. this vol., 764).—Fresh analyses of platyphylline perchlorate, m.p. 222—223°, indicate the formula C$_{18}$H$_{25}$O$_5$N (not C$_{17}$H$_{25}$O$_5$N) for platyphilline (I); this harmonises with the now established formula C$_8$H$_{15}$O$_2$N for platynecine (II), which has been obtained cryst., m.p. 148—148·5°, $[\alpha]_D$ — 56·8° in CHCl$_3$ (*picrate*, m.p. 184—185°; hygroscopic *hydrochloride*; *perchlorate*; *aurichloride*, m.p. 199—200°; *methiodide*, m.p. 202—203°, stable towards cold 50% NaOH). (II) does not contain NMe, so that N is probably dicyclic. Zerevitinov's method shows 2 OH, but only a *Bz$_1$* derivative, m.p. 119—120°, $[\alpha]_D$ — 87·9° in EtOH, containing 1 active H, could be isolated. (II) is transformed by conc. H$_2$SO$_4$ at 100° into *anhydroplatynecine* (III), C$_8$H$_{13}$ON, b.p. 194—195°/750° mm., $[\alpha]_D$ — 25·19° [*picrate*, m.p. 265—270° (decomp.); *picrolonate*, m.p. 226—227° (decomp.); *methiodide*, m.p. 211—213°], which is not catalytically hydrogenated, does not contain active H, and does not react with NH$_2$OH or NH$_2$·CO·NH·NH$_2$. Electrochemical reduction (Tafel) of (II) gives (III), also obtained by the successive action of SOCl$_2$ and KOH–EtOH on (II). Hydrolysis of (I) with conc. H$_2$SO$_4$ affords (III). H. W.

Constitution of vasicine. H. R. JUNEJA, K. S. NARANG, and J. N. RÂY (J.C.S., 1935, 1277—1279).—o-Nitrobenzylsuccinamic acid, m.p. 116°, is reduced (FeSO$_4$) to the *NH$_2$*-acid, m.p. 145°, which with NaOAc gives a *compound* CH$_2$$\langle{}^{N=C\cdot CH_2}_{C_6H_4\cdot N-CO}\rangle$CH$_2$, m.p. 192°, reduced eletrolytically to a base having a *picrolonate*, m.p. 203—210° (decomp.). *Succino-o-nitrobenzylimide*, m.p. 130°, obtained from o-NO$_2$·C$_6$H$_4$·CH$_2$Cl, and K succinimide, is reduced to a *base* (II), C$_6$H$_4$$\langle{}^{CH_2\cdot N-CO}_{N=C\cdot CH_2}\rangle$CH$_2$, m.p. 186°. Reduction of (II) electrolytically gives a *picrolonate*, m.p. 207—213° (decomp.), identical with that obtained by reduction of vasicine, which must be C$_6$H$_4$$\langle{}^{CH_2\cdot N----CH_2}_{N=C\cdot CH(OH)}\rangle$CH$_2$ F. R. S.

Vasicine. M. L. BERI, K. S. NARANG, and J. N. RÂY (J. Indian Chem. Soc., 1935, **12**, 395—399; cf. this vol., 765).—The following unsuccessful attempts to synthesise vasicine are described (cf. Späth et al., this vol., 764). CHEtBr·CO·NHPh when heated with conc. aq. KOH at 50° gives 3-*ethylindolenone*, m.p. 264—265°, which would not condense with urethane. o-NH$_2$·C$_6$H$_4$·CO·NH$_2$ (I) with CHEtBr·COBr with C$_5$H$_5$N in C$_6$H$_6$ affords its α-*bromobutyryl* derivative, m.p. 144°, converted by NaOH–aq. EtOH at 50° into 4-*hydroxy-2-α-bromopropylquinazoline*, m.p. 218° (reduced by Zn–3% NaOH to the 2-*n*-propyl compound). (I) condenses with itaconic anhydride to give o-(β-*carboxy-Δ^β-butenoylamido)benzamide*, m.p. 174—176° (decomp.), cyclised (NaOH) to the *quinazolone* C$_6$H$_4$$\langle{}^{NH\cdot C\cdot CH_2\cdot C(CO_2H):CH_2}_{CO-N}\rangle$, m.p. 197—198°, which could not be decarboxylated. J. W. B.
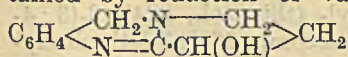
Alkaloids of *Ammodendron Conollyi*, Bge. I. A. OREKHOV and N. PROSKURNINA [with G. LAZUREVSKI] (Ber., 1935, **68**, [*B*], 1807—1809).—The leaves of *A. Conollyi* when extracted with C$_2$H$_4$Cl$_2$ yield pachycarpine (*d*-sparteine) and *ammodendrine* (I), C$_{12}$H$_{20}$ON$_2$ (also + 1H$_2$O), m.p. 73—74°, $[\alpha]_D$ ± 0° (non-cryst. *hydrochloride*, *hydrobromide*, and *sulphate*; *hydriodide*, m.p. 218—220°; *perchlorate*, m.p. 199—200°). Treatment of (I) with MeI yields N-*methylammodendrine*, C$_{13}$H$_{22}$ON$_2$, m.p. 65—66° (*hydriodide*, m.p. 183—185°), the *methiodide*, m.p. 163—165°, of which is stable towards alkali. (I) is therefore a monacidic, *sec.* base; the second N and O are non-reactive, pointing to the presence of :N·CO. (I) gives a non-cryst. *Bz* derivative. H. W.

***Lycoris* alkaloids. IX. 6 : 7-Methylenedioxy-N-methylphenanthridone as product of the degradation of lycorine.** H. KONDO and S. UYEO (Ber., 1935, **68**, [*B*], 1756—1760).—The skeleton of lycorine (I) is a 6 : 7-methylenedioxyhydrophenanthridine in which CH$_2$O$_2$ is attached to the C$_6$ nucleus A', whilst the hydrobenzene ring B' is attached to a fourth N-containing ring (cf. *A*). The position of the substituents in B' and the constitution of the fourth ring are not elucidated. Phenanthridine is isolated from the products of the distillation of (I) with Zn dust. The change is not accompanied by isomerisation, since (I) is transformed by the successive action of MeI and Ag$_2$O into *lycorineanhydromethine*, C$_{17}$H$_{15}$O$_2$N, m.p. 98·5° [*picrate*, m.p. 141—142° (decomp.)], which is oxidised by KMnO$_4$ to an *acid* (II), C$_{17}$H$_{11}$O$_6$N (+ H$_2$O), m.p. 252° (decomp.) (*Me* ester, m.p. 208°), and an *acid* (III), C$_{16}$H$_{11}$O$_5$N, m.p. 288° (decomp.) (*Me* ester, m.p. 195°), which does not react with NH$_2$OH or p-NO$_2$·C$_6$H$_4$·NH·NH$_2$ or absorb H, but gives Gaebel's reaction. (II) is oxidised to (III) by H$_2$O$_2$ in alkaline solution and hence is an α-CO-acid. Decarboxylation of (III) yields 6 : 7-*methylenedioxy-10-methylphenanthridone* (IV) (*A*), m.p. 238°, which is prepared thus : 6-bromopiperonal and o-C$_6$H$_4$Br·NH$_2$ give the corresponding Schiff's
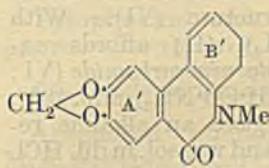
base, transformed by Cu powder in CO_2 at 180—200° into 6 : 7-*methylenedioxyphenanthridine*, m.p. 181°; the *methiodide*, decomp. 255° after darkening at 246°, of the latter is oxidised by $K_3Fe(CN)_6$ in alkaline solution to (IV).   H. W.

Cotarnine series. II. Reactivity of the aldehyde group in cotarnine and benzoylcotarnines. III. Isomeric biscotarninoacetones. B. B. DEY and (MISS) P. L. KANTAM (J. Indian Chem. Soc., 1935, **12**, 421—429, 430—435; cf. this vol., 366).— II. Cotarnineoxime (I) [formed in the cold from cotarnine (II), NH_2OH,HCl, NaOAc, and H_2O] with PhNCO in C_6H_6 yields the phenylcarbamate of cotarnomethylphenylcarbamideoxime, and with PhNCS yields cotarnomethylphenylthiocarbamideoxime (cf. *loc. cit.*). (I) with *N*-NaOH and BzCl affords the *benzoylated oxime of benzoylcotarnine* (III), m.p. 158°, and with Ac_2O affords the *acetylated oxime of acetylcotarnine*, m.p. 113°. Both are insol. in alkali. (I) is reduced by Na–EtOH (hot) to hydrocotarnine. Benzoylcotarnine (IV) (improved prep.) (*azine*, m.p. 220°; o-, m.p. 150, m-, m.p. 113°, and p-*toluidil*, m.p. 111°; p-*phenetidil*, m.p. 135°) is oxidised to benzoylcotarninic acid, and yields an oxime (*Ac* derivative, m.p. 152°) the Bz derivative of which is identical with (III). (II) and o-$NO_2 \cdot C_6H_4 \cdot COCl$ afford o-*nitrobenzoylcotarnine*, m.p. 138° (*oxime*, m.p. 193— 194°; *anil*, m.p. 164°). These results favour the structure $CHO \cdot R \cdot [CH_2]_2 \cdot NMeBz$ for (IV) (R= $CH_2O_2 \colon C_6H \cdot OMe$). Cotarnine anil, o-, m.p. 119°, and p-*toluidil* (V), m.p. 114—115°, unlike the corresponding derivatives of (IV), are unstable and decomposed by alkali. This is attributed to the presence of a *sec.* imino-H in (II). Attempts to benzoylate (V) failed, the product being benzo-p-toluidide. (II) and p-aminoacetophenone in EtOH when heated at 40° (15 min.) yield *anhydrocotarnino-p-aminoacetophenone* (VI; R′=·$CH_2 \cdot CO \cdot C_6H_4 \cdot NH_2$), m.p. 190—191° (*Ac$_1$* derivative, m.p. 105°, sol. in dil. acids), which contains a free diazotisable NH_2. These results favour the structure (VI). With $CO(NH_2)_2$ (II) affords *anhydrocotarninocarbamide* (VI; R′=·$NH \cdot CO \cdot NH_2$), m.p. 182°, which gave an alkaline reaction and was sol. in dil. HCl. A hot aq. solution with picric acid gave cotarnine picrate. Similarly (II) with phthalimidine affords *anhydrocotarninophthalimidine* (VI; R′=
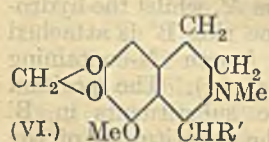
$C_6H_4 <^{CH}_{CO} > NH$), m.p. 143—144°, decomposed by boiling H_2O; with m-OH·$C_6H_4 \cdot OMe$ affords *anhydrocotarninoresorcinol* Me_1 *ether*, m.p. 221—222°; and with 2-nitroresorcinol affords *anhydrocotarnino-2-nitroresorcinol*, m.p. 201° (sparingly sol. *hydrochloride*). Attempts to condense (II) with o-, m-, and p-cresol and α- and β-$C_{10}H_7 \cdot OH$ were unsuccessful. III. The compound, m.p. 83°, obtained by Liebermann *et al.* (A., 1904, i, 263) by condensing (II) with $COMe_2$ in presence of Na_2CO_3 is biscotarnylideneacetone (VII) [methiodide (VIII), m.p. 168° (lit., m.p. 144°)]. When the condensation is carried out with EtOH as solvent, the product is an isomeride, *biscotarninoacetone* (IX), m.p. 150—151° [*methiodide*

(VI.)

$+2H_2O$ (X), m.p. 210°], sol. in dil. acids and not acted on by Ac_2O, BzCl, or PhNCO. It is also formed when (VII) is treated with warm EtOH, and is reduced by Na–Hg to *biscotarninoisopropyl alcohol*, m.p. 108° (decomp.). (X) when boiled with an excess of 20% alkali yields N-*methylbiscotarnylideneacetone* [*hydrochloride*, m.p. 182° (decomp.); *platinichloride*], which with MeI is converted into (VIII). (VIII) and NaOH when steam distilled yield NMe_3 and *biscotarnonideneacetone* as an oil which slowly solidified and was N-free. (VII) with Ac_2O does not give the expected Ac derivative, but is converted into (IX). Two isomeric compounds could not be obtained from (II) and COPhMe, the *isoquinoline* derivative being the only recognisable product.   H. G. M.
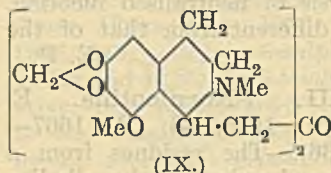
(IX.)

Papaverine phenylethylbarbiturate (" pavemal "). A. MOSSINI and G. RECORDATI (Boll. Chim. farm., 1935, **74**, 638—639).—*Papaverine phenylethylbarbiturate*, m.p. 145—146°, is prepared from the acid and the base in EtOH, and its existence confirmed by a m.-p. graph.   E. W. W.

Synthesis of tetrahydroharman derivatives under physiological conditions. II. G. HAHN, L. BÄRWALD, O. SCHALES, and H. WERNER. **III. Synthesis of the yohimbine skeleton.** G. HAHN and H. WERNER (Annalen, 1935, **520**, 107—123; 123—133).—II. Under such conditions tryptamine condenses more readily, and to give better yields, with α-keto-acids (I) than it does with the corresponding aldehydes. The yield depends on p_H, the optimum val. (in parentheses) of which varies with different (I), decreases with rise of temp. >25°, and with increase in the no. of OMe in the phenyl-pyruvic acid, and is increased by light. Thus tryptamine hydrochloride (II) with homopiperonal in H_2O (p_H 6·2) at 23° affords (8 days : 15% yield) 3-(3 : 4-methylenedioxybenzyl)- 3 : 4 : 5 : 6-tetrahydronorharman isolated as its *hydrochloride*, decomp. 273°. Similarly (II) and 3 : 4 : 5-$C_6H_2(OMe)_3 \cdot CH_2 \cdot CHO$ gives (16, 0, and 20% yields, respectively, at p_H 6·2, 5·2, and 3·8) 3-(3 : 4 : 5-*trimethoxybenzyl*)-, m.p. 85° (III), and with PhCHO (p_H 5·2), 3-*phenyl*-, m.p. 158—160° [*hydrochloride*, m.p. 253° (decomp.)], -3 : 4 : 5 : 6-*tetrahydronorharman*. Methylglyoxal becomes oxidised to $AcCO_2H$ and with (II) gives (IV) (below); furfuraldehyde gives a *substance*, m.p. 122°. By condensation of (II) with the appropriate (I) are obtained 3-*methyl*- (IV), decomp. 220° (p_H 6·2) [*Me* ester, m.p. 138° (*hydrochloride*, decomp. 268°)], 3-*benzyl*-, decomp. 253° (p_H 6·2), 3-(3 : 4-*methylenedioxybenzyl*)-, decomp. 250° (p_H 6·2), 3-(4-*hydroxy-3-methoxybenzyl*)-, decomp. 239—240° (p_H 6·2) (from 4-*hydroxy-2-methoxyphenyl-pyruvic acid*, decomp. 161°), 3-(3 : 4-*dimethoxybenzyl*)-, decomp. 230—232° (p_H 4·2), and 3-(3 : 4 : 5-*trimethoxybenzyl*)-, decomp. 191° (p_H 5·3), -3 : 4 : 5 : 6-*tetrahydronorharman-3-carboxylic acid*. By heating with MeOH–HCl these are decarboxylated to give the *hydrochlorides* of 3-benzyl- (this vol., 224), 3-(3 : 4-methylenedioxybenzyl)-, decomp. 268°, 3-(4-hydroxy-3-methoxybenzyl)-, decomp. 252—254°, and 3-(3 : 4-

dimethoxybenzyl)-, decomp. 230°, ·3 : 4 : 5 : 6-tetra-hydronorharman, and the free base (III).

III. Condensation of *p*- and *m*-$OH \cdot C_6H_4 \cdot CH_2 \cdot CO \cdot CO_2H$ with (II) (p_H 4·2) at 25° (sunlight) affords, respectively, 3-p-, decomp. 240—241°, and 3-m-*hydroxybenzyl*-3 : 4 : 5 : 6-*tetrahydronorharman*-3-*carboxylic acid*, decomp. 225—227°, decarboxylated to the *hydrochloride*, decomp. 246—247°, of 3-p- (V) and the *hydrochloride*, decomp. 245—246°, of 3-m-*hydroxybenzyl*-3 : 4 : 5 : 6-*tetrahydronorharman* (VI). With warm 40% CH_2O at p_H 4·4, (VI) readily condenses to give 3-(3-*hydroxy*-6-*hydroxymethylbenzyl*)-3 : 4 : 5 : 6-*tetrahydronorharman hydrochloride*, decomp. 283—285°, which undergoes ring-closure on basification to give a *hexadehydroyohimbol* (VII), decomp. 267—269°. Since (V) does not condense with CH_2O under the same conditions the OH in yohimbine (already shown to be in ring E) is most probably at C_{17}. J. W. B.
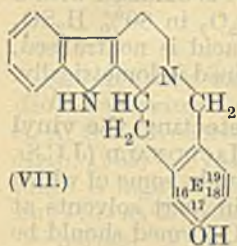
Cactus alkaloids. XVI. Synthesis of anhalonine and of lophophorine. E. SPÄTH and F. KESZTLER (Ber., 1935, 68, [*B*], 1663—1667).—Synthetic *dl*-anhalonine (A., 1924, i, 69) is resolved by *l*-tartaric acid in MeOH into *l*-anhalonine (I), m.p. 85—86°, $[\alpha]_D^{25}$ −56·3° in $CHCl_3$, identical with the natural base; treatment of the mother-liquors with *d*-tartaric acid affords d-*anhalonine*, m.p. 84·5—85·5°, $[\alpha]_D^{25}$ +56·7° in $CHCl_3$. (I) is converted by CH_2O and HCO_2H into *N*-methyl-*l*-anhalonine $[\alpha]_D^{25}$ −47·0° in $CHCl_3$ (picrate, m.p. 162—163°), identical with natural lophophorine. H. W.

Strychnine and brucine. XXXIV. Action of methyl sulphate on methoxymethyldihydroneobrucidine and similar bases in boiling benzene solution. O. ACHMATOWICZ and R. ROBINSON (J.C.S., 1935, 1291—1294).—Methylation (Me_2SO_4) of neobrucidine gives *neobrucidine dimethiodide* (+0·5H_2O), m.p. 298° (decomp.), identical with so-called methoxymethyldihydrobrucidine dimethiodide-*B* (cf. A., 1927, 889). *Dihydrobrucidine methosulphate*, m.p. 287—288° (decomp.), gives the *methiodide*, m.p. 298° (decomp.), identical with methoxymethyltetrahydrobrucidine methiodide-*B*, and the methosulphate also yields the *dimethiodide* (+0·5H_2O), m.p. 286—288° (decomp.). Methoxybenzylhydroneobrucidine and Me_2SO_4 followed by NaI form *N(a)-methyl*-*N(b)-benzylneobrucidinium di-iodide*, m.p. 246—24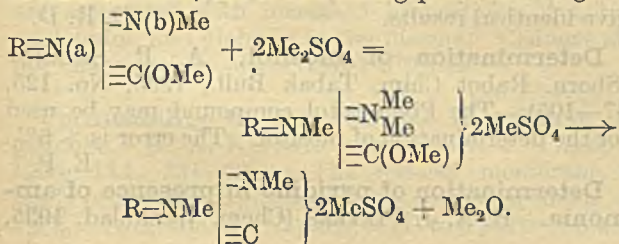8° (decomp.), which gives the *dichloride* (+7H_2O), m.p. 90—92°. The OMe-bases (A., 1927, 888, 889) when heated with Me_2SO_4 give Me_2O, the measurement of the vol. corresponding in amount with the yield of dimetho-salts, the action taking place in 3 stages :

$$R \equiv N(a) \begin{vmatrix} =N(b)Me \\ \equiv C(OMe) \end{vmatrix} + 2Me_2SO_4 =$$

$$R \equiv NMe \begin{vmatrix} =N \begin{matrix} Me \\ Me \end{matrix} \\ \equiv C(OMe) \end{vmatrix} 2MeSO_4 \longrightarrow$$

$$R \equiv NMe \begin{vmatrix} =NMe \\ \equiv C \end{vmatrix} 2MeSO_4 + Me_2O.$$

(VII.)

The bearing of this theory on hitherto inexplicable facts is discussed. F. R. S.

***Strychnos* alkaloids. LXXXVII. Hydrogenation of the isomeric brucinolones.** H. LEUCHS and A. DORNOV (Ber., 1935, 68, [*B*], 1785—1791).—Catalytic hydrogenation of brucinolone *b* (I) (PtO_2-50% AcOH) gives *dihydrobrucinolone* b, m.p. 285°, $[\alpha]_D^{20}$ −9° in AcOH; *dihydroisobrucinolone* (II), m.p. 260°, $[\alpha]_D^{20}$ −26° in AcOH, is obtained similarly. Another *dihydrobrucinolone*, m.p. 290° (decomp.), $[\alpha]_D^{20}$ +2° to +3° in AcOH, which cannot be further hydrogenated catalytically, is obtained from brucinonic acid and Na–Hg, whilst under like conditions (II) is produced in small yield from dihydrobrucinonic acid. The following are obtained by reduction (Adams) of the requisite Ac derivatives : *acetyldihydrobrucinolone* b, m.p. 253°, $[\alpha]_D^{20}$ −34·5° in AcOH; *acetyldihydrokryptobrucinolone*, m.p. (indef.) 235—238°, $[\alpha]_D^{20}$ −113° to −108° in AcOH; *acetyldihydroisobrucinolone*, m.p. 185°, $[\alpha]_D^{20}$ −58·5° in AcOH. *Brucinolone* b *hydrate hydrochloride*, $C_{21}H_{14}O_6N_2, HCl, 0·5H_2O$, $[\alpha]_D^{20}$ +16·5° in H_2O, is obtained by the successive action of $9N$-H_2SO_4 and $BaCl_2$ on (I). The corresponding *perchlorate*, $C_{24}H_{24}O_6N_2, HClO_4$, m.p. about 230° (decomp.), $[\alpha]_D^{20}$ +15·6° in H_2O (*perchlorate of* Me ester, m.p. 157—158°, $[\alpha]_D^{20}$ +21·2° in H_2O), rapidly absorbs 2 H in H_2O without completion of the action which, if interrupted at this stage, gives small amounts of a *perchlorate*, $C_{21}H_{26}O_4N_2, HClO_4$ or $C_{21}H_{24}O_4N_2, HClO_4$, m.p. about 220° (decomp.), $[\alpha]_D^{20}$ +6·2° in H_2O, whereas if hydrogenation passes to completion in H_2SO_4 a OMe-free *salt*, $C_{19}H_{30}O_3N_2, HClO_4$, m.p. 285° (decomp.), $[\alpha]_D^{20}$ −39° in H_2O, which does not give the red brucine colour or the Otto reaction results. iso*Brucinolone hydrate perchlorate*, m.p. 195—200°, $[\alpha]_D^{20}$ +4° in H_2O, similarly yields (I). Brucinolone hydrate II, as perchlorate, absorbs 2 H with production of a *compound*, $C_{21}H_{24}O_5N_2, H_2O$, m.p. 250°, $[\alpha]_D^{20}$ −11·9° in AcOH. H. W.

Tylophorine and tylophorinine from *Tylophora*.—See this vol., 1433.

Alkaloids of mu-fang-chi.—See this vol., 1433.

Arsenated phenoxyethanols [*isopropanols*]. M. R. STEVINSON and C. S. HAMILTON (J. Amer. Chem. Soc., 1935, 57, 1600—1601).—p-$OH \cdot C_6H_4 \cdot AsO_3H_2$ and $CH_2Cl \cdot CHMe \cdot OH$ in $6N$-NaOH give p-β-*hydroxy-n-propoxyphenylarsinic acid* (I), m.p. 132° (*H Na* salt), which with HNO_3 (*d* 1·9; 1 mol.) at 0° gives the *nitrate*, m.p. 158—159°, or (2 mols.) α-2-*nitro*-4-*arsinophenoxy*isopropyl *nitrate*, m.p. 183° (decomp.), hydrolysed by $3N$-H_2SO_4 to the *alcohol* (II), m.p. 175°. (II) is hydrogenated (Raney Ni; 2 atm.) in dil. NaOH to α-2-*amino*-4-*arsinophenoxypropan*-1-*ol*, +H_2O, m.p. 87°, and anhyd., m.p. 137° [*Na H* and *K H* salts; *anhydride*, m.p. 200° (decomp.); N-*Ac* derivative, m.p. 153°]. (II) is reduced (SO_2) to p-β-*hydroxy-n-propoxyphenylarsinoxide*, m.p. > 250°. By reduction with H_3PO_2 are prepared 1 : 1'-*arseno*-3 : 3'-*diamino*-, m.p. 156—158° (decomp.), and -*dinitro*-4 : 4'-*di*-β-*hydroxy-n-propoxybenzene*, m.p. 200—205° (decomp.) [*dinitrate*, m.p. 158—160° (decomp.)]. R. S. C.

Esters of thio-acids. I. Esters of thio-acids of arsenic and antimony. R. KLEMENT and R. REUBER (Ber., 1935, 68, [*B*], 1761—1765).—Thioarsenious esters are obtained from $AsCl_3$ and NaSR in warm EtOH, whilst the corresponding Sb compounds are unstable towards EtOH and are obtained directly from their components. When treated with S they afford thioarsenates and thioantimonates, respectively. The As compounds are only slowly attacked by boiling H_2O, whereas the Sb compounds are readily hydrolysed to Sb_4O_6 and the mercaptan, which is largely oxidised immediately to the corresponding disulphide. With Na_2S reaction occurs thus: $Sb(SR)_3 + 3Na_2S = Na_3SbS_3 + 3NaSR$. The chemotherapeutic action of the compounds has been investigated. The following *thioarsenites* are described: *Ph₃*, m.p. 95°; *tribenzyl*, a liquid which cannot be distilled in a high vac. without decomp.; (p-C_6H_4Me)₃, m.p. 76° (whence *tri-p-tolyl thioarsenate*, m.p. 74°); *tri-p-methylbenzyl*, an oil (p-*methylbenzyl mercaptan*, b.p. 93°/12 mm.). The following *thioantimonites* have been obtained: *Ph₃*, m.p. 70—71°; *tribenzyl*, an oil; $(C_6H_4Me)_3$, m.p. 95° (decomp.) [*tri-p-tolyl thioantimonate*, m.p. 91—93°].   H. W.

Configuration of heterocyclic compounds. III. Optical resolution of 10-ethylphenoxarsine-2-carboxylic acid. (MISS) M. S. LESSLIE and E. E. TURNER (J.C.S., 1935, 1268—1269).—dl-10-*Ethylphenoxarsine-2-carboxylic acid*, m.p. 162—163°, prepared from 10-chlorophenoxarsine-2-carboxylic acid and MgEtI, is resolved through strychnine d-, m.p. 247—248° (decomp.), $[\alpha]_{5461}^{20}$ +57·4° in $CHCl_3$, and l-10-*ethylphenoxarsine-2-carboxylate*, m.p. 188—189°, $[\alpha]_{5461}^{20}$ −63·2° in $CHCl_3$, into d- and l-*acids*, m.p. 128—129°, $[\alpha]_{5461}^{20}$ ±139·0° in EtOH. The optical stability of the ions is of the same order as that of the Me acid (A., 1934, 1118).   F. R. S.

Mercuration of p-cymene. J. E. NEWSTROM and K. A. KOBE (J. Amer. Chem. Soc., 1935, 57, 1640—1642).—p-Cymene and $Hg(OAc)_2$ in EtOH–AcOH, when well stirred at < 135°, give p-*cymene-di-(mercuric chloride)* (13%), amorphous, decomp. at < the m.p., -2- (I) (38%) and -3-*mercuric chloride* (II) (26%), m.p. 177·5—178°. 3-*Di-p-cymyl mercury* has m.p. 102—102·2°. The mixed m.-p. diagram of (I) and (II) shows a min.-melting mixture [50—60% of (I)] with m.p. 127°. (I) and (II) distil at 760 mm., but cannot be separated thus.   R. S. C.

Chemical groups of proteins which possess affinity for polysaccharides. IV. Rôle of tyrosine. S. J. VON PRZYŁECKI and H. RAFALOWSKA. **V. Silk fibroin and peptone.** H. RAFALOWSKA, J. KRASNODEBSKI, and E. MYSTKOWSKI (Biochem. Z., 1935, 280, 92—96, 96—98).—IV. Free tyrosine unites with P-free polysaccharides, mol. compounds existing over a considerable range of p_H (7·5—3).

V. Fibroin adsorbs amylose and dextrin. The greater is the surface and degree of purity, the greater is the amount of polysaccharides adsorbed. Elution occurs much more readily than with the polysaccharide-tyrosine symplex. Considerable affinity exists also between amylose and silk peptone (Fischer's tetrapeptide), the ppt. at p_H 7 containing 10% of peptide.   P. W. C.

Vitamin-*E*. III.—See this vol., 1287.

Protein determination from acid-combining power.—See this vol., 1261.

Influence of hydrogen peroxide on the precipitability of proteins.—See this vol., 1266.

Titrimetric determination of organic substances by oxidation with chromic acid. H. C. S. SNETHLAGE (Z. anal. Chem., 1935, 102, 321—328; cf. this vol., 1140).—The substance is oxidised with a known vol. of standard aq. $K_2Cr_2O_7$ in 80% H_2SO_4 solution at 100°. The excess of acid is neutralised, and the excess of $K_2Cr_2O_7$ determined iodometrically.   J. S. A.

Formaldehyde method of detecting the vinyl group. G. R. CLEMO and J. M. MACDONALD (J.C.S., 1935, 1294—1295).—Many compounds, some of which do not contain the vinyl group, in inert solvents at 0° give CH_2O with O_3. The CH_2O formed should be determined (as the dimedon compound), because compounds containing the vinyl side-chain give about 10 times as much CH_2O as those without it.   J. L. D.

Volumetric determination of some carbonyl compounds. I. Review of literature. S. HÄHNEL (Svensk Kem. Tidskr., 1935, 47, 235—248).   E. P.

Determination of creatine and creatinine. F. EGGS and G. VANOLI (Klin. Woch., 1935, 14, 204—205).—Benedict's method for determination of creatine gives inaccurate results, part of the creatinine formed being destroyed by the high temp. By evaporating to dryness after addition of two vols. of 0·1N-HCl at ≯ 60° an accuracy within 4—5% can be obtained for pure solutions and urine.   NUTR. ABS. (*m*)

Colorimetric determination of polypeptides by triketohydrindene hydrate (ninhydrin). M. POLONOVSKI (Compt. rend. Soc. Biol., 1935, 120, 28—29).—Ninhydrin reacts only with polypeptides containing a glycyl unit with its NH_2 free.   R. N. C.

Colour reaction of some phenylamines. RAYMOND-HAMET (Bull. Sci. pharmacol., 1934, 41, 481—489; Chem. Zentr., 1935, i, 1095).—Reactions are given for dihydroxyphenylethylmethylamine, adrenaline, noradrenaline, dihydroxynor-β-ethyladrenaline, dihydroxynor- and o- and p-methoxynor-ephedrine, ethylaminothanol-pyrocatechol, amino-, methylamino-, and ethylamino-acetopyrocatechol, o-, m-, and p-methoxy-, dihydroxy-, dimethoxy-, 3 : 4 : 5-, 2 : 4 : 5-, and 2 : 3 : 4-trimethoxy-, and 3 : 4 : 5-triethoxy-phenylethylamine.   J. S. A.

Iodometric determination of phenol. H. A. J. PIETERS (Chem. Weekblad, 1935, 32, 508—509).—The d'Ans (A., 1934, 268) and Koppeschaar methods give identical results.   D. R. D.

Determination of inositol. A. P. SMIRNOV (Sborn. Rabot Chim. Tabak Bull., 1935, No. 125, 87—105).—The Pb–inositol compound may be used for the determination of inositol. The error is ≯ 6%.   E. P.

Determination of pyridine in presence of ammonia. H. A. J. PIETERS (Chem. Weekblad, 1935,

32, 509).—Houghton's method (B., 1909, 1195) gives high results unless the last traces of NH_3 are removed by distillation with excess of an alkaline hypobromite solution. D. R. D.

Hydrochloric acid as reagent for proteins and their derivatives. H. KÜHL (Pharm. Zentr., 1935, **76**, 625—629).—The violet colour formed by the action of HCl on some proteins and their decomp. products is sp. only for those containing ·CHO or :CO groups. Aldehydic or ketonic carbohydrates or the simple aldehydes and ketones produce red to brown colours. Furfuraldehyde is the simplest compound which gives the violet colour, and it is also formed by pyrrole when an aldehyde containing a Me group is present. E. H. S.

Biochemistry.

Respiratory exchange of oxygen and carbon dioxide during re-breathing from a rubber bag. S. A. GLADSTONE and S. DACK (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1315—1319).—CO_2 discharge into the lungs is high during the first period of re-breathing, but falls as alveolar CO_2 increases. O_2 absorption is $>$ normal in the first stage, and falls later. The R.Q. is > 1 in the first period, but falls rapidly in later periods. Addition of O_2 to the bag scarcely affects O_2 absorption; CO_2 discharge and the R.Q. are slightly depressed. Addition of CO_2 causes marked depressions in O_2 absorption, CO_2 discharge, and the R.Q. R. N. C.

Respiratory quotients less than 0·7 in certain poikilotherms. L. DONTCHEFF and C. KAYSER (Compt. rend., 1935, **201**, 474—476).—Poikilotherms react differently to hypertension of CO_2, some (e.g., tortoise) responding by a hyperventilation, as with most homeotherms, whilst others (e.g., frog) do not change their respiratory rate, and consequently experience an increase in alkaline reserve. Vals. of R.Q. $< 0·7$ obtained with fasting frogs are erroneous. F. O. H.

Changes in human cerebral blood-flow consequent on alterations in blood-gases. F. A. GIBBS, E. L. GIBBS, and W. G. LENNOX (Amer. J. Physiol., 1935, **111**, 557—563).—Cerebral blood-flow in man increases and decreases $\propto CO_2$ tension and inversely $\propto O_2$ tension in the arterial blood. The changes due to CO_2 are $>$ those due to O_2. R. N. C.

Comparison of various concentrations of sodium oxalate solution with heparin for the determination of packed cell volume. O. S. WALTERS and J. W. MAY (J. Lab. Clin. Med., 1935, **20**, 385—390).—Vals. obtained in the centrifugal method by the use of 1·5% $Na_2C_2O_4$ solution were identical with those obtained with heparin. CH. ABS. (p)

Factors influencing the sedimentation rate of erythrocytes. T. H. CHERRY (J. Lab. Clin. Med., 1934, **20**, 257—271).—Changes in sedimentation rates are caused by disturbances in the balance between cellular and fluid elements in the blood. High rates are associated with increased proportions of fibrin, euglobulin, and globulin in the plasma. Changes are not characteristic of particular diseases. CH. ABS. (p)

Permeability of the red-cell membrane to glucose. K. A. KLINGHOFFER (Amer. J. Physiol., 1935, **111**, 231—242).—The red-cell membrane is freely permeable to glucose (I) in solutions of concn. $< 2·3\%$. Addition of < 2 parts of (I) to 5 parts of blood results in an increase in corpuscular vol. comparable with that produced by H_2O or urea solution and approx. equal in % to the serum vol. Addition of > 2 parts of (I) results in an increase in cell vol. $<$ with the same vol. of H_2O; the change in permeability is not due to dilution of the serum or serum electrolytes, but is partly due to the increased (I) concn. There is no evidence that the permeability of the cell to bases is affected by increase of the concn. of serum non-electrolytes. R. N. C.

Effect of cortico-adrenal extract on leucocytes in blood of normal adult rabbits. C. A. FOX and R. W. WHITEHEAD (Proc. Soc. Exp. Biol. Med., 1935, **32**, 756—757).—The leucocyte counts are unaffected by prolonged treatment. R. N. C.

Erythrocytes, hæmoglobin, and leucocyte count in cancerous affections of the bird. R. SALGUES (Compt. rend., 1935, **201**, 430—432).—Cancerous growths in various situations cause a decrease in the no. of erythrocytes, % of hæmoglobin, and the leucocyte count, although the last two are sometimes increased. J. L. D.

Hæmatological studies on cattle. I. Hæmoglobin, erythrocytes, and leucocytes in different breeds of cattle. M. MANRESA and N. C. REYES (Philippine Agric., 1934, **23**, 588—603).—The hardiness of cattle was $\propto$ the hæmoglobin content of the blood. CH. ABS. (p)

Regeneration of hæmoglobin. H. L. KEIL and V. E. NELSON (Proc. Iowa Acad. Sci., 1933, **40**, 103—107; cf. this vol., 380).—Feeding Fe (as $FeCl_3$) in amounts $\Rightarrow$ 10 mg. daily did not stimulate hæmoglobin (I) regeneration in anæmic rats. Of a no. of elements examined, only Cu produced positive effects. Intraperitoneal injection of $FeCl_3$ or Fe^{III} citrate into rats with nutritional anæmia increased (I), as also did $Fe(OH)_3$ in rats receiving milk and Cu. CH. ABS. (p)

Amount of hæmoglobin in the blood. E. R. HOLIDAY, P. M. T. KERRIDGE, and F. C. SMITH (Lancet, 1935, **229**, 661—665).—A crit. survey of the hæmoglobinometers in present use, and their standardisation. L. S. T.

Can hæmatoprosthetin be regarded as a mixture of oxyhæmin and oxyhæmin anhydride? A. HERZOG (Biochem. Z., 1935, **280**, 137—147).—Tables summarise the % C and Fe of a no. of preps. of hæmatin and oxyhæmin (I). The higher or lower vals. of the C : Fe ratio for these preps. depend on the method of prep., and the low C vals. cannot always be explained by assuming the entry of O or H_2O into the

mol. Hæmatoprosthetin is not a mixture of (I) and its anhydride.   P. W. C.

Number of carbon atoms in the prosthetic group of blood-pigment. A. HERZOG (Biochem. Z., 1935, **280**, 148—155).—The author's view, based on the results of analysis, that the low vals. for C obtained with hæmatoprosthetin are due not to entry of O or H_2O into the mol., but to loss of C, is further supported by new determinations of the Fe content of Teichmann's hæmin, oxyhæmin, hæmatoprosthetin, and chlorohæmatoprosthetin, and by the results of a guaiacol colour reaction which detects the C eliminated.   P. W. C.

Action of sodium hydroxide on Teichmann's hæmin, hæmatoprosthetin, and hæmoglobin. A. HERZOG (Biochem. Z., 1935, **280**, 156—160).—In alkaline solution the absorption spectra of Teichmann's hæmin, hæmatoprosthetin, and methæmoglobin differ according to the time of action and [NaOH]. A degradation of hæmoglobin under these conditions could not be detected.   P. W. C.

Properties of reptilian blood. IV. The alligator (*Alligator mississippiensis*, Daudin). D. B. DILL and H. T. EDWARDS (J. Cell. Comp. Physiol., 1935, **6**, 243—254).—The alkaline reserve of reptilian blood is not affected by exposure to high or low temp. Blood-lactate is apparently const. at 5° or 38° body-temp. Oxygenated red corpuscles of the alligator and crocodile have a buffer val. per unit of hæmoglobin (I) > that of human or lizard blood. The Bohr effects in human and lizard (I) are < in crocodile and alligator (I); the effect of O_2 on the base-binding capacity of (I) varies similarly.   R. N. C.

Cholesterol of maternal and fœtal blood at the conclusion of pregnancy. D. ROSENBLOOM (Proc. Soc. Exp. Biol. Med., 1935, **32**, 908—910).—Cholesterol in maternal is > in fœtal blood.   R. N. C.

Determination of blood-cholesterol. J. E. ANDES (J. Lab. Clin. Med., 1935, **20**, 410—415).—The sample (0·25 c.c.) of whole blood or plasma is mixed with anhyd. $CaSO_4$. After 30 min. at room temp. the mass is extracted with $CHCl_3$ and the colour developed by the Liebermann–Burchard method.
                    CH. ABS. (*p*)

Colorimetric determination of blood-cholesterol. R. S. FIDLER (J. Lab. Clin. Med., 1934, **20**, 307—311).—The Liebermann–Burchard procedure is modified. An artificial standard is prepared from naphthol-green *B*.   CH. ABS. (*p*)

Portal and hepatic blood-sugar after glucose administration. G. GIRAGOSSINTZ and J. M. D. OLMSTED (Proc. Soc. Exp. Biol. Med., 1935, **32**, 668—670).—Injection of moderate amounts of glucose (I) into the duodenum of the decerebrate cat or amytalised dog sometimes, but not always, increases portal blood-(I) to vals. > hepatic (I). After 1 hr., while absorption is still taking place, hepatic (I) is always > portal (I), whilst portal lactic acid (II) is > hepatic (II), although the difference does not account for the whole of the difference between hepatic and portal (I).   R. N. C.

Distribution of glucose in blood. J. M. D. OLMSTED (Amer. J. Physiol., 1935, **111**, 551—553).—

The corpuscles of rabbit, rat, guinea-pig, cat, dog, and human blood contain no glucose (I), either in normal conditions or high and low blood-sugar, after adrenaline and insulin, respectively. C_2O_4'' renders the corpuscles permeable to (I), human corpuscles being particularly sensitive.   R. N. C.

Determination of glucose in 0·1 ml. of blood by a modified Folin–Malmros method. H. S. H. WARDLAW (Med. J. Austral., 1934, **2**, 571—573).—Details of the technique are given.   CH. ABS. (*p*)

Hagedorn–Jensen method for [determining] blood-sugar. G. D. MACCO (Diagnostica tec. lab. [Napoli], Riv. mens., 1934, **5**, 561—563).—The $Zn(OH)_2$-protein ppt. is centrifuged instead of filtered.   CH. ABS. (*p*)

Application of Yamada's colorimetric cryogenin method to the micro-determination of fructose and the determination of true glucose. H. OKAMURA (Japan J. Med. Sci., II, Biochem., 1935, **3**, 9—14).—Deproteinisation of blood is effected with $CdCl_2$, and true total sugar determined in the same filtrate as fructose. The true glucose val. is obtained by difference.   NUTR. ABS. (*m*)

Factors affecting blood glycolysis *in vitro* and *in vivo*. F. Y. HSU (J. Physiol., 1935, **84**, 173—185).—The view that the glycolytic rate of the blood of pigs and sheep is < that of dogs and cats is confirmed. Individual differences in the glycolytic rate of dog's defibrinated blood are due to variations in the leucocyte content. Glycolysis is also observed in the blood in blood-vessels, which can also produce lactic acid at the expense of blood-sugar; this phenomenon may explain the same property in lung tissue.
                    R. N. C.

Glycolysis in the blood of the goat. J. T. CUTTER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 921—926).—The rate of glycolysis in goat-blood is > in dog-blood. Inorg. PO_4''' rises slowly without any initial decrease; it is only slightly retarded by addition of glucose, and unaffected by NaF, even though this suppresses glycolysis.   R. N. C.

Effect of arginase activators on the free arginine of blood. M. REISS, F. FLEISCHMANN, and L. SCHWARZ (Z. physiol. Chem., 1935, **236**, 73—78; cf. this vol., 1014).—The free arginine content of rabbits' blood is decreased following intravenous administration of glutathione (I), cysteine (II), $FeCl_2$, and ascorbic acid (III) (and subcutaneous administration of toxic doses of $FeCl_3$ and $MnSO_4$), the max. effect appearing after about 1 hr. $FeCl_2$ given with or immediately after (I), (II), and (III) causes no appreciable increase in the reduction. In pregnant rabbits and in those inoculated with carcinoma the reduction produced by the activators before the physiological or pathological reduction sets in is > that in normal rabbits.   W. McC.

Glutathione. II. Relation between reduced and oxidised glutathione and the oxygen content and capacity of blood. F. W. OBERST and E. B. WOODS. **III. Disappearance of glutathione added to various solutions and biological fluids.** F. W. OBERST (J. Biol. Chem., 1935, **111**, 1—7, 9—16).—II. There is no direct relation between the

degree of O_2 saturation of blood and the % of un-reduced glutathione (I), which was never found > 30%. The higher total (I) vals. are associated with higher cell vols. and O_2 capacities.

III. (I) is destroyed in aq. solutions of urinary albumin and globulin, ovalbumin, caseinogen, gelatin, heparin, serum, aq. humour, vitreous humour, and Bactopeptone. (I) added to whole blood is destroyed, and hæmolysis lowers the normal whole-blood val. A suspension of laked or unlaked erythrocytes in iso-tonic saline loses (I) as slowly as in whole blood. It is concluded that the small losses in whole blood are due to the diffusion of (I) from the cells and its subsequent destruction by the serum-proteins.

H. D.

Determination of blood-urea. G. L. PESKETT (Brit. J. Exp. Path., 1934, **15**, 306—308).—The vol. of the digestion mixture in Cole's method is limited to 2 ml., the amount of EtOH is reduced to < one third, and the sensitivity of the titration end-point is increased sufficiently to permit the use of $0.006N$-acid and -alkali. Slightly warming the mixture before distillation flocculates proteins, and the clear supernatant liquid is practically colourless.

CH. ABS. (p)

Micro-determination of urea in blood. A. W. WITTERMANS (Nederland. Tijdschr. Geneesk., 1935, **79**, 311).—The procedure combines the urease method (Conway's units) with the indophenol-blue NH_3 reaction, a simple photo-electric apparatus being used for colorimeter. 0·1 ml. of blood suffices for duplicate determinations; the accuracy is about ± 2.5 mg. per 100 ml.

NUTR. ABS. (m)

Effect of administered glucose on the amino-nitrogen content of the blood. J. M. LUCK, B. L. DAVIS, jun., and W. VAN WINKLE, jun. (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1039—1041).—Ingestion of glucose (I) in human subjects is followed by a fall of blood-NH_2-N, considered to be due to increased adrenaline secretion evoked by the increased insulin secretion after ingestion of (I).

R. N. C.

Micro-determination of biological carbon, especially of residual carbon in blood. (A) W. STEPP. (B) V. RUPPERT (Z. physiol. Chem., 1935, **235**, 273—275, 276).—(A) Ruppert's conception (this vol., 674) of residual C is less useful than the usually accepted one and he overlooks the author's work (Ergebn. Physiol., 1921, **19**, 290—325).

(B) The author's views are maintained.

W. McC.

Friend's method for the determination of chlorides [in blood]. J. E. HEARN (J. Lab. Clin. Med., 1934, **20**, 302—303).—A solution of $AgNO_3$ of which 1 c.c. is equiv. to 1 mg. of NaCl is substituted for the $0.02N$ solution used originally (A., 1922, ii, 389).

CH. ABS. (p)

Blood-calcium in southern Chinese. W. W. CADBURY and T. T. YAN (Chinese Med. J., 1935, **49**, 700—702).—Blood-Ca approximates to that of the white race.

H. G. R.

Determination of serum-iron. F. C. BING and R. F. HANZAL (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1013—1014).—Serum is ashed with conc. H_2SO_4 and

30% H_2O_2, diluted, $KMnO_4$ added until pink, the solution covered with EtOAc, and NH_4CNS added. The EtOAc layer is compared colorimetrically with a standard. The benzidine method can be used for hæmoglobin, but allowance must be made for the serum-proteins, which affect the colour. The non-hæmoglobin Fe is inorg.

R. N. C.

Phosphorus of blood. III. Phosphorus partition in whole blood and in serum, and the serum-calcium and plasma-phosphatase during healing of late rickets. G. STEARNS and E. WARWEG (Amer. J. Dis. Children, 1935, **49**, 70—90; cf. this vol., 374).—The org. acid-sol. or ester fraction of the P of red corpuscles is lowered in untreated active late rickets. On administration of vitamin-D vals. increase in advance of the inorg. P of serum. The readily hydrolysable fraction of the ester-P (10 min. boiling with N-acid) is not significantly different from normal. Plasma-phosphatase increases in rickets, declines as healing progresses, but is still > normal when röntgenologic healing is complete.

CH. ABS. (p)

Acid-soluble, mineral, and ultrafilterable phosphorus of the blood. I. POTOP (Compt. rend., 1935, **201**, 490—492).—The acid-sol. (I), mineral, and ultrafilterable P (II) in the blood-serum and blood-plasma of dogs have been determined. Addition of $CaCl_2$ *in vitro* produces changes in the proportion of (II) in accord with the results of Scholtz (A., 1931, 506) and Grollmann (A., 1927, 584). In normal serum and plasma (II) is entirely mineral and composed of orthophosphates (III). In experimental acidosis the proportion in the serum of (I) and (III) increases, whilst in alkalosis it diminishes.

H. G. M.

Total protein content of plasma and serum. W. LEHMAN and F. H. SCOTT (J. Biol. Chem., 1935, **111**, 43—44).—The % of protein in oxalated plasma and defibrinated serum was the same.

H. D.

Alteration of protein distribution, *in vitro*, between corpuscles and plasma caused by isos-motic and hyperosmotic solutions. C. J. BELLIS and F. H. SCOTT (J. Biol. Chem., 1935, **111**, 17—42).—The increases in the serum-protein content produced by the addition of isotonic solutions of NaCl, $CaCl_2$, and $BaCl_2$ $\propto$ dilution; hypertonic solutions decreased the serum-protein content to a limiting val. and increased the non-protein-N. The changes occur chiefly in the albumin fraction. Although the γ of the hypertonic solutions were > that of H_2O, their addition to serum was without influence of its γ. The electrokinetic potentials of the erythrocytes and serum-proteins were either zero or reversed by treatment with hypertonic solutions. A modified viscosimeter is described.

H. D.

Effect of a low-calorie low-protein diet on blood-proteins. W. C. CUTTING and R. D. CUTTER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1053—1056).—A low-calorie protein-free diet concentrates the blood and increases serum-protein in man, due chiefly to low fluid intake; the increase in serum-protein is not quite $\propto$ that of blood concn., indicating that some protein is lost. Total blood-proteins are lowered,

but their character is unchanged by 2 days of protein deprivation. R. N. C.

Influence of parenteral administration of protein- and non-protein-colloids on blood-proteins. H. HEINLEIN (Arch. exp. Path. Pharm., 1935, **179**, 127—144).—Parenteral administration of "caseosan" or horse-serum to rabbits increases blood-fibrinogen and -globulin and decreases -albumin. Non-protein colloids (Cu, Bi, S, trypan-blue, etc.) have a similar but more marked and rapid action, which is therefore not specifically related to the phenomena of anaphylactic shock or antigen–antibody reaction. The hyperproteinæmia is due to increased cellular reaction. F. O. H.

Protein fractions of blood sera. II. Blood sera of opium addicts. R. N. CHOPRA, S. N. MUKHERJEE, and G. S. CHOPRA. **III. Malarial sera during and after the rigour stage.** R. N. CHOPRA, S. N. MUKHERJEE, and B. SEN (Indian J. Med. Res., 1935, **22**, 561—570, 571—580).—II. Opium addicts show a lowered blood-p_H, concurrent with an increase of CO_2 tension. Buffer action is reduced, due to lowered alkaline reserve, and its efficiency as a buffer through increased CO_2 tension, σ is increased, and relative η decreased, indicating increased fluid and decreased protein contents. In some cases η of the whole blood increases. Total proteins are diminished. The albumin and euglobulin fractions are increased, whilst the pseudoglobulin fraction is decreased.

III. During the rigour stage in malaria, blood-p_H and buffer action are scarcely changed, whilst σ and η both fall, particularly σ. Total proteins fall, albumins decrease, euglobulin increases, whilst pseudoglobulin remains practically normal. After the rigour subsides the physical properties and protein contents tend to return to normal. R. N. C.

Determination of plasma-fibrin. S. ROSENFELD and A. S. WIENER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 788—791).—The fibrin is coagulated with tiger-snake venom, washed with H_2O, dried, and weighed. The results agree closely with those obtained by the micro-Kjeldahl method. R. N. C.

Effect of temperature on hæmolysis by hypotonic solutions. V. V. LEPESCHKIN (Pflüger's Archiv, 1935, **235**, 756—763).—Resistance of red corpuscles to hæmolysis by hypotonic NaCl or Na_2SO_4 solutions, unbuffered or lightly buffered with PO_4''' at p_H 7·3, increases with rise of temp. to a max. at 40—50°, afterwards declining through spontaneous hæmolysis at high temp. High PO_4''' concns., or the substitution for hypotonic solutions of pure buffer solutions at the same p_H, shift the max. to 23—25°, probably through increased permeability of the corpuscles to PO_4''' at high temp. In acid solution temp. has no effect. The osmotic pressure of the corpuscles does not play a decisive part in the increased resistance, since the cooling of a corpuscle suspension hæmolysed at high temp. does not intensify hæmolysis. This effect is attributed to increased viscosity of the corpuscular protoplasm. R. N. C.

Specificity of antivenomous sera with special reference to sera prepared with venoms of Indian and South African snakes. M. L. AHUJA (Indian J. Med. Res., 1935, **22**, 479—484).—Antivenenens of Indian and Cape cobras each exert a protective effect against the venom of either species, but neither protects against the venom of the banded krait. Each antivenenen inhibits the hæmolytic effect of both cobra venoms, which therefore contain the same hæmolytic principle. R. N. C.

Detoxication of snake venom by the photodynamic action of methylene-blue. H. E. SHORTT and S. M. K. MALLICK (Indian J. Med. Res., 1935, **22**, 529—536).—*Daboia* venom (I) is rapidly detoxicated by the photodynamic action of methylene-blue (II), the rate of detoxication depending on the time of exposure and the concns. of (I) and (II). The optimum concn. of (II) is approx. 1/50,000. Detoxication of (I) by (II) also destroys its antigenic properties. R. N. C.

Venom of *Lachesis* (*Bothrops*) snakes. I. Blood-coagulating activity and purification of venom of *L. jararaca*. D. VON KLOBUSITZKY (Arch. exp. Path. Pharm., 1935, **179**, 204—216).—Fresh venom (total N, 9·704%; heat-coagulable N, 8·971%; light petroleum extract, 5·296%; inorg. salts, 4·437%; Cl, 0·179% of dry substance) in concn. of 0·005% has a blood-coagulating action; with 0·01—0·02% it inhibits coagulation whilst higher concns. have a hæmolytic action. Pptn., dialysis, etc. of the venom yields a colloidal active product, "bothropotoxin" (I), free from hæmolytic action, from which toxic and blood-coagulating principles could not be isolated. Replacement of Ca and destabilisation of fibrinogen are concerned in the blood-coagulation by (I). F. O. H.

Gelation of blood with nucleated corpuscles and pathological blood. E. BIOCCA (Atti R. Accad. Lincei, 1935, [vi], **21**, 666—670).—Blood with nucleated erythrocytes (birds, reptiles, amphibia, fishes) when hæmolysed and treated with neutral salts [$K_3Fe(CN)_6$, $(NH_4)_2SO_4$, $KMnO_4$, NaCl, etc.] gelatinises even when dil. (down to 2%). Drying at room temp. does not prevent the reaction, which is also shown by blood of new-born and leucæmic (but not leucocytosic) persons. The phenomena is due to nucleoproteins of the nuclei. F. O. H.

Effect of anticoagulants on the determination of certain substances in blood. I. BLITSTEIN (Rev. belge Sci. méd., 1935, **7**, 69—154).—The effects of $K_2C_2O_4$, Na citrate, NaF, $ZnSO_4$, heparin, hirudin, and "liquoid Roche," in the determination of cell-vol., dry matter, Cl, cholesterol (I), inorg. P, non-protein-N, serine, and globulins were examined. The vals. for serum and plasma were compared. For plasma vals. the first four anticoagulants are not satisfactory, and the last three are not universally applicable. For the determination of cell vol., dry matter, Cl, and (I) all three can be used, but for inorg. P only "liquoid" can be used if equal plasma and serum vals. are to be obtained. For the determination of non-protein-N and the proteins it is better to use serum. NUTR. ABS. (m)

Heparin: a chondroitinpolysulphuric acid. A. SCHMITZ (Z. physiol. Chem., 1935, **236**, I; cf. this

vol., 646, 1024).—Highly purified heparin (I) (1000 units per mg.) contains no H_2SO_4 and yields no hydrochloride. The ash content is $< 4\%$. Possibly derivatives of (I) (or other inhibitors of coagulation) occur in the organism or are produced during isolation, but the active principle of (I) appears in all cases to be a monocarboxylic derivative of a polysaccharide.
W. McC.

Immunological reactions and viscosity. L. Du Noüy (Science, 1935, **82**, 254).—Certain immunological reactions accompanied by changes in η are summarised. L. S. T.

Ultra-violet absorption spectra of normal antitoxic and antimicrobic serums and their respective protein fractions. I. Pirosky (Folia Biol., 1931, Nos. 3—4, 9—10).—Spectrographic differences between normal and antitoxic sera are examined. Clear differences are shown in the spectrograms of euglobulins, pseudoglobulins, and albumins separated by electrodialysis. Ch. Abs. (p)

Heterophile antibodies in infectious mononucleosis. C. A. Stuart (Proc. Soc. Exp. Biol. Med., 1935, **32**, 861—863).—Emulsions of guinea-pig kidney adsorb the sheep-cell antibodies from rabbit antiguinea-pig-kidney serum, but do not adsorb them from infectious mononucleosis serum. Boiled sheep cells adsorb the antibodies from both sera. Injection of guinea-pig emulsion into rabbits produces a high lysin but a low agglutinin content; in infectious mononucleosis the two are of the same order.
R. N. C.

Effects of hyperpyrexia induced by physical means on complement-fixing antibodies. J. G. Hadjopoulos and W. Bierman (J. Lab. Clin. Med., 1934, **20**, 227—230).—Exposure of rabbits, after injection of killed bacteria, to radiothermy sufficient to raise their temp. to 41—42° caused a temporary decrease in the concn. of complement-fixing antibodies. Ch. Abs. (p).

Equivalence-point ratio of antibody to antigen in ovalbumin precipitates. S. B. Hooker and W. C. Boyd (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1104—1106).—The mean equivalence-point antibody-antigen ratio in ovalbumin–antiserum ppts. is 9.99 ± 0.13. R. N. C.

Antigens for complement fixation in amoebiasis. C. F. Craig and L. C. Scott (Proc. Soc. Exp. Biol. Med., 1935, **32**, 958—960).—EtOH extracts of the mucoid material from the intestines of dogs infected with *Endamœba histolytica* are excellent antigens for complement fixation in amoebiasis.
R. N. C.

New antigens for the Kolmer modification of the Wassermann test. J. A. Kolmer (Amer. J. Clin. Path., 1935, **5**, 55—59).—In the prep. of cholesterolised and lecithinised antigens described, the sensitiveness is increased by addition of $COMe_2$-insol. lipins. Ch. Abs. (p)

Rabies fixed virus as an antigenic agent when inactivated by the photodynamic action of methylene-blue. H. E. Shortt and A. G. Brooks (Indian J. Med. Res., 1935, **22**, 557—560).—The antigenic activity of rabies fixed serum is impaired by the photodynamic action of methylene-blue.
R. N. C.

Antigenic fixatives of tubercle bacilli. II. Purification and fractionation of lipins with hapten activity from heat-killed bacilli. M. A. Macheboeuf and A. Bonnefoi (Ann. Inst. Pasteur, 1935, **55**, 433—440; cf. A., 1934, 564, 929; this vol., 256, 407).—Heat-killed tubercle bacilli are washed with H_2O and dried and freed from extractable lipins with $COMe_2$; the residue is exhaustively extracted with hot 96% EtOH. On cooling, an inactive fraction is pptd.; the solution is then evaporated in vac., and the dried residue taken up with $CHCl_3$. A fraction containing practically the whole hapten activity is pptd. with $COMe_2$ (P 3.8, N 2.36%). Repetition of this $COMe_2$ pptn. leads to no significant change in the hapten activity or in the chemical composition; pptn. is almost quant. Fractional pptn. of the $CHCl_3$ solution with cooled MeOH yields fractions of higher hapten activity and different chemical composition (P 3.32, N 1.43% after 5 pptns.).
E. A. H. R.

Anti-gonadotropic sera. C. Bachman (Proc. Soc. Exp. Biol. Med., 1935, **32**, 851—854).—Rabbits injected with anterior pituitary-like hormone (I) from pregnancy urine yield sera that give weak complement-fixation reactions with (I) solutions and extracts of male urine *in vitro*; human serum-proteins give stronger and less const. reactions. There is no apparent connexion between these reactions and the sp. (I) inhibition by such sera that can be demonstrated biologically. R. N. C.

Placental immunity. I. Determination of dosage of placental globulin in measles prophylaxis. S. Karelitz, C. K. Greenwald, and A. J. Klein. **II. Comparison of maternal circulating blood immunity with that of placental fluid.** S. Karelitz and C. K. Greenwald (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1359—1362, 1362—1365).—I. The measles prophylactic vals. of the amounts of human blood-serum and of placental extract that contain one unit of diphtheria antitoxin (I) are equiv. Both the measles antibody and (I) are contained in the globulin extract of placenta, which is effective in measles prophylaxis.

II. The (I) titre of placental fluid is equal to that of the serum of the circulating maternal blood at the time of placental expulsion. Those of the circulating maternal blood and placental blood and tissue fluid are alike in most cases. R. N. C.

Comparative action of the bile acids on tetanus and diphtheria toxins; special properties of lithocholic acid. L. Velluz (Compt. rend., 1935, **201**, 432—434).— > 50 mg. of Na glyco- or taurocholate are required to destroy the toxicity of 1000 lethal doses of tetanus toxin (I) at 37—38° during 5 days; diphtheria toxin (II) is unchanged. Na cholate, deoxy- and litho-cholate are about 500 times as active in detoxifying (I), and are progressively more capable of destroying (II) because of the no. of OH-groups in the mols. J. L. D.

Heat-stable agglutinogens in the *Suipestifer* group. P. Levine and A. W. Frisch (Proc. Soc.

Exp. Biol. Med., 1935, **32**, 883—886).—The various strains of *Suipestifer* differ widely from one another in their ability to absorb phage and agglutinins.
R. N. C.

Stability of streptofibrinolysin. R. R. MADISON and J. K. VAN DEVENTER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1041—1043).—The fibrinolytic titre of *Streptococcus* filtrate often shows considerable increase on mixing with normal horse-serum, during neutralisation with sp. immune serum, or when stored at 4°.
R. N. C.

Antifibrinolytic titre of commercial antistreptococcal sera. J. K. VAN DEVENTER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1117—1118).—Vals. are given for 28 sera. Each species is immunised only against the homologous fibrinolysin.
R. N. C.

Complement titre of the blood in allergic conditions. E. B. TILDEN (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1135—1136).—The complement content of the blood of allergic patients is similar to the average content of general clinical cases.
R. N. C.

Mutual interaction of liquid films.—See this vol., 1317.

Concentration of heavy water within the human organism. G. ORBÁN (Orvosi Hetilap, 1935, **79**, 193—194).—No appreciable amount of D_2O was detected in H_2O from brain and liver of old men or from flesh of old oxen. The osmotic function of the kidneys probably prevents accumulation of D_2O.
CH. ABS. (*p*)

Hydrogen-ion concentration of the digestive tract of the fowl. R. L. MAYHEW (J. Amer. Vet. Med. Assoc., 1935, **39**, 148—152).—p_H vals. averaged 5·0 in the crop, increasing to neutrality in the cæcum. Acidity of the posterior portion was higher in birds 10—11 weeks old than in older ones. CH. ABS. (*p*)

Dust in the organism. II. Technique of determination of siliceous particles and particles of carbon in the lung. E. KAHANE (J. Pharm. Chim., 1935, [viii], **22**, 204—211).—The lung-tissue is digested with $H_2SO_4 + HNO_3 + HClO_4$ and the siliceous material collected. The SiO_2 content is determined by treatment with $H_2SO_4 + HF$. In the determination of free C, the tissue is digested first with HNO_3, and the remaining lipoid material treated with fuming HNO_3 until sol. in $COMe_2$.
R. S.

Chemical analyses of the flesh and viscera of slaughterhouse animals. G. BALBONI (Quad. Nutrizione, 1934, **1**, 275—283).—Tables give data for edible portion, solid residue, N, protein, fat, and ash of the ox, calf, horse, pig, and lamb. NUTR. ABS. (*m*)

Distribution of choline. J. P. FLETCHER, C. H. BEST, and O. M. SOLANDT (Biochem. J., 1935, **29**, 2278—2284).—The total choline (I) content of tissues is determined by digestion of the tissue with HCl, extraction of the (I) followed by acetylation, and assay of the acetylcholine using the isolated intestine of the rabbit. The results are correct within 10%. The total (I) contents of the various tissues of the white rat and other animals, and of many foods of both animal and vegetable origin, have been determined. Spermatic fluid contains the greatest amount ; next in order come the various parts of the central

nervous system and the liver. Fat and blood contain the least (I).
J. N. A.

Iodine contents of various endocrine organs of normal rabbits. A. OHTA (Sei-i-Kwai Med. J., 1934, **53**, No. 8, 1—8).—The I content of organs decreased in the order, thyroid, spleen, adrenal gland, thymus, testicle, liver, male blood, female blood, ovary (trace). Pituitary and pancreas contained none.
CH. ABS. (*p*)

Mineral constituents of bone. I. Methods of analysis. C. M. BURNS and N. HENDERSON (Biochem. J., 1935, **29**, 2385—2395).—Analysis of bone-phosphate by a method which involves filtering off the ppt. produced by $(NH_4)_2MoO_4$ gives low results. Extraction of the bones by alkaline glycerol by the method of Morgulis removes some phosphate, so that the remaining salt does not accurately represent the original bone. Methods are described for the analysis of bone-Ca, -P, and -carbonate with an accuracy of 1·5%, 1·5%, and 3%, respectively. Bone probably contains a phosphate which is not tertiary Ca or Mg phosphate.
W. O. K.

Calcium content of bone determined *in vivo*. A. W. ENDTZ (Maandschr. Kindergeneesk., 1934, **4**, 7).—An improvement of the method of de Does *et al.* (1933) is described. The Ca content of the radius in normal children is > that in the radius of children suffering from rickets, osteopsathyrosis, or intestinal infantilism with osteoporosis. NUTR. ABS. (*m*)

Normal distribution of calcium between the skeleton and soft tissues. O. A. BESSEY, C. G. KING, E. J. QUINN, and H. C. SHERMAN (J. Biol. Chem., 1935, **111**, 115—118).—Of the total body-Ca of rats, 99·3% is in the skeletal system. In immature growing rats, and in adult rats on a low-Ca diet, the % is less (about 99·0%).
F. A. A.

Chemistry of bone-salts. R. KLEMENT (Z. physiol. Chem., 1935, **235**, 272 ; cf. this vol., 1004).—Since the nature of the salts in bone cannot be deduced from chemical analysis alone, and since X-ray examination indicates that the Ca is present chiefly as hydroxyapatite (cf. Trömel *et al.*, A., 1932, 707), the conclusions of Marek *et al.* must be rejected.
W. McC.

Distribution of diethylbarbituric acid in brain. E. KEESER and I. KEESER (Arch. exp. Path. Pharm., 1935, **179**, 226—228).—Using better methods of extraction, the preferential absorption of barbital in the diencephalon after intravenous injection of suitably small doses into rabbits is confirmed (cf. this vol., 525).
F. O. H.

Etiology and histology of dental tartars. J. D. BERKE (Dental Cosmos, 1935, **77**, 134—139).—Deposition of Ca salts is not by crystallisation, but occurs in a matrix of fungi, bacteria, fibrin, hæmoglobin, phagocytes, and epithelial cells. CH. ABS. (*p*)

Fibre forms in animal hairs. R. O. HALL (Nature, 1935, **136**, 478).—Straightening and steaming certain animal guard hairs with supernormal curvature at the tip results in further contraction. This is opposed to Woods' views (this vol., 1266).
L. S. T.

Rhythmic changes in the fœtal liver after feeding. H. A. STUART and G. M. HIGGINS (Amer. J. Physiol., 1935, **111**, 590—595).—Liver-glycogen (I) in the rat fœtus increases to a max. 12 hr. after the feeding of the mother, and falls again to the initial level after 24 hr. Fœtal (I) is > maternal (I) in proportion to the wt. of the liver, both before and after feeding. Fœtal (I) remains fairly high when maternal (I) is lowered by fasting; it begins to rise immediately food is given to the mother. R. N. C.

Glycogen content in the central nervous system of human embryos. O. FUSEJIMA (Sei-i-Kwai Med. J., 1934, **53**, No. 9, 1—79).—Histological analysis. CH. ABS. (p)

Glycogen. II. Occurrence of glycogen in the neoplasma and allied changes in epithelial covering. S. HORIE (Sei-i-Kwai Med. J., 1934, **53**, No. 9, 243—267; cf. this vol., 237).—Histological analysis. CH. ABS. (p)

Determination of muscle-hæmoglobin. R. H. WATSON (Biochem. J., 1935, **29**, 2114—2121).—Quant. extraction is achieved by washing the minced unperfused tissue with $M/15$-PO_4''' buffer at p_H 6·5, adsorption from the extract by kieselguhr, elution with aq. NH_3, and clearing of the eluted fluid by $Al(OH)_3$. The relative concns. of hæmoglobin (I) in blood and muscle are then determined from the position of the α-band of the oxyhæmoglobin (reversion spectroscope) and the total concn. of (I) is determined spectrophotometrically. (I) in muscle extracts is also determined colorimetrically by conversion into acid hæmatin. Data, mainly from heart-muscle, are compared with those of Whipple (Amer. J. Physiol., 1926, **76**, 693). F. O. H.

Non-protein nitrogenous constituents of fish and lobster muscle. J. CAMPBELL (J. Biol. Board Canad., 1935, **1**, 179—189).—The total non-protein-N in muscle of cod, herring, haddock, and salmon is of the same order; that of skate is higher, mainly as a result of larger proportions of urea, NH_3, and volatile bases; that of lobster is still higher, due to larger mono-NH_2-acid and histidine–arginine (I) fractions. Cod muscle is rich in the lysine (II) fraction and low in (I) fraction. Herring has intermediate proportions, but (II) is approx. double (I). In lobster (II) is < in cod, but the N of (I) is extremely high. Relationships between morphology and chemical composition are examined. CH. ABS. (p)

Determination of fermentable sugar in muscle. A. STEINER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 968—971).—The muscle is fixed in N-H_2SO_4 at −4°, ground up, and extracted with the same solution. Glycogen and hexose monophosphate are removed by pptn. twice with $Fe_2(SO_4)_3$–$HgSO_4$ reagent in H_2SO_4 solution, the mixture is neutralised with $BaCO_3$ and filtered. After removal of Fe and Hg with H_2S, and of Ba and excess of H_2S, the filtrate is evaporated in vac., salts are pptd. with EtOH, and the filtrate is again evaporated in vac. The residue is dissolved in H_2O, and total sugar determined by Cu and I in one part of the solution after hydrolysis with N-H_2SO_4. In other parts glucose is determined by fermentation with Fleischmann's yeast at an alkaline p_H, and glucose and maltose together at an acid p_H. Mannose does not interfere. Tetanic stimulation of muscle causes an increase in glucose, but not in maltose. R. N. C.

Stony deposits in the gluteal muscles of a horse. A. H. KHAN (Vet. Rec., 1933, **13**, 1134—1135).—Grey deposits in an aged horse consisted mainly of Ca Al silicate. CH. ABS. (p)

Metabolism of the phospholipins. VI. Relative proportions of saturated and unsaturated fatty acids in phospholipins of different degrees of unsaturation. VII. Selection and retention of unsaturated fatty acids by phospholipins of animal tissues. R. G. SINCLAIR (J. Biol. Chem., 1935, **111**, 261—273, 275—284; cf. A., 1932, 643).—VI. By the Twitchell Pb salt–EtOH method it has been shown that the ratio of solid to liquid acids in phospholipins (I) of the liver, skeletal muscle, and kidney of the rat is const., regardless of the degree of unsaturation of the mixed acids. Differences in the degree of unsaturation of tissue-(I) fatty acids are due to differences in the relative proportions of the various unsaturated fatty acids. A micro-method which permits the determination of the relative proportions and the I vals. of solid and liquid acids in 30—40 mg. of mixed acids is described.

VII. The feeding of a fully saturated fat has no effect on the degree of unsaturation of the tissue-(I), and it does not interfere with the effect of small amounts of very unsaturated fat on the unsaturation of the (I). The high degree of unsaturation induced in tissue-(I) by daily feeding of a small amount of highly unsaturated fat is maintained during prolonged fasting. J. N. A.

Relation between the pituitary and lipin content of organs : relationship between the pituitary and adrenalin content of the adrenals. I. T. USUI (Sei-i-kwai Med. J., 1934, **53**, No. 4, 1—103; No. 5, 105—171).—Effects are recorded of injections of pituitrin (I), pituglandol (II), hypophorin, puberogen, and antuitrin (III) on the fatty acid, cholesterol, and unsaponifiable matter of organs of rats. Hypophysectomy induces changes in the lipin content of organs which can be restored, to some extent, by injection of (I), (II), or (III). The coincident change in adrenaline content of the adrenal cannot be so remedied. CH. ABS. (p)

Lipochromes of higher animals and of man. L. ZECHMEISTER and P. TUZSON (Naturwiss., 1935, **23**, 680—685).—A review.

Lipochromes of fats. L. ZECHMEISTER and P. TUZSON (Orvosi Hetilap, 1935, **79**, 115—116).—The fats of the cow and horse contain, respectively, 11 and 6 mg. per kg. of carotene (I) and fowl fat contains 5 mg. per kg. of (I)-free xanthophyll. The lipochromes of human fat are identical with those in the plants from which they originate. NUTR. ABS. (m)

Occurrence of a saturated hydrocarbon, pristane, in sardine, herring, and sperm oils. Y. TOYAMA and T. TSUCHIYA (J. Soc. Chem. Ind. Japan, 1935, **38**, 254—258B; cf. A., 1923, i, 890).—An *iso*paraffin, regarded as pristane, has been recovered in very small amount from the condensates obtained by the steam-distillation in vac. of sardine, small herring, mixed fish (sardine+herring), and sperm oils. E. L.

Gadusene, an unsaturated hydrocarbon occurring in animal and vegetable oils. Z. NAKAMIYA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1935, **28**, 16—26).—A detailed account of work already noted (this vol., 1264).

Actiniasterol. E. KLENK and W. DIEBOLD (Z. physiol. Chem., 1935, **236**, 141—144; cf. Dorée, A., 1909, i, 152).—The sea anemone, *Anemonia sulcata*, yields a sterol, *actiniasterol* (I), m.p. 145—146°, $[\alpha]_D^{20}$ —42·5° in $CHCl_3$ (*acetate*, m.p. 126·0—126·5°). (I) in AcOH with PtO_2+H_2 gives the *acetate*, m.p. about 120°, of the H_4-derivative, m.p. 139—140°.
W. McC.

Reduced-glutathione contents in an incubated egg and in the organ tissues of a chick and the effect of sodium glutamate on their glutathione contents. F. MURATA (Sei-i-Kwai Med. J., 1933, **52**, No. 10, 1—34; cf. this vol., 511, 536).—Reduced glutathione (I) is slightly higher in the yolk of the fertilised than in that of the unfertilised egg. During incubation vals. decline to zero at approx. the 15th day. In the embryo (I) increases to a max. on the 18th day. Injection of Na glutamate increases (I) in yolk and embryo. Chicks show a marked increase in (I) in the digestive tract after 1 week, and a further increase after 3 weeks, notably in lungs.
CH. ABS. (*p*)

Colouring matter of domestic cocoons. IX. Water-soluble colouring matter of yellow cocoons; colouring matter of white, green, and red cocoons. X. Fluorescent colour of cocoons in ultra-violet light and the colouring matters of cocoons. M. OKU (J. Agric. Chem. Soc. Japan, 1934, **10**, 1239—1252, 1253—1257; cf. this vol., 883).—IX. Yellow cocoons yield a glucoside, sol. in 80% EtOH, giving an amorphous brown powder and glucose on hydrolysis. The EtOH-extract of white cocoons contains H_2O-sol. pigments resembling flavonol. Green cocoons similarly yield colouring matter resembling bombycetin and bombycin. The red pigment in red cocoons is a xanthophyll. The green colour in *Rhodinia fugax* is chlorophyll.

X. Coloured cocoons give a yellow fluorescence in ultra-violet light. When the colouring matter is extracted a violet fluorescence is observed. This may be due to sericin and fibroin. The isolated pigments, lutein, violaxanthin, carotene, bombycin, bombycetin, etc., give a yellow fluorescence.   CH. ABS. (*p*)

Behaviour of aqueous solution of the domestic cocoon. XXI. Isoelectric points of sericin and fibroin. H. KANEKO and K. YAMAMOTO. **XXII. Adsorption of colouring matter by sericin.** H. KANEKO and Y. NAKAZAWA (J. Agric. Chem. Soc. Japan, 1934, **10**, 1291—1294, 1295—1297; cf. this vol., 511).—XXI. The 3 isoelectric points for each of fresh and dry cocoons and raw and boiled-off silk were determined. Boiling cocoon fibre with H_2O or alkali lowered the first (lowest) isoelectric point in proportion to the boiling-off coeff. It was also lowered by treatment with higher fatty acids or bleaching agents and under the action of air and heat, and was raised by treatment with reducing agents or by dyeing.

XXII. Adsorption of natural pigments and of dyes

by sericin-*A* was markedly superior to that by sericin-*B*.   CH. ABS. (*p*)

Putrefactive decomposition of Bengal silk cocoon. S. DUTT (J. Indian Chem. Soc., 1935, **12**, 458—462).—Complete hydrolysis by HCl of the cocoons gave various NH_2-acids, the relative amounts of which are similar to those found in the hydrolysis of Bengal silk (A., 1909, i, 750), except that this gives rise to much less serine. The products of the putrefaction of the cocoons are CO_2, NH_3, NH_2Me, NH_2Et, *p*-$OH\cdot C_6H_4\cdot[CH_2]_2\cdot NH_2$, $NH_2\cdot[CH_2]_2\cdot OH$, and fibrous matter. The formation of these amines explains why the product of putrefaction of silk acts as a pressor substance for the heart.   H. G. M.

Chemical composition of the crystalline style and of the gastric shield : occurrence of the style oxidase. C. BERKELEY (Biol. Bull., 1935, **68**, 107—114).—Acid hydrolysis of the cryst. styles of *Schizothaerus nuttalli*, *Mya arenaria*, *Ostrea gigas*, and *Saxidomus giganteus* yields protein, glucosamine, and H_2SO_4 and approx. the same amounts of glycuronic acid. These are cleavage products of mucin rather than of chondrin. The gastric shield in *S. nuttalli* is chitin. *Panope generosa*, *Pholadidea penita*, and the gastropod *Crepidula fornicata* have an oxidase system in the cryst. style (cf. A., 1933, 297, 1201).
CH. ABS. (*p*)

Coccids of Japan. VIII. Nitrogenous compounds and mineral constituents of *Iceria purchasi*, Mask. M. KONO and R. MARUYAMA (J. Agric. Chem. Soc. Japan, 1935, **11**, 21—28; cf. A., 1934, 1381).—Analytical data.   CH. ABS. (*p*)

Influence of the physical properties of milk on its rate of digestion *in vivo*. C. Y. CANNON and D. L. ESPE (Iowa Agric. Exp. Sta. Rept., 1933, 35—36; cf. this vol., 379).—Young calves excrete fat even when none is supplied in the diet. Butter-fat renders casein more easily digested by calves. High-fat milk leaves the stomach more quickly than does low-fat milk.   CH. ABS. (*p*)

Influence of the food of the cow on the nutritional value of the milk. E. SCOTT, L. A. ERF, and C. J. DELOR (Vet. Alumni Quart., 1933, **20**, 154—166).—Nutritional anæmia in rats was relieved by feeding milk from cows receiving lucerne–grain rations with $CuSO_4$, MnI_2, Fe sulphate, As, $AlCl_3$, and $ZnCl_2$, or by supplementing the diet with an EtOH extract of dried lucerne dissolved in olive oil, or by feeding halibut oil. The relationship between the food of the cow and the hæmopoietic properties of the milk is examined.   CH. ABS. (*p*)

Variations in the fat content of human milk during suckling. D. LUCIGNANI (Riv. Clin. pediat., 1934, No. 4, 412).—During suckling the fat % increased during the first 10 min. and fell slightly in the last 5, whilst the quantity of milk suckled was greatest in the first 5 min., fell in the second 5, and increased in the last 5, although not quite to the level of the first period. Thus the fat content varies inversely with the quantity.   NUTR. ABS. (*m*)

Spectrographic examination of some Indian milks. N. K. DE (Indian J. Med. Res., 1935, **22**, 499—508).—The vitamin-*A* contents of human, cow,

goat, and buffalo milk are similar, and average 71.3×10^{-6} g., corresponding with 0·15—0·2 g. of cod-liver oil, per 100 c.c. In human milk Cu and Fe are high, and Ca and P low. Cow milk contains Si, unlike the other milks, and is high in Ca and low in Fe and Cu. Fe, Cu, and Mn are low, and Ca, Mg, and Na high, in buffalo milk. Goat milk contains all the above metals in fair proportions. R. N. C.

Colorimetric micro-determination of magnesium in milk. M. SATO and K. MURATA (J. Agric. Chem. Soc. Japan, 1935, **11**, 431—434).—Milk (5 c.c.) is deproteinised, freed from Ca, treated with sol. starch, Titan-yellow, and 0·4N-NaOH, and the resulting pink colour is compared with suitable standards. F. O. H.

Properties of human seminal plasma. M. W. GOLDBLATT (J. Physiol., 1935, **84**, 208—218).—Human seminal plasma contains a powerful vaso-dilator and can stimulate plain muscle. The active depressor substance is distinct from other depressors present in tissue extracts. The oxytocic power of seminal plasma is probably due to a sp. substance. The plasma also contains a substance with acetyl-choline-like effect on the eserinised rectus abdominus of the rat. The acetylcholine equiv. of seminal plasma is $> 10^{-6}$ g. per c.c. (Cf. this vol., 1006.) R. N. C.

Inorganic constituents of the cerebrospinal fluid. VI. Sulphur. E. WATCHORN and R. A. McCANCE (Biochem. J., 1935, **29**, 2291—2296).—In non-nephritic patients serum-inorg. S is 1—4 mg. per 100 ml. Vals. up to 35 mg. were found in chronic interstitial nephritis. The inorg. S in ventricular and cerebrospinal fluids is about $\frac{1}{3}$—$\frac{1}{4}$ of the serum val. As the whole of the serum-inorg. S is ultrafilterable, these fluids are not serum ultrafiltrates. In tuber-culous meningitis the cerebrospinal-fluid-S val. ap-proaches the serum val. The inorg. S vals. of patho-logical effusions suggest that these fluids have been formed by ultrafiltration. Modifications are intro-duced into the method of Cuthbertson et al. (A., 1931, 1177) for determining inorg. S. E. A. H. R.

Ultra-violet absorption spectrum of cerebro-spinal fluid in progressive general paralysis. I. PIROSKY (Rev. especialidades, 1931, **6**, 1250—1256).—Differentiation is shown between normal fluids and those of general paralysis, the latter con-taining small quantities of protein. Variations in the shape of curves and width of absorption bands in paralysis are due to pseudoglobulin. CH. ABS. (p)

Silicotungstic acid reaction of cerebrospinal fluid. M. NAGY (Orvosi Hetilap, 1935, **79**, 126—127).—Globulin is quantitatively pptd. by 1% silico-tungstic acid solution and may thus be determined nephelometrically. CH. ABS. (p)

Alleged occurrence of acetylcholine in the saliva. O. S. GIBBS (J. Physiol., 1935, **84**, 33—40). —Intravenous injection of saliva in the cat induces a fall of blood-pressure, followed by a slight rise. Atropine does not abolish the effect in concns. sufficient to abolish that of acetylcholine (I). Injec-tion of saliva into the artery of the gland reduces the secretion evoked by added (I). There is no indication that saliva contains (I). R. N. C.

Bile acids of Argentine snakes. V. DEULOFEU (Anal. Asoc. Quím. Argentina, 1935, **23**, 22—25).—See this vol., 378.

Total and neutral chlorine contents of gastric juice. L. BERKESY (Orvosi Hetilap, 1935, **79**, 183—184).—The total Cl increased continuously to the end of secretion. No consistent relationship was apparent between total Cl' and acid concn., or between neutral Cl' and total acidity. Alkalisation of gastric juice is probably effected by the mucin produced in the stomach. CH. ABS. (p)

Influence of duodenal secretions on acid gastric contents. C. M. WILHELMJ, L. C. HENRICH, and F. C. HILL (Amer. J. Physiol., 1935, **111**, 293—304).—Gastroduodenostomy and gastrojejunostomy, but not pyloroplasty, result in the dog in increased entry of duodenal secretions into the stomach. The average composition of the duodenal secretions is normal. The efficiency of duodenal secretion in lowering the acidity in approx. 0·1N-HCl in the stomach is due rather to dilution than neutralisation, the average distribution of the reduction between the two being 75% and 25%, respectively. The presence of large amounts of duodenal secretion apparently increases HCl secretion in the stomach; the effect is evident only after the stomach has been stimulated by histamine. The Cl content of the mixed gastric secretions depends on the ratio of acid fluid and extra fluid present. R. N. C.

Methylene-blue as a stain for mucus. A. G. LOWNDES (Nature, 1935, **136**, 398).—The view that methylene-blue is one of the best stains for mucus is maintained. L. S. T.

Reflector effect on water and sodium chloride excretion. S. JANSSEN (Pflüger's Archiv, 1935, **235**, 523—533).—Depressor section, vagotomy, or femoral clamping increases excretion of H_2O and NaCl, and the concn. of NaCl in the urine. R. N. C.

Excessive water-intake and excretion of chloride by dogs. L. WOLFF (Arch. exp. Path. Pharm., 1935, **179**, 200—203).—H_2O-diuresis in dogs is accompanied by an excretion of Cl' $>$ the ingested Cl'. The source of this excess Cl' is not only the blood. F. O. H.

Determination of urinary chlorides with mer-curic nitrate. C. E. HOLDRIDGE and J. W. CAVETT (J. Lab. Clin. Med., 1934, **20**, 303).—The method previously described for plasma-Cl' (A., 1933, 1182) is adapted. Urine is diluted (1 : 20) and 5—10 c.c. are titrated as for a protein-free blood filtrate. Turbid urine is boiled with 10% aq. sulphosalicylic acid and filtered. CH. ABS. (p)

Is there a racial factor in metabolism? M. DAMODARAN and K. G. ANANTHANARAYANAN (Current Sci., 1935, **4**, 96—97).—The N distribution in the urine of vegetarian and meat-eating South Indians is compared with that of Europeans. F. N. W.

Determination of urea in urine with a photo-electric densitometer. New technique. E.

OBERMIER and R. MILTON (Diagnostica tec. lab. [Napoli], Riv. mens., 1934, 5, 741—752).—Furfuraldehyde, $SnCl_2$, and HCl give a blue colour when boiled together, but not at 0°. Addition of urea to the mixture at 0° produces the blue colour, the intensity of which $\propto$ the amount of urea added. Technique and an instrument for the application of this reaction to urine analysis are described.

CH. ABS. (p)

Effect of clamping the large arteries on the composition of the urine. H. HUNGERLAND (Pflüger's Archiv, 1935, 235, 644—654).—Clamping the femoral or saphenous artery in the dog causes a rise in total bases, HCO_3', Cl, H_2O, and the basic — acidic ion difference in the urine, whilst NH_3, PO_4, and excess acid fall. The effects are similar to those obtained by clamping the carotid, but the max. changes appear after the loosening of the ligature.

R. N. C.

Porphyrins excreted in porphyrinuria. W. HOERBURGER and H. FINK (Z. physiol. Chem., 1935, 236, 136—140; cf. this vol., 776).—By means of p_H–fluorescence curves the coproporphyrin from the urine of a patient suffering from Pb poisoning and that from the urine of a patient to whom salvarsan had been administered was identified as coproporphyrin-III. The urine of another patient contained coproporphyrin-I.

W. McC.

Calcium and phosphorus metabolism in a case of acromegaly showing marked osteoporosis. W. DE M. SCRIVER and A. H. BRYAN (J. Clin. Invest., 1935, 14, 212—219; cf. A., 1934, 680).—The osteoporosis described was probably due to insufficient intake of Ca and P associated with increased excretion. No evidence of hyperactivity of the thyroid or parathyroid was obtained.

CH. ABS. (p)

Sodium chloride and protein changes induced by adrenalectomy and glucose administration. H. SILVETTE and S. W. BRITTON (Amer. J. Physiol., 1935, 111, 305—311).—Adrenalectomy in cats is followed by progressive diminution in the concn. of Na and Cl' in blood-serum, liver, and muscle, together with a slight diminution in serum-protein. A much greater diminution of Na and Cl' in serum and tissues may be caused, without harm to the animal, by intraperitoneal injection of glucose (I). Reductions in Na and Cl' two or three times > those following adrenalectomy must occur to cause death. For <24 hr. muscular tremors and prostration follow intraperitoneal injection of large quantities of (I). This condition seems to be due to excessive salt loss and is different from the severe convulsive (hypoglycæmic) seizures of adrenal insufficiency.

NUTR. ABS. (m)

Ingestion of excess sodium chloride in allergic diseases. (A) B. PAUL and P. VÉGH. (B) L. ROSA (Orvosi Hetilap, 1934, 78, 1015—1016, 1048—1049).—(A) In allergic hepatopathy only part of the NaCl given perorally enters the blood. Most is probably retained by the liver parenchyma.

(B) Retention of NaCl by the liver is not due to parenchymal absorption, but to insufficient function of the liver.

CH. ABS. (p)

Experimental production of loss of hæmatopoietic elements of the gastric secretion and of the liver in swine with achlorhydria and anæmia. D. K. MILLER and C. P. RHOADS (J. Clin. Invest., 1935, 14, 153—172).—Achlorhydria and anæmia can be produced by feeding a modified canineblack-tongue-producing diet. Gastric secretions and liver simultaneously lose anti-pernicious anæmia activity. The condition is relieved by administration of liver extract.

CH. ABS. (p)

Spleen, hæmoglobin, and erythrocytes in nutritional anæmia of the rat. C. J. HAMRE and C. D. MILLER (Amer. J. Physiol., 1935, 111, 578—589).—The spleen is disorganised and unable to produce blood-elements in severe nutritional anæmia. It enlarges during recovery when Cu and Fe are fed in adequate quantities, and is actively erythropoietic. Cu, but not Fe, enlarges the spleen and increases erythropoiesis when fed alone as a supplement to milk. Neither metal causes complete recovery of hæmoglobin.

R. N. C.

Azotæmia in acute Bright's disease. J. B. RENNIE (Lancet, 1935, 229, 658—660).—Determinations of non-protein-N of the blood of children suffering from acute nephritis show that azotæmia occurs in most cases at the onset of the disease. No relation occurs between the level of non-protein-N and the height of blood-pressure, the amount of œdema, or the cerebral manifestations. Sufficient protein in the diet has no adverse effect on the disappearance of the azotæmia.

L. S. T.

Biochemistry of burns. I. Blood- and urine-chloride and -non-coagulable nitrogen. II. Creatinine. III. Blood-purines. IV. Oxidation–reduction activity of the blood. G. CICALA (Arch. Farm. sperim., 1935, 60, 312—324, 325—330, 331—336, 337—341).—I. Severe cutaneous burns in rabbits (resulting in death after 7—14 days) decrease blood-Cl' and increase blood-urea-N, especially after 3 days; the variations in the urinary levels are less marked.

II. Blood-creatinine increases whilst the urinary content tends to diminish.

III. Blood-uric acid increases.

IV. Reduced glutathione of the blood markedly increases.

F. O. H.

Carcinogenic action of aromatic hydrocarbons. O. SCHÜRCH and A. WINTERSTEIN (Z. physiol. Chem., 1935, 236, 79—91).—The carcinogenic action (on mice and rabbits) of highly purified 1 : 2-benzpyrene (I) has been confirmed. The H_4- and the 3'(or 2')-Me derivatives of (I) are inactive. Purest chrysene (II) is inactive but 1 : 2-benzcarbazole, often an impurity in (II), appears to possess activity.

W. McC.

Carcinogenic hydrocarbons and their relationship to the sterols. J. W. COOK (Chem. Weekblad, 1935, 32, 563—566).—A lecture.

Sterols, sex hormones, and cancer. G. BOURNE (J. Cancer Res. Comm. Sydney, 1935, 7, 34—39).—A discussion.

Presence of carotene in ovarian tumours. C. Y. CHU, P. L. LI, and C. S. YANG (Chinese Med. J., 1935, 49, 751—754).—A case of ovarian cyst was

accompanied by large quantities of carotene in the ovaries and in the blood. H. G. R.

Action of iron-vitamin-C preparations on tumours. F. ARLOING, A. MOREL, and A. JOSSERAND (Compt. rend., 1935, **201**, 456—458).—The use of intravenous injection of sol. Na derivatives of $FeCl_2$ and $FeCl_3$ with normal and oxidised ascorbic acid, respectively, in cancer therapy (rabbit, man) is described (cf. this vol., 775). F. O. H.

Glutathione and ascorbic acid in tissues of normal and tumour-bearing albino rats. G. E. WOODWARD (Biochem. J., 1935, **29**, 2405—2412).—The tissues of rats, bearing Walker no. 256 carcinoma or Philadelphia no. 1 sarcoma, had glutathione (I) and ascorbic acid (II) contents not significantly different from those of normal tissue. The (I) content of the carcinoma tissue was slightly $>$ that of the sarcoma, whilst (II) is lower in the former, although $>$ in any normal tissue except adrenal. Long-continued injections of (II), mannose, glucose, or oxidation-reduction dyes into tumour-bearing rats did not materially affect growth of the tumours or the concns. of (II) or (I) in the tumour-tissue or other tissues of the body. X-Ray treatment lowered the (I) content of the tumours provided the growth rate was also retarded. W. O. K.

Effects of oxidation-reduction potential indicator dyes on the metabolism of tumour and normal tissues. K. A. C. ELLIOTT and Z. BAKER (Biochem. J., 1935, **29**, 2396—2404).—At concns. about $10^{-3}M$, a no. of dyes, the redox potentials of which vary from that of dichlorophenol-indophenol (I) to that of methylene-blue (II), inhibit the respiration of tumour slices in the absence of glucose (III), but accelerate in its presence. Dyes with a potential more positive than that of (I) inhibit the respiration even in presence of (III), whilst cresyl-violet (IV) at the negative end of the series accelerates even in absence of (III). With brain, testis, retina, and kidney, dyes of the main group inhibit respiration even in presence of (III), whilst with liver-tissue they increase the respiration in presence or absence of (III). Thionine, prune, (II), and (IV), besides accelerating the respiration of tumour slices in (III) medium, also increase the aërobic glycolysis. At $10^{-5}M$, the dyes usually give a slight increase in the average rate of respiration in presence of, and some inhibition in absence of, (III). In $10^{-3}M$ concn. 4 : 6-dinitro-o-cresol increases the glycolysis of tumour-tissue and of brain, liver, and testis. It inhibits the respiration of liver and of tumour-tissue even in the presence of (III). It markedly inhibits respiration of tumour in the absence of (III) and of other tissues in the absence or presence of (III). In $10^{-5}M$ concn. it accelerates the respiration of tumour, brain, and liver considerably. W. O. K.

Relation between castration and blood pressure in rabbits. T. IIJIMA (Japan J. Med. Sci., IV [Proc. Japan Pharmacol. Soc.], 1933, **7**, 119).—Castration of either sex did not alter blood pressure, but increased sensitivity to adrenaline. CH. ABS. (p)

Ascorbic acid in cataract with special reference to dinitrophenol cataracts. E. M. JOSEPH-SON (Science, 1935, **82**, 222—223).—The toxic effects, especially cataracts, of dinitrophenol, and cataracts of all types have been successfully treated with vitamin-C. L. S. T.

Allergic factor in the ætiology of non-specific colitis. D. C. HARE (Lancet, 1935, **229**, 767—768).—Evidence for the view that allergic factors play a part in the ætiology of sp. colitis is discussed. L. S. T.

Heat cramps and uræmic cramps with special reference to their treatment with sodium chloride. E. H. DERRICK (Med. J. Australia, 1934, **2**, 612—616).—Cramps associated with loss of NaCl in perspiration were prevented by drinking H_2O containing 10 g. of NaCl per gallon. CH. ABS. (p)

Specific rotation of cystine excreted in cystinuria. B. H. BROWN and H. B. LEWIS (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1100—1102).—l-Cystine from cystinuric patients differs from protein l-cystine in $[\alpha]^{20}$ by approx. $1\cdot5°$. There is no evidence that the two α vals. are fundamentally different. R. N. C.

Diabetes insipidus : treatment with intermedin and pitmelanin. H. H. TURNER (Endocrinol., 1935, **19**, 275—283).—Intermedin (I) and pitmelanin contain the antidiuretic factors of the pituitary, and are free from pressor action ; they can be used to control the symptoms of diabetes insipidus. The reduction in diuresis from (I) is $<$ that from pituitrin. R. N. C.

Anti-ketogenic substance and phloridzin diabetes. P. T. BLACK (J. Physiol., 1935, **84**, 15—19).—Female rats injected daily with anterior pituitary extracts containing the ketogenic principle develop a resistance to its action in 4 months. Large doses of phloridzin given in such circumstances and while fasting produce only slight ketonuria. R. N. C.

Hypoglycæmic action of pancreatic diathermy. A. ROBECCHI (Minerva med., 1934, II, 905—909).—Changes in the glycæmic curve following diathermy are compared in normal fasting individuals, normal individuals after ingestion of 50 g. of glucose, and in diabetics after ingestion of glucose. CH. ABS. (p)

Creatinine clearance during the hyperthermia of diathermy and fevers. W. T. GRANT and G. MEDES (J. Lab. Clin. Med., 1935, **20**, 345—349).—In dogs hyperthermia caused by diathermy is accompanied by increased creatinine (I) clearance. In patients with fever caused by infection there was no general change in (I) clearance, although urea clearance varied widely. CH. ABS. (p)

Hæmorrhagic chick disease of dietary origin. H. J. ALMQUIST and E. L. R. STOKSTAD (J. Biol. Chem., 1935, **111**, 105—113; cf. this vol., 903).—Details of experiments already reported (ibid., 1148) are given. F. A. A.

Metabolic criteria of hyperparathyroidism. C. L. ROBBINS and D. M. KYDD (J. Clin. Invest., 1935, **14**, 221—227).—Parathyroid glands were normal in cases of multiple myeloma and in Paget's disease in which alleged metabolic criteria of hyperparathyroidism were exhibited. Ca excretion could not be

correlated with its concn. in the serum. Ingestion of PO_4''' diminished the calcinuria without changing the blood picture. CH. ABS. (*p*)

Trichogenic action of the thiol group in hereditary hypotrichosis of the rat. G. J. MARTIN and R. E. GARDNER (J. Biol. Chem., 1935, **111**, 193—196).—Cysteine (I) through the SH group acts as a stimulant to the hair follicle, causing a trichogenic action in hereditary hypotrichosis of the rat. (I) cannot be replaced by glutathione, and cystine causes only a temporary growth of hair. It is concluded that there is an absence in the hairless rat of an enzyme capable of breaking peptide linkings involving S-containing groups into the constituent NH_2-acids. J. N. A.

Ionic changes and urea in certain kidney and heart diseases ; the acid–base equilibrium. C. P. MAYER and I. TESSIERI (Semana med., 1935, I, 480—488). CH. ABS. (*p*)

Urea clearance test in children. W. W. PAYNE and H. SHUKRY (Arch. Dis. Childhood, 1934, **9**, 335—338).—In diseases involving the kidney, the latter loses the capacity of excreting urea earlier than the capacity to concentrate urea. CH. ABS. (*p*)

Increased blood pressure in experimental nephritis. H. SAKAMOTO (Japan J. Med. Sci., IV [Proc. Japan Pharmacol Soc.], 1933, **7**, 118).—After ingestion of K_2CrO_4, $HgCl_2$, uranyl nitrate, or cantharidin into rabbits, anuria, albuminuria, and hæmaturia developed, with an increase in blood pressure. The sensitivity of the pressure to administration of adrenaline was not increased. CH. ABS. (*p*)

Glucoproteins in hepatopathy. V. GAUDIO and E. HINRICHSEN (Minerva med., 1934, II, 909—913).—Following ingestion of glucose (I), the combined (I) in hepatic patients was < in normal subjects. The ratio of combined to free (I) was lower in hepatic cases, and did not return to the initial val. until 4 hr. after the ingestion. CH. ABS. (*p*)

Plasma-fat acids after adrenaline injection in normal subjects and in patients with liver disease : prognostic significance. C. M. JONES and J. W. FISH (J. Clin. Invest., 1935, **14**, 143—152).—Intramuscular injection of adrenaline is followed, in normal subjects, by a sharp rise in blood-fat acids within 0·5 hr. with subsequent return to normal in 2 hr. Abnormal curves are obtained in cases of liver disease. CH. ABS. (*p*)

Serum-protein precipitated by Hayem's solution, occurring in multiple myeloma. B. M. JACOBSON (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1257—1258).—An amorphous protein mass is pptd. by Hayem's solution from the blood of multiple myeloma cases in which serum-euglobulin is > pseudoglobulin. The protein is pptd. completely by all globulin precipitants except CO_2, and is almost completely confined to the euglobulin fraction, pptd. by 14% Na_2SO_4. It is not the Bence-Jones protein which is not pptd. by Hayem's solution. R. N. C.

Henry's reaction (iron flocculation). C. A. VIDELA, E. SAVINO, and L. M. DALKE (Rev. Assoc. méd. Argentina, 1934, **48**, 1385—1389).—The reaction (flocculation of Fe albuminate by serum from malarial patients) was positive in 76% of malarial cases and in 29% of non-malarial cases examined. CH. ABS. (*p*)

Flocculation and "super-flocculation" in Henry's reaction. V. CHORINE (Compt. rend. Soc. Biol., 1935, **119**, 1323—1326).—"Super-flocculation" and flocculation in presence of melanin involve the same phenomenon, *i.e.*, pptn. of the euglobulin. H. G. R.

Colloidal carbon flocculation test in spinal fluid. P. G. SCHUBE (J. Lab. Clin. Med., 1934, **20**, 314—316; cf. A., 1933, 526).—The specificity of the test for neurosyphilis is confirmed. Modifications of the method are described and the mechanism of flocculation is discussed. CH. ABS. (*p*)

Calcium contents of cerebrospinal fluid, blood-serum, and serum ultrafiltrate : its relation to clinical findings in eighty psychiatric patients. J. J. MICHAELS and O. M. SEARLE (Arch. Neurol. Psychiatry, 1935, **33**, 330—341).—The Ca content and the ratio between diffused and non-diffused Ca are normal in neuropsychiatric disorders. CH. ABS. (*p*)

Œdema, especially œdema of renal origin. E. J. KIRK (Amer. J. Clin. Path., 1935, **5**, 21—39).—A lowering of the serum-protein, notably of the albumin fraction, accompanied œdema produced in dogs by plasmopheresis. Blood-Cl' increased and Cl' in the gastric contents declined. The total and free acidity of the gastric fluid was lowered. CH. ABS.

Lipase and esterase in blood-serum. Diagnostic value in pancreatic disease. M. W. COMFORT and A. E. OSTERBERG (J. Lab. Clin. Med., 1934, **20**, 271—278).—Increased activity of serum-lipase is associated with pancreatitis. The concn. of serum-esterase is unrelated to the condition of the pancreas. CH. ABS. (*p*)

Urinary excretion of " S-substance " [soluble specific polysaccharide] in lobar pneumonia. D. S. PEPPER (Yale J. Biol. Med., 1934, **7**, 13—21).—In many cases of lobar pneumonia the " S-substance " (I) is excreted in urine within 12 hr. after the original chill. Methods of separating (I) are described. In infection types I, II, and III, the amount of (I) excreted is related to the severity of the case. With higher types (I) is usually not detectable. CH. ABS. (*p*)

Endocrine inter-relations during pregnancy. H. SELYE, J. B. COLLIP, and D. L. THOMSON (Endocrinol., 1935, **19**, 151—159).—The placenta probably secretes corpus luteum hormone, but is independent of ovarian hormones. R. N. C.

Glycosuria and lactosuria of pregnant and of lactating women. H. J. BROCK and R. S. HUBBARD (Amer. J. Digest. Dis. Nutrit., 1935, **2**, 27—33).—A method for determining ≮ 5 mg. of lactose (I) in 100 ml. of urine is described. (I) is usually absent from the urine of normal women. The urine of most pregnant women contains (I) in very varying amount, but its presence is not inevitable even in the later months of pregnancy. During lactation, especially in the puerperium, lactosuria practically always occurs. NUTR. ABS. (*m*)

Serum-colloid osmotic pressure in normal pregnancy. W. J. DIECKMANN (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1127—1129).—The calc. and determined osmotic pressures of serum at different stages of pregnancy agree, indicating that in normal pregnancy there is no change in the serum-proteins, and that the slight œdema that generally occurs is not due to low colloid osmotic pressure.   R. N. C.

Punctate basophilia in rheumatic cases after chrysotherapy. G. J. GRIFFITHS and J. RACE (Lancet, 1935, **229**, 714—715).—The effects of Au and Pb preps. on the blood picture are described.
L. S. T.

Incidence of rickets in rabbits. W. K. WILSON (Nature, 1935, **136**, 434).   L. S. T.

Egg-yolk and chicken fat as preventives of rickets and " slipped " tendons of chicks. E. W. HENDERSON and T. T. MILBY (Iowa Agric. Exp. Sta. Rept., 1933, 39—40; cf. A., 1933, 1072).—Neither cod-liver oil nor sunlight prevented " slipped tendon," which is attributed to excessive P or an associated factor. The no. of affected cases was reduced by limiting P-rich protein concentrates. Excess of fibre (ground oats) had no effect on the disorder.
CH. ABS. (p)

Influence of protein levels and calcium and phosphorus balance on rachitis of chicks. H. L. WILCKE, E. W. HENDERSON, and C. MURRAY (Iowa Agric. Exp. Sta. Rept., 1933, 42).—In chicks with " slipped " tendon the ash of bones was > normal, and blood-Ca and -inorg. P were normal. In rachitis all three vals. were low. The bone-ash of females was > that of males during the first 8 weeks. Effects of varying proportions of dietary Ca and P are recorded.   CH. ABS. (p)

Adrenaline content of the adrenal glands in scurvy and in inanition. W. DEUTSCH and W. SCHLAPP (J. Physiol., 1935, **83**, 478—482).—Adrenaline in the adrenals of guinea-pigs falls in scurvy and inanition. Ascorbic acid does not fall in the adrenals in inanition if the diet contains sufficient green food.
R. N. C.

Dietary protein in relation to sterility. I. J. CUNNINGHAM and C. S. M. HOPKIRK (New Zealand J. Sci. Tech., 1935, **17**, 420—432).—Sterility was induced in male rats by feeding high-protein diets and also by giving diets in which a large part of the protein was derived from maize or maize with gelatin. Results are discussed in relation to bull sterility on high-protein pastures, and to the significance of the essential NH_2-acids, e.g., tryptophan, arginine, and lysine, in the normal activity of the testis.
A. G. P.

Relation of blood-calcium and -phosphorus in sterility of dairy animals. C. Y. CANNON, J. A. SCHULZ, and D. L. ESPE (Iowa Agric. Exp. Sta. Rept., 1933, 35).—No relationship was apparent.
CH. ABS. (p)

Results of treatment in syphilis. M. H. O'CONNOR (Irish J. Med. Sci., 1935, **109**, 24—38).—A review of the effects of neoarsphenamine, Bi, and KI.
CH. ABS. (p)

Effect of salts on the Wassermann reaction. R. D. DE LA RIVIÈRE, N. KOSSOVITCH, and H. T.

TRY (Ann. Inst. Pasteur, 1935, **55**, 417—432).—The hæmolytic effects of Hg, As, and Bi salts on human and animal erythrocytes are described. Previous treatment of a syphilitic serum with these salts, particularly with novarsenobenzene, frequently leads to a negative Wassermann reaction.   E. A. H. R.

Low basal metabolic rates obtained by low-calorie diets in coronary artery disease. A. M. MASTER, H. L. JAFFE, and S. DACK (Proc. Soc. Exp. Biol. Med., 1935, **32**, 779—783).—The basal metabolic rate in patients with coronary artery thrombosis is lowered by an 800-cal. diet.   R. N. C.

Prognosis of coronary thrombosis based on the non-protein-nitrogen in the blood. C. LE R. STEINBERG (J. Lab. Clin. Med., 1934, **20**, 279—285).— In 20 out of 31 cases non-protein-N was $\not< 40$ mg. per 100 c.c.   CH. ABS. (p)

Lipin and hæmorrhagic changes in adrenal cortex following traumatic shock. J. K. DONAHUE and W. M. PARKINS (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1249—1253).—Traumatic shock in dogs produces a definite depletion in adreno-cortical lipins, and also hæmorrhages into the cortex, which are more severe if intraperitoneal injection of glucose precedes trauma.   R. N. C.

Physics applied to tuberculosis. P. N. CORYLLOS (J. Franklin Inst., 1935, **220**, 287—304).—An essay.   W. R. A.

Basal metabolism in pulmonary tuberculosis. Observations of about 240 cases. L. CHAROSKY (Rev. Assoc. Med. Argentina, 1934, **48**, 1256—1261).— Basal metabolism was increased in 63% of the cases, especially in active tuberculosis. In inactive cases metabolism is approx. normal.   CH. ABS. (p)

Methylene-blue in the treatment of urinary tuberculosis with presentation of a purified drug. B. E. GREENBERG, M. L. BORDNY, T. L. DAVIS, and C. ARMSTRONG (J. Urol., 1935, **33**, 168—174).—Unfavourable effects are due to impurities in methylene-blue. A method of purification is described.
CH. ABS. (p)

Blood-sugar and blood-urea in trypanosomiasis. E. R. JONES (Vet. Rec., 1933, **13**, 1062—1063).—In affected cattle and sheep only one case of hyperglycæmia and none of hypoglycæmia were observed. Blood-urea was high only in one instance, although low vals. were observed in certain cases of *T. congolese* infection.   CH. ABS. (p)

Standards for predicting basal metabolism in the immediate pre-adult years. M. E. STARK (Amer. J. Physiol., 1935, **111**, 630—640).
R. N. C.

Effects of heavy water on mammalian metabolism. H. G. BARBOUR (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1365—1369).—D_2O depresses metabolism in mice, but the depression is small if the animal is well fed and watered. A certain quantity of D_2O is contained in the insensibly-lost H_2O.
R. N. C.

Water and base balance of the body. P. H. LAVIETES, L. M. D'ESOPO, and H. E. HARRISON (J. Clin. Invest., 1935, **14**, 251—265).—The total base concn. throughout the body is approx. uniform. Na

and to an almost equal degree Cl′ are very largely confined to extracellular H_2O. Formulæ for calculating total and extracellular H_2O exchanges from alterations in body-electrolytes are given.

Ch. Abs.

Changes in distribution of body-water accompanying increase and decrease in extracellular electrolyte. D. C. Darrow and H. Yannet (J. Clin. Invest., 1935, **14**, 266—275).—Loss of extracellular electrolyte (with little change in total body-H_2O) simulated dehydration and resulted in a decrease of serum-Na and -Cl, and an increase in protein concn. and no. of red cells. An increase in electrolytes produced an increase in serum-Na and -Cl, a decline in protein concn., and an increase in the protein concn. of red cells due to loss of H_2O. Under these conditions H_2O moved from intra- to extra-cellular spaces.

Ch. Abs. (p)

Water studies in obesity. E. C. Bartels and B. Blum (J. Lab. Clin. Med., 1935, **20**, 401—409).—Disturbances in H_2O balance resulting from low-calorific diets are examined. Ch. Abs. (p)

Relation between metabolism, potential formation, and function of frog's skin. E. Huf (Pflüger's Archiv, 1935, **235**, 655—673).—A strip of frog's skin excised 4—5 min. after decapitation and suspended between identical Ringer's solutions induces a potential between the two that falls during the first 5 min., and then rises to 6 times the min. val. The increase depends on O_2 supply, and does not occur if the skin has been placed in KCN for $\frac{1}{2}$ hr. If the frog has been poisoned with $CH_2Br \cdot CO_2H$ (I) before decapitation, the potential curve is normal, or falls after a low max., or falls without rising, according to the degree of poisoning. The effects of moderate poisoning are hindered by lactate (II), but not by glucose (III). Strips of abdominal skin from the same frog, moderately poisoned by (I), suspended in Ringer's solutions containing (II) and (III), respectively, develop nearly equal potentials, but whilst that with (III) falls soon after reaching its max., that with (II) remains high for 1 hr.; replacement of (III) by (II) causes a recovery of the potential. With skin from normal frogs the potential persists in both solutions. Normal skin suspended between two identical Ringer's solutions induces a migration of Cl′ from the epithelium side to the serosa side; the effect is reduced or abolished by poisoning with KCN or (I), but in the latter case is restored by (II). In normal Ringer's solution H_2O passes from the epithelium side to the serosa; addition of KCN reverses this effect. The permeability to Cl′ in the direction serosa → epithelium of a strip of skin suspended between Ringer's solution on the serosa side and spring H_2O on the epithelium side is increased by KCN.   R. N. C.

Absorption and excretion in segments of the colon in man. F. S. Curry and J. A. Bargen (Surg. Gynecol. Obstet., 1935, **60**, 667—674).—Distal segments of the colon absorbed methylene-blue (I), atropine, sucrose (II) (which was excreted in urine), As (as neoarsphenamine), and glucose (III). These segments did not excrete (I) (when administered orally) or intravenous (II) and (III). Orally administered As (treparsol) was excreted in amounts

which, at times, were > those appearing in the urine.   Ch. Abs. (p)

Certain blood changes associated with physical exhaustion in the normal dog. F. W. Schlutz, A. B. Hastings, and M. Morse (Amer. J. Physiol., 1935, **111**, 622—629).—Exhaustive exercise produces a rise in lactate (I) and a fall of $HCO_3′$ of blood in the first 15 min., both tending to return to the initial vals. afterwards; at exhaustion the fall in $HCO_3′$ is often > the rise in (I). The p_H at exhaustion usually falls below the previous exercise level. Serum-sugar (II) remains normal or rises in the first 15 min.; it then tends to fall. A relation appears between (II) and serum-(I) in dogs exercised by swimming at 38°, suggesting that at exhaustion (I) is dependent on (II).

R. N. C.

Effect of a diet of pure glucose on the fluid balance of the body. F. B. Byron (Clin. Sci., 1934, **1**, 245—250).—An exclusive glucose–H_2O diet produced immediate loss in body-wt. and parallel losses of Na and K.   Ch. Abs. (p)

Rôle of liver in growth, reproduction, and lactation. H. G. Smith and W. H. Seegers (Proc. Iowa Acad. Sci., 1933, **40**, 109—110).—EtOH-extracted beef liver as sole source of protein in an otherwise complete ration was inadequate for the growth of rats. Addition of raw liver or substitution of dried whole liver for the extracted material improved growth. A H_2O- and Et_2O-insol. fraction of liver gives conclusive results.   Ch. Abs. (p)

Effect of feeding desiccated thymus on growth. E. M. MacKay and R. H. Barnes (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1309—1312).—Rate of growth of the albino rat is slightly impaired by desiccated ox liver or kidney in the diet, and to a greater extent by ox thymus. The effects of these tissues ∝ their purine-N contents, and are probably due to the nuclear material they contain.   R. N. C.

Influence of chicken-liver feeding on depancreatised dogs. F. S. Cuthbert and A. C. Ivy (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1209—1210).—Chicken-liver fed to a totally depancreatised dog controlled with insulin causes increase of body-wt. and of glucose (I) excretion in the urine, but the increase is > the calc. (I) equiv. of the liver. Substitution of (I) for liver results in excretion of only 1/3 of the (I) given. The liver has no insulin-sparing action.   R. N. C.

Influence of diet on the sugar-tolerance of healthy men and its reference to certain extrinsic factors. H. P. Himsworth (Clin. Sci., 1934, **1**, 251—264).—Decreased tolerance to glucose and impaired sensitivity to insulin due to a high-fat diet and reverse effects due to a high-carbohydrate diet are not associated with changes in blood-p_H. Occurrence of ketosis in normal men or the addition of raw liver or lecithin to a high-fat diet had no effect on insulin-tolerance (see also A., 1934, 1143).

Ch. Abs. (p)

Effect of heat and alcohol extraction on the nutritive value of casein. H. W. Schultz, W. H. Seegers, and H. A. Mattill (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1026—1029).—Extraction of casein

for 4 days with boiling 95% EtOH reduces considerably its val. in supporting lactation in the rat, but the difference is only slightly accentuated in the second generation. The nutritive val. is also reduced by heating, prolonged heating at 120° being more effective than short heating at 150°. EtOH extract of wheatgerm increases the nutritive val. of the extracted casein that has been heated to 120°, but not when it has been heated to 150°. Et$_2$O extracts of wheatgerm are ineffective. R. N. C.

Biological value of mixed cereal proteins. W. H. ADOLPH and F. W. CHENG (Chinese J. Physiol., 1935, 9, 245—252).—The biological val. of the protein of mixed cereal flour has been determined by measuring the N balance and growth rate of rats. Mixtures show biological vals. > that of any of the single cereals (maize + millet + soya-bean > maize + kaoliang + soya-bean > wheat + cowpea > maize + soya-bean > soya-bean, millet > cowpea > kaoliang). E. P.

Availability of indole derivatives for supplementing diets deficient in tryptophan. L. C. BAUGUESS and C. P. BERG (Proc. Iowa Acad. Sci., 1933, 40, 110—111).—Neither α-oximino-β-3-indolylpropionic nor β-3-indolylacrylic acid could replace tryptophan for growth purposes (cf. A., 1934, 554, 1252). CH. ABS. (p)

Absorption of carbon particles from gastrointestinal tract. F. S. CUTHBERT and A. C. IVY (Proc. Soc. Exp. Biol. Med., 1935, 32, 1272—1273).—C particles fed to dogs are absorbed from the gastrointestinal tract and deposited in the mesenteric lymph glands, and, after prolonged feeding, in the spleen and Kupffer cells of the liver. R. N. C.

Temperature coefficients and viscosity. J. H. BODINE and V. THOMPSON (J. Cell. Comp. Physiol., 1935, 6, 255—261).—The temp. coeff. val. of O$_2$ consumption of the normal *Melanoplus differentialis* embryo increases with age. It is not changed by partial or complete dehydration with hypertonic solutions, and not necessarily altered by changes of η. R. N. C.

Influence of electrolytes on respiration in nerve. T. H. CHANG, M. SHAFFER, and R. W. GERARD (Amer. J. Physiol., 1935, 111, 681—696).—The action of ions on nerve respiration is related to their effect on the colloidal structure of nerve. Na˙ maintains the normal O$_2$ consumption, which is decreased 10—40% in its absence. K˙, Rb˙, and Cs˙ depress respiration when in excess, but the absence of K˙ has no effect. Small changes in Ca˙˙ affect irritability and respiration, which inversely ∝ [Ca˙˙]. Mg˙˙, but not Ba˙˙, can replace Ca˙˙ in nerve; neither can in grey matter. The decalcifying Na salts increase nerve respiration, the increase being approx. ∝ decalcifying power. Al˙˙˙ depresses respiration and coagulates the colloids. Univalent anions show little or no influence. Isotonic sugar solution depresses respiration to 50%, the effect being decreased or abolished by NaCl and increased by KCl or CaCl$_2$. Ca˙˙ is not antagonised by Na˙ or K˙, but cations antagonise anions. Results support the view that the structural nerve-colloids are negatively charged. R. N. C.

Influence of blood-constituents on oxygen consumption in nerve. M. SHAFFER, T. H. CHANG, and R. W. GERARD (Amer. J. Physiol., 1935, 111, 697—710).—O$_2$ consumption of dog nerve in serum is > in Ringer's solution. The behaviour of other tissues is similar, but quantitatively sp. The increase in the case of nerve is related to the serum-proteins. Respiration in Ringer's solution is increased by glycine, decreased by lecithin and acetylcholine, and unaffected by urea, creatine, lactic acid, or glucose. The rôle of the proteins is probably physical and concerned with osmotic effects. R. N. C.

Some metabolic effects of clamping visceral arteries, splanchnic vaso-constriction, and adrenal and hepatic stimulation, with special reference to the calorigenic action of adrenaline and sympathin. F. R. GRIFFITH, jun., and F. E. EMERY (Amer. J. Physiol., 1935, 111, 369—381).—Blood-lactic acid in cats is increased by clamping the visceral arteries, stimulation of the splanchnic after adrenalectomy and hepatic nerve section, splanchnic-adrenal stimulation after hepatic nerve section, and stimulation of the nerves to the liver. O$_2$ consumption is decreased by the two former operations and increased by the two latter, these increases being ascribed to adrenaline or sympathin, which is produced in amounts sufficient to overcome the metabolic-depressive effect of vaso-constriction. R. N. C.

Influence of optically-active amino-acids on tissue metabolism. B. KISCH (Biochem. Z., 1935, 280, 41—54).—The influence of various *dl*-, *d*-, and *l*-NH$_2$-acids on the respiration and oxidative NH$_3$ formation by kidney slices is investigated. Using the *d*-series of NH$_2$-acids, the increase of respiration was for rat-kidney cortex with alanine, *iso*leucine, and leucine 108, 34, and 24%, respectively, for sheep-kidney 94, 39, and 24%, and for pig-kidney 51, 199, and 94%. The *d*-series of acids always have a greater effect on respiration than the corresponding members of the *l*-series (except with *iso*leucine with rat and guinea-pig tissue) and always have considerably greater deaminating power. The Henle loop tissue, however, shows no considerable deaminising power. The kidney cortex tissue (ox and sheep) behaves in the same way as does the corresponding tissue of adult animals. P. W. C.

Respiration values of fresh mammalian tissue. B. KISCH (Biochem. Z., 1935, 280, 55—57).—Tables summarise the respiration vals. of a no. of tissues of various animals both fresh and after keeping on ice for several hr. The vals. show individual variations with the same kind of animal and considerable variations with different types of animal. The vals. are greatest with all animals for kidney cortex and decrease with kidney medullary tissue, liver, heart, and diaphragm. After keeping for 3 hr. on ice the respiration of kidney cortex and medullary tissue increases or remains unchanged, but of liver, heart, and diaphragm decreases. P. W. C.

Resting respiration of mammalian tissue in hydrogen cyanide. I. TORRES (Biochem. Z., 1935, 280, 114—117).—The respiration of rat liver, kidney, spleen, and brain in serum is inhibited by >90% by

5×10^{-3} HCN, of diaphragm muscle only by 60%, of liver, kidney, and spleen is increased by methylene-blue by 2—4 times, and is not related to the flavin content. P. W. C.

Significance of fumaric acid in respiration of animal tissues. I. Introduction, summary, and methods. A. SZENT-GYÖRGYI. **II. Influence of C_4 acids on tissue-respiration.** I. BANGA. **III. Oxidation and reduction of C_4 dicarboxylic acids.** K. LAKI. **IV. Micro-determination of fumaric acid and its application.** F. B. STRAUB. **V. Micro-determination of succinic acid and its application.** B. GÖZSY. **VI. Fumaric and malonic acids.** E. ANNAU. **VII. Experiments *in vivo*.** S. HUSZÁK (Z. physiol. Chem., 1935, **236**, 1—20, 20—31, 31—42, 42—53, 54—58, 58—66, 66—68).—I. The respiration of pigeon's breast-muscle in PO_4''' buffer at p_H 7 (Thunberg–Barcroft technique) in presence of codehydrogenase (A., 1933, 748) indicates a marked dehydrogenase system for succinic (I), lactic, glycerophosphoric, glutamic, and citric acids, glyceraldehydephosphoric ester, and hexose mono- and di-phosphate. (I) dehydrogen-ase (A., 1934, 807) is differentiated by its reaction const., independence of codehydrogenase, ability to utilise O_2 as H acceptor, etc. Experimental data (see below) indicate that a fumarate (II)–oxal-acetate (III) reaction [due to (II) dehydrogenase and codehydrogenase], together with an intermediate product (functioning as H acceptor) derived from the respiratory enzyme–cytochrome complex, forms the basis of the respiratory system. Conversion of (III) into (I) and then into (II) by (I) dehydrogenase also occurs.

II. The rapid decrease in O_2 uptake by normal muscle preps. is due to outward diffusion of (II) and is compensated by addition of (II). This effect is sp. for C_4 dicarboxylic acids. Thus (III), hydroxy-fumarate and -maleate are active, whilst lower mono-or di-carboxylic acids are inactive or inhibitory. (III) rapidly disappears from incubated aërobic or anaërobic muscle excepting when H donator is removed by washing. As_2O_3-treated muscle readily converts (II) into (III), the reduction of which, however, is markedly inhibited. Aq. extracts of muscle with CO_2 yield a prep. of highly active de-hydrogenase of (II), lactate, and citrate, free from donator. The wash-liquor contains a substance [heat-labile and pptd. by half-saturation with $(NH_4)_2SO_4$ or by $COMe_2$] which allows (II)-dehydrogen-ase to use O as acceptor and is possibly a cyto-chrome–protein complex; this factor is essential to the respiratory system.

III. (I) shows marked H donation to dyes or O only at concns. $> 10^{-4}M$; H acceptation by (II) follows a parallel course. *l*-Malic acid inhibits (I) dehydrogenase; maleic acid has little action. *l*-Malic acid resembles (II) as H acceptor when activated by washed muscle. Reduction–oxidation potentials of the system maleate–(I), the dependence of (II) dehydrogenase activity on concn. of (II), and the behaviour of allied acids in presence of muscle were investigated.

IV. (II) is extracted from muscle totally by EtOH

and to the extent of 25—40% by 5% $CCl_3 \cdot CO_2H$. Extraction of these fluids by Et_2O and removal of Et_2O gives a residue which is titrated by $0 \cdot 01N$-$KMnO_4$. A correction is necessary for oxidisable substances in Et_2O, and approx. the same amount of (II) must be determined on account of continuous oxidation. Pigeon's breast-muscle contains $0 \cdot 008$—$0 \cdot 009$% of "(II)." Application of this method to the influence of malonate and (III) on (II)-dehydrogen-ase is described.

V. Tissue-suspension is treated with 20% $CCl_3 \cdot CO_2H$, filtered, and the filtrate treated with $0 \cdot 5M$-$KMnO_4$ at the b.p. just to complete oxidation. The residue after removal of Et_2O from an Et_2O extract is added to suspensions of washed muscle (the small O_2 uptake of which is determined in con-trol experiments) with and without addition of malonate [which inhibits oxidation of (I) (A., 1926, 434)]. The difference in O_2 uptake is due to (I). Standardisation with known amounts of (I) is neces-sary owing to loss on deproteinisation, incomplete inhibition by malonate, etc. Application of the method indicates aërobic (but not anaërobic) (I) formation from (II) in presence of malonate.

VI. The O_2 uptake of liver and kidney in PO_4''' buffer or Ringer's solution is decreased by malonate and increased by (II); the effects with pulped tissue are $>$ those with sections. (III) can be detected following aërobic incubation in Ringer's solution, but not in PO_4''' buffer. Formation of ketones by liver-tissue alone or in presence of $AcCO_2H$ (cf. A., 1934, 802) is suppressed by (II) and enhanced by malonate; with added butyric or β-hydroxy-butyric acid (II) inhibits, but malonate is without effect.

VII. Intravenous administration of malonate to rabbits (0·5 g. per kg.) produces a marked $COMe_2$ reaction in the urine, max. after 30—60 min.; with (II), (III) but not $COMe_2$ is formed. $COMe_2$ form-ation follows administration of β-hydroxybutyric acid and is markedly diminished by simultaneous injection of (II). Similarly formation of $AcCO_2H$ from injected (III) (0·2 g. per kg.) is enhanced by subcutaneous injection of As_2O_3 (3 mg. per kg.) which retards reduction of (III). Formation of (III) from (II) is also demonstrable in As_2O_3-treated rabbits. The relative non-toxicity of malonate is related to its *in-vitro* behaviour in PO_4''' and Ringer's solution. F. O. H.

Biological value of the proteins of white, wheat, and rye breads. R. B. FRENCH and H. A. MATTILL (Cereal Chem., 1935, **12**, 365—371).—The biological vals. for maintenance are given for the proteins of white, whole-wheat (50 : 50), and rye (25 : 75) breads. Young rats did not utilise rye bread as well as the protein of milk-supplemented white or whole-wheat bread, nor could they utilise any of the bread-proteins for their maintenance needs as well as could mature rats. The biological vals. of all the breads were of the same order when determined on mature rats or on man. Bread-proteins may be classed with meat-proteins, and are inferior only to proteins of the highest biological val., *e.g.*, those of milk. E. A. F.

Protein-synthesising function of the liver. A. MILELLA (Policlin., 1935, **42**, 220—238).—In curarised dogs with artificial respiration, samples of blood were taken from the hepatic veins before and at short intervals after injecting into the portal vein 200 ml. of a 10% solution of the NH_2-acids of meat, prepared by enzymic digestion of skeletal muscle. 5 min. after injection the albumin (I) content of the blood of the hepatic vein rose and remained above the original val. for 20—30 min. Globulin (II) of the serum fell and remained below the original level, but the ratio (I) : (II) after injection was always much > before. In dogs previously poisoned with P, (I) and the (I) : (II) ratio fell and in normal dogs injected with 200 ml. of N-NaCl (I) fell slightly and (II) was unchanged. Results similar to the above were obtained when 200 ml. of 10% NH_2-acid solution from meat were placed in the stomach, but the increase in (I) in the hepatic vein appeared later. These results suggest that the liver can synthesise protein from NH_2-acids. NUTR. ABS. (*m*)

Nitrogen metabolism of certain invertebrates. R. TRUSZKOWSKI and S. CHAJKINÓWNA (Biochem. J., 1935, **29**, 2361—2365).—Aq. extracts of some invertebrates were tested for urease, uricase (I), xanthine oxidase, and uric acid (II), and it is deduced that uricotelic N metabolism is probable in the black-beetle, cockroach, May-beetle, and Roman snail. In the colorimetric determination of (II) blank determinations are made on portions of the solution to be examined after incubation with (I). H. D.

Proteins and carbohydrates : their gastric digestion. M. E. REHFUSS (J. Amer. Med. Assoc., 1934, **103**, 1600—1605).—Even in diseased individuals there is no incompatibility between protein and carbohydrate digestion. CH. ABS. (*p*)

Oxidation of *l*- and *dl*-tyrosine by the livers and kidneys of various animals. F. BERNHEIM (J. Biol. Chem., 1935, **111**, 217—224).—Broken cell suspensions of the kidney and liver of the rat, cat, and dog, together with the purified enzyme of the kidney, were used. Kidney suspension and purified kidney-enzyme oxidise *d*- (I) but not *l*-tyrosine (II), and up to 4 O can be taken up for each mol. of (I) oxidised by the suspension. With the purified enzyme only 1 or 2 O are taken up, depending on the degree of purification. Deamination occurs with the suspension when 1 O is taken up, and this is not affected by $0.005M$-KCN, but the further oxidation is inhibited. Liver suspensions oxidise (I) and (II), in each case 4 O being taken up. $0.005M$-KCN completely stops the oxidation of (II), whilst that of (I) is unaffected. (I) is and (II) is not deaminated by liver suspension. Neither (I) nor (II) will reduce methylene-blue in presence of liver. J. N. A.

Uric acid synthesis in pigeons. I, II. R. B. FISHER (Biochem. J., 1935, **29**, 2192—2197, 2198—2207).—I. The source of C for uric acid (I) synthesis in pigeons is investigated. There is a correlation between the quantity of the food ingested at a given time and the (I) excreted 24 hr. later. The (I) excreted $\propto$ ingested N.

II. 100 mg. of *l*-lactate (II) administered to pigeons on a normal diet increases the excretion of (I), whilst *d*-lactate does not. A statistical study of the results indicates that the effect of (II) is due to participation in the synthesis of (I). H. D.

Nutritive value of canavanine. M. OGAWA (J. Agric. Chem. Soc. Japan, 1935, **11**, 558—563).—The average daily requirement of the $(NH_2)_2$-acid, canavanine, for normal growth of young animals is 0·05—0·1 g. per kg. body-wt. P. G. M.

Influence of glycine on excretion of creatine and creatinine. M. ADAMS, M. H. POWER, and W. M. BOOTHBY (Amer. J. Physiol., 1935, **111**, 596—610).—Glycine (I) causes an increase in excretion of creatine (II) in the urine by man, but creatinine excretion is generally unaffected. The increase usually occurs within the first week, and generally establishes itself in a few days, but in some cases the increase is gradual. (II) tolerance is reduced by (I). Glutamic acid does not affect (II) excretion. R. N. C.

Utilisation of amides in nitrogen metabolism. M. MEZINCESCO (Ann. Physiol. Physico-Chim. biol., 1934, **10**, 1041).—Addition of asparagine, NH_2Ac, or succinamide to a carbohydrate diet on which min. endogenous N excretion has been established reduces N loss by about 30%. Creatinine and S excretions are not affected. There is no increased production of creatine. NUTR. ABS. (*m*)

Liberation of ammonia by the brain after natural stimulation. J. KAHN and L. CHEKOUN (Compt. rend., 1935, **201**, 505).—The brain, removed from the fish, *Carassius*, kept in H_2O of low O_2 content and therefore respiring abnormally quickly, liberates NH_3 more rapidly than a brain similarly removed from the fish kept in well-aërated H_2O. At 15—16°, increase of the respiratory movements from 30 to 75 per min. was associated with an increase of NH_3 production of 43%. Lowering the temp. 10° (without defective aëration) reduces the rate of breathing and also the NH_3 production by about 50%. W. O. K.

Precursors of coprosterol and the bile acids in the animal organism. O. ROSENHEIM and T. A. WEBSTER (Nature, 1935, **136**, 474).—Addition of cholestenone (I) to diets poor in cholesterol (II) gives rise to a large increase in the excretion of fæcal coprosterol (III) by animals. (I), arising presumably from cholestene-3 : 4-diol, and coprostanone, and not (II) itself, are regarded as the immediate precursors of (III), which is formed from them by bacterial reduction in the intestine. The possible rôle of (I) in the conversion of (II) into bile acids and certain sexual hormones is discussed. L. S. T.

Deuterium as an indicator in the study of intermediary metabolism. I. R. SCHOENHEIMER and D. RITTENBERG. **II. Methods.** D. RITTENBERG and R. SCHOENHEIMER. **III. Rôle of the fat tissues.** R. SCHOENHEIMER and D. RITTENBERG. **IV. Mechanism of coprosterol formation.** R. SCHOENHEIMER, D. RITTENBERG, and M. GRAFF (J. Biol. Chem., 1935, **111**, 163—168, 169—174, 175—181, 183—192).—I. The uses and limitations of D as an indicator are discussed. *Tetra-*

deuterostearic acid (" 6 : 7 : 9 : 10 "), m.p. 69°, prepared by catalytic reduction of linoleic acid with D_2, has m.p. 69°, not depressed by stearic acid.

II. The prep. of D_2 by electrolysis of dil. D_2SO_4 in D_2O is described. In determining D in org. compounds the water formed by combustion is frozen out by solid CO_2.

III. A D-containing fat was prepared by partial catalytic reduction of linseed oil by D_2, and fed to groups of mice as 1%, 4%, and 20% of their diet. The results of *post-mortem* analyses indicate that most of the fat is deposited in the fat tissues before utilisation.

IV. 4 : 5-*Dideuterocoprostanone* (I), prepared by addition of D_2 to cholestenone (II) (Pd catalyst), has $[\alpha]_D^{25} + 36.9°$, m.p. 62°, not depressed by coprostanone (III). One D is replaced by H by boiling with KOH in EtOH. (II), fed to a dog on a dog-biscuit diet, is converted into cholesterol; on a meat diet, it is converted into coprosterol (IV). (III) [using (I) as indicator] is converted into (IV) by dog or man.   F. A. A.

Metabolism of isolated fat-tissue. II. Dependence on body-weight, growth, and nature of food. H. RUSKA and A. QUAST (Arch. exp. Path. Pharm., 1935, **179**, 217—225; cf. this vol., 114).— Marked variations in the respiration of fat-tissue (rat) are related to the presence of brown fat-tissue, which has an O_2 uptake and anaërobic glycolysis > and R.Q. < those of white. The vals. for fat-tissue are more dependent on body-wt. and growth than are those of other tissues. The ratio glycolytic activity/ respiration is > that of liver or kidney, but < that of retina, brain cortex, or tumour. The possibility of fat-synthesis by fat-tissue *in vitro* is discussed.   F. O. H.

Effect of fat on gastric motility. B. A. Mc-SWINEY and W. R. SPURRELL (J. Physiol., 1935, **84**, 41—49).—The degree of gastric delay produced by fats ∝ their concn. in the diet. The action of the fat occurs directly in the stomach; the effect in the duodenum is governed by intragastric conditions.   R. N. C.

Fat metabolism. I. Oxidation of butyric, crotonic, and β-hydroxybutyric acids in presence of guinea-pig liver slices. II. Oxidation of normal saturated fatty acids in the presence of liver slices. III. Formation and breakdown of acetoacetic acid in animal tissues. M. JOWETT and J. H. QUASTEL (Biochem. J., 1935, **29**, 2143—2158, 2159—2180, 2181—2191).—I. Liver slices are incubated with β-hydroxybutyric (I), crotonic (II), and butyric (III) acids in glycerophosphate buffer and the rate of formation (Q_{Ac}) of $CH_2Ac \cdot CO_2H$ (IV) is determined by measuring the CO_2 produced on breakdown with NH_2Ph,HCl as catalyst. In all cases Q_{Ac} increases with the substrate concn.; with (II) a max. occurs. With (II) and (III) optimum concns. of K· and Ca·· are shown to exist. The optimum p_H for (I) and (III) is 7·4 and for (II) 7·7. The mean Q_{Ac} are in the order (III)>(II)>(I). The Q_{Ac} of (III) may be raised by addition of (I), whilst addition of (II) lowers it. Inhibition of the Q_{Ac} by a no. of unsaturated compounds is shown; that produced by propion-

ate and cinnamate, which inhibit with (II) and (III) but not with (I), shows that (II) and (III) are not intermediates in the oxidation of (I) to (IV). Of the possible modes of formation of (IV) from (II) and (III), that involving the adsorption of (II) and (III) on the same enzyme is favoured.

II. The production of (IV) by liver slices on treatment with straight-chain fatty acids of 2—10 C is investigated. With even nos. of C the order of Q_{Ac} is 4, 6, 8>10>2; acids containing 5, 7, and 9 C produce small but significant quantities, whilst $EtCO_2H$ produces none. Since the production of (IV) from (III) is <, and its inhibition by NaOBz is >, those of the higher homologues, the β-oxidation theory of the metabolism of fatty acids is discarded and a mechanism based on the oxidation of alternate C atoms is put forward.

III. In the absence of added fatty acids, rat kidney, brain, and spleen do not produce (IV); rat testes give a little. In the presence of added fatty acid all these tissues produce some. With (I) and guinea-pig kidney Q_{Ac} is greatest in the absence of K· and Ca··. The anaërobic destruction of (IV) by kidney is 30— 40% of its aërobic rate; the rate is decreased by removal of K· and Ca··. Malonate increases Q_{Ac} with rat and guinea-pig livers in the absence of added substrate; with the former liver respiration is decreased and with the latter increased. Atoxyl (V) and quinine inhibit spontaneous formation of (IV) by liver, the action of (V) occurring at concns. which inhibit liver-esterase activity.   H. D.

Biology of carbohydrate metabolism. R. P. VAN CALCAR (Chem. Weekblad, 1935, **32**, 530—537).— A review comparing and contrasting the degradation of glycogen in muscle and the fermentation of glucose by zymase.   S. C.

Rôle of the nervous system in the regulation of the glycogen metabolism of skeletal muscle. H. M. HINES and G. C. KNOWLTON (Amer. J. Physiol., 1935, **111**, 243—249).—The glycogen (I) content of the denervated gastrocnemius muscle of the rat remains normal for 48 hr. after section of the sciatic nerve, and falls considerably on the 3rd day. Administration of glucose (II) produces normal (I) storage in the denervated tissue 24 hr. after nerve section, but not after > 24 hr. Depletion of tissue-(I) by adrenaline (III) or insulin (IV), followed by (II) administration, produces (I) storage up to the level before depletion. (III) and (IV) produce approx. equal decreases in (I) of denervated and control muscle; thyroxine decreases (I) in denervated muscle in doses < those required for normal muscles. Fasting reduces (I) in denervated muscle. The period elapsing before (I) falls in denervated muscle corresponds with the time of loss of viability before atrophy begins; the persistence of the normal (I) content for 24 hr. after section does not suggest that reflexes are involved in (I) metabolism.   R. N. C.

Availability of bread carbohydrates. E. P. LAUG, L. A. GARAVELLI, and T. P. NASH, jun. (Cereal Chem., 1935, **12**, 356—364).—Assays with phloridzin-ised dogs and on reducing substances excreted in the urine of normal dogs after bread feeding showed that practically the whole of the non-cellulose carbo-

hydrates of white, whole-wheat, and rye breads are available for nutrition. Whole-wheat bread carbohydrates appear to be absorbed more rapidly than those of white or rye bread, whilst rye-bread carbohydrates appear to be less completely assimilated than those of whole wheat or white bread. Dogs could apparently be maintained indefinitely in a good nutritional state on an exclusively bread diet.

E. A. F.

Sugar utilisation in eviscerated rabbits. D. R. DRURY (Amer. J. Physiol., 1935, **111**, 289—292).— The rate of utilisation of glucose (I) by eviscerated rabbits varies between 45 and 236 mg. per kg. per hr. Pre-operative fasting decreases the need of (I).

R. N. C.

Utilisation of galactose following complete removal of the liver. J. L. BOLLMAN, F. C. MANN, and M. H. POWER (Amer. J. Physiol., 1935, **111**, 483—491).—Galactose (I) injected intravenously in normal dogs is removed from the blood in 2 hr.; 10—30% is excreted in the urine. In hepatectomised animals 50—60% is excreted in the urine. Nephrectomy delays the clearance from the blood; the delay is greater if hepatectomy is also performed. Hepatectomy decreases, but does not abolish, (I) utilisation; the utilised (I) is not converted into glucose, since the hypoglycæmia of hepatectomised animals is unaffected. Partial (50—70%) hepatectomy does not alter (I) excretion in the urine. (I) excretion is increased by acute degenerative lesions of the liver ∝ the histological changes produced. R. N. C.

Metabolic fate of galactose in adult dogs and rabbits. J. H. ROE and G. R. COWGILL (Amer. J. Physiol., 1935, **111**, 530—538).—Galactose (I) administered intraperitoneally to rabbits is transformed into glucose (II) if the animals have not fasted. In the adult dog, blood-(I) following injections shows no difference in concn. between the afferent and efferent blood of the leg muscles and brain. The portal and hepatic blood show significant falls of (I) and corresponding rises of (II) during the passage through the liver. R. N. C.

Determination of benzoic acid in biological material. Enzymic transformation of the acid in horse-kidney. H. WAELSCH and G. KLEPETAR [with A. BUSZTIN] (Z. physiol. Chem., 1935, **236**, 92—102).—The acid (liberated by hydrolysis if necessary) is determined by a modification of the method of Grossfeld (A., 1916, ii, 158). In kidney pulp and in glycerol extracts of horse kidney, BzOH undergoes enzymic alteration, being probably converted into OH-derivatives. W. McC.

Rôle of the lungs in the removal of lactic acid in physical work. D. ALPERN, E. SIMONSON, G. SIRKINA, and L. TUTKIEWITSCH (Pflüger's Archiv, 1935, **235**, 554—561).—Lactic acid (I) in the arterial blood of the dog after physical work is < in the right heart, whilst glucose (II) is higher, the rise in (II) being > the fall in (I). The removal of (I) in the lungs is probably not a resynthesis of (II), but rather an oxidative process, which accounts for 10—20% of the total O_2 consumption. R. N. C.

Can ethyl alcohol serve as oxidation material in muscular activity? G. TROSCHKE (Pflüger's Archiv, 1935, **235**, 785—788).—Ingestion of EtOH and sugar followed by muscular work results in bloodsugar and EtOH attaining their max. at the same time. EtOH indirectly accelerates sugar supply to the muscles by replacing it in the metabolism of nonmuscular organs. R. N. C.

Alcohol injected intravenously: effect of habituation on rate of metabolism. H. W. NEWMAN and W. C. CUTTING (J. Pharm. Exp. Ther., 1935, **54**, 82—89).—A possible acquired tolerance to EtOH is investigated. A daily intake of 5—7 c.c. of EtOH per kg. body-wt. for 3 months causes no increased rate of EtOH metabolism in the dog. H. D.

Etiology of so-called alveolar pyorrhœa. I. Influence of diet on mineral metabolism. L. I. KAUSHANSKY (Dental Cosmos, 1935, **77**, 69—74).— Base-forming rations ("soda") and acid-forming rations (NH_4Cl) produced changes in the K, Na, Ca, and Mg contents of dogs' blood and in the dental enamel and dentine. The decline in blood-Ca was more marked on the base-forming ration. The K : Ca ratio and the Loeb ionic coeff. of the blood were changed by both rations. CH. ABS. (p)

Calcium–potassium law of Ehlenberg. I. Y. ISHIZUKA (J. Agric. Chem. Soc. Japan, 1935, **11**, 574—588).—Absorption of K is retarded with increasing concn. of Ca, growth being correspondingly decreased. P. G. M.

Calcium in nutrition in China. W. M. ADOLPH (Nutrition Notes [China], 1934, No. 2, 8 pp.).—A review. CH. ABS. (p)

Effects on calcium and phosphorus metabolism in dairy cows of feeding low-calcium rations for long periods. E. B. MEIGS, W. A. TURNER, E. A. KANE, and L. A. SHINN (J. Agric. Res., 1935, **51**, 1—26).—In normal cattle the % of Ca and P and the Ca : P ratio of the whole body and of the bone are substantially const. Differences effected by use of low-Ca rations are much < are usually supposed. After 9 months on low-Ca rations cows utilise approx. 50% of the Ca intake for calf and milk production. Poor reproduction following substitution of hay or straw for lucerne in cows' rations is attributable to deficiency of vitamin-A rather than to that of Ca. A. G. P.

Phosphorus requirement of dairy heifers. J. G. ARCHIBALD and E. BENNETT (J. Agric. Res., 1935, **51**, 83—96).—Data for 1-, 2-, and 3-year heifers are given. Rowen and legume hays provide sufficient P when fed alone, but ordinary mixed hay may be deficient. Retention and utilisation of N and Ca were similar with low- and high-P rations. The utilisation of ingested P was proportionally higher with low-P rations, but the resulting storage of P in no case equalled that produced by high-P rations. A. G. P.

Individual variation in response to drugs. A. J. CLARK (Edinburgh Med. J., 1935, **42**; Trans. Med.-Chirurg. Soc. Edinburgh, Session 1934—1935, **114**, 1—14).—Variations in individual response of man and certain animals to a no. of drugs are discussed. CH. ABS. (p)

Sympathetic dilator fibres in the muscles of the cat and dog. E. BÜLBRING and J. H. BURN (J. Physiol., 1935, **83**, 483—501).—Perfusion of the hind-limb muscles with Ringer's solution containing eserine (I) and adrenaline (II) and stimulation of the sympathetic chain liberates an acetylcholine-like substance in the perfusate. Vaso-dilatation occurs on stimulation when the muscles are perfused with defibrinated blood containing (II) or pituitary extract, or injected with (I) or ergotoxine (III). The effect is increased by (I) and abolished by atropine except after (III) or in Et_2O anæsthesia. R. N. C.

Pharmacological action of the alkaloids of fumaraceous plants. II. Corydine. R. A. WAUD (J. Pharm. Exp. Ther., 1935, **54**, 40—45).— Corydine is very similar in action to *iso*corydine (A., 1934, 325) with a smaller tendency to produce catalepsy. H. D.

Mechanism of morphine hyperglycæmia. II. Action of opium alkaloids on the total carbon dioxide and alkali reserve in blood-plasma of rabbits. III. Influence of opium alkaloids on adrenaline content of blood in normal rabbits. IV. Influence on blood-sugar and plasma alkali reserve of rabbits. H. GYOKU (Folia Pharmacol. Japon., 1934, **19**, No. 1, 1—13, 13—25; Japan. J. Med. Sci., IV [Proc. Japan Pharmacol. Soc.], 1934, **8**, 111; cf. this vol., 528).—II. The increases in alkali reserve caused by pantapon, morphine, heroin, codeine, *apo*morphine, thebaine, papaverine, narceine, and narcotine were in the order named. Parallel increases in blood-sugar occurred.

III. Adrenaline was determined by perfusion through the vessels of a frog's leg.

IV. Morphine hyperglycæmia was lessened by cutting the vagus and splanchnic nerves and removing the thyroid glands. CH. ABS. (*p*)

Mechanism of strychnine action or its combination with various uterus tonics on the isolated rabbit uterus. K. IBA (Folia Pharmacol. Japon., 1934, **19**, 51—58).—Strychnine (I) (1 in 20,000—1,000,000) increases the contraction of the isolated uterus. When added to half the min. stimulative doses of tyramine, pilocarpine, histamine, $BaCl_2$, pituitrin, or quinine (I) exerts an additive effect. With choline chloride, adrenaline, and quinine there is potentiation. CH. ABS. (*p*)

Non-modification of the sympathicolytic activity of yohimbine by the introduction of a double linking into the molecule. RAYMOND-HAMET (Compt. rend., 1935, **201**, 434—436).—*apo*-Yohimbine (1 mg. per kg.) abolishes the rise in carotid pressure and increase in kidney vol. which are produced when adrenaline is injected into a dog under chloralose anæsthesia. 3 mg. per kg. completely reverses the effects, as is the case with yohimbine. J. L. D.

Effect of amytal on pilocarpine-induced submaxillary and gastric secretion. M. F. MONTGOMERY (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1287—1290).—Amytal depresses both salivary and gastric secretions 6 hr. after administration in dogs; they

fall to a min. in 2—3 days, afterwards returning slowly to normal. R. N. C.

Detoxification of amidopyrine by sodium amytal. C. L. ROSE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1242—1243).—The min. lethal dose of amidopyrine in mice and rats is increased by addition of Na amytal. R. N. C.

Sodium amytal for anæsthesia in studies on mitochondria. J. McA. KATER (Science, 1935, **82**, 256).—Na amytal is suitable for experiments with rabbits on mitochondria of the liver; there is no difference between anæsthetised and unanæsthetised material. L. S. T.

Surface anæsthesia of the outer ear passage of guinea-pigs. S. IKEBE (Folia Pharmacol. Japon., 1934, **19**, 62—69).—The anæsthetising power of procaine, tutocaine, tropacocaine, cocaine, and nupercaine increased in the order named. The action of Et, Pr, Bu, amyl, hexyl, and heptyl alcohols increased with mol. wt. MeOH (20% solution) had no action. Paraldehyde, McCHO, MeOAc, and EtOAc in 10—20% solution were anæsthetics. Menthol (10—20%) produced anæsthesia, but camphor was inactive. *p*-Cresol produced more intense effects than *o*- or *m*-cresol or PhOH. CH. ABS. (*p*)

Influence of various local anæsthetics on the cornea after extirpation of the superior cervical ganglion. K. ARIMA (Folia Pharmacol. Japon., 1934, **19**, 204—210).—The intensity of action of the anæsthetics was in the decreasing order, pantocaine, cocaine, procaine, tutocaine. Simultaneous application of adrenaline and anæsthetic produced an earlier and more prolonged effect on the side having the ganglion still intact. CH. ABS. (*p*)

Isolation, properties, and pharmacological action of hagarotoxin. K. SAMAAN (J. Egypt. Med. Assoc., 1935, **18**, 17—31).—An Egyptian product (El Hagar, El Hindi, or Indian stone), apparently a mixture of sand and dried secretion of certain frogs, contains hagarotoxin (I) which has anæsthetic and toxic properties. (I) is obtained by EtOH extraction, has m.p. 161°, and gives a bright red colour with conc. H_2SO_4. CH. ABS. (*p*)

Sex variation in the ketonuria of ether anæsthesia in rats. G. A. EMERSON (J. Pharm. Exp. Ther., 1935, **54**, 90—96).—Female rats show a ketonuria on Et_2O anæsthesia > that of males; feeding of $CH_2Ac \cdot CO_2H$ increases the ketonuria, whereas none is produced by injection of adrenaline alone. H. D.

Ether dosage after pre-anæsthetic medication with narcotics (barbiturates, magnesium sulphate, and morphine). F. A. CALDERONE (J. Pharm. Exp. Ther., 1935, **54**, 24—39).—After morphine and sub-anæsthetic doses of Na amytal (I) there is no change in the blood-Et_2O concn. necessary for surgical anæsthesia and respiratory failure in dogs; after anæsthetic doses of (I), Na dial, and Na barbital the Et_2O concn. for respiratory failure is decreased and $MgSO_4$ influences the surgical anæsthesia concn. only when the doses approach anæsthetic ones. There is an additive effect in the causation of respiratory failure. H. D.

Barbiturates. XII. Factors governing distribution. J. M. DILLE, C. R. LINEGAR, and T. KOPPANYI. XIII. Analysis of the duration of action. T. KOPPANYI, C. R. LINEGAR, and J. M. DILLE (J. Pharm. Exp. Ther., 1935, 54, 46—61, 62—71; cf. A., 1934, 1254).—XII. After intravenous injection of barbiturates (I) into dogs and fowls, there is at first a rapid, then a slower, decrease in (I) concn. in the blood. After barbital (II) the brain contains less, and after nembutal (III) more, (I) than the other organs. Injection of (II) in 50% MeOH into carotid increases the concn. in the brain.

XIII. Long-acting (I) such as (II) and phenobarbital are destroyed slowly in the body, whilst (III) is quickly destroyed and rapidly disappears from the central nervous system. H. D.

Effect of nembutal on serum-cholesterol of dogs. E. H. BIDWELL, F. H. SHILLITO, and K. B. TURNER (Proc. Soc. Exp. Biol. Med., 1935, 32, 1235—1236).—Nembutal in amounts sufficient to produce deep narcosis in dogs does not affect total serum-cholesterol. R. N. C.

Pharmacological action of insulin. M. TAMAKI, T. MATSUI, and T. KOBAYASHI (Japan. J. Med. Sci., IV [Proc. Japan Pharmacol. Soc.], 1933, 7, 117—118).—Insulin has no action on smooth muscle, and no antagonistic effect against atropine or ergotamine. CH. ABS. (p)

Control of some ectoparasites of laboratory rats by atomised pyrethrum extracts in oil. E. M. SEARLS and F. M. SNYDER (J. Econ. Entom., 1935, 28, 304—310).—Spraying with a petroleum extract of pyrethrum (2·1% of pyrethrins) was effective against body lice and produced no ill effects on the animals. A. G. P.

Exchanges of water, electrolytes, and heat during phenylethylhydantoin sickness. F. W. ROOKWELL (J. Clin. Invest., 1935, 14, 202—211).—A temporary H_2O retention was followed by retention of Na, Cl, and K in the order named. During the fever acidosis and increased O_2 consumption occurred. The increased heat production was not at the expense of protein. CH. ABS. (p)

Effects of acetyl-β-methylcholine on the gastric acidity of monkeys. J. H. FERGUSON and E. R. B. SMITH (J. Physiol., 1935, 83, 455—458).—Intraventricular, intravenous, or subcutaneous injection of acetyl-β-methylcholine in green monkeys abolishes temporarily the free acidity of the gastric contents. Total Cl is unaltered. The lowest threshold dose is that required intraventricularly. The effect is antagonised by atropine. There is little evidence that the disappearance of acidity is due to simple neutralisation. Posterior pituitary extracts give no anacidity response. R. N. C.

Choline and certain of its derivatives. I. Pharmacological activity of acetylphosphocholine and acetylarsenocholine relative to acetylcholine. A. D. WELCH and M. H. ROEPKE (J. Pharm. Exp. Ther., 1935, 54, 118—126).—The actions of the P and As analogues of acetylcholine (I) on the blood-pressure of the pithed cat, the turtle's and frog's

heart, and the rabbit's intestine are qualitatively the same as that of (I), but quantitatively very much less. H. D.

Effect of methylhistamine and hydroxyethylglyoxaline on gastric secretion and blood-pressure in the dog. J. G. SCHNEDORF and A. C. IVY (Proc. Soc. Exp. Biol. Med., 1935, 32, 777—778).—Methylhistamine is as potent as histamine in its gastro-secretory and depressor actions, but hydroxyethylglyoxaline has neither of these actions. R. N. C.

Non-production of granulocytopenia with an amidopyrine compound in some acute infections. M. M. KUNDE, R. P. HERWICK, A. LEARNER, and M. STERNBACK (Proc. Soc. Exp. Biol. Med., 1935, 32, 1121—1125).—Cibalgine (I) does not reduce the leucocyte count in normal rabbits, nor the leucocytosis in gastro-intestinal infection. Thyroidectomised rabbits receiving (I) develop leucocytosis similarly to normal animals when infected. R. N. C.

Influence of bile salts on the nervous system following intraspinal usage. S. S. LICHTMAN and E. L. STERN (Proc. Soc. Exp. Biol. Med., 1935, 32, 1201—1204).—Na deoxycholate does not affect the spinal cord when introduced intraspinally in the lumbar region of the cat in minute quantities in aq. solution; larger quantities produce motor and sensory disturbances and respiratory paralysis. In EtOH solution it affects traumatised spinal cord tissue in doses that are harmless in aq. solution. The hæmolytic action of bile salt is reduced by spinal cord tissue or fluid protein. R. N. C.

Effects of phenanthrene derivatives on lipin contents of organs. T. USUI (Sei-i-Kwai Med. J., 1934, 53, No. 7, 154—161).—Injection of thebaine and dihydrohydroxycodeine hydrochlorides or hydrocodeine phosphate into mice causes an increase in the lecithin, cholesterol, and total fat-acid contents of the liver, spleen, kidneys, and heart. CH. ABS. (p)

Action of pyrazolone derivatives on the vascular system. J. BÖCK, H. KAUNITZ, and H. POPPER (Arch. exp. Path. Pharm., 1935, 179, 170—179).—Retardation of the diffusion of injected Na fluorescein into the anterior chamber of the rabbit's eye by injection of Ca salts is confirmed. Pyrazolone derivatives (novalgin, melubrin) and ferrum saccharatum oxydatum have a similar action, which is due to decreased permeability of the blood-vessel walls. A related phenomenon is the retardation by these substances of the increase in protein content of the aq. humour replacing that removed from the anterior chamber. F. O. H.

Toxicity and absorption of digilanid. F. ŠVEC (Arch. exp. Path. Pharm., 1935, 179, 157—163).—Digilanid (mixture of -A, -B, and -C) (A., 1933, 877, 1146) has a min. lethal dose (Hatcher–Magnus) of 0·3754 mg. per kg. (cat). The min. lethal dose enterally is approx. twice that intravenously. Following oral administration approx. 3/4 of the lethal dose of the glucoside is absorbed from the intestinal tract in 14 hr. F. O. H.

New agent for stimulating metabolism : dinitro-o-cyclopentylphenol (preparation 2769/1)

and its action on basal metabolic rate. F. E. C. DEVEGNEY (Brit. J. Exp. Path., 1934, **15**, 360—362). —The basal metabolic rate may be increased 25—30% by very small doses (1—2·5 mg. per kg. per 24 hr.) of the prep. in the form of the Na salt.   CH. ABS. (*p*)

Anthelmintic action of *o*-heptylphenol and 6-hexyl-*m*-cresol against *Ascaris lumbricoides, Necator americanus*, and *Trichuris trichiura*. P. D. LAMSON, D. M. MOLLOY, and H. W. BROWN (Amer. J. Hyg., 1935, **21**, 188—199).—These compounds cause no irritation of the mucous membrane of the mouth. Homologues with smaller alkyl groups are irritating, those with larger groups non-irritating but inactive towards *A. lumbricoides*.   CH. ABS. (*p*)

Acetylsalicylic acid poisoning. S. C. DYKE (Lancet, 1935, **229**, 613—614).—Poisoning by 435 grains in a woman resulted in symptoms of profound toxæmia with evidence of hepatic, renal, and cerebral damage.   L. S. T.

Some effects of 2 : 4-dinitrophenol on pregnancy in the white rat. L. M. R. WULFF, L. A. EMGE, and F. BRAVO (Proc. Soc. Exp. Biol. Med., 1935, **32**, 678—680).—Fertility is not appreciably affected by intragastric administration of 2 : 4-dinitrophenol, but the no. of still-births and the mortality rate of the young during the nursing period are increased.   R. N. C.

Effect of 2 : 4-dinitrophenol on calcium, creatine, and creatinine excretion in the rat. L. I. PUGSLEY (Biochem. J., 1935, **29**, 2247—2250).— The feeding of 25 mg. of 2 : 4-dinitrophenol per rat daily caused approx. 100% increase in the excretion of Ca in the fæces, with marked creatinuria and increased excretion of creatinine.   J. N. A.

Physiological activity of some pyrocatechol derivatives. M. G. MULINOS and R. L. OSBORNE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1344—1345).— A no. of o-$C_6H_4(OH)_2$ (I) derivatives show sympathomimetic action, chloroacetylpyrocatechol (II) being the most powerful. (I) shows vasopressor activity, but (II) raises blood-pressure by medullary stimulation. (II) shows midriatic action, and raises blood-sugar in unanæsthetised rabbits. The contributory factors to the chemical constitution of sympathomimetics are stated.   R. N. C.

Biological experiments with esters of *p*-hydroxybenzoic acid. H. CREMER (Z. Unters. Lebensm., 1935, **70**, 136—150).—The esters (nipagin, nipasol) had no harmful effect on scorbutic or otherwise avitaminose animals in respect of growth, fertility, resistance to infectious diseases, arteriosclerosis (in rabbits), or intermediate oxidative metabolism. The blood picture was unaffected. The activity of vitamins was not impaired, but, on the contrary, they were protected from decomp.   E. C. S.

Action of methylglyoxal on acetoacetic acid. V. Effect of the ketol on the respiration of surviving tissue. R. STÖHR (Z. physiol. Chem., 1935, **235**, 265—271 ; cf. A., 1933, 88, 377).— $OH\cdot CHAc\cdot CH_2Ac$ (I) in low concn. (0·0033—0·033M) restricts the respiration of surviving tissues. Except when its concn. is high (I) disappears in liver and kidney, but not in diaphragm. Possibly the toxic

action of (I) or of its degradation products (perhaps AcCHO) masks an increased uptake of O_2.   W. McC.

Toxicity of calcium cyanamide. F. SCHOOFS (J. State Med., 1935, **43**, 116—118).—A discussion.   CH. ABS. (*p*)

Effect of alcohol on spleen volume. F. D. McCREA, D. F. MARION, W. W. TYSON, and W. P. KAVANAGH (J. Lab. Clin. Med., 1935, **20**, 350—352).— Intravenous administration of small doses of dil. EtOH to cats anæsthetised with urethane caused contraction of the spleen followed by rhythmic relaxations and contractions. The size of the splenic waves increased with the dosage of EtOH.   CH. ABS. (*p*)

Quaternary ammonium salts and the action currents in nerve. S. L. COWAN and H. R. ING (J. Physiol., 1935, **84**, 90—110).—The action current of crab nerve is unaffected by a no. of quaternary NH_4 salts (I) or curarine (II) in low concns. It is slightly depressed by sea-H_2O saturated with AgCl, and abolished under these conditions by addition of (I) or (II). The action current of frog nerve is not affected by (I) or (II), even when the nerve is asphyxiated after treatment and recovered in O_2. The action current is diminished in a (I)-poisoned nerve by solid AgCl, and to a smaller extent by Ringer's solution saturated with AgCl. NEt_4I increases the galvanometer deflexion × time area.   R. N. C.

Mechanism of the arsenite action on medullated nerve. F. O. SCHMITT and R. K. SKOW (Amer. J. Physiol., 1935, **111**, 711—719).—Nerve oxidase is not inhibited by AsO_3''' in sufficient quantity to inhibit nerve respiration 50—80% and block action potentials. Substrate activation is inhibited by AsO_3''', the degree of inhibition and the AsO_3''' extinction time of the action potential showing marked seasonal variations. Respiration is scarcely protected by preliminary treatment with cysteine or glutathione, but the action potential extinction time is prolonged, although the eventual extinction is not prevented. ·SH does not restore irritability after AsO_3''' block.   R. N. C.

Epithelial cells of the iris in cultures in *in vitro*. VII. Influence of arsenious acid, sodium arsenite, sodium arsenate, and arsenic acid on the growth of cultures : histological changes. VIII. Influence of atoxyl, sodium cacodylate, neoarsphenamine, myoarsphenamine, and sodium salviol. K. SANJO (Folia Pharmacol. Japon., 1934, **19**, 151—164, 165—177).— VII In low concns. growth is increased. Larger amounts damage the cells. The activity of the compounds decreased in the order H_3AsO_3, Na_3AsO_3, H_3AsO_4, Na_3AsO_4.
VIII. Similar results are recorded. The (decreasing) order of activity was myoarsphenamine, neoarsphenamine, Na salviol, Na cacodylate, atoxyl.   CH. ABS. (*p*)

Influence of various arsenic compounds on the growth of cultures of fibroblast *in vitro* : morphological changes in the cultures. II. H. OKADA (Folia Pharmacol. Japon., 1934, **19**, 191—198 ; cf. this vol., 399).—Small concns. of Na

arsphenamine, neo- and myo-arsphenamine increased the growth in cultures. Larger proportions poison the tissue. Tartar emetic produces similar effects. Ch. Abs. (*p*)

Effect on blood-sugar of some organic compounds with labile sulphur. III. A. C. de Degiorgi (Anal. Asoc. Quím. Argentina, 1935, **23**, 8—13; cf. A., 1933, 859).—The hyperglycæmia in rabbits due to injection of Na *N*-methyl-, *N-iso*propyl-, *NN*-dipropyl-, *NN*-di*iso*propyl-, *N*-amyl-, and *N-iso*amyl-dithiocarbamate and NH_2Me *N*-methyldithiocarbamate for the dialkyl is $>$ that for the monoalkyl compounds, that for the *iso*alkyl is $>$ that for the *n*-alkyl compounds, and that for the NH_2Me is $>$ that for the corresponding Na salt. F. R. G.

Effect of sulphur on Merino sheep : safe dose of sulphur for cattle. D. G. Steyn (J. S. African Vet. Med. Assoc., 1934, **5**, 18—22; cf. A., 1933, 530).—Administration of 30 g. of S daily had no harmful effect over a 14-month period. A dosage of 45 g. had no harmful action on the live-wt. or digestive processes, but breath odour was unpleasant. The ability of S to prevent loss of body-wt. during periods of food scarcity is indicated. Ch. Abs. (*p*)

Effect of certain bactericides, especially copper sulphate, on the longevity of honey bees. E. M. Hildebrand and E. F. Phillips (J. Econ. Entom., 1935, **28**, 559—565).—Even in sublethal doses $CuSO_4$ acts as a repellent to bees and decreases the total food ingested. The min. lethal dose cannot be determined accurately, since amounts $>$ this are ingested prior to death. CaO did not shorten the life of bees, but lowered the food intake. A. G. P.

Pharmacodynamic study of vanadates. A. H. Roffo, O. Calcagno, and R. L. Ramirez (Rev. Assoc. méd. Argentina, 1932, **46**, 1524—1528).—Salts of V are hypertensive irrespective of the anion. Ch. Abs. (*p*)

Factors affecting the hypotensive action of sodium nitrite in dogs. E. Hug (Rev. Soc. Argentina biol., 1934, **10**, 451—452).—The depressive effect on arterial pressure of injections of $NaNO_2$ into anæsthetised dogs is intensified by addition of acid. If $NaNO_2$ is injected 2—3 min. after injection of HCN (5 mg. per kg.) it has a hypertensive action and counteracts the hypotensive effect of HCN. Ch. Abs. (*p*)

Diagnosis of hydrocyanic acid and arsenical poisoning under field conditions. D. G. Steyn (J. S. African Vet. Med. Assoc., 1934, **5**, 106—112).—HCN is determined by the Na picrate method. As is converted into AsH_3 and determined by the blackening of $AgNO_3$ test-paper. Ch. Abs. (*e*)

Effect of fluorine in natural waters on the teeth of small fish. A. Neff (Science, 1935, **82**, 301—302).—A relationship between the amount of F' in a given H_2O and the condition of the teeth of the fish living in it appears to exist. L. S. T.

Occurrence of mottled enamel in Iowa. C. T. Ostrem, D. A. Greenwood, H. A. Wilhelm, and V. E. Nelson (Proc. Iowa Acad. Sci., 1933, **40**, 99—102).—Records of mottling due to F in drinking-H_2O are given. Ch. Abs. (*p*)

Oxygen compounds of fluorine. J. Suru (Tech. Kurir, 1935, **6**, No. 7, 1—2; cf. Ruff *et al.*, A., 1931, 810; 1934, 378; this vol., 715; Cady, *ibid.*, 181).—Sensitivity towards F gases is individual. O_2F_2 behaves physiologically very like $(C_2H_4Cl)_2S$ (I). In addition it penetrates the skin and attacks the nerves. Salts of fatty acids (*e.g.*, Mg, Al, Zn, and especially Cd) in vaseline which protect against (I) (*e.g.*, those yielding tetramethylene sulphide) seem to protect also against O_2F_2. E. P.

Tissue changes in poultry resulting from ingestion of sodium hydrogen carbonate. G. F. Delaplane (Vet. Alumni Quart., 1934, **21**, 149—166).—Lesions, resembling those in cases of gout, and deposition of Na urate were caused by continuous feeding of $NaHCO_3$ (1·6—2% in drinking-H_2O or 3·0—3·3% of the feed). Lesions were not caused by $CaCO_3$, $KHCO_3$, NaOH, Na_2SO_4, or NaCl. Urate deposition in birds receiving Na_2SO_4 was $>$ in those receiving $KHCO_3$. Ch. Abs. (*p*)

Survival of salt-treated adrenalectomised rats. R. Gaunt, C. E. Tobin, and J. H. Gaunt (Amer. J. Physiol., 1935, **111**, 321—329).—The life-span of adrenalectomised rats is considerably extended by oral administration of 0·9% NaCl or the Rubin-Krick salt solution, the latter being more effective. Daily intraperitoneal injections of 0·9% NaCl are also beneficial. The rate of growth is sub-normal. R. N. C.

Effect of carbon dioxide on the beat of the lateral body walls of the grasshopper embryo. J. F. Walker (J. Cell. Comp. Physiol., 1935, **6**, 317—334).—The time of recovery of the beat after exposure to pure CO_2 is $>$ the time required for cessation, and $\propto$ it when the latter is $<$ 10 min. The beat when stopped by 95% CO_2 may be resumed while the embryo is still exposed. Response of the embryo to a given CO_2 tension depends on the tension of the previous environment; acceleration occurs when the CO_2 tension is decreased. The beat is unaffected in an O_2 tension of 6·8%. R. N. C.

Boron poisoning in dogs. G. W. Clough (Vet. Rec., 1933, **13**, 585).—Borax, used in error for H_3BO_3 in ear treatment of dogs, caused severe disorders and death. B was detected in alkaline stomach contents and in urine. Ch. Abs. (*p*)

Influence of mercury on cultivated tissue. I. (*a*) Influence of mercuric chloride, bromide, cyanide, and oxycyanide on growth and morphological picture of fibroblast *in vitro*. (*b*) Influence of neptal, salyrgan, novasurol, and imamicol. K. Hirashima (Folia Pharmacol. Japon., 1934, **19**, 219—238, 239—247).—Growth was increased by low and inhibited by higher concns. of the salts. Toxicity decreased in the order $HgCl_2$, $HgBr_2$, $Hg(CN)_2$, $HgO-Hg(CN)_2$.
b. The org. Hg compounds reacted similarly, but concns. $>$ those of inorg. salts were necessary to produce the same effect. The (decreasing) order of activity was imamicol, novasurol, salyrgan, neptal. Ch. Abs. (*p*)

Lead poisoning in calves. W. P. Moss (Vet. Rec., 1933, **13**, 1099—1100).—Stomach contents of calves suspected of death from Pb poisoning contained approx. 0·022 grain of Pb per oz.   Ch. Abs. (*p*)

Reactions of rat and mouse ova to hydrogen ions. B. V. Hall (Proc. Soc. Exp. Biol. Med., 1935, **32**, 747—748).—The oölemma swells and then dissolves in Ringer's solution at acid p_H, the time of dissolving decreasing with p_H. The process appears to be similar to that occurring *in utero*.   R. N. C.

Hydrogen-ion concentration and the rhythmic activity of the nerve cells in the ganglion of the *Limulus* **heart.** I. Chao (Biol. Bull., 1935, **68**, 69—73; cf. A., 1934, 1399).—Application of H_2CO_3 to the dorsal median ganglion in sea-H_2O or Ringer's solution rapidly inhibits rhythmic activity at p_H 5·2. HCl increases the heart-rate, and inhibition is first observed near the toxic concn. of 0·001N. In Ringer's solution without Mg 0·001N-NaOH is inhibitory. Smaller concns. of aq. NH_3 cause temporary inhibition not referable to $NH_4^{\cdot}$. The effect of weak acids and bases is attributable to penetration of undissociated mols. into the living cells. The ganglion is relatively resistant to p_H changes in the external medium.   Ch. Abs. (*p*)

Physico-chemical theory of [nerve] excitation and inhibition. N. Rashevsky (Physical Rev., 1934, [ii], **45**, 125).   L. S. T.

Physico-mathematical theory of organic form. N. Rashevsky (Physical Rev., 1934, [ii], **45**, 125).—The general arrangement which cells will assume in early embryonic stages under the influence of the various forces of attraction and repulsion known to exist between them is discussed.   L. S. T.

Light intensity as an inhibiting factor in the fixation of atmospheric nitrogen by Manchu soya beans. F. S. Orcutt and E. B. Fred (J. Amer. Soc. Agron., 1935, **27**, 550—558).—Inoculated soya beans grown in N-free sand, with high light intensity, failed to initiate N fixation. The latter commenced after partial shading for 1 week. The effect of light intensity is correlated with the C : N ratio within the plant. An extremely high ratio probably inhibits N fixation.   A. G. P.

Lethal action of radiant energy on living cells. F. F. Heyroth and J. R. Loofbourow (Physical Rev., 1934, [ii], **45**, 126; cf. A., 1934, 926; this vol., 120).—The existence of a frequency threshold for the lethal action of radiant energy on living cells is discussed. The destruction of cell-enzymes as a possible mechanism of lethal action appears to be eliminated, but destruction of compounds of the cell-nucleus is of great importance.   L. S. T.

Influence of Röntgen treatment on uric acid metabolism. S. Okaue (Folia Pharmacol. Japon., 1934, **19**, 259—268).—Rabbits treated for 80—120 min. excreted less urine, which usually had a lowered N content. Urinary uric acid increased on the following day. Blood-uric acid increased immediately with treatment, returning to normal within 1 hr. of cessation, and subsequently declined.   Ch. Abs. (*p*)

Differential effect of radium radiation on the carbohydrate metabolism of normal and tumour tissues irradiated at low temperature. H. G. Crabtree (Biochem. J., 1935, **29**, 2334—2343).—Tumour tissue subjected to β+γ irradiation at 37·5° suffers a decrease in respiration, although both aerobic and anaerobic glycolysis are unaffected; irradiation after HCN treatment of the tissue has a more marked effect. At 0—10° respiration is decreased, but glycolysis is scarcely affected. The metabolism of normal spleen, liver, kidney, and testis at low temp. is unaffected by irradiation.   H. D.

Some factors influencing the heat production of muscle after stretching. U. S. von Euler (J. Physiol., 1935, **84**, 1—14).—The resting heat and the stretch response of frog's sartorius are increased by soaking in Ringer's solution at p_H 8—9, whilst the stretch response is diminished or abolished at p_H 5—6. The stretch response is increased by cocaine and diminished by $C_{16}H_{33}\cdot NMe_3Br$ or Na oleate. The extra heat rate resulting from stretch reaches a max. in 10 sec., and then remains high, rising gradually in O_2 and falling in N_2. The differences in apparent initial heat in the stretch response in O_2 and N_2 are considered to be due to rapid oxidation processes not preceded by non-oxidative breakdown.   R. N. C.

Proposition of " T.N.N." equations in the kinetics of enzymes. K. Nakajima and T. Kamata (J. Fac. Agric. Hokkaido, 1934, **35**, 151—291).—Modifications of equations for unimol. reactions are examined in relation to the activity of numerous enzymes.   Ch. Abs. (*p*)

Metabolism of tissues growing in culture. VI. Effect of radium on the lactic dehydrogenase and arginase systems of embryonic tissue. B. E. Holmes (Biochem. J., 1935, **29**, 2285—2290; cf. A., 1933, 747).—A tissue culture method has the advantage over the manometric technique in studying the effect of irradiation on tissue metabolism in that the conditions are more suitable for the prolonged life of the tissue. The main disadvantage is that the metabolic reactions cannot proceed at their optimum rates if the tissue is not shaken. The lactic dehydrogenase system in the tissue of young embryos is more susceptible to γ-rays than that of older embryos. The coenzyme is possibly the part of the system affected. Arginase activity of a tissue culture is not impaired by γ-rays.   E. A. H. R.

Schardinger enzyme and co-enzymes involved in phosphorylation and oxido-reduction. B. Andersson (Z. physiol. Chem., 1935, **235**, 217—225).—The oxidation by the enzyme of xanthine in presence of methylene-blue is not affected by addition of cozymase (I), but that of MeCHO is inhibited by addition of active or inactivated (I), adenylpyrophosphate, adenylic acid (from muscle), and adenosine (not by addition of Warburg's co-enzyme). The enzyme inhibits phosphorylation during glycolysis, but does not inhibit some enzymic oxidations which require the presence of (I) as activator. Associated with the enzyme is a non-dialysable, thermolabile substance, possibly identical with the substance which oxidises MeCHO, which inhibits alcoholic fermentation and glycolysis.   W. McC.

Peroxidases and cell activity in the developing egg (*Orthoptera*). J. H. BODINE and E. J. BOELL (Proc. Soc. Exp. Biol. Med., 1935, **32**, 783—787).—The peroxidase reaction of the developing grasshopper's egg at 25° is negative before and positive after the diapause, becoming negative again in the embryo after hatching. Pre-diapause eggs exposed to temp. 0—5° show a positive reaction, apparently owing to the destruction of a naturally-occurring inhibitor. R. N. C.

Mechanism of catalase inhibitions. H. BLASCHKO (Biochem. J., 1935, **29**, 2303—2312).—A manometric method for the study of reversible catalase (I) inhibitions is described. NaN_3, NH_2OH, N_2H_4, $NHPh\cdot NH_2$, EtO_2H, $KClO_4$, resorcinol, p- and m-$C_6H_4(NH)_2$ give reversible, $HgCl_2$ a partly reversible, and $KClO_3$ an irreversible inhibition. All substances known to give methæmoglobin compounds act as reversible inhibitors of (I), which supports the theory that (I) is a hæmin compound. E. A. H. R.

Catalase in embryonic development. II. First phase of development of eggs of *Salmo irideus* and *Esox lucius*. U. SAMMARTINO (Arch. Farm. sperim., 1935, **60**, 342—352; cf. this vol., 519).—The primary segmentation (4—10 days) of the eggs influences neither the absorption of H_2O from the medium nor the (approx. const.) catalase activity. F. O. H.

Enzymic amylolysis. IV. Action of β-amylase on starch preparations. M. SAMEC [with R. MODIC] (Z. physiol. Chem., 1935, **236**, 103—118).—Preps. from potato starch which yield different colours with I differ as regards their behaviour on treatment with β-diastase from wheat and are divided into 3 types : the amyloamyloses, which are relatively slowly but completely degraded ; the Lintner and Fouard varieties, with which degradation ceases when about 65% of the calc. amount of maltose (I) has been produced, and the erythroamyloses (and Meyer's dextrin), which are rapidly degraded until 45—50% of the calc. amount of (I) has been produced. The degree of dispersion of the preps. affects the rate, but not the type, of reaction, and the diminution in the intensity of the colour produced with I $\propto$ the extent of saccharification. The material left after saccharification has mol. wt. about 2000 (13—15 glucose residues) and resembles the original material in [α] and in colour produced with I, but has reducing properties and is much more highly dispersed. W. McC.

Specificity of amylases. II. Degradation of the hydroxyethyl ether of potato-starch to non-reducing substances. W. ZIESE (Z. physiol. Chem., 1935, **235**, 235—245; cf. this vol., 401).—As regards its behaviour towards α- and β-amylase the ether does not differ from that of Lintner starch. The action of the enzyme reduces the viscosity of the solutions to 0·1—0·05 of its original val., but the degradation products have no reducing power. W. McC.

Yeast amylase. I. Preparation of amylase solution from pressed yeast. K. ONO (J. Agric. Chem. Soc. Japan, 1935, **11**, 60—67).—Neutralised aq. extracts of yeast pretreated with EtOAc had poor amylolytic power. Active extracts were obtained by means of aq. $(NH_4)_2HPO_4$ at 5°. Amylase was unstable at room temp. CH. ABS. (*p*).

Taka-amylase. I. Amount of glucose formed by the action of taka-diastase on starch. II. Reaction-velocity coefficients for amylase and maltase action. III. Optimum p_H for taka-diastase action. T. KITANO (J. Soc. Chem. Ind. Japan, 1935, **38**, 376—381B, 381—385B, 385—388B). —I. The action of taka-diastase (I) on starch (II) produces, in addition to dextrin and maltose (III), a polysaccharide sol. in 95% EtOH which possesses strong reducing properties. (III) and glucose (IV) cannot therefore account for the whole reducing powers developed by (II) when incubated with (I). (II) is rapidly hydrolysed to (III) and other polysaccharides, but further hydrolysis to (IV) is slow, although more rapid than if due to the action of maltase (V) alone. This is accounted for by the intermediary formation of a trisaccharide which is hydrolysed further to (III) and (IV). The action of (V) is independent of substrate concn. An enzyme prep. similar to (I) in its action on (II) can be obtained from soya beans by inoculation with *Aspergillus oryzæ*.

II. The production of sugars from (II) by very dil. (I) solutions follows a unimol. course. At higher enzyme concn. (V), but not amylase (VI), still gives a unimol. coeff. (VI) activity does not increase correspondingly with concn.

III. The optimum p_H for (V) action is always < that for (VI) action. Both optima increase with rise of temp. E. A. H. R.

Effect of ultra-violet light on enzymic reactions. I. Diastase. S. BANERJEE and H. K. SEN (J. Indian Chem. Soc., 1935, **12**, 379—383).—The enzyme action of malt-diastase (I) on starch at p_H 5·4—5·8 is destroyed by exposure to ultra-violet light, but $NH_2\cdot CHPh\cdot CO_2H$, asparagine, gelatin, tyrosine, $NH_2\cdot C_6H_4\cdot CO_2H$, and NH_4 citrate exert a protective action. Other catalysts which normally increase the activity of (I) have no protective action. J. W. B.

Determination of pectolytic activity of filtration enzymes. A. MEHLITZ and H. MAASS (Z. Unters. Lebensm., 1935, **70**, 180—186).—The original method (A., 1934, 465) is modified. Instructions are given for the prep. of the pectin (I) solution, which should be adjusted to p_H 3·6 by addition of citric or tartaric acid. The % of (I) need not be so rigidly fixed (at 2·0%) as was previously stated. Fermentation is carried out at 37—38° for 15 hr., and is stopped by addition of CH_2O. E. C. S.

Influence of proteins on the activity of yeast-invertase. E. L. SAUL and J. M. NELSON (J. Biol. Chem., 1935, **111**, 95—103).—Yeast-invertase solutions (I), on dilution, lose a disproportionate amount of activity in hydrolysing sucrose at p_H 3. This loss is less in the presence of added protein (II). Irreversible inactivation of (I) in solution at p_H 3 is also reduced by (II). At p_H 4·5, the optimum for this reaction, or in more alkaline solution, the abnormal loss in activity is not found, and (II) has no influence.
F. A. A.

Biochemical detection of carbohydrates, polysaccharides, alcohols, glucosides, and other organic compounds. H. DAMM and A. LEMBKE (Naturwiss., 1935, **23**, 641).—Enzyme preps. extracted under definite conditions from various microorganisms are allowed to act on the compound in question. From the course of the reaction, e.g., production of acid, the constitution of the compound is deduced, 10 mg. of substance being usually sufficient.
W. O. K.

Cardiac glucosides. XII. Glucosidases of *Digitalis* leaves. A. STOLL, A. HOFMANN, and W. KREIS (Z. physiol. Chem., 1935, **235**, 249—264; cf. this vol., 754).—Fresh and dried leaves of *D. lanata* and *D. purpurea* contain the glucosidases digilanidase and digipurpidase, which hydrolyse the true glucosides of the leaves of these plants liberating digilanids *A*, *B*, and *C* and purpurea glucosides *A* and *B* (deacetyldigilanids *A* and *B*), respectively. The enzymes, which are desmo-enzymes and cannot be extracted from the leaves, also liberate the terminal glucose residue from deacetyldigilanid *C* and from scillaren *A*. Although the enzymes do not exhibit abs. specificity, they act more rapidly on the substrates with which they are associated in the leaves than on other substrates.
W. McC.

Enzymic synthesis of cholesteryl esters. S. V. NEDSVEDSKI (Z. physiol. Chem., 1935, **236**, 69—72).—Lipase (from pig pancreas) in presence of CaCl₂, PhMe, and Na cholate, taurocholate, or glycocholate produces cholesteryl palmitate, stearate, and oleate in good yields (up to 90%) from colloidal aq. solutions of cholesterol and the fatty acid.
W. McC.

Castor-bean lipase. VI. Preparation of highly active *Ricinus* lipase and its properties. E. TAKAMIYA (J. Agric. Chem. Soc. Japan, 1935, **11**, 68—76).—Treatment of castor beans with N-acid (org. or inorg.) increases lipase activity without hydrolysis of protein. The lipase exists as a protolipase. Beans are treated with N-H_2SO_4 saturated with CO_2, and subsequently extracted with Et_2O. To the extract is added light petroleum and the ppt. removed, washed, dissolved in olive oil, and again washed with Et_2O and petroleum. The purified lipase after drying over H_2SO_4 in a vac. showed positive Molisch and sterol tests, but a negative Millon reaction, contained N 7·5% and P 1·48%, and was inactivated by oxidising and reducing agents. The olive oil solution mixed with $CHCl_3$ and treated with 20% $SbCl_3$ in $CHCl_3$ gave a deep blue colour changing slowly to pinkish-violet.
CH. ABS. (p)

Relative choline-esterase activities of serum and corpuscles from the blood of certain species. E. STEDMAN and E. STEDMAN (Biochem. J., 1935, **29**, 2107—2111).—Data from gasometric determinations of choline-esterase (I) in various sera agree with those from the titration method (A., 1933, 315, 1081). The absence of (I) from ox, sheep, and goat sera is confirmed; the corpuscles, however, contain appreciable amounts, whilst those of cat, fowl, and duck are inactive. (I) is absent from cerebrospinal fluid (cat, man), but occurs in the basal ganglia and, to a greater extent, cortex of the brain (cat).
F. O. H.

Digestion of digestive enzymes in the herring (*Clupea harengus*, L.). H. I. BATTLE (J. Biol. Board Canad., 1935, **1**, 145—157).—Weak lipolytic and amylolytic enzymes are present in gastric juices, and more active ones in pyloric, cæcal, and intestinal mucosa. The lipase in the latter is rendered more active by bile. Chitin is not digested. Acid extracts from gastric juice are concerned in the reddening of food organisms containing a chitinous exoskeleton. The acid gastric juice can remove hyalodentine from fish scales, but basic extracts from the pyloric cæca are without effect.
CH. ABS. (p)

Proteolytic enzymes. VI. Specificity of papain. M. BERGMANN, L. ZERVAS, and J. S. FRUTON. **VII. Synthesis of peptides of *l*-lysine and their behaviour with papain.** M. BERGMANN, L. ZERVAS, and W. F. ROSS (J. Biol. Chem., 1935, **111**, 225—244, 245—260).—VI. The action of papain has been investigated on several peptides containing no free α-NH_2 or α-CO_2H, but having a β- or γ-CO_2H in the side-chain. These are hydrolysed by papain–HCN and in each case a CO·NH next to the end CO·NH is hydrolysed. If leucine be situated next to the acyl, however, the site of hydrolysis is moved one NH_2-acid residue away from the acyl; thus *benzoylglycyl-l-leucylglycine*, m.p. 186°, $[\alpha]_D^{24}$ −35·8° in H_2O+1 equiv. of NaOH [*d-form*, m.p. 186°, $[\alpha]_D^{24}$ +35·2° in H_2O+1 equiv. NaOH (*Me* ester, m.p. 180°)], yields hippuric acid, whilst *carbobenzyloxy-l-leueylglycylglycine*, m.p. 144°, $[\alpha]_D^{22}$ −12·8° in EtOH (*Et* ester, m.p. 105°; *d-form*, m.p. 144°, $[\alpha]_D^{22}$ +12·3° in EtOH), yields *carbobenzyloxy-l-leucylglycine*, m.p. 115° (*Et* ester, m.p. 103—104°). The free CO_2H of the side-chain is not necessary for papain action, but two CO·NH must be present, one of them being hydrolysed and the other probably serving as a point of attachment. Also, if H in the CO·NH be replaced by Me the linking becomes resistant to hydrolysis. With optical isomerides of a peptide, the *d*-form is hydrolysed very slowly or not at all. The following compounds are described : *l-glutamyl-α-glycine Et ester*, m.p. 151°; *carbobenzyloxyglycyl-l-glutamyl-α-glycine*, m.p. 98—100° (*Et* ester, m.p. 169°); *glycyl-l-glutamyl-α-glycine*; *glycyl-l-glutamylglycine Et ester*; *glycylglutamic acid-diketopiperazine*, m.p. 240°; *l-asparagyl-α-glycine Et ester*, m.p. 232°; *carbobenzyloxyglycyl-l-asparagyl-α-glycine Et ester*, m.p. 148°; *benzoyldiglycyl-l-glutamylglycine Et ester*, m.p. 252°; *carbobenzyloxyglycyl-l-isoglutamine*, m.p. 185°; *benzoyl-l-isoglutamine*, m.p. 158°; *carbobenzyloxytriglycine*, m.p. 196°; *carbobenzyloxytetraglycine*, m.p. 230°; *carbobenzyloxyglycylsarcosyldiglycine*, m.p. 127°; *carbobenzyloxyglycyl-l-leucylglycine Me ester*, m.p. 131° (*d-ester*, m.p. 131°); *glycyl-l-leucylglycine*, $[\alpha]_D^{24}$ −41·2° in H_2O; *diglycyl-l-leucylglycine*, $[\alpha]_D^{24}$ −43·2° in H_2O (*Bz* derivative, m.p. 195°); *triglycyl-l-leucylglycine*, $[\alpha]_D^{24}$ −28·4° in H_2O (*carbobenzyloxy*-derivative, m.p. 225°); *benzoyl-dl-leucylglycylglycine*, m.p. 168°.

VII. The following method for the synthesis of lysine peptides with the lysine coupled as in natural proteins has been devised. *αε-Dicarbobenzyloxy*-l(+)-*lysine*, m.p. 150° (*amide*, m.p. 155°), is converted into the acid chloride, which when heated loses BzCl giving *ε-carbobenzyloxy-α-carboxy-l-lysine anhydride*,

m.p. 100° (decomp.), which with dil. HCl yields ε-*carbobenzyloxy-l-lysine*, m.p. approx. 255°, $[\alpha]_D^{25}$ +14·0° in H_2O+2 equiv. HCl, and with MeOH–HCl gives the corresponding *Me ester hydrochloride*, m.p. 117° (*amide hydrochloride*, m.p. 203°). This ester is coupled through its α-NH_2 with any chloride, followed by conversion into the azide, which is then condensed with an NH_2-acid ester or peptide ester. The ε-carbobenzyloxy-group can be removed simultaneously with the terminal α-carbobenzyloxy-group, and with an acylated terminal α-NH_2, the removal of the ε-group does not interfere with the acyl. In simple acylated lysine peptides with the ε-NH_2 unsubstituted, papain causes a cleavage next to the CO·NH, but if the ε-NH_2 be acylated as well, hydrolysis occurs also at the amide linking.. Thus α-*hippuryl-ε-carbobenzyloxy-l-lysineamide*, m.p. 209°,

NHBz·CH_2·CO·NH·CH([CH_2]$_4$·NH·CO_2CH_2Ph)·CO·NH_2
is hydrolysed at * and †, but the hydrolysis at † will result only if the α-NH_2 of the lysine be acylated. The rate of hydrolysis at † is > at *. The specificity of papain is compared with that of other peptidases. The following compounds are described : α-hippuryl-ε-carbobenzyloxy-*l*-lysine (*Me* ester, m.p. 145°; *hydrazide*, m.p. 195°); α-*hippuryl-ε-carbobenzyloxy-1-lysylglycine Et ester*, m.p. about 163°; α-*hippuryl-1-lysylglycine Et ester hydrochloride*, m.p. 123—133°, $[\alpha]_D^{25}$ −30·5° in H_2O; α-carbobenzyloxyglycyl-ε-carbobenzyloxy-*l*-lysine (*Me* ester, m.p. 97°; *Et* ester, m.p. 146°; *amide*, m.p. 130—134°; *hydrazide*, m.p. 167°); α-glycyl-1-lysine *Me ester dihydrochloride*, m.p. 177°, $[\alpha]_D^{25}$ −23·9° in H_2O; α-*carbobenzyloxyglycyl-ε-carbobenzyloxy-1-lysylglycineamide*, m.p. 90—95°; α-*benzoyl-ε-carbobenzyloxy-1-lysineamide*, m.p. 172—173°; α-*benzoyl-1-lysineamide hydrochloride*; α-*benzenesulphonyl-ε-carbobenzyloxy-1-lysine Me ester*, m.p. 80°. J. N. A.

Pancreatic proteinase. I, II. Effects of various compounds on activity of the enzyme. L. FARMER and A. M. WYNNE (Biochem. J., 1935, **29**, 2313—2322, 2323—2330).—I. The initial rate of proteolysis is measured directly by a determination of the total protein and is > the rate of accumulation of NH_2-N. This latter rate is therefore not a satisfactory index of proteinase (I) activity. Of five proteins investigated, caseinogen (II) was the most rapidly hydrolysed. Initially ovalbumin is hydrolysed at a rate comparable with the other proteins, but subsequent hydrolysis is slow, due perhaps to the liberation of an anti-(I) substance. The initial rate of hydrolysis varies with the substrate concn. in accordance with the theory of Michaelis and Menten, and ∝ (I) concn. The reaction rate is linear during the breakdown of sometimes as much as 65% of the protein. The lower p_H limit for (II), fibrin, and hæmoglobin decreases with their isoelectric points, supporting the theory that (I) is active only on protein anions. A (I) unit is defined.
II. The influence of various substances on the initial rate of hydrolysis of (II) by (I) was investigated. Inhibitions by mono- and di-saccharides and by glycerol are believed to be due to a disturbance of effective H_2O concn. Higher polysaccharides were less effective inhibitors. Asparagine, aspartic acid, and glutamic acid caused a definite, cysteine a less

marked, activation; other NH_2-acids were ineffective. Emulsified triacetin, tributyrin, and triolein, fresh ox-bile, and bile salts were inhibitory. Indicators and dyes inhibitory towards fumarase and urease had no effect. $CaCl_2$, NaCN, $K_4Fe(CN)_6$, and $K_3Fe(CN)_6$ had an activating effect. Heavy metals were without effect, so that CN′ activation cannot be due to their removal. E. A. H. R.

Trypsinogen, enterokinase, and trypsin system. Assay methods for trypsinogen and enterokinase. R. W. BATES and F. C. KOCH (J. Biol. Chem., 1935, **111**, 197—215).—Simple methods are described for the prep. of trypsinogen (I) free from trypsin and enterokinase (II), and for the accurate assay of (II). (I) is more stable at p_H 2·5 than at 6·0, and it can be stabilised in neutral solution by 0·05N-KCl. Activation of (I) by (II) occurs in the presence of substrate at p_H 8·2. (II) is rapidly destroyed at p_H vals. of 2·5 and 11·7. The results of a comparative study are not in agreement with the additive compound theory, and it is concluded that (II) acts as an enzyme in the activation of (I). J. N. A.

Proteolytic enzyme content of latex from the fig tree (*Ficus carica*, L.). Seasonal variation. B. H. ROBBINS (Proc. Soc. Exp. Biol. Med., 1935, **32**, 892—893).—The enzyme content shows seasonal variations, being min. in early summer and max. in early winter. R. N. C.

Proteolytic enzyme in the latex from the fig tree (*Ficus glabrata*). p_H of optimal activity. B. H. ROBBINS (Proc. Soc. Exp. Biol. Med., 1935, **32**, 894—896).—The optimum p_H for the enzymic hydrolysis of ficin-gelatin is 5. R. N. C.

Arginase in skeletal muscle. G. KLEIN and W. ZIESE (Z. physiol. Chem., 1935, **235**, 246—248).—An inactive form (activated by 0·005M-$MnSO_4$, but not by $FeSO_4$) of arginase occurs in muscle (calf, ox, horse, wether, rat). In rat-muscle, which contains much more arginase than does the muscle of other animals, the content in hot is much < in cold weather. W. McC.

Enzymes in ontogenesis (*Orthoptera*). I. Tyrosinase. J. H. BODINE and E. J. BOELL (J. Cell. Comp. Physiol., 1935, **6**, 263—275).—Tyrosinase (I) activity increases in the grasshopper egg for the first 20 days of development at 25°, afterwards remaining approx. const. until hatching. (I) is confined to the yolk and serosa cells until these are engulfed in the embryo, when it is transferred to the embryonic cells. R. N. C.

Phosphatase in heterotopic bone formation following transplantation of bladder mucosa. E. M. REGEN and W. E. WILKINS (J. Lab. Clin. Med., 1934, **20**, 250—252).—Bone formation around transplants in the sheath of the rectus abdominus muscle in dogs was accompanied by increased phosphatase activity of the implanted tissue. CH. ABS. (*p*)

Course of phosphatase activity in healing of fractured bone. W. E. WILKINS and E. M. REGEN (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1373—1376).—Fracture in the adult rabbit bone is followed by a

rapid rise in phosphatase activity at the site of the injury, which reaches a max. at the 22nd day and then falls gradually as healing proceeds.   R. N. C.

Influence of sodium thioglycollate on the glycolytic enzyme system of muscle extract. L. MICHAELIS and C. V. SMYTHE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 825—827).—The positive manometric pressure developed by addition of $SH \cdot CH_2 \cdot CO_2H$ (I) to inactivated muscle extract is not accompanied by formation of lactic acid, and is due to (I) itself. There is therefore no evidence that (I) regenerates the inactivated enzyme system.   R. N. C.

Activated transformation of phosphate during glycolysis. H. VON EULER and R. VESTIN (Svensk Kem. Tidskr., 1935, **47**, 231).—Thermally inactivated solutions of cozymase which do not effect alcoholic fermentation accelerate the phosphorylation and the production of lactic acid using muscle extract.
E. P.

Enzymic reactions with synthetic phospho-pyruvic acid (enolised phosphopyruvic acid). O. MEYERHOF and W. KIESSLING (Biochem. Z., 1935, **280**, 99—109).—The velocity and course of fermentation of synthetic phosphopyruvic acid (I) are identical with those of natural (I). Both acids ferment completely and the acid must have a symmetrical structure. A method is described for the partial separation of the enolase which converts (I) into 2-phosphoglyceric acid (II) from the phosphoglyceromutase which converts 3-phosphoglyceric acid into (II). By addition of AsO_4''', the velocity of fermentation of natural and synthetic (I) can be increased to that of hexosediphosphoric acid. AsO_4''' has a similar action in the degradation of (I) with formation of lactic acid in muscle extract.   P. W. C.

Separation of "enolase" and "phospho-glyceromutase." R. AKANO (Biochem. Z., 1935, **280**, 110—113).—Owing to the extreme sensitivity or small amount of phosphoglyceromutase, it is possible by adsorption on various adsorbents, especially animal charcoal, to separate from dialysed yeast maceration extract an enzymic prep. containing chiefly enolase, by use of which the equilibrium 2-phosphoglyceric acid ⇌ phosphopyruvic acid can be attained without any considerable displacement by the equilibrium 2- ⇌ 3-phosphoglyceric acid.
P. W. C.

Adenosinetriphosphoric acid in living yeast. H. VON EULER, E. ADLER, and M. PÉTURSSON (Svensk Kem. Tidskr., 1935, **47**, 249—251).—A prep. obtained from fresh top yeast is identical with adenosinetriphosphoric acid from muscle. Possibly the co-enzyme has the same action in the yeast as in the muscle, or is itself the phosphate carrier.   E. P.

Preparation of $d(—)$-3-phosphoglyceric acid. A. VERCELLONE and C. NEUBERG (Biochem. Z., 1935, **280**, 161—162).—Details are given for increasing the yield of this acid in fermentations of hexose diphosphate by increasing the amount of yeast used and for its separation as the cryst. Ba salt by pptn. with EtOH.   P. W. C.

Phosphorylation with living yeast. C. NEUBERG (Biochem. Z., 1935, **280**, 163—166).—Fructose monophosphate in presence of muscle-adenylic acid is converted by yeast into hexose diphosphate (and adenylpyrophosphate).   P. W. C.

Fermentation of trioses by yeasts. C. NEUBERG and E. HOFMANN (Biochem. Z., 1935, **280**, 167—172). —A detailed account of the work, the results of which have been already described (this vol., 1164).
P. W. C.

***Saccharomyces pêka*, nov. sp.** Y. TAKEDA (J. Agric. Chem. Soc. Japan, 1934, **10**, 1280—1282).— The yeast in " pêka " (used in the production of " Beishu ") ferments glucose, maltose, sucrose, raffinose, mannose, fructose, α- and β-methylglucoside, but not galactose, lactose, rhamnose, dextrin, mannitol, inulin, xylose, arabinose, sorbitol, or dulcitol. Optimum conditions for growth and fermentation, respectively, are 33° and 33—35°, p_H 4·0—5·5 and 5·0—6·3.   CH. ABS. (p)

Hydrogenation of unsaturated ketones by fermenting yeast.—See this vol., 1367.

Haplophase and diplophase in *Saccharomycetes*. Ö. WINGE (Compt. rend. Trav. Lab. Carlsberg, 1935, **21**, No. 4, 77—112).—A discussion of the facultative alternation of haploid and diploid generations in yeasts.   E. A. H. R.

Amino-acid content of wheat-flour dough. L. W. SAMUEL (Biochem. J., 1935, **29**, 2331—2333).— The NH_2-acid content of flour dough increases with time; in dough to which yeast has been added it increases to a limit and then decreases. In a solution containing glutamic acid, sugar, salt, and yeast at p_H 5·9 and 29° the NH_2-acid content decreases slowly, so that in dough the degradation of proteins by yeast is not very important.   H. D.

Inhibitor of fermentation in yeast. H. VON EULER, E. ADLER, and G. DAHLGREN (Z. physiol. Chem., 1935, **236**, 119—130).—The inhibitor occurs in top, and to a smaller extent in bottom, yeast, but not in yeast maceration juice. It is thermolabile and non-dialysable (high mol. wt.) and is purified by pptn. with EtOH, removal of impurities by dialysis, adsorption on $Al(OH)_3$, and elution with aq. Na_2HPO_4. In proportion to its concn. it delays the onset and diminishes the extent of fermentation. KCN does not affect it. Probably its action is reversible (added cozymase ∝ its amount diminishes the action), and it does not destroy any of the components of the fermentation system. It seems not to be a dehydrogenase or protease, nor to affect glycolysis in muscle extract or other processes of carbohydrate degradation.   W. McC.

Influence of saponin and other poisons on yeast. W. SCHWARTZ and H. KRETZDORN (Biochem. Z., 1935, **280**, 72—87).—The acceleration of fermentation by saponin (I) is accompanied by considerable injury of the cell, but the injury occurs only in presence of fermentable sugar. Similarly injury by NaCl and KNO_3 occurs only during fermentation. This difference between the effect on resting and fermenting cells indicates that the action of (I) is not solely on the permeability of the cells.   P. W. C.

Iron in the sea and in marine plankton.—See this vol., 1343.

Effect of skim-milk, lactose, vinegar, and iodine on the quantitative character of a coccidian infection. E. R. BECKER and N. F. MOREHOUSE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1030—1031).—The numerical increase of the coccidian content of the alimentary tract of the rat is not restrained by skim-milk or lactose in the diet, or I or vinegar in the drinking-H_2O.   R. N. C.

Metabolism of protozoa. II. Biochemical reactions in the presence of washed cells of *Glaucoma pyriformis*. N. R. LAWRIE (Biochem. J., 1935, **29**, 2297—2302).—A suspension of *G. pyriformis* can bring about the proteolysis of caseinogen over a wide range of p_H with an optimum at p_H 6·0, but ovalbumin is only slightly affected. Diastase, succinic dehydrogenase, a thermolabile peroxidase, and (probably) glutathione are also present in the protozoon.   E. A. H. R.

Effect of low temperature on trypanosomes (*Trypanosoma equiperdum*) in mammals. N. KALABUCHOV and L. LEVINSON (Nature, 1935, **136**, 553).—When bats infected with *T. equiperdum* are kept at 3° or 10° for 3—8 days the micro-organisms disappear from the blood and the animals recover. At room temp., infected animals die within 9 to 13 days.   L. S. T.

Diastatic activity of *Aspergillus*. N. S. WEI and K. S. CHIN (Science [China], 1934, **18**, 1193—1198).—Of 10 species examined *A. oryzæ* had the greatest activity.   CH. ABS. (*p*)

Effect of ammonium chloride on the growth and production of acid by *Aspergillus niger*. E. L. FULMER, L. M. CHRISTENSEN, and H. SCHOPMEYER (J. Amer. Chem. Soc., 1935, **57**, 1537—1538).—NH_4Cl is an excellent sole source of N for the growth of and production of acid by *A. niger*. On a medium containing sucrose 12·5, $MgSO_4,7H_2O$ 0·08, $FeSO_4,7H_2O$ 0·01, $ZnSO_4$ 0·01, and KH_2PO_4 0·125% at p_H 3 and 30°, max. production of acid occurs with 0·188% of NH_4Cl (the calc. first optimum for the growth of yeast and the concn. which produces min. hydration of wheat-gluten), but the optimum for formation of mycelium is with 0·275—0·5% of NH_4Cl.   R. S. C.

Effect of rice-bran extract on growth of organisms from several genera. A. J. SALLE and R. W. DUNN (Proc. Soc. Exp. Biol. Med., 1935, **32**, 939—942).—Carbohydrate-fermenting organisms are stimulated by EtOH extract of rice-bran, irrespective of species, whilst non-carbohydrate-fermenting organisms are unaffected. The stimulating agent is therefore related to the carbohydrates, and is probably pantothenic acid (cf. this vol., 408).   R. N. C.

Enzyme formation and polysaccharide synthesis by bacteria. E. A. COOPER and J. F. PRESTON (Biochem. J., 1935, **29**, 2267—2277).—Mannose and arabinose inhibit polysaccharide (I) formation from sucrose by *B. mesentericus*, *B. megaterium*, and *Ps. pruni*, and also by *Ac. xylinum* from sorbitol; the action is probably due to a toxic effect on the cell, and not to an interference with enzyme action. Glycerol, mannitol, and sorbitol diminish the di-

astatic power of *B. megaterium*, due probably to a depression in the rate of formation of the enzyme in the cell. *B. megaterium* and *Ac. xylinum* do not synthesise (I) from fatty acids. Peptone is not essential for (I) formation by *B. megaterium*, *Ps. pruni*, and *B. syringæ*, and can be replaced by asparagine as sole source of N. Bacteria pathogenic to plants synthesise (I) from sucrose; these are of the fructosan type, and no evidence has been obtained of the formation of dextrans or pentosans. Spore-forming organisms related to *B. mesentericus* also form similar products.   J. N. A.

Reducing intensity of luminous bacteria in presence of agents affecting oxidations. I. M. KORR (J. Cell. Comp. Physiol., 1935, **6**, 181—216).—The limiting reduction E_h of *Achromobacter fischeri* suspensions in beef-peptone broth at p_H 7·6 and 24—28° is $-0·214 \pm 0·003$ volt. Heat treatment of the cultures lowers respiration without affecting reducing intensity, unless the cultures are injured by high temp. Reducing intensity is not affected by urethanes, except when in sufficient concn. to cause cytolysis. It is unaffected by P_2O_7'''', KF, KCN, or $CH_2Cl·CO_2H$, but is lowered by AsO_3''', $CH_2Br·CO_2H$, and $CH_2I·CO_2H$. Rate of E_h change is slackened by most of these agents.   R. N. C.

Survival and rate of death of intestinal bacteria in sea-water. P. J. BEARD and N. F. MEADOWCROFT (Amer. J. Publ. Health, 1935, **25**, 1023—1026).—Data are given for the rates of death of *Eberthella typhosa* and *Escherichia coli* in polluted sea-H_2O. The latter is resistant enough to serve as an indicator of pollution.   E. A. H. R.

Chemistry and pharmacology of fermented foodstuffs. IV. W. KEIL and F. PÖRTNER (Biochem. Z., 1935, **280**, 61—64).—The ability to produce acetylcholine (I) appears to be characteristic of the strain of organisms (probably identical with Henneberg's *B. cucumeris fermentati*) which was isolated by the authors from cabbage and cucumber fermentations (this vol., 529). (I) can be isolated in the pure state from maize–sunflower silage.   P. W. C.

Voges–Proskauer reaction. S. S. EPSTEIN and M. LEVINE (Proc. Iowa Acad Sci., 1933, **40**, 80; cf. A., 1934, 698).—Methods of procedure are examined. The creatine–KOH reagent may be stored for 3 weeks at room temp. or 6 weeks in ice. When the reaction with 10% KOH was weak, special reagents were advantageous in accelerating colour production, *e.g.*, creatinine (I), $FeCl_3$, or $Cu–NH_3–NaOH$. Best results were given by (I) in 40% KOH. CH. ABS. (*p*)

Colloidal culture media for bacteria. N. N. KLODNIZKY (Ann. Inst. Pasteur, 1935, **55**, 486—490).—Anaërobic bacteria can be cultivated in the presence of O_2 if the medium is a colloidal solution. This is achieved by adding 0·1% of agar to a bouillon. Most of the ordinary pathogenic bacteria can also grow in this medium, giving typical cultures often different from those obtained in ordinary bouillon.   E. A. H. R.

Culture medium for the production of diphtheria toxin. E. M. TAYLOR (Ann. Inst. Pasteur,

1935, **55**, 474—485; see this vol., 1003).—The prep. of a bouillon containing only a peptic digest of pig's stomach and 2% of maltose is described. It is best sterilised by passing through a Seitz filter at 32—33°. The highest yields of toxin are obtained with a surface area of 1·2 sq. cm. per c.c. The CH_2O-detoxicated substance retains its efficiency as an immunising agent.   E. A. H. R.

Modified technique for detection of the *Escheri-chia–Aerobacter* group in milk. A. MOLDAVAN (Amer. J. Publ. Health, 1935, **25**, 1032—1033).— An agar plug is introduced immediately above the inoculated medium. Gross contamination can be detected within 8 hr.   E. A. H. R.

Influence of ultra-violet rays on the physiological activity of *Azotobacter*. III. Effect of ultra-violet and monochromatic rays on pigment production. A. ITANO and A. MATSUURA (J. Agric. Chem. Soc. Tokyo, 1935, **11**, 564—573).—A short exposure to ultra-violet light stimulates pigment production, the optimum being 10 min. As in the case of growth, black, red, and green rays have more effect than violet and orange.   P. G. M.

Nitrous products in cultures of *Azotobacter chroöcoccum* and its relation to other soil micro-organisms. D. M. NOVOGRUDSKI (Microbiol. U.S.S.R., 1933, **2**, 237—250; cf. B., 1932, 200).— *B. denitrofluorescens*, *B. mycoides*, and *B. mesentericus* which require fixed N for growth, developed on N-free media if cultivated with *A. chroöcoccum*. Bacteria for which protein is the only possible source of N (*B. mycoides*, *B. subtilis*) were able to reproduce only on old cultures of *A. chroöcoccum*. Bacteria capable of utilising protein, NH_2-acids, or NH_3 grew in both young and old cultures of *A. chroöcoccum*. Production of NH_3 by this organism in the early stages, and of protein after cessation of N fixation, cannot be demonstrated analytically. The temporary formation of small amounts of these compounds is indicated.   CH. ABS. (p)

Influence of nitrogenous compounds on the respiratory quotient of *Rhizobium*. D. A. ANDERSON and R. H. WALKER (Proc. Iowa Acad. Sci., 1933, **40**, 73—74; cf. A., 1933, 638).—The R.Q. of the cultures was influenced by the form in which N was supplied. In glucose–yeast media vals. were always > 1. The O_2 consumption with yeast extract was > that with any other N source. In glucose media free from N the R.Q.=1; with $NaNO_3$ supplied, vals. were >1 and with NH_4Cl, <1.   CH. ABS. (p)

Acidobacteria in the mouth and their decalcifying action on the teeth. D. ANTONIOTTI (Rev. Odontol., 1932, **22**, 217).—Cultures of *B. acidophilus* utilise Ca salts from teeth to neutralise acids produced during growth.   CH. ABS. (p)

Sugar dissimilation by *Shigella paradysenteriæ*, var. Sonne. H. REYNOLDS, C. S. McCLESKEY, and C. H. WERKMAN (Proc. Iowa Acad. Sci., 1933, **40**, 81—82).—Changes in sugar consumption, acidity, and population associated with the growth of the acid and alkaline types of the organism are examined, together with the effect of aeration.
                                        CH. ABS. (p)

Micro-organism which decomposes the specific carbohydrate of *Pneumococcus* type VIII. G. M. SICKLES and M. SHAW (Proc. Soc. Exp. Biol. Med., 1935, **32**, 857—858).—A variety of *B. palustris* that decomposes the sp. carbohydrate of *Pneumococcus* type VIII has been isolated from uncultivated soil. It does not attack the types I, II, and III carbohydrates. The sol. enzyme is conc. by ultrafiltration and protects mice against heavy doses of the *Pneumococcus*.   R. N. C.

Type II *Pneumococcus* specific precipitate. H. O. CALVERY (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1099—1100).—Analytical vals. for two samples of the ppt. are given.   R. N. C.

Decomposition of the group-*A* substance in horse saliva by a myxobacterium. K. LANDSTEINER and M. W. CHASE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 713—714).—The group-*A* substance is decomposed by Morgan and Thaysen's bacterial-polysaccharide-destroying *Myxococcus* (cf. A., 1933, 1207), but not by other types of organisms, which tends to support the view that it is a carbohydrate.
                                        R. N. C.

Decomposition of the group-*A* substances. K. LANDSTEINER and M. W. CHASE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1208).—The group-*A* substance in horse saliva is destroyed by the polysaccharide-fermenting organism, *Saccharobacterium ovale*.
                                        R. N. C.

Properties of viantigen of *Eberthella typhi*. A. FELIX, S. S. BHATNAGAR, and R. M. PITT (Brit. J. Exp. Path., 1934, **15**, 346—354).—Detection, and conditions of production, of the viantigen together with its thermal stability are examined. Use of formolised extracts in the prep. of antiserum is recommended.   CH. ABS. (p)

Antigenic differences between related bacterial strains : criticism of the mosaic hypothesis. F. M. BURNET (Brit. J. Exp. Path., 1934, **15**, 354—359).—A Flexner dysentery bacillus is composed of immunologically similar antigen mols. CH. ABS. (p)

Horse-sickness. II. Nature of the immunising agents in formolised virus. G. G. KIND (J. S. African Vet. Med. Assoc., 1934, **5**, 25—28).—The anatoxin in a formolised virus from spleen pulp was light-sensitive, and destroyed by $Na_2C_2O_4$ or by media made alkaline with NH_3. The virus was attenuated by exposure to CH_2O but not by $(CH_2)_6N_4$.
                                        CH. ABS. (p)

Nature of ultra-viruses. C. ACQUA (Atti R. Accad. Lincei, 1935, [vi], **21**, 593—599).—Filterable viruses are considered to be ultra-viruses with autocatalytic action, and not living organisms. T. H. P.

Stimulatory action of disinfectants. H. KÜHL (Pharm. Ztg., 1935, **80**, 1010—1011).—Inhibition of growth by dil. bactericidal preps. varies with the type of bacteria. With basic Al acetate solution (the antiseptic action of which decreases with age) and a virulent strain of *B. coli*, stimulatory, null, and inhibitory actions are shown by approx. concns. of 0·01—0·05, 0·10, and 0·2—0·5%, respectively. The growth of *Penicillium glaucum* in milk is stimulated by 0·0002% of CH_2O. The stimulation is exempli-

fied by the growth of various moulds on rye bread treated with $C_6H_4Cl\cdot CO_2H$–BzOH. F. O. H.

Comparison of the resistance of bacteria and embryonic tissue to germicidal substances. I. Merthiolate. II. Metaphen. III. Mercurochrome. IV. Hexylresorcinol. A. J. Salle and A. S. Lazarus (Proc. Soc. Exp. Biol. Med., 1935, **32**, 665—667, 937—938, 1057—1060, 1119—1120).—I. The toxicity index for merthiolate (I) is > for PhOH. II. The toxicity indices of metaphen (II) and PhOH are of the same order as applied to tissue cultures. (II) has a high PhOH coeff. in respect to its effect on *Staph. aureus.* III. Mercurochrome has a low PhOH coeff., and a high toxicity index compared with PhOH, and is poorer as a germicide than (I) or (II). IV. The toxicity index of hexylresorcinol is low and the PhOH coeff. high; it is the most efficient of the germicides tested. R. N. C.

Bactericidal action of ketonurine. A. E. Osterberg and H. F. Helmholtz (J. Amer. Med. Assoc., 1934, **102**, 1831—1832).—Ketonurine having p_H ≯ 5·5 and ≮ 0·5% of β-hydroxybutyric acid (I) is bactericidal toward urinary strains of *Es. coli.* The p_H is conveniently ascertained by chlorophenol-red paper. A fairly const. ratio (1 : 5) exists between $COMe_2 + CH_2Ac\cdot CO_2H$ and (I). By use of the nitroprusside test for $COMe_2 + CH_2Ac\cdot CO_2H$, the amount of (I) may be calc. Ch. Abs. (p)

Continuous oligodynamic action of elements on bacteria. Y. Seuderling (Duodecim., 1933, **A**, **16**, No. 8, 1).—In agar-culture tests with 40 species of bacteria Be and Al proved inactive. The effect of Ag, Cu, and Au decreased in the order named. With Cd and Hg and also with As, Sb, and Bi the inhibitory action decreased with increasing at. wt. Te produced a large effective zone free from bacteria. Co had slightly greater activity than elements of group I. The life of the bacteria was shorter as the effective zone increased and was affected most by Cd, Hg, As, and Sb and least by Au and Bi. Ch. Abs. (p)

Action of human blood on the meningococcus. N. Silverthorne and D. T. Fraser (Brit. J. Exp. Path., 1934, **15**, 362—366).—Most adult blood samples were bactericidal. Samples from infants were more often non-bactericidal. Cases are recorded of infants with meningitis in which the blood, initially non-bactericidal, became active 2 weeks after administration of serum. Ch. Abs. (p)

Unsaturated ethers of pyrogallol.—See this vol., 1362.

Germicidal properties and mercuration of alkylresorcinolcarboxylic acids.—See this vol., 1364.

Sulphide analogues of azo-dyes having bactericidal properties.—See this vol., 1360.

Effect of desiccated thyroid, 2 : 4-dinitrophenol, and cortical hormone extract on the vitamin-*C* content of some organs of the guinea-pig fed graded doses of ascorbic acid. J. L. Svirbely (J. Biol. Chem., 1935, **111**, 147—154).—Cortical hormone extract or 2 : 4-dinitrophenol (I)

has no influence on the survival period of guinea-pigs on a scorbutic diet. The condition of guinea-pigs on a diet including 0·5% of desiccated thyroid is improved by the addition of large amounts of ascorbic acid (II) (5—10 mg. *per diem*). The (II) content of the organs depends on the amount fed; it is diminished when (I) or desiccated thyroid, which increase the metabolic rate, is given. F. A. A.

Potential action of acetylcholine. H. Gremels and F. Zinnitz (Arch. exp. Path. Pharm., 1935, **179**, 229—233).—Continuous injection of acetylcholine (I) (≮ 0·5 × 10⁻⁶ g. per min.) into cats produces a correspondingly continued depression of blood-pressure, the max. effect being equal to that produced by single dosage. The data indicate a " potential " action similar to that of adrenaline and confirm the hormonal character of (I). F. O. H.

Effect of eserine and acetylcholine on gastrointestinal motility in normal dogs. R. Frank, L. Zimmerman, and H. Necheles (Proc. Soc. Exp. Biol. Med., 1935, **32**, 686—689).—Eserine combined with small quantities of acetylcholine produces peristalsis in doses in which it is ineffective *per se.* R. N. C.

Action of acetyl-β-methylcholine on ventricular rhythms induced by adrenaline. M. H. Nathanson (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1297—1299).—Acetyl-β-methylcholine neutralises the effect of adrenaline on the human ventricle. R. N. C.

Adrenal insufficiency in the marmot and opossum, and theories of cortico-adrenal function. S. W. Britton and H. Silvette (Science, 1935, **82**, 230—232).—After adrenalectomy the serum-Na and -Cl of the marmot and opossum show a definite increase, the NaCl content of the muscles appears to be increased, and the muscle-H_2O % is markedly reduced. The animals die from carbohydrate insufficiency and not from NaCl disturbance. The results oppose the theory that NaCl metabolism is regulated by the adrenal cortex and support the carbohydrate theory of cortico-adrenal function (A., 1934, 1144). L. S. T.

Extracellular and intracellular water loss during suprarenal insufficiency in the dog. G. A. Harrop, W. M. Nicholson, J. L. Soffer, and M. Strauss (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1312—1315).—Adrenal cortex insufficiency induces a diuresis in which Na and Cl excretion are increased, and involves loss of extracellular H_2O. On administration of cortical hormone (I) there occurs a second diuresis in which K, N, and PO_4 are increased, and intracellular H_2O is lost. The action of (I) is to restore and maintain the correct K and Na concns. and osmotic pressure in the plasma. R. N. C.

Mortality of adrenalectomised young rats, with improved technique of operation, and after a period of treatment with cortical hormone. P. Schultzer (J. Physiol., 1935, **84**, 70—82).—With the improved technique of operation the mortality rate is 100%. Daily injections of cortical hormone prolong life indefinitely. R. N. C.

5 b*

Chemical principles of the Viale reaction. M. HESS (Diagnostica tec. lab. [Napoli], Riv. mens., 1934, **5**, 655—666).—Viale's test is not sp. for adrenaline and cannot serve for its determination in blood or urine. Human blood usually gives a negative reaction. The brownish colour sometimes observed is probably due to tyrosine and tryptophan. A positive reaction in urine is due to phenols (cf. A., 1933, 1210). CH. ABS. (p)

Influence of the oxidation–reduction system on adrenaline action. II. K. TERAI (Folia Pharmacol. Japon., 1934, **19**, 248—258; cf. this vol., 1172). —The effects of adrenaline on the pupil of the frog's eye and on blood pressure and blood-sugar in rabbits are removed by benzoquinone and caused to reappear by quinol. CH. ABS. (p)

Pharmacodynamics of the autonomic nervous system in schizophrenia. I. Effect of intravenous injections of adrenaline on blood pressure and pulse rate. H. FREEMAN and H. T. CARMICHAEL (Arch. Neurol. Psychiatry, 1935, **33**, 342—352). CH. ABS. (p)

Effect of trauma on healthy vigorous dogs with or without adrenal glands. W. W. SWINGLE and W. M. PARKINS (Amer. J. Physiol., 1935, **111**, 426—439).—Adrenalectomised dogs develop profound and fatal shock following a degree of trauma < that required for normal dogs. Hence the adrenal of the normal animal contains sufficient reserve cortical hormone (I) to prevent shock following trauma. Injection of (I) in adrenalectomised animals prevents shock following slight trauma, and also rapidly restores animals suffering from shock. R. N. C.

Histamine content of the lungs. I. SIBUL (Pflüger's Archiv, 1935, **235**, 742—755).—Perfusion of the lungs of the cat with histamine-free blood does not result in the appearance of histamine (I) in the perfusate. If (I) is added to the blood *in vitro* the effect on the isolated guinea-pig uterus decreases after some hr. (I) introduced into the lung circulation disappears at the rate of 0·3 mg. in 1½ hr.; it induces contraction of the lung vessels, particularly on the venous side. R. N. C.

Insulin hypoglycæmia. W. DAMESHEK, A. MYERSON, and C. STEPHENSON (Arch. Neurol. Psychiatry, 1935, **33**, 1—18).—Changes in glucose and O_2 in vessels supplying the brain and arm are compared before and after intravenous administration of insulin (I). The glucose taken up by the brain decreased during the hypoglycæmic reaction; that by the arm usually increased. The uptake of O_2 increased with the severity of the (I) reaction, but the lactic acid content decreased. The pressure of the spinal fluid increased early in the reaction, but no sugar appeared in the fluid up to 1·5 hr. Injection of adrenaline immediately after (I) diminished the symptoms. CH. ABS. (p)

Mechanism of the circulatory changes accompanying insulin hypoglycæmia. A. C. ERNSTENE, J. E. F. RISEMAN, B. STERN, and B. ALEXANDER (Amer. J. Physiol., 1935, **111**, 440—445).—The cardiac output in cats with denervated hearts during insulin hypoglycæmia is increased if the adrenals are intact. O_2 consumption is unchanged. The O_2 content of the arterial and mixed venous blood is increased in normal animals and those with denervated hearts, but is decreased if the adrenals are inactivated. The arterio-venous O_2 difference is unchanged in normal animals, decreases if the heart is denervated, and increases if the adrenals are inactivated. R. N. C.

Stimulation of adrenal medulla by irradiated insulin. J. M. LUCK and G. M. RICHMOND (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1056—1057).—Insulin irradiated with soft X-rays causes a reduction of blood-NH_2-acids in normal, but not in adreno-medullated, rabbits. Hence the irradiation does not destroy the ability of insulin to stimulate the adrenal medulla. R. N. C.

Effect of insulin on the glycogen content of livers of polyneuritic animals. C. Y. CHEN (Ann. Res. Counc. Nat. Univ. Peiping [Rept.], Agric. Sci. Ser., 1934, No. 1, 9 pp.).—Injection of insulin lowers the liver-glycogen in pigeons. Vals. for control birds receiving yeast were the same as for those receiving vitamin-B_1 only. CH. ABS. (p)

Nature of the action of insulin. V. VENDÉG (Pflüger's Archiv, 1935, **235**, 674—699).—Insulin (I) accelerates glycogen (II) deposition in the liver of the dog at high blood-glucose (III) vals., and (II) breakdown with normal or low (III). Both effects ∝ the quantity of (I) given. The (II) content of the liver also affects the action of (I); (II) deposition is more rapid, or breakdown slower, in a (II)-poor liver. The disappearance of much (III) indicates that (I) also increases (III) oxidation. (I) accelerates (II) deposition in muscle in hypoglycæmia; (II) breakdown in hypoglycæmia is less marked than in liver, deposition occasionally occurring. Glucose infusion in freshly depancreatised animals causes deposition of the same amount of (II) in the liver as in fasting normal animals, if the initial (II) val. is low. R. N. C.

Action of benzylcarbonyl chloride on insulin and other proteins. W. E. GAUNT, G. HIGGINS, and A. WORMALL (Nature, 1935, **136**, 438—439).—$CH_2Ph·O·COCl$ (I) readily inactivates insulin (II), and the loss of hypoglycæmic power by (II) is probably due to the blocking of the free NH_2-groups. (I) also reacts smoothly with native proteins at approx. p_H 8 and 5°, with marked diminution in the free NH_2-N of the protein; in many cases, the product, carbobenzyloxy-protein, contains practically no free NH_2-N. On injection into rabbits, the carbobenzyloxy-derivative of serum-globulin produces antibodies which, from precipitin and inhibition tests, appear to be sp. for the new grouping, the carbobenzyloxy-NH_2-acid group, in the protein. L. S. T.

Action of the melanophore hormone on pigment migration and pupil width of the frog's eye. A. JORES and K. G. CAESAR (Pflüger's Archiv, 1935, **235**, 724—732).—The melanophore hormone is generally ineffective in the frog's eye in the light, but in the dark the pupil pigments are deepened. Hypophysectomy has no effect; the hormone can still be detected in the mid-brain. Irritation of the pituitary darkens the retina pigments. The eye-ball is unaffected; the pupil is widened. R. N. C.

Mechanism of parathyroid hormone action. J. B. Collip, L. I. Pugsley, H. Selye, and D. L. Thomson (Brit. J. Exp. Path., 1934, **15**, 335—336).— The characteristic effect of the parathyroid on the bones of rats cannot be ascribed to an action of the hormone on the renal threshold for PO_4'''. It is doubtful whether ergosterol acts merely by stimulating production of the parathyroid hormone.

Ch. Abs. (*p*)

Influence of parathormone on the neuro-muscular system : an experimental analysis. E. Gellhorn (Amer. J. Physiol., 1935, **111**, 466—476).—Perfusion of frog muscle with Ringer's solution containing parathormone (I) increases the height of contraction to a degree $\propto$ the concn. of the (I) solution ; the effect is reversible. Inactivation of (I) by boiling with 10% HCl or EtOH destroys the effect. The action of (I) is abolished by curare, Ca-deficiency, and degeneration of the nerve-endings, showing that it acts on the neuro-muscular junction. Sr can partly replace Ca. The effect of Ca on the muscle is increased by subliminal concns. of (I), but this synergism is absent in the heart. (I) does not enhance the decrease in imbibition caused by $CaCl_2$. R. N. C.

Possible inter-relationship between the physiological actions of the parathyroid glands and vitamin-*D*. J. H. Jones (J. Biol. Chem., 1935, **111**, 155—161).—A suitable diet $+ 0.75\%$ $BeCO_3$ produces Be-rickets in young pups ; this condition is not prevented by ultra-violet irradiation or cod-liver oil. Large doses of parathyroid extract (I) do not raise the serum-Ca, but large doses of irradiated ergosterol (II) produce marked hypercalcæmia and toxic symptoms. Hence the failure of rachitic animals to respond to (I) is not due to lack of vitamin-*D*, or the toxicity of (II) to stimulation of the parathyroid glands. F. A. A.

Iodine metabolism and thyroid activity. I. Bónis (Orvosi Hetilap, 1935, **79**, 99—100).—No consistent relationship was found. Ch. Abs. (*p*)

Hormonic symptomatology of the thyroid : to what extent is it explicable on the basis of altered metabolic rate ? J. H. Means and J. Lerman (Endocrinol., 1935, **19**, 181—186).—The symptoms of abnormal thyroidism attributable to change of heat production are connected with sweating, skin temp., and body-wt. The remaining symptoms are due to other physiological actions of thyroxine. R. N. C.

Proliferative activity of the thyroid gland of the female guinea-pig during the sexual cycle. K. S. Chouke, H. Friedman, and L. Loeb (Anat. Rec., 1935, **63**, 131—137).—The mitotic activity of the thyroid is low in the follicular and high in the lutein phase of the cycle. R. N. C.

Anti-thyrotoxic action of ascorbic acid. V. Demole and F. Ippen (Z. physiol. Chem., 1935, **235**, 226—232).—In guinea-pigs the fatal toxic action of subcutaneously administered thyroxine (I) is counteracted by giving approx. proportionate doses of ascorbic acid (II). The (II) content of the liver and adrenals is greatly reduced by giving (I). W. McC.

Effect of hypothyroidism on antidiuretic action of pressor principle of posterior pituitary. B. Stern and D. R. Gilligan (Proc. Soc. Exp. Biol. Med., 1935, **32**, 843—846).—The antidiuretic effect of pitressin injected subcutaneously is the same in normal and thyroid-deficient patients. R. N. C.

Relation of blood volume to certain glands of internal secretion. Effect of thyroid and gonad ablation. M. Friedlander, N. Laskey, and S. Silbert (Endocrinol., 1935, **19**, 342—346).—Thyroidectomy (cat, man) lowers blood vol. in males, but does not affect either blood vol. or chemistry in females. Blood vol. is reduced by bilateral ovariectomy, but not by orchidectomy. R. N. C.

Effect of iodine and desiccated thyroid on the anterior pituitary of goitrous and thyroidectomised rabbits. D. Marine, S. H. Rosen, and C. Spark (Proc. Soc. Exp. Biol. Med., 1935, **32**, 803—810).—KI restores the hypertrophic pituitary to normal in parenchymatous goitre, but not after thyroidectomy, whereas desiccated thyroid restores it to normal in both cases. Hence I is effective only in the form of thyroxine. R. N. C.

Cytological responses of rat thyroid to treatment with anterior pituitary and potassium iodide. A. C. Halpern (Proc. Soc. Exp. Biol. Med., 1935, **32**, 854—857).—Anterior pituitary and KI both stimulate mitosis in the rat thyroid. Mitochondria tend to become granular. KI does not affect the Golgi material, but pituitary tends to draw it out of the follicle cells into the intercellular regions. R. N. C.

Basal metabolism and the thyrotropic hormone of the anterior pituitary. F. Zajíc (Pflüger's Archiv, 1935, **235**, 575—581).—The thyrotropic hormone influences basal metabolism in the dog exclusively through the thyroid. The presence of thyroid hormone in not sufficient to allow its action to occur. The R.Q. is unaltered ; the increases of pulse and temp. and the fall of body-wt. are parallel with the rise of basal metabolism. The absence of the effect in thyroidectomised animals is hence an indication of complete thyroidectomy. (Cf. this vol., 541.) R. N. C.

Hormone affecting metabolism and substance stimulating insulin production of the anterior pituitary. O. Steppuhn (Wien. Arch. inn. Med., 1934, **26**, 87—100).—The anterior pituitary produces a hormone which very rapidly mobilises depôt fat, causes hyperlipæmia and acetonæmia, and reduces liver-glycogen. Associated with the hormone there is a substance which stimulates insulin production and counteracts the effect of the fat-mobilising hormone. Nutr. Abs. (*m*)

Action of anterior pituitary extract and its effect on blood-sugar. K. Venkatachalam and A. N. Ratnagiriswaran (Indian J. Med. Res., 1935, **22**, 425—431).—Anterior pituitary extract depresses blood-pressure in cats and raises blood-sugar to nearly double the normal val. This increase is enhanced by atropine or vagal section, both of which also increase blood-pressure *per se*. Blood-sugar is reduced by gonad extract (II), which neutralises the effect of (I), this effect being inhibited by atropine or vagal section. (II) sensitises, and (I) desensitises,

the vagal centre to electric stimulation; the hyperglycæmic action of (I) is the result of this action, which is possibly due to thyroid stimulation. R. N. C.

Glutathione concentration of livers and muscles of rats following injection of pituitary growthhormone. H. Goss and P. W. Gregory (Proc. Soc. Exp. Biol. Med., 1932, **32**, 681—683).—A single injection of growth-hormone (I) in normal or spayed female rats reduces liver- and muscle-glutathione (II) considerably. (II) appears to be raised before or after injection by feeding. A series of 5 daily doses of (I) restores liver-(II) to normal, and increases muscle-(II) to vals. > normal. R. N. C.

Physiological effects of pituitary growth-hormone : growth and efficiency of food utilisation. H. W. Nilson, L. S. Palmer, and C. Kennedy (Amer. J. Physiol., 1935, **111**, 341—351).—The hormone promotes growth and increases the efficiency of dry matter utilisation, but does not increase the relative H_2O consumption. R. N. C.

Pituitary hormones and the blood-sugar level. M. C. Hrubetz (Proc. Soc. Exp. Biol. Med., 1935, **32**, 842—843).—Blood-sugar in rats is unaffected by antuitrin-*S* or -*G*, theelin, or growth-hormone. R. N. C.

Chemistry of oxytocin (the oxytocic hormone of the pituitary gland). IV. Action of nitric and nitrous acids and sulphur dioxide : extraction with pyridine, ethyl alcohol, chloroform, and acetone. N. Das and B. C. Guha (Indian J. Med. Res., 1935, **22**, 517—520).—Oxytocin is inactivated to 50—60% by SO_2, to 75% by conc. HCl, to 85—90% by HNO_2 in presence of AcOH, and completely by HNO_3 and by HNO_2 in presence of HCl; it is unaffected by AcOH alone. It is not dissolved or inactivated by C_5H_5N, EtOH, $CHCl_3$, or $COMe_2$. R. N. C.

Oxytocic hormone of the posterior lobe of the pituitary gland. VII. (A) Ultra-violet absorption spectra. J. M. Gulland and N. S. Lucas. **(B) Adsorption and electrodialysis.** M. Freeman, J. M. Gulland, and S. S. Randall (Biochem. J., 1935, **29**, 2208—2220).—(A) There is no correlation between the curves of ultra-violet absorption and the oxytocic activity of posterior lobe extracts; the curves are markedly similar to those of peptides.

(B) Attempts at concn. of the preps. by a no. of adsorbents at different p_H were unsuccessful. The hormone is inactivated by Ac_2O. Electrodialysis of preps. did not effect concn. or separation of the oxytocic and pressor hormones. At $p_H > 8$ the hormone remained in the centre compartment of the cell, whilst at $p_H < 6$ it migrated to the cathode. H. D.

Effects of pituitrin, pitressin, and pitocin on the copper-reducing substances in the serum and urine of dogs. A. R. McIntyre, R. F. Sievers, and H. F. Elias (Endocrinol., 1935, **19**, 298—304).—Injection of pituitrin, pitressin, or pitocin in dogs fasted for 18 hr. increases the Cu-reducing power of the serum; that of the urine varies, and is not related to that of the serum. There is no pro-portional variation in the fermentable and nonfermentable Cu-reducing substances of the urine. R. N. C.

Acquired resistance to the thyroid-stimulating and pseudo-luteinising hormone of cattle anterior pituitary. P. Max, M. M. Schmeckebier, and L. Loeb (Endocrinol., 1935, **19**, 329—341).—Prolonged injections of thyrotropic hormone (I) of the anterior pituitary in guinea-pigs produce stimulation of the thyroid and characteristic ovary changes, followed by retrogression and a return to normal. A second series of injections after a rest produces only a transitory stimulation of the thyroid, and the refractory state develops more rapidly. The effect is considered to be due to formation of neutralising substances, and also to the antagonism between (I) and thyroxine. R. N. C.

Gonad-stimulating activity of pituitary glands from horses of different ages and sex types. A. A. Hellbaum (Anat. Rec., 1935, **63**, 147—157).—The pituitaries of young normal mares and geldings show luteinising activity, those of old mares and geldings and of stallions show follicle-stimulating activity, whilst those of colts and fœtuses show both types of activity; those of pregnant mares vary. R. N. C.

Sex comparison of gonadotropic hormone content of anterior pituitaries from rats before and after puberty. M. McQueen-Williams (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1051—1052).—The gonadotropic hormone content of the female pituitary is > that of the male in young animals. Both fall very suddenly as maturity is approached, but whilst the potency of the female pituitary remains low, that of the male attains its former val. R. N. C.

Anterior pituitary hormone content of the hypothalamus of the dog. G. Pighini (Endocrinol., 1935, **19**, 293—297).—Female rats injected with emulsion of the tuber cinereum tissue from normal dogs show a definite maturation of the ovaries and uterine hypertrophy, similar to that obtained with anterior pituitary hormone (I). Previous injection of the dogs with (I) does not increase the (I) content of the emulsions. R. N. C.

Anterior-pituitary–gonadal inter-relations. W. O. Nelson (Endocrinol., 1935, **19**, 187—198).—The % of basophiles and acidophiles in the male rat anterior pituitary is > in the female, whilst chromophobes are less. Castration of rats injected with œstrin (I) causes a fall of basophiles. The suppressing influence of the gonads on the gonadotropic activity of the pituitary is due to the action of (I) on the secretory cycle of the anterior lobe basophiles. (I) and prolactin control lactation in guinea-pigs. In monkeys (I) abolishes the hyperglycæmia and glycosuria following pancreatectomy. R. N. C.

Age factor in responsiveness to gonadotropic hormones. H. Selye, J. B. Collip, and D. L. Thomson (Proc. Soc. Exp. Biol. Med., 1935, **32**, 800—803).—Œstrus does not occur in 12-day-old rats injected with pituitary extract, nor in ovariectomised rats implanted with the ovaries of 12-day-old rats. R. N. C.

Effect of urine from pregnant women on the ovary-stimulating potency of the pituitaries of rabbits and rats. LE R. GOODMAN (Amer. J. Physiol., 1935, **111**, 312—320).—Intravenous injection of Et_2O-extracted urine of pregnancy increases the ovary-stimulating potency of the pituitaries of normal male and female and spayed female rabbits, but reduces or does not alter that of normal male and female and castrated male rats. Subcutaneous injection in spayed female rats, or spaying without injection (rabbit or rat), increases the potency. The potency in normal male rats is >. in normal females, but in castrated males is < in castrated females. The action of the pregnancy urine on the pituitary appears to be partly direct and partly indirect through the gonads in rabbits, and wholly indirect in rats.
R. N. C.

Prolongation of pregnancy in the rat by injection of human pregnancy urine extract. E. C. HOOPES and J. L. KING (Amer. J. Physiol., 1935, **111**, 507—514).—Injection of 75 units of antuitrin-S delays parturition for 3 days and prolongs it over 2 days. Fœtuses remain alive. R. N. C.

Preoperative administration of an extract of pregnancy urine : a study of the ovaries and of the endometria in hyperplasia of the endometrium following such administrations. E. C. HAMBLEN (Endocrinol., 1935, **19**, 169—180).—Anterior-pituitary-like luteinising extract of pregnancy urine, affects mature but not early follicles in women ; it increases the degenerative changes commonly observed. Recent corpora lutea are produced in mature women with hyperplasia. Endometrial changes are rare. R. N. C.

Factors to be considered in immature female rat titration of pregnancy urine. L. DAVY (Proc. Soc. Exp. Biol. Med., 1935, **32**, 927—931).—Vaginal opening can be prevented by excess of pregnancy urine, which causes luteinisation, and is only an indication of follicular activity. Increase of ovary wt. does not occur with doses of urine that are too excessive for follicle stimulation and insufficient for luteinisation. The uterine reactions are too variable for incorporation into the criteria of the unit dose.
R. N. C.

Reactivity of the uterus to pre-sacral nerve stimulation and to adrenaline, pituitrin, and pilocarpine administered during certain sexual states in the anæsthetised rabbit. J. J. SAUER, C. E. JETT-JACKSON, and S. R. M. REYNOLDS (Amer. J. Physiol., 1935, **111**, 250—256).—The uterus is contracted by pilocarpine only after administration of œstrin, and not after castration or in pseudo-pregnancy. In castrated animals it is contracted by adrenaline or pituitrin, and by pre-sacral nerve excitation if corpora lutea are absent; the inhibitory action of the latter lasts only until the 11th day in pseudo-pregnancy. R. N. C.

Reactions of anterior pituitaries of male rats to administration of anterior pituitary-like substances and to œstrin. J. M. WOLFE and D. PHELPS (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1305—1309). R. N. C.

Synergism between œstrin and oxytocin. G. F. MARRIAN and W. H. NEWTON (J. Physiol., 1935, **84**, 133—147).—The sensitivity of the mouse uterus to pitocin (I) is increased considerably by 400—500 mouse-units of œstrin, so that 1 unit of (I) causes constriction sufficient to kill or expel the fœtus. The effect is the same whether œstrone, œstriol, or the Et_2O-sol. phenol of pregnancy urine is used. The reactivity of the uterus returns to normal 15 hr. after cessation of injections. R. N. C.

Reaction of anterior pituitaries of mature female rats to injections of large amounts of œstrin. J. M. WOLFE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1192—1195). R. N. C.

Morphological and quantitative reaction of anterior pituitaries of castrated female rats to œstrin injections. J. M. WOLFE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1189—1191). R. N. C.

Comparatively low levels of œstrin in cases of chorioepithelioma and hydatidiform mole. G. VAN S. SMITH and O. W. SMITH (Proc. Soc. Exp. Biol. Med., 1935, **32**, 847—849).—Œstrin (I) was low and anterior pituitary-like hormone (II) high in several cases of chorioepithelioma or hydatidiform mole. Injection of (I) in one case lowered blood- and urinary (II) without raising (I). R. N. C.

Effect of œstrin on ovaries and adrenals. H. SELYE, J. B. COLLIP, and D. L. THOMSON (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1377—1381).—Œstrone (I) injected into late pregnant rats prolongs the life of the corpora lutea and interferes with parturition. (I) injected during lactation maintains diœstrus, and enlarges the ovaries, pituitary, and adrenals; the no. of corpora lutea is not increased. (I) given to young female rats atrophies the ovaries and does not influence the pituitary or adrenals. The enlargements of the ovaries produced by (I) in adult rats disappear after 3 weeks, and œstrus reappears. (I) does not maintain the corpora lutea in lactating rats after hypophysectomy. (I) and anterior pituitary-like hormone may act synergistically or antagonistically to each other in different circumstances. R. N. C.

Extraction of œstrin from female urine after acidification with various acids. W. K. CUYLER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1352—1357).—Œstrin can be extracted from urine acidified with AcOH, $CCl_3 \cdot CO_2H$, or (best yield) tartaric acid. Extraction after acidification with H_2SO_4 or HCl gives negative results. R. N. C.

Effect of œstrin on uterine activity and its relation to experimental abortion and parturition. J. M. ROBSON (J. Physiol., 1935, **84**, 121—132).—Injections of ketohydroxyœstrin (I) over a period of ≮ 12 hr. in pregnant and ovariectomised mice increase the reactivity of the uterus to oxytocin, which becomes of the same order as in normal parturition if injections are continued over 2—3 days. Abortion occurs 1—3 days after cessation of injections. (I) injections do not increase the spontaneous rhythmic contractions *in vitro*. R. N. C.

Action of œstrin on the uterus of hypophysectomised and of pregnant rabbits. J. M.

ROBSON (J. Physiol., 1935, **84**, 148—161).—The response of the uterus to œstrin (I) is not qualitatively affected by the absence of the pituitary. (I) does not increase the reactivity of the uterine muscle to oxytocin during pseudo-pregnancy and all but the later stages of pregnancy, but the progestational response of the endometrium is sometimes affected. In the later stages of pregnancy (I) affects the uterine muscle normally in the absence of corpus luteum secretion.   R. N. C.

Movements of the uterus. II. Action of extract of corpus luteum on the uterus of the unanæsthetised rabbit. III. Action of gonadotropic extracts on movements of the uterus in anæsthetised rabbits. T. N. MORGAN (J. Obstet. Gynæcol. Brit. Emp., 1935, **42**, 79—83, 84—87).—Effects on sexually mature and immature rabbits, castrated and normal, are described.   CH. ABS. (*p*)

Concentration of gonad-stimulating hormone in blood-serum and of œstrin in the urine throughout pregnancy in the mare. H. H. COLE and F. J. SAUNDERS (Endocrinol., 1935, **19**, 199—208).—Gonad-stimulating hormone is produced rapidly in the serum after its first appearance and increases to a max. on the 70th day, afterwards disappearing. The curve of increase is sigmoid, the decrease curve resembling that of a unimol. reaction. Œstrin appears in the urine at the 100th day, and rises to a max. between the 200th and 275th days, afterwards decreasing, and disappearing 1—2 days after parturition.   R. N. C.

Follicular apparatus of the ovary of the hypophysectomised immature rat and the effects of hypophyseal gonadotropic hormones on it. C. E. LANE and R. O. GREEP (Anat. Rec., 1935, **63**, 139—146).—The follicle content of the ovary rises to a max. at 4 days after hypophysectomy and then falls steadily. Follicle-stimulating hormone increases total follicles and decreases the vesicular %; luteinising hormone increases the latter and does not affect the former.   R. N. C.

Failure of theelin and thyroxine to affect plumage and eye-colour of the blackbird. C. H. DANFORTH and J. B. PRICE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 675—678).—Injection of theelin or thyroxine in male birds does not change the plumage and iris colours to those of the female.   R. N. C.

Duration of œstrus in ovariectomised and adrenal-ovariectomised rats before and after theelin. F. E. EMERY and E. L. SCHWABE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 910—913).—Total adrenalectomy does not affect the œstrous cycles occurring after ovariectomy, the min. doses of theelin (I) required, the duration following 1—10 rat-units of (I), or the tendency for œstrus to recur after a positive reaction to (I).   R. N. C.

Experiments with theelin and galactin on growth and function of the mammary glands of the monkey. E. ALLEN, W. M. GARDNER, and A. W. DIDDLE (Endocrinol., 1935, **19**, 305—313).—Galactin induces lactation only in mature animals with fully developed mammary glands, whether or not theelin has previously been given.   R. N. C.

Gross action of prolactin and follicle-stimulating hormone on the mature ovary and sex accessories of fowl. R. W. BATES, E. L. LAHR, and O. RIDDLE (Amer. J. Physiol., 1935, **111**, 361—368).—Prolactin (I) decreases, and follicle-stimulating hormone increases, the wts. of the mature fowl ovary and sex accessories and the œstrin output. The effects of prolan and corpus luteum hormone on the ovary resemble that of (I).   R. N. C.

Prolactin induces broodiness in fowl. O. RIDDLE, R. W. BATES, and E. L. LAHR (Amer. J. Physiol., 1935, **111**, 352—360).—Injection of prolactin induces full or partial broodiness in hens. Other pituitary hormones, œstrin, and corpus luteum hormone are ineffective.   R. N. C.

Maternal behaviour induced in virgin rats by prolactin. O. RIDDLE, E. L. LAHR, and R. W. BATES (Proc. Soc. Exp. Biol. Med., 1935, **32**, 730—734).—Administration of prolactin for 5 days to virgin rats, the ovaries of which have been stimulated by prolan or follicle-stimulating hormone, induces maternal behaviour.   R. N. C.

Experiment to produce lactation in castrate women. A. A. WERNER (Endocrinol., 1935, **19**, 144—150).—Injection of amniotin (I) stimulates and induces development of the breasts. Follutein and corporin combined with (I) increase the effect. Prolactin stimulates the breasts, whether or not (I) has been injected previously, but does not cause lactation; in some cases it produces severe anaphylaxis, suggesting that it is protein in nature.
                                    R. N. C.

Sex hormones and related substances. IV. Dehydrogenation of equilin to equilenin. W. DIRSCHERL and F. HANUSCH (Z. physiol. Chem., 1935, **236**, 131—135; cf. this vol., 1242).—At 80° in N_2 equilin (I) in EtOH is converted in 16 hr. into equilenin (*picrate*, m.p. 209° corr.) by a large amount of Pd-black. In (I) the double linking is probably at C7 : 8 and may move to C8 : 9 before the dehydrogenation.
                                    W. McC.

Effects of water-soluble preparations of androsterone and androsteronediol on castrated rats. V. KORENCHEVSKY, M. DENNISON, and S. L. SIMPSON (Biochem. J., 1935, **29**, 2131—2142).—Comparison of H_2O-sol. (Li salt of monosuccinic ester) preps. of androsterone (I) and androsteronediol (II) with (oil-sol.) (I) and (II) indicates a general similarity [*i.e.*, characteristic differences in growth of certain genital organs and a markedly greater action with (II) than with (I)]. The rat-units of " comb-growth activity " of H_2O-sol. (I) and (II) are 1·60 and 0·067 mg., respectively, the ratios to the units of (I) and (II) being 1 : 9 and 1 : 3, respectively. The ratio of activity of H_2O-sol. (I) to that of H_2O-sol. (II) is approx. 2 : 1 with capons but approx. 1 : 24 with rats. Other comparative aspects of the action of (I) and (II) are discussed.   F. O. H.

Inability of testicular hormone to masculinise plumage and eye-colour of female Brewer's blackbird. C. H. DANFORTH and J. K. FISHER (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1115—1117).—The hormone is ineffective even in doses 10—12 times

as great in proportion to wt. as that producing marked comb-growth in capons. R. N. C.

Assay of fat-soluble androsteronediol. V. KORENCHEVSKY and M. DENNISON (Biochem. J., 1935, **29**, 2122—2130).—The effect of androsteronediol (I) (this vol., 346) on the growth of genitalia of castrated rats indicates a rat-unit of " comb-growth activity " to be approx. 21 and of " whole male sexual activity " approx. 19×10^{-6} g. (A., 1934, 1269; this vol., 1174). The rat- and capon-unit of (I) are therefore approx. $\frac{1}{8}$ and $\frac{1}{3}$ those of androsterone, respectively. (I) is also characterised by preferential stimulation of some of the organs. F. O. H.

The male sexual hormone and its artificial preparation in the laboratory. L. RUZICKA (Bull. Soc. chim., 1935, [v], **2**, 1497—1512).—A lecture.

Quantitative assay for the testicular hormone by the comb-growth reaction. II. T. F. GALLAGHER and F. C. KOCH (J. Pharm. Exp. Ther., 1935, **54**, 97—117; cf. A., 1930, 118).—In the assay of testicular hormone by the comb-growth method the response after 5 daily doses is measured and corrections are made for the initial size of the comb and body-wt. All assays are expressed in terms of a standard prep. assayed in parallel with each set of unknowns. The age and previous use in assays of capons are without importance. H. D.

Vitamins. I. Fat-soluble. II. Water-soluble. V. E. LEVINE (J. Chem. Educ., 1935, **12**, 357—362, 429—435).—A comprehensive summary. L. S. T.

Human requirements for vitamins. D. B. JONES *et al.* (Amer. Publ. Health Assoc. Year Book, 1934—1935, 69—72).—A review. CH. ABS. (*p*)

Inter-relationship of vitamins and other dietary constituents. I. Their relation to the production of urinary calculi. H. C. HOU (Chinese J. Physiol., 1935, **9**, 299—305).—A high dosage of vitamin-*D* or protein, or a low dosage of phosphate in a diet deficient in vitamin-*A*, increases the frequency of production of urinary calculi to 100%. The frequency is much lower when the same diet is used without vitamin-*D* or with low protein and high starch content. When a high-cereal diet is supplemented with cod-liver oil, calculi are not developed. E. P.

Pro-vitamin-*A* in the food of whales. J. C. DRUMMOND and R. J. MACWALTER (J. Exp. Biol., 1935, **12**, 105—107).—The plankton (" krill ") which constitutes the main food of Antarctic whales contains small amounts of carotene and (possibly) still smaller amounts of xanthophyll. The main pigment appears in the acid fraction after saponification, and may be astacene (I). (I), mainly in the form of esters, together with a small amount of another pigment resembling that of salmon-muscle, is present in oil extracted from the fæces of whales. NUTR. ABS. (*m*)

Oxygen consumption of rats in *A*-avitaminosis and when fed with carotene. N. TÖRNBLOM (Skand. Arch. Physiol., 1935, **71**, 200—210).—There is no significant difference between the O_2 consumption of rats developing well-marked symptoms of deficiency on a diet deprived of vitamin-*A*, and that of rats maintained in health on the same diet by the daily addition of 0·01 mg. of carotene. NUTR. ABS. (*m*)

Absorption and utilisation of carotene and vitamin-*A* in choledochocolonostomised vitamin-*A*-deficient rats. J. D. GREAVES and C. L. A. SCHMIDT (Amer. J. Physiol., 1935, **111**, 492—501).—Female rats with simple avitaminosis-*A* respond to oral administration of carotene (I) in 4—6 days. Choledochocolonostomised rats do not respond to oral administration of (I), but response is obtained with subcutaneous injections in certain concns., or oral administration together with deoxycholic or glycodeoxycholic acid, indicating that bile acids act as carotene carriers across the intestinal tract. (I) absorption after daily oral administration in small quantities is not appreciably affected by the fat content of the diet. Orally-fed vitamin-*A* is absorbed by the rat with internal bile fistula in sufficient amounts to correct the vaginal smear picture. R. N. C.

Utilisation of carotene by jaundiced and phosphorus-treated vitamin-*A*-deficient rats. J. D. GREAVES and C. L. A. SCHMIDT (Amer. J. Physiol., 1935, **111**, 502—506).—Administration of carotene (I) by any route to vitamin-*A*-deficient icteric rats produces little or no conversion into vitamin-*A* (II). The ability of the rat to transform (I) into (II) is reduced by treatment with P, but not by C_6H_6, $CHCl_3$, or CCl_4. Results indicate that the liver is responsible for the conversion. R. N. C.

Determination of carotene and vitamin-*A* in blood-serum by the alkali-digestion method. M. VAN EEKELEN and A. EMMERIE (Acta brev. Neerl. Physiol., 1934, **4**, 171—172).—10 ml. of serum are heated with 1 ml. of 60% aq. KOH at 100° for 30 min. After cooling, 5 ml. of EtOH are added and the mixture is shaken with 50 and 25 ml. of Et_2O. The combined Et_2O extracts are washed twice with 10 ml. of H_2O, once with 20 ml. of 3% aq. KOH, and twice with 50 ml. of H_2O, dried and evaporated in a CO_2 atm. The residue is dissolved in light petroleum and the carotene content determined colorimetrically. Vitamin-*A* is then determined by concentrating the solution to 0·2 ml., adding one drop of Ac_2O and 1—2 ml. of $SbCl_3$ reagent, and matching the blue colour produced. The results agree with those obtained by the van den Bergh technique. NUTR. ABS. (*m*)

Vitamin-*A* and carotenoid content of human serum and milk. J. G. MENKEN (Maandschr. Kindergeneesk., 1934, **4**, 22).—Colorimetric determinations of vitamin-*A* and carotene (I) gave results as follows : in 60 better-class persons $3\cdot6 \pm 2\cdot4$ Lovibond blue units of vitamin-*A* and $0\cdot0043 \pm 0\cdot0023$ mg. of (I) (no vitamin-*A* in 3·3% of cases); in 133 persons of both sexes of the labouring class, $2\cdot1 \pm 1\cdot6$ units and $0\cdot0029 \pm 0\cdot0017$ mg. of (I) (no vitamin-*A* in 14·3%); in 74 mothers (*in partu*) of the labouring class, $1\cdot3 \pm 1\cdot2$ units and $0\cdot0047 \pm 0\cdot0026$ mg. of (I) (no vitamin-*A* in 14·9%); in 76 infants (serum from umbilical cord) $1\cdot3 \pm 1\cdot6$ units and $0\cdot0008 \pm 0\cdot0003$ mg. of (I) (no vitamin-*A* in 48·7%); in 49 samples of human colostrum $6\cdot6 \pm 3\cdot4$ units and $0\cdot0051 \pm 0\cdot0037$ mg. of (I) (no vitamin-*A* in 2%); in 42 patients with eczema, $3\cdot3 \pm 1\cdot9$ units and $0\cdot0030 \pm 0\cdot0018$ mg. of (I) (no

vitamin-A in 2·4%) ; in 89 patients with other diseases, 2·5±2·1 units and 0·0025±0·0017 mg. of (I) (no vitamin-A in 21%). The measurements refer to 10 ml. of serum. NUTR. ABS. (*m*)

Qualitative blood-cell changes in the rat due to vitamin-A. P. D. CRIMM and D. M. SHORT (Amer. J. Physiol., 1935, **111**, 397—405).—Avitaminosis-A results in a neutrophil index lag, inhibition of formation of granulocytic cells, and impairment of the protein-fixing function of the reticulo-endothelial system. All these effects are abolished by halibut-liver oil, which after prolonged administration in conc. form produces leucocytosis with a " left shift " of the Arnath index ; blood-cholesterol remains within normal limits, and the cholesterol of the fish oil is not responsible for the above hypervitaminosis effects. Desiccated thyroid fed to vitamin-A-deficient rats hastens the onset of xerophthalmia. The -A content of the liver is correlated with the blood-cell and pathological findings. R. N. C.

Effect of diet on the quantity of vitamin-A and -D occurring in hens' eggs. B. H. THOMAS and F. W. QUACKENBUSH (Iowa Agric. Exp. Sta. Rept., 1933, 27).—The vitamin-A content of eggs was increased by supplementary feeding of cod-liver oil, although the increase was not $\propto$ the additional -A intake. The efficiency of transference of dietary -A to the eggs declined as the -A intake increased. CH. ABS. (*p*)

Nutritional properties of red palm oil. J. L. ROSEDALE and C. J. OLIVEIRO (Malayan Med. J., 1934, **9**, 140—145).—Lard and earthnut, gingelly, and coconut oils contain little or no vitamin-A. Red palm oil (0·05% of the diet being the min. prophylactic dose) and king ray, shark, and carp oils are good sources of the vitamin. Coconut, earthnut, gingelly, red palm, and olive oils contain no vitamin-D, but are activated by direct sunlight, exposure for short periods daily causing complete healing of rickets in rats (red palm oil least effective). Red palm oil, in doses of about 50 mg. daily, is effective in promoting growth and preventing or healing xerophthalmia in rats. Heating at 140—160° for 30 min. leaves a substantial fraction of the activity intact, but higher temp. (220°) causes complete inactivation. NUTR. ABS. (*m*)

Synthetic vitamin-A-free milk suitable for vitamin-A studies in very young puppies. W. O. FROHRING (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1021—1024).—The composition is given of a synthetic milk that resembles bitch's milk, but is free from vitamin-A. It can also serve for studying vitamin-B_1, -B_2, and -D. R. N. C.

Spectrographic study of the vitamin-A content of some oils and fats. N. K. DE (Indian J. Med. Res., 1935, **22**, 509—516).—Vitamin-A (I) vals. are given for a no. of fats and oils. Vegetable oils contain insufficient (I) to allow spectrographic detection. EtOH washing is suitable for fish oils, but useless for milk fats. R. N. C.

Vitamin-A values of Indian fish-liver oils determined biologically and tintometrically. A. R. GHOSH and B. C. GUHA (Indian J. Med. Res., 1935, **22**, 521—528).—The biological and tintometric vitamin-A vals. of a no. of Indian fish-liver oils do not agree strictly. The biological activity depends on the diluent used, solutions in EtOH, EtOAc, CHCl$_3$, and arachis oil showing progressively decreasing activities. R. N. C.

" Lovibond unit " of vitamin-A. M. VAN EEKELEN, A. EMMERIE, and L. K. WOLFF (Acta brev. Neerl. Physiol., 1934, **4**, 172—175).—The " units " used to express results of vitamin-A determinations by the SbCl$_3$ method have been converted into international units as follows : 1 cod-liver oil unit (Rosenheim and Webster)=208, 1 blue val. (Drummond and Hilditch)=20·8, 1 Lovibond unit (Wolff) =4·2, and 1 blue unit (Moore)=0·39. NUTR. ABS. (*m*)

Differential reactions between carotene and oils rich in vitamin-A. V. E. LEVINE and G. E. BIEN (Proc. Soc. Exp. Biol. Med., 1935, **32**, 873—876).—Carotene (I) and oils containing vitamin-A (II) give blue colours with SbCl$_3$, CCl$_3$·CO$_2$H (III), and CCl$_3$·CHO,H$_2$O (IV), which in the case of (II) oils change to purple on heating ; cod-liver oil and butter-fat yield the purple colour immediately with (III) or (IV). CH$_2$O–H$_2$SO$_4$ reagent (V) gives a purple colour with (I), whilst with (II) the acid layer is coloured red and the CHCl$_3$ layer green. (III), (IV), and (V) can be used to distinguish between (I), (II), and sterols ; (III) and (IV) also distinguish between cholesterol and ergosterol. R. N. C.

Reaction to differentiate vitamin-A from carotene by means of antimony trichloride. A. C. ANDERSEN and V. E. LEVINE (Proc. Soc. Exp. Biol. Med., 1935, **32**, 737—741).—The blue colour of vitamin-A (I) with SbCl$_3$ is changed on heating to 60° to red, the depth of which $\propto$ the concn. of (I), whereas with carotene the blue is unchanged. Pyrocatechol inhibits the formation of the colours. R. N. C.

Colour reaction of vitamin-A. E. ROSENTHAL and J. ERDÉLYI (Biochem. J., 1935, **29**, 2112—2113).—A reply to Andersen and Levine (see above). Guaiacol (I) ensures the production of a stable and suitable colour in the SbCl$_3$ test for vitamin-A (this vol., 792), but not in that for carotene. Whilst (I) can be replaced by heating for qual. differentiation, (I) is essential for exact determinations. F. O. H.

Detection of vitamin-A by means of the magneto-optic apparatus. G. M. WISSINK and J. W. WOODROW (Physical Rev., 1934, [ii], **45**, 126).—Using a modified Allison apparatus, a characteristic min. has been found for all substances investigated which contained vitamin-A. This min. was not obtained with strongly-irradiated cod-liver oil, pure carotene, peanut and Wesson oils. L. S. T.

Crystalline vitamin-B_1.—See this vol., 1385.

Oryzanin : vitamin-B_1. V. Activity of oryzanin hydrochloride. S. OHDAKE and T. YAMAGISHI (Bull. Agric. Chem. Soc. Japan, 1935, **2**, 111—119).—By curative tests on polyneuritic pigeons, 0·0015 mg. of cryst. oryzanin hydrochloride (vitamin-B_1) is equiv. to the standard unit. A. L.

Treatment of human beri-beri with crystalline vitamin-B_1. A. J. Hermano and F. Eubanas (Philippine J. Sci., 1935, **57**, 277—287).—A report of the successful treatment of a no. of cases.

P. G. M.

Functional studies of the nervous system in experimental beri-beri. C. F. Church (Amer. J. Physiol., 1935, **111**, 660—679).—The characteristic neurological symptoms resulting from vitamin-B_1 deficiency are described.

R. N. C.

Properties of blue fluorescent substances formed by oxidation of vitamin-B_1 (quinochromes). H. W. Kinnersley, J. R. O'Brien, and R. A. Peters (Biochem. J., 1935, **29**, 2369—2384).—At room temp. oxidation of vitamin-B_1 (I) by $KMnO_4$ or MnO_2 in EtOH produces a strongly fluorescent solution. By comparing the catatorulin activity of these solutions (yielding only non-cryst. oils) with their colour reactions, it is concluded that the blue fluorescent substance is biologically active. The S is removed from (I) as H_2S by a treatment with hot alkali which leaves the N intact. (I) reacts very slowly if at all with HNO_2. The fluorescent compound is probably not identical with thiochrome.

W. O. K.

Vitamin-B_2 requirements of the chick. S. Lepkovsky and T. H. Jukes (J. Biol. Chem., 1935, **111**, 119—131).—The findings of Elvehjem and Koehn (this vol., 669) that a factor, essential for the normal growth of chicks, not present in the heated diets used, is present in aq. liver extracts are confirmed. This factor is distinct from vitamin-B_2 and, unlike it, is not adsorbed from aq. liver extracts by fuller's earth.

F. A. A.

Structure and synthetic production of vitamin-C. J. di Gleria (Kisérlet. Közl., 1934, **37**, 267—269).—Natural and synthetic samples of ascorbic acid showed the same oxidation–reduction potential.

Ch. Abs. (p)

Behaviour of l-ascorbic acid and chemically related compounds in the animal body. Influence of generalised ether anæsthesia on their urinary excretion. S. S. Zilva (Biochem. J., 1935, **29**, 2366—2368; cf. this vol., 1036).—The excretion of antiscorbutic compounds by the kidneys is increased by Et_2O anæsthesia; this difference increases with the antiscorbutic activity of the compound used. Anæsthesia does not influence the fixation of the vitamin in the tissues.

H. D.

Effect of ascorbic acid on the work of the isolated surviving frog's heart. L. Billing (Pflüger's Archiv, 1935, **235**, 791—794).—The energy of the action of the surviving heart in serum salt solution is increased by ascorbic acid (I) in concn. 1 in 10^6. The action is enhanced by lactic acid. With (I) concns. of 1 in 10^5 arrhythmia occurs. R. N. C.

Insusceptibility of the rat to a dietary deficiency of vitamin-C. C. T. Suden and O. E. Malley (Proc. Soc. Exp. Biol. Med., 1935, **32**, 753—754).—A diet of bread and boiled whole milk, scorbutigenic to guinea-pigs, was without effect on rats up to 3 generations.

R. N. C.

Inactivation of diphtheria toxin *in vivo* and *in vitro* by crystalline vitamin-C (ascorbic acid). C. W. Jungeblut and R. L. Zwemer (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1229—1234).—Vitamin-C (I) in quantities of 0·5—5 mg. inactivates diphtheria toxin (II) *in vitro*: larger quantities are ineffective. (I) also inactivates (II) in guinea-pigs, but the effect is not so precise. Guinea-pigs with large quantities of (I) stored in their organs show a negative or reduced sensitivity to (II).

R. N. C.

Vitamin-C and diphtheria toxin. C. K. Greenwald and E. Harde (Proc. Soc. Exp. Biol. Med., 1935, **32**, 1157—1160).—Vitamin-C (I) under certain conditions increases the resistance of guinea-pigs to diphtheria toxin (II). The toxicity of (II) solutions is decreased by contact for 1 hr. at room temp. with (I); guinea-pigs that survive injections of the mixture are not immunised. (I) does not destroy the antitoxic properties of diphtheria antitoxin (III), or the slightly toxic (II)–(III) mixture.

R. N. C.

Vitamin-C. VII. Germination of seeds. vi. Effect of light on its production during germination. VIII. Chemical nature. i. Separation from cabbage juice. IX. ii. Vitamin-C and ether. X. iii. Narcotine and vitamin-C. XI. Physiological studies. i. Antiscorbutic value and method of administering. XII. Chemical nature. iv. Vitamin-C in the liver and adrenal of cattle. XIII. v. Extraction and solvents. XIV. vi. Extraction of vitamin-C and p_H value of the solution. XV. Physiological studies. ii. Antiscorbutic value and administration. XVI. Enzyme and vitamin-C. i. XVII. Chemical nature. vii. Change of content in barley. T. Matsuoka (Mem. Coll. Agric. Kyoto, 1935, No. 35, 1—10, 11—23, 25—30, 31—38, 39—47, 49—56, 57—64, 65—70, 71—80, 81—92, 93—108).—VII. Formation of vitamin-C occurs during germination of rice in the dark, but is considerably increased by sun- or artificial light.

VIII. 1·5 g. of raw cabbage or 1·5 c.c. of juice per 100 g. body-wt. is required to protect guinea-pigs from scurvy. By fractionation with EtOH and $Pb(OAc)_2$, a substance was obtained which protects in a dose of 4 mg. per 500 g. body-wt.

IX. At p_H 4, vitamin-C is not extracted with Et_2O, whereas at p_H 7—8 approx. 40% is sol.

X. Methylnornarcotine does not prevent scurvy in guinea-pigs.

XI. More vitamin-C is required to cure scurvy than to prevent it. The dose may be administered daily, but at 5-day intervals it is not effective.

XII. Crude ascorbic acid has been prepared from ox adrenal by extraction with EtOH–$COMe_2$, MeOH, and Et_2O.

XIII. Vitamin-C is sol. in EtOH, $COMe_2$, wet Et_2O, and wet light petroleum.

XIV. The extraction of vitamin-C by EtOH or $COMe_2$ does not depend on the p_H. Destruction during concn. is more rapid in alkaline solution.

XV. In feeding tests the addition should take place on about the 22nd day of feeding with the basal ration; otherwise the scurvy will be too severe.

Animals which have received abundant vitamin-*C* before the test require a larger quantity in the test.

XVI. Orange juice increases diastatic and decreases peptic action, but does not affect that of pancreatic lipase.

XVII. Vitamin-*C* is produced by barley, even in the dark, after germination, and reaches a max. at blooming, after which it decreases. Vitamin-*C* has no auxin-like action on germinated oats.

H. G. R.

Ascorbic acid (vitamin-*C*) and the germination and growth of seedlings. L. HAVAS (Nature, 1935, **136**, 435).—Vitamin-*C* (I) in concns. of 1—5 parts in 10^4 accelerates the growth and increases the length of wheat seedlings grown under sterile conditions in absence of added nutrients. Compared with controls the wt. of the shoots increased by 25—30% and those of the roots up to 50%. Germination is not stimulated. A concn. of 25 parts in 10^4 has a slight inhibitory effect on germination and a marked one (24—45%) on growth and wt. of the seedlings. A concn. of 50 parts in 10^4 is practically lethal. Oat seedlings are less sensitive than wheat in both respects, but plants with a high natural content of (I) are more sensitive.

L. S. T.

Vitamin-*C* of Chinese oranges. H. C. HOU (Chinese J. Physiol., 1935, **9**, 223—243).—Canton oranges have a slightly higher, Swatow a slightly lower, antiscorbutic activity than Sunkist, whilst Wenchow oranges are definitely inferior. Chemical determination of ascorbic acid gave similar results.

E. P.

Vitamin-*C* content of Chinese amaranth (Hsien ts'ai). H. C. HOU (Chinese J. Physiol., 1935, **9**, 253—260).—Red amaranth (*Amaranthus gangeticus*) has the same antiscorbutic activity as Sunkist orange juice; green amaranth (*A. blitum*) has slightly > double. For the green amaranth the graph of protection from scurvy (guinea-pigs) is not a straight line. Complete protection requires > 3 g. According to chemical titration green amaranth contains 4 times as much ascorbic acid as the red.

E. P.

Differences in values of vitamin-*C* by chemical and biological methods. H. C. HOU (Chinese J. Physiol., 1935, **9**, 291—298).—Vitamin-*C* contents obtained by Key and Elphick's modification of Höjer's method agree with those found by chemical methods in case of oranges, but give lower vals. with vegetables (lucerne, beet leaves, beetroot, green and red amaranth, and fresh *Capsicum*). The possible presence of interfering substances in the titration and those in biological absorption are discussed.

E. P.

Determination of vitamin-*C*. V. A. DEVJATNIN and V. M. DOROSCHENKO (Biochem. Z., 1935, **280**, 118—125).—A no. of substances which possess no antiscorbutic activity reduce 2 : 6-dichlorophenolindophenol and so cause high results for the vitamin-*C* content as determined by the Tillmans method. A modification which is designed to avoid such errors is described.

P. W. C.

Determination of ascorbic acid in urine with phospho-18-tungstic acid. G. MEDES (Biochem. J., 1935, **29**, 2251—2255).—Urine is treated with CH_2O and Folin's uric acid reagent and after 20 min.

the colour is compared with known ascorbic acid (I) standards. Phenols and S compounds do not interfere, and the method, which is simple and rapid, gives results within 8% of those obtained with dichlorophenol-indophenol. $HgCl_2$ and $NaHSO_3$ may be used in place of CH_2O. If urine be acidified with AcOH and saturated with H_2S, the (I) remains unchanged for $\not< 24$ hr.

J. N. A.

Identity of natural vitamin-*D* from different species of animals. O. RYGH (Nature, 1935, **136**, 552—553).—No difference in the antirachitic effect in chicks of vitamin-*D* (I) obtained from the liver and body fats of a woman, a cow, and numerous species of fish could be detected (cf. this vol., 417). No prep. showed an absorption max. at 260—270 mμ, or rotation in EtOH. Esterification with o-$C_6H_4(CO)_2O$ and C_5H_5N after 10 days was 100%. Maleic anhydride was without effect on the (I).

L. S. T.

Non-identity of vitamin-*D*$_2$ (irradiated ergosterol, calciferol) and the natural vitamin-*D* from cod-liver oil. O. RYGH (Nature, 1935, **136**, 396—397).—The ultra-violet absorption, α, and certain chemical reactions of irradiated ergosterol differ from those of vitamin-*D* from cod- and tunny-liver oils.

L. S. T.

Supposed identity of artificial antirachitic vitamin (irradiated ergosterol) and the natural vitamin-*D* of cod-liver oil. M. J. L. DOLS (Diss., Nijmegen, 1935, 139 pp.).—Chickens were protected from rickets by 2% of cod-liver oil in the ration, but not by irradiated ergosterol (I) equiv. to 20% of cod-liver oil, as determined on rats. The unsaponifiable fraction of cod-liver oil was as effective for chicks as the corresponding amount of whole oil. The val. of irradiated (I) for chicks was not enhanced by dissolving it in the saponifiable fraction of cod-liver oil. A tunny-liver oil concentrate was nearly as effective as cryst. calciferol (II) for rats, and as effective, in rat dosage, as cod-liver oil for chicks; it follows that the material having antirachitic potency in the tunny concentrate like that in cod-liver oil is not (II). Irradiated cholesterol (III) in rat dosage was as effective for chicks as cod-liver oil, whence the material activated was probably not (I). 250 international units per 100 g. of ration, in the form of cod-liver oil, tunny-liver oil concentrate, or irradiated (III), sufficed for chicks, whilst 2500 as (II) were insufficient.

NUTR. ABS. (*m*)

Treatment of low-calcium tetany with calciferol. R. S. STACEY (Lancet, 1935, **229**, 656—658).—Administration of large amounts of calciferol maintains freedom from symptoms with normal blood findings. Possible toxic effects are discussed.

L. S. T.

Vitamin-*D* in the nutrition of calves. O. J. HILL (Proc. 20th Ann. Meet. West. Div. Amer. Dairy Sci. Assoc., 1934, 60—63).—Calves receiving a basal ration without vitamin-*D* showed lower bone-ash and blood-inorg. P than those directly irradiated or receiving irradiated food or cod-liver oil. Sun-cured lucerne and viosterol induced proper calcification. Direct irradiation prevented further development of rickets.

CH. ABS. (*p*)

Influence of diet on antirachitic potency of cow's milk. B. H. Thomas and C. Y. Cannon (Iowa Agric. Exp. Sta. Rept., 1933, 26—27).—Feeding of irradiated moulds increased the vitamin-D potency of butter fat after 3 days and continued to do so throughout the experimental period (30 days).
Ch. Abs. (p)

Depression of intestinal reduction by vitamin-D. L. Yoder (Iowa Agric. Exp. Sta. Rept., 1933, 28).—Viosterol in < the min. effective dose caused a decline in fæcal reduced Fe. This may be related to the observation that in rats receiving vitamin-D, food passed the intestines in approx. 70% of the time necessary in the case of control animals.
Ch. Abs. (p)

Influence of the calcium and phosphorus contents of the diet on the vitamin-D requirements. A. Querido (Acta brev. Neerl. Physiol., 1935, 5, 9—11).—The development of rickets in rats, on a diet with Ca : P ratio of 1 and P content 0·12%, could not be completely prevented by administration of ⊁ 0·005 mg. of calciferol (I) daily. On a diet with Ca : P ratio 4 and the same P content, 0·0006 mg. of (I) was an adequate prophylactic dose. The rats did not develop rickets when the Ca : P ratio was 1 and the P content 0·35%. Mild rickets developed with this amount of P and Ca : P ratio 4, but was readily preventible by minute doses of vitamin-D.
Nutr. Abs. (m)

Properties of vitamin-E concentrates. H. S. Olcott (Proc. Iowa Acad. Sci., 1933, 40, 110).—Preps. from lettuce and wheat-germ oil are obtained by fractional crystallisation of unsaponifiable lipins. Further conc. fractions are separated by fractional distillation in vac., the most active being that having b.p. 190—220°/0·1 mm. The product is resin-like and does not crystallise. The vitamin is not destroyed by acetylation, benzoylation, or mild hydrogenation, but is decomposed by Br. Ch. Abs. (p)

Follicular hormone and the time of blooming of hyacinths. R. Harder and I. Störmer (Biochem. Z., 1935, 280, 126—136).—The length of leaf and height of bloom were somewhat increased by administration of progynon, but the no. of blooms was not increased. P. W. C.

Follicular (œstrus) hormone and plant tumours. L. Havas (Nature, 1935, 136, 516).—The effect of injecting aq. solutions of cryst. œstrus hormones (I) (from urine of pregnant mares) on the characteristic tumours produced in tomato plants by *Bacillus tumefaciens* has been investigated. The tumours above the site of injection of (I) (the petiole) increase while those below decrease in size. It is uncertain whether the direction of (I) migration is const. L. S. T.

Accumulation of ions : relations between protoplasm and sap in *Valonia*. S. C. Brooks (J. Cell. Comp. Physiol., 1935, 6, 169—170).—Protoplasm of coenocytes of *V. ventricosa*, Aghard, in sea-H_2O containing RbCl takes up Rb at the mean rate of 10^{-6} mol. per sq. cm. per hr., and allows it to diffuse into the vacuole at 9×10^{-8} mol. per sq. cm. per hr. The Rb accumulation ratio reaches a max. at the second day, after which the proto-plasm loses Rb to the sap and the external solution, in both of which [Rb] increases. The accumulation ratio for the protoplasm cannot clearly be deduced, since the exact vol. of the protoplasm is not clear; the solubility limit of RbCl is probably approached.
R. N. C.

Effect of the performance of physical work on mimosa. W. E. Burge and G. C. Wickwire (Science, 1935, 82, 304—305).—The effect is to increase the capacity of the leaves of the plant to do work and to support fatigue. L. S. T.

Flow and coagulation of latex in *Scorzonera Tau-Sagiz*. N. N. Kiselev and K. A. Kuzmina (Bull. Acad. Sci. U.R.S.S., 1935, 397—412).

Effect of nutritive state on the quantity of vitamin-A present in the leaves of *Coleus blumei*. E. S. Haber and P. P. Swanson (J. Agric. Res., 1935, 51, 75—81).—Well-nourished plants produced more vitamin-A than did poor stunted plants. When differentiated growth was induced in a single plant, undeveloped branches and luxuriantly growing ones contained similar amounts of -A. Possible relationships between nutrient factors and -A synthesis are discussed. A. G. P.

Effects of zinc salts on the oxidation process in plant cells. H. S. Reed and J. Dufrenoy (Science, 1935, 82, 249—250).—A summary.
L. S. T.

Plant growth substances. XV, XVI.—See this vol., 1351.

Origin, formation, and chemical processing of amber. C. Plonait (Angew. Chem., 1935, 48, 605—607; cf. B., 1935, 465).—A lecture. Data are tabulated for the appearance, hardness, d, m.p., and C, H, S, EtOH-sol., and succinic acid contents of 5 types of Baltic ambers. S. M.

Variations in the mineral and organic substances of *Nicotiana tabacum* during development. I. Vladescu (Bull. Cult. Ferment. Tutunului, 1934, 23, 231—287, 359—437).—Variations in plant composition can be expressed satisfactorily only in terms of amounts per plant. Results calc. per unit dry matter are misleading, since a no. of constituents are changing simultaneously. Changes in mineral content are determined during the first 30 days after germination. During this period nicotine synthesis proceeds relatively more rapidly than that of protein.
From the age of 30 days until maturity the total dry matter, N, P, Ca, Mg, and K per plant increase to a max. at flowering, subsequently declining until lateral buds develop, when a further increase to a second, and higher, max. occurs. Si, Fe, and Mn increase steadily with the age of the plant, probably accumulating in insol. forms. Nicotine formation increases with primary and secondary growth, declining between flowering and later development. Addition of Mn to soil retards flowering and the associated condition of max. accumulation of org. and inorg. constituents. Ch. Abs. (p)

Seasonal changes of reducing and non-reducing sugars in the upper and under parts of

citrus fruits. K. Takata (J. Agric. Chem. Soc. Japan, 1934, **10**, 1069—1076).—At all stages of ripening the upper halves of fruit contained more reducing sugars than lower halves. In upper halves vals. increased in winter. Seasonal changes in reducing and non-reducing sugars were approx. parallel.
Ch. Abs. (*p*)

Constituent of *Bæomyces roseus*, Pers. G. Koller and W. Maass (Monatsh., 1935, **66**, 57—63).—Extraction with Et_2O of soil on which this lichen is growing yields *bæomycesic acid*, $C_{19}H_{18}O_8$ (*anilide*, decomp. 210°), which is probably 4-6'-hydroxy-5'-aldehydo-4'-methoxy-*o*-toluoyl-2-hydroxy-3 : 6-dimethylbenzoic acid, since it gives, with AcOH, atranol Me ether, and, with MeOH, the *Me ether*, m.p. 88—90°, of Me hæmatommate, β-orcinol being also formed in each case. E. W. W.

Chemistry of higher fungi. XXIII. *Geaster fimbriatus*, Fr., and *Polystictus velutinus*, Pers. O. Ruthner and J. Zellner (Monatsh., 1935, **66**, 76—80).—*G. fimbriatus* contains an ergosterol–fungisterol mixture, fatty acids, mannitol, urea, polysaccharides, and a pigment. The EtOH extract of *P. velutinus*, when fractionated, yields *substances*, m.p. 98° and 130°, resembling the cerebrin-like substances obtained from *Amanita muscaria* etc. (cf. A., 1923, i, 987); ergosterol; mycose; and a residue extracted with light petroleum and with Et_2O. The former extract contains oleic acid and other fatty acids; the latter, substances resembling tannins. Glucose, choline, and a polysaccharide are present in the aq. extract. E. W. W.

Chemistry of lichens. IV. *Gyrophora Dillenii* (Tuck.), Müll. Arg., and *Parmelia furfuracea*, L. J. Zellner (Monatsh., 1935, **66**, 81—86).—*G. Dillenii* contains ergosterol, carotenoid compounds, and fatty acids; a mixture of lichen acids probably containing gyrophoric and lecanoric acids; mannitol, glucose, a polysaccharide, basic substances, lichenin, and a pigment. *P. furfuracea* contains an ergosterol–fungisterol mixture; fatty acids; atranorin; a *substance*, m.p. 185°, resembling hypogymnol (cf. A., 1934, 570); physodic acid; dark resinous substances; erythritol; and lichenin. E. W. W.

Chemical examination of *Cuscuta reflexa*, Roxb. I. Constituents. R. R. Agarwal and S. Dutt (J. Indian Chem. Soc., 1935, **12**, 384—388).—From the boiling EtOH extract of air-dried *C. reflexa* (contains 9·85% of ash of which 80·88% is H_2O-sol.: Na, K, Mg, Ca, NO_3', PO_4''', CO_3'', and SiO_2 present) is isolated (in addition to a wax *substance*, m.p. 74°) the Δ^α-lactone, *cuscutalin*, $C_{18}H_{10}O_4$, m.p. 68° (no CO; reduces Tollens' reagent). After successive extraction of the conc. mother-liquor with C_6H_6 and EtOAc, H_2O extracts *cuscutin*, $C_{15}H_{12}O_9$, softens 179°, m.p. 208—209° (decomp.) (0·2% yield) [Ac_2, m.p. 140°, $(CO_2Et)_2$, m.p. 151° (decomp.), and $(OMe)_2$, m.p. 193°, derivatives; *Pb* salt], which is acidic. J. W. B.

Chestnut. E. D. Kharyuzova (Bull. Appl. Bot. Genetics, 1934, Ser. 8, No. 3, 3—112).—Biochemical and analytical data are given. Ch. Abs. (*p*)

Quince. R. Y. Kordon (Bull. Appl. Bot. Genetics, 1934, Ser. 8, No. 3, 3—112).—Analyses are recorded.
Ch. Abs. (*p*)

Composition of raspberries. T. Macara (Analyst, 1935, **60**, 592—595).—The composition of raspberries grown in Cambridgeshire is compared with that of similar fruit grown in Scotland. The influence of climate is apparent only in respect of sol. solids, which were 10·9—12·2 and 6·5—9·2%, respectively. The amount of insol. matter depends on the variety of fruit, the type of soil, and the length of time the fruit is on the cane. E. C. S.

Fomes pomaceus (Pers.), Big and Guill, infecting plum trees. E. Fisher (Trans. Brit. Mycol. Soc., 1935, **19**, 102—113).—In healthy plum wood, cells of the trachexæ have uniform composition, but in the fibres lignin are more conc. near the middle lamella where it is accompanied by certain aldehydes. The remainder of the fibre wall has a relatively higher cellulose content and, usually, no aldehydes. Medullary ray cells are similarly formed. Gum formation characteristic of the early stages of decay is associated with the removal of starch from the ray cells. The characteristic of the "white rot" stage is not a delignification of wood elements but a removal of the lining layer from the walls of wood fibres. Ch. Abs. (*p*)

Biology of *Fomes pini* (Thone), Lloyd (*Trametes pini* [Thone], Fries). W. C. Percival (Bull. N.Y. State Coll. Forestry [Tech. Publ. No. 40], 1933, **6**, No. 1, *b*, 72 pp.).—Germination of basidiospores was favoured by a high sugar content in the substrate and by p_H 5·0—6·0. Optimum production of mycelium occurred at 25° in a high-sugar medium, and was not greatly affected by p_H in the range 3·85—7·90. Exposure to light through glass caused darkening of mycelium, which was intensified by direct sunlight. Ch. Abs. (*p*)

Pollen of some Leguminosæ. J. N. Martin (Proc. Iowa Acad. Sci., 1933, **40**, 86—87).—The occurrence of starch, sugars, dextrin, proteins, and fats in pollen of 30 species is examined.
Ch. Abs. (*p*)

Constituents of the stems of *Leucothoe Grayana*, Max. M. Yamashita (Sci. Rep. Tôhoku, 1935, **24**, 197—201).—The stems of *L. Grayana*, gathered in October, contained grayanotoxin (I), sucrose (2·5%), and an amorphous *substance* (II), m.p. 246—248°, whereas those gathered in June contained only (II) and a smaller amount of (I). R. S. C.

Bitter principles of the columba root. Columbin. F. Wessely, K. Dinjaski, W. Isemann, and G. Singer (Monatsh., 1935, **66**, 87—110).—Columbin as extracted from the root (*Jatrorrhiza palmata*, Miers) has $[\alpha]_D$ +34° to +42°, and is not readily purified. It forms an *Ac* derivative, m.p. 230° (decomp.), $[\alpha]_D$ +20° to +22° (all rotations are in C_5H_5N). When heated at 200—210° in N_2, the product is *decarboxycolumbin*, $C_{19}H_{22}O_4$, m.p. 149°. This is converted by alkali into *decarboxyisocolumbin*, $C_{19}H_{22}O_4$, m.p. 210°, also obtained by the action of alkali on *decarboxyacetylcolumbin*, m.p. 169·5°, $[\alpha]_D$ −326°, or by heating iso*columbin*, $C_{20}H_{22}O_6$, m.p. 190° (decomp.), $[\alpha]_D$

$+68°$ to $+79°$. The last is the product obtained by treating columbin with alkali; when acetylated it forms acetylcolumbin. The formula of columbin is established as $C_{20}H_{22}O_6$. The mol. contains a lactone group (possibly two); there is no evidence of CO or alkoxyl groups; hydrogenation leads to acid substances, but gives no definite indication of unsaturation. E. W. W.

Roots of *Aristolochia indica*, Linn. I. P. R. KRISHNASWAMY, B. L. MANJUNATH, and S. V. RAO. II. Essential oil. U. S. K. RAO, B. L. MAN-JUNATH, and K. N. MENON (J. Indian Chem. Soc., 1935, **66**, 476—485, 494—498).—I. The following substances have been isolated from the crushed roots : an essential oil (I) slightly volatile in steam; the glycerides of stearic, lignoceric, cerotic, oleic, and linoleic acids; sitosterol; a *glucoside*, m.p. 285—290° (*Ac* derivative, m.p. 162—163°), of a *phytosterol*, m.p. 146°; an alkaloid *aristolochine*, m.p. 215° (cryst. from MeOH) or m.p. 158—159° (decomp.) (from PhMe; this probably is a mol. compound containing PhMe) [*hydrochloride*, m.p. 268° (decomp.)] (cf. Wehmer, "Die Pflanzenstoffe," 1931, Vol. I, p. 263; Hesse, A., 1896, i, 180); allantoin; glucose and unidentified hydrolysable sugars; ceryl alcohol; and iso*aristolochic acid* (II), $C_{17}H_{11}O_7N$, m.p. 275° (decomp.) (*Na* salt+ H_2O; *Bz* derivative, m.p. 170—171°), isomeric with aristolochic acid (cf. Wehmer, *loc. cit.*). (II) contains 1 active H (Zerevitinov) and with Me_2SO_4 gives a *Me₁ ether*, m.p. 267° (decomp.), unaffected when refluxed with *N*-MeOH–KOH. (II) does not, therefore, contain CO_2H. (II) with $KOH-H_2O_2$ yields a dibasic *acid*, $C_{16}H_{13}O_9N$, m.p. 164·5°, which loses 1 H_2O at 120° during 3 hr.

II. Repeated fractionation of (I) after the removal of saponifiable matter gave a sesquiterpene *ishwarene*, $C_{15}H_{24}$, b.p. 130—132°/10 mm., $[\alpha]_D^{25}$ −42·37° (*monohydrochloride*, b.p. 128—130°/1 mm., $[\alpha]_D^{30}$ −18·7° in EtOH), and a pale green fraction from which a ketone *ishwarone*, $C_{15}H_{22}O$, b.p. 118—120°/1 mm., $[\alpha]_D^{30}$ −46·47° [*semicarbazone*, m.p. 240°; p-*nitrophenylhydrazone*, m.p. 186·5°; 2 : 4-*dinitrophenylhydrazone*, m.p. 167·5°; iso*oxime*, m.p. 133°, insol. in alkali but contains 1 active H (Zerevitinov)], and an alcohol *ishwarol*, $C_{15}H_{24}O$, b.p. 126—128°/1 mm., $[\alpha]_D^{30}$ −7·29° in EtOH, were obtained. The alcohol does not react with PhNCO and resinifies when heated with o-$C_6H_4(CO)_2O$. (I) also contains a little camphor. H. G. M.

Original acids in American pine resin.—See this vol., 1372.

Constituents of the Chinese drug hsi-hsin (*Asarum sieboldi*, Miq.). T. Q. CHOU and J. H. CHU (Chinese J. Physiol., 1935, **9**, 261—266).— Besides constituents formerly found, the steam-distillate of hsi-hsin contains pinene (cf. Kaku, A., 1932, 663). The C_6H_6 extract of the finely-powdered drug yielded after removal of the volatile oil a neutral *substance*, m.p. 124°, $[\alpha]_D^{20}$ −130°, containing no OMe and not reacting with Ac_2O and $NHPh·NH_2$. E. P.

Digestion of chlorophyll *in vitro*. A. G. CZIMMER (Magyar Orvosi Arch., 1934, **35**, 465—471).—Chlorophyll is digested by pepsin–HCl followed by glycerol extract of pancreas. Phæophytin and phæophorbides were produced. CH. ABS. (*p*)

X-Ray interpretation of denaturation and the structure of the seed-globulins. W. T. ASTBURY, S. DICKINSON, and K. BAILEY (Biochem. J., 1935, **29**, 2351—2360).—The X-ray study of denaturation of the seed-globulins in their normal state and on stretching indicates that the process of denaturation involves the liberation of peptide chains which aggregate on coagulation to parallel bundles, so that the röntgenograms of stretched denatured edestin (I) and ovalbumin (II) are similar to that of β-keratin (III) fibres; in the case of (II) the polypeptide chains must be shorter than those of (I) and (III). The actual transition of cryst. excelsin to an intermediate fibrous form (excelsan ?) is observed. H. D.

Basic amino-acids of typical forage-grass proteins. E. J. MILLER (Biochem. J., 1935, **29**, 2344—2350).—The proteins of grasses are prepared by the method of Chibnall (A., 1934, 229) and analysed by that of Vickery (A., 1932, 1148). Arginine, histidine, and lysine represented 12·1—13·1%, 1·9—2·7%, and 4·4—5·3%, respectively, of the total N. The basic NH_2-acids of the isolated proteins and of the proteins extracted by 4% HCl from spring pasturage occurred in approx. the same proportions. H. D.

Alkaloids of mu-fang-chi. T. Q. CHOU (Chinese J. Physiol., 1935, **9**, 267—274).—The drug was soaked in 1% AcOH and the alkaloids after pptn. with Na_2CO_3 were dissolved in $CHCl_3$. Two substances were isolated : *menisine*, $C_{19}H_{22}O_3N$, m.p. 152°, $[\alpha]_D^{20}$ +290° in $CHCl_3$ [*hydrochloride*, non-cryst., m.p. about 260°; *phosphate*, m.p. 280°; *methiodide*, m.p. 263° (decomp.); *hydrate*, m.p. 127°], a *tert.*-base containing 2 OMe; *menisidine*, $C_{36}H_{41}O_6N_2$, m.p. 176°, $[\alpha]_D^{20}$ +260° in $CHCl_3$ [*dihydrochloride*, m.p. 265° (decomp.); *phosphate*, m.p. 290°; *dimethiodide*], a *tert.*-base containing 3 OMe which forms an additive *compound* with $2COMe_2$. E. P.

Alkaloids of *Anagyris fœtida*. II. H. R. ING (J.C.S., 1935, 1053—1054; cf. A., 1933, 727).—Small amounts of *N*-methylcytisine and *d*-sparteine (hexahydrodeoxyanagyrine), but no *l*-lupanine, have been isolated from the mother-liquors from the crystallisation of cytisine and anagyrine obtained from the seeds of *A. fœtida*. H. G. M.

Chemical examination of *Tylophora asthmatica* and isolation of the alkaloids tylophorine and tylophorinine. A. N. RATNAGIRISWARAN and K. VENKATACHALAM (Indian J. Med. Res., 1935, **22**, 433—441).—The isolation of two cryst. alkaloids, *tylophorine*, $C_{24}H_{27}O_4N$, decomp. 275°, and *tylophorinine*, $C_{23}H_{27}O_4N+0·5H_2O$, decomp. 232—233°, is described. The alkaloid content of the leaves, stem, and root is 0·2—0·3%. The plant contains also ceryl alcohol, a phytosterol, m.p. 192—193°, a wax alcohol, m.p. 89—90°, a flavone colouring substance, chlorophyll, glucose, KCl, Ca salts, wax, caoutchouc, resins, and tannin. R. N. C.

Occurrence of phenylethylamine in fungi. W. KEIL and H. BARTMANN (Biochem. Z., 1935, **280**, 58—60).—The EtOH extract of *Boletus luteus* and of *B. elegans* contains choline, putrescine, and fumaric acid, but only that of *B. luteus* contains phenylethylamine. P. W. C.

Constituents of kanzantiku (*Arundinaria hindsi*, Makino). K. YOSHIMURA and I. YAMASHITA (J. Agric. Chem. Soc. Japan, 1935, **11**, 355—356).—3·5 kg. of seed (which resembles unpolished rice in composition) yield (as aurichloride) 0·3 g. of betaine and 0·5 g. of choline. F. O. H.

Chemical composition of sea-weed. P. KLASON (Svensk Kem. Tidskr., 1935, **47**, 215—220).—The lignin of sea-weed contains no OMe. Instead of CHO it has OH. The formula is possibly $NH_2 \cdot C_6H_3(OH) \cdot CH_2 \cdot CH(OH) \cdot CH_2 \cdot OH$ and after losing 1 H_2O $NH_2 \cdot C_6H_3(OH) \cdot CH \colon CH \cdot CH_2 \cdot OH$. The sea-weed contains lignin 30%, methylpentose 6·6%, ash and fibre 2%, cellulose 60·4%. The proportion of xylose to hexose is 1 : 1, whilst in higher plants it is 3 : 2. Ppts. with naphthylaminesulphonic acid have different structures, for which formulæ are given. E. P.

Caffeic acid in prunes and its behaviour as a laxative principle. E. MRAK, J. FESSLER, and C. SMITH (Science, 1935, **82**, 304).—Caffeic acid (I) (0·03% on dried prune), but not chlorogenic acid, has been isolated from Santa Clara prunes. With rabbits, dogs, and human beings (I) shows no significant laxative effect (cf. A., 1934, 692). L. S. T.

Gramine and two concomitants in the leaves of varieties of barley. K. BRANDT, H. VON EULER, H. HELLSTRÖM, and N. LÖFGREN (Z. physiol. Chem., 1935, **235**, 37—42; cf. this vol., 1040).—Gramine, possibly identical with donaxine, is detected in 5 further varieties of barley out of 17 examined; the content is approx. const. during the period of development of the plant. The separation of its two concomitants with absorption bands at 330 and 270 mμ, respectively, is effected by $Pb(OAc)_2$ in neutral or alkaline solution. The " 330 solution " gives a positive Molisch reaction and gives a yellow cryst. ppt. with $NHPh \cdot NH_2$. It immediately decolorises $KMnO_4$ in dil. H_2SO_4. " Substance 270 " is probably a purine derivative. The variations of the amounts of " 330 " and " 270 " with the period of development of the leaves are recorded. H. W.

Gramine from Swedish strains of barley.— See this vol., 1386.

Active principle of *Piper Chaba*, Hunter. P. K. BOSE (Sci. and Cult., 1935, **1**, 111).—The dried stem of the plant contains 0·38% of piperine. W. McC.

Plant-phosphatides. H. ARNI (Diss., Zürich, 1933; Bied. Zentr., 1935, A, **5**, 444).—Methods for the isolation of phosphatides and the corresponding acids from green plants are described. Wheat-gluten yields a carbohydrate-free phosphatide; unpolished rice, a lysolecithin possessing hæmolytic properties; leaves of *Ricinus* and rhubarb, phosphatides containing only 1·5% P. Stinging-nettle and *Ricinus* contain N-free phosphatide-acids. A. G. P.

Leaf carotenes. G. MACKINNEY (J. Biol. Chem., 1935, **111**, 75—84).—Leaf carotenes were isolated from 59 different plant species and the % of α- (I) and β-carotene (II) approx. determined from the [α]$_D$, m.p., and ultra-violet absorption spectra. 24 preps. contained only (II) and in the remaining preps. (I) was present up to 35%. The (II) from different sources gave no mutual depression of m.p. and had identical ultra-violet absorption spectra. H. D.

Carotene. IX. Carotenes from different sources and some properties of α- and β-carotene. H. H. STRAIN (J. Biol. Chem., 1935, **111**, 85—93; cf. A., 1934, 931).—The proportion of α- (I) to β-carotene (II) in preps. from a no. of sources was determined by fractional adsorption from $C_2H_4Cl_2$. The products obtained were contaminated by colourless crystals, some of which remained at the top of the adsorption column, and others were present in such high concn. that they caused the rapid elution of (II). Dipalmitylcarbinol behaves similarly in the adsorption column. The [α]$_D$ and ultra-violet absorption spectra of (I) and (II) were determined in a variety of solvents; (I) and (II) form stable compounds with $SbCl_3$ in CH_2Cl_2 and $C_2H_4Cl_2$ with max. absorption at identical λ; they also give an unstable blue colour with $CCl_3 \cdot CO_2H$ in CH_2Cl_2, $CHCl_3$, and $C_2H_4Cl_2$. H. D.

Colorimetric determination of carotene in plant-tissue. W. C. RUSSELL, M. W. TAYLOR, and D. F. CHICHESTER (Plant Physiol., 1935, **10**, 325—340).—Dry powdered material is extracted with petroleum. Fresh material is triturated with $COMe_2$ and sand. The pigments are transferred to petroleum solution by shaking the $COMe_2$ extract with this solvent and removing $COMe_2$ by washing with H_2O. From the petroleum solution xanthophyll is removed by MeOH (88—89% MeOH avoids emulsification) and chlorophyll is extracted with 25% KOH in MeOH. After appropriate concn. the petroleum solution of carotene is compared colorimetrically with standard aq. $K_2Cr_2O_7$ (0·00206 mg. of carotene per c.c. = 0·036% $K_2Cr_2O_7$ solution). A. G. P.

Constituents of the wax-like coating of the pear, *Pyrus communis*, L. K. S. MARKLEY, S. B. HENDRICKS, and C. E. SANDO (J. Biol. Chem., 1935, **111**, 133—146).—Air-dried pear skins, extracted with light petroleum and then Et_2O, yield fractions (I) and (II), corresponding with 1·95% and 2·38% of the dry wt., respectively. About 40% of (I) consists of acids, mainly oleic acid; of these, about 1/3 are unesterified. The hydrolysate from (I) also contains glycerol, a mixture of primary alcohols C_{20}—C_{30}, and hydrocarbons, mostly $C_{29}H_{60}$. (II) consists of ursolic and other resinous acids. The results are compared with similar data for the apple. F. A. A.

Total sterol content of cereals and legumes and method for its determination. E. KEDING (Diss., Munich, 1932; Bied. Zentr., 1935, A, **5**, 343).—Results of phytosterol analyses depended on the pretreatment of the material. Alkaline hydrolysis increases the amount obtained (Soxhlet). Vals. for beans and peas were similar, as also were those for maize and wheat. A. G. P.

Oiticica fat [oil].—See this vol., 1350.

Oil of *Berteroa incana* (grey cress-seed oil). C. LUTENBERG and S. IVANOV (Fettchem. Umschau, 1935, **42**, 167—168).—The seeds yielded 25% of oil having n_D^{40} 1·4750, I val. 181·0, acid val. 3·22, sap. val. 181·2, ester val. 178·0, CNS val. 109·4, and unsaponifiable matter 1·5%. The fatty acids had mean

mol. wt. 290·7 and yielded 8% of solid acids, m.p. about 50°. Bromination of the liquid fatty acids gave linolenic acid hexabromide, whilst after oxidation di-, tetra-, and hexa-hydroxystearic acids were recognised. G. H. C.

Oil of Cassia absus. Z. AHMAD (Z. Unters. Lebensm., 1935, 70, 166—169).—Oil extracted from the whole seed (4%) and from the kernel (6%) with light petroleum of b.p. 60—80° and 30—50°, respectively, had d^{20} 0·9276, 0·9284, n_D^{20} 1·4840, 1·4735, sap. val. 190·4, 185·6, I val. (Wijs) 130·5, 125·7, Ac val. 12·0, 10·8, acid val. 2·5, 1·4, unsaponifiable matter 8·4%, 4·8%; the fatty acids of the whole seed (mean mol. wt. 282·4, I val. 129·2) consisted of 19·0% saturated and 81·0% unsaturated. E. C. S.

Supposed occurrence of acids of uneven number of carbon atoms in vegetable oils and fats. I. Daturic acid from the seeds of Datura stramonium, Linn. B. L. MANJUNATH and S. SIDDAPPA (J. Indian Chem. Soc., 1935, 12, 400—404).—The unsaponifiable portion (26%) of the oil (16·3%) extracted by ligroin from the seeds contains a phytosterol, m.p. 134° (Ac derivative, m.p. 129°). The unsaturated acids, separated by Twitchell's method, contain oleic and linoleic acids. By fractionation of their Me esters, palmitic (I), stearic (II), and a little lignoceric acid are isolated from the saturated acids. So-called daturic acid is actually a mixture of (I) and (II). J. W. B.

Chemistry of the flowers of the mullen (Flores verbasci). III. L. SCHMID and C. KEMENY (Monatsh., 1935, 66, 1—5).—The presence of thapsiaic acid, $CO_2H \cdot [CH_2]_{14} \cdot CO_2H$ (A., 1932, 931), is confirmed by comparison with synthetic material (cf. A., 1926, 499). E. W. W.

Cellulose resources. I. Composition of Deccan hemp and Indian mallow cultivated in Manchuria. M. SHIKATA, K. AKAGI, and N. URANO. **II. Properties of α-celluloses from various plants.** M. WATANABE. **III. Rayon pulp from cotton stalks.** M. SHIKATA and K. AKAGI (J. Agric. Chem. Soc. Japan, 1935, 2, 621—623, 624—634, 635—638).—I. Analyses of the basts and stalks of Deccan hemp (Hibiscus cannabis, L.) and Indian mallow (Abutilon Aircennoe, Gaertn.) are given.

II. The α-celluloses of cotton-seed hairs, cotton bast fibre, Deccan hemp, and Indian mallow are compared.

III. Prep. of pulp from cotton stalks is described. A. L.

Carbohydrates of the bulbs of Allium. IV. Hydrolysis of scorodose by enzymes. Y. KIHARA (J. Agric. Chem. Soc. Japan, 1935, 11, 29—33; cf. this vol., 673).—Scorodose (a fructan) was hydrolysed by taka-diastase (optimum p_H 5·5—5·6 and 30°), malt extract, pressed yeast, and germinating Allium bulbs. Emulsin, snail extract (Eulota), saliva, and dormant bulbs had no action. Treatment of dormant bulbs with KCN did not induce enzymic activity. Germinating bulbs and leaves of Allium contained invertase. CH. ABS. (p)

Wood hemicelluloses. W. G. CAMPBELL (Nature, 1935, 136, 299).—In addition to starch (this vol.,

797), the cell-walls of oak sapwood yield a product which gives with I a purple colour changing to blue on keeping. It is more closely allied to hemicellulose-A than the starch, and appears to consist of uronic and aldobionic anhydride residues (approx. 14%), anhydroxylose (approx. 10%) and anhydroglucose residues (approx. 75%). Hydrolysis of the starch from oak leaves indicates that certain hemicelluloses of oak wood are derived from starch by steps involving the oxidation of primary OH and the subsequent formation of anhydroxylose residues by decarboxylation. L. S. T.

Hemicelluloses. II. Association of hemicelluloses with lignin. A. G. NORMAN and (in part) J. G. SHRIKHANDE (Biochem. J., 1935, 29, 2259—2266).—Polyuronide hemicelluloses (I) are easily extracted from woods and plant materials by dil. sulphite solution if the material has been previously chlorinated. There is probably some form of combination or association between lignin (II) and (I), since the extraction of (I) depends on a treatment effecting the dissolution of (II). J. N. A.

Glucosides and minerals in citrus fruits. L. W. GADDUM (Proc. Florida State Hort. Soc., 1934, 83—85).—At certain stages of maturity a grapefruit may contain 0·0004 g. of Cu and 0·1 g. of naringin (I). Citrus glucosides contain glucose and rhamnose with (I) (grapefruit) or hesperidin (orange). No alkaloids or cyanophoric glucosides occur. The bitterness of (I) is not an obstacle to the use of grapefruit cannery refuse as a stock feed. In addition to the customary elements, grapefruit contain spectrographically detectable amounts of Zn, Cu, Ni, Mn, B, Cd, Al, and Pb. Cases of Zn deficiency are recorded. Pulp of the fruit contains more Cu than does the albedo. The reverse is true of the Zn content. The cultural treatment of trees affects the Cu content of fruit > the p_H, sugar, or acid contents. CH. ABS. (p)

Sugar content of pods of paprika plant types. A. TOMPOS (Kisérlet. Közl., 1934, 37, 286—288).—Analyses are recorded. During ripening the glucose (I) and sucrose contents increased considerably. Approx. 40% of the dry matter consisted of (I). CH. ABS (p)

(A) Chemical analysis of plant tissue. (B) Determination of carbohydrates. (C) Determination of nitrogen in relatively simple compounds. W. E. TOTTINGHAM, Z. I. KERTESZ, W. E. LOOMIS, and T. G. PHILLIPS (Plant Physiol., 1935, 10, 383—386, 387—392, 393—399).—Reports of committees on current methods and recommendations arising therefrom. A. G. P.

Comparative colour test for coumarin and melilotic acid in Melilotus species. J. S. CLAYTON and R. K. LARMOUR (Canad. J. Res., 1935, 13, C, 89—100).—The method is based on the colour intensity produced by coupling diazotised p-$NO_2 \cdot C_6H_4 \cdot NH_2$ with coumarin (I). Melilotic acid (II) produces a similar colour and is determined simultaneously. Obermayer's method (A., 1913, ii, 353) is subject to error, since there is a partial distillation of (II) with (I) and the subsequent titration with $KMnO_4$ leads to falsely high vals. for (I). The dis-

tillate also contains a third substance which reduces $KMnO_4$ but gives no colour with diazonium reagents. Extraction of (I) from sweet clover by Et_2O is incomplete after 20 hr. A tentative method of examining EtOH extracts is described. A. G. P.

Boron status of fruit and leaves in relation to "internal cork" of apples in the Nelson district. H. O. ASKEW (New Zealand J. Sci. Tech., 1935, **17**, 388—391).—The B content of apples affected with "internal cork" was approx. 1/3 of that of healthy fruit. The severity of the disease was inversely $\propto$ the % of B in the fruit. A. G. P.

Weeds and poisonous plants of Southern Rhodesia. C. K. BRAIN (Rhodesia Agric. J., 1934, **31**, 779—791).—Sorghums, Johnson grass, Sudan grass, and Kaffir corn, when wilted in hot dry weather, produce sufficient HCN to poison cattle. HCN disappears when the plants regain turgidity.
CH. ABS. (p)

Iodine content of tea. A. ITANO and Y. TUJI (J. Agric. Chem. Soc. Japan, 1935, **11**, 545—551).— The I content of dried leaves is 0·45—1·20 mg. per kg.; it is greater in young leaves. 50—60% of the I can be extracted with H_2O. P. G. M.

Iodine content of Chinese marine algæ. P. S. TANG and P. C. WHANG (Chinese J. Physiol., 1935, **9**, 285—290).—The I content of 10 species has been determined. The results are doubtful owing to the influence of storage, season, and analytical errors.
E. P.

Absorption of sulphur dioxide by lucerne and its relation to leaf injury. M. D. THOMAS and G. R. HILL, jun. (Plant Physiol., 1935, **10**, 291—307).—Leaf destruction in lucerne fumigated with SO_2 approaches a linear function of the amount of SO_2 absorbed in a given time. An appreciable amount of gas may be adsorbed without injury, which appears when the rate of absorption exceeds a certain threshold val. These relationships are examined in connexion with smoke injury of plants. A. G. P.

Wave-lengths of radiation in the visible spectrum inhibiting the germination of light-sensitive lettuce seed. L. H. FLINT and E. D. McALISTER (Smithsonian Misc. Coll., 1935, **94**, No. 5, 1—11).— Germination is more markedly inhibited by a band in the region of 760 mμ than by those at 420—520 mμ, previously recorded. In the latter case the relative effect of radiations on germination is similar to that in inducing phototropic response in etiolated oat coleoptiles, max. vals., in each case, corresponding with 440 and 480 mμ. A. G. P.

Biochemical modifications in phytopathology. R. SALGUES (Compt. rend. Soc. Biol., 1935, **119**, 1396—1398).—In Napel aconite infected with *Septoria lycoctoni macrospora*, only the leaves show any variation in total alkaloid. Leaves of *Prunus laurocerasus* infected with *Phyllosticta matthiolana* show a decrease in HCN, glucosides, and insol. polysaccharides and an increase in sol. sugars. H. G. R.

Phosphatide auto-complex coacervates as ionic systems and their relation to the protoplasmic membrane.—See this vol., 1321.

Causes of immunity to the apple woolly aphis (*Eriosoma lanigerum*, Hausmann). R. M. GREENSLADE, A. M. MASSEE, and W. A. ROACH (East Malling Res. Sta. 21st Ann. Rept. [1933], 1934, 220—224).—Apple bark contains a substance which imparts immunity or susceptibility to attack by woolly aphis. The substance is insol. in EtOH, but sol. in Et_2O. The life of the aphis on apple-bark media is prolonged by the presence of *Torula rubra*.
CH. ABS. (p)

Fractional ultrafiltration.—See this vol., 1342.

Fractional electrical transport as a tool in biochemical research. R. J. WILLIAMS (J. Biol. Chem., 1935, **110**, 589—597).—Apparatus is described for determining the chemical nature of physiologically active substances and for giving an approx. isoelectric point, if amphoteric. Other uses, *e.g.*, electrolytic purification, separation of lecithins and kephalins, are suggested. H. G. R.

Modification of the apparatus and technique for the micro-determination of ammonia in biological liquids. M. POLONOVSKI and P. BOULANGER (Bull. Soc. Chim. biol., 1935, **17**, 944—959).— A modification of the apparatus of Parnas and Heller embodying a water-jacket to prevent the condensation of droplets of liquid between the distillation flask and the absorption tube. A. L.

Micro-determination of halogens in body-fluids and tissues. W. LIPSCHITZ (Arch. internat. Pharmacodyn., 1935, **49**, 379—392).—75—200 mg. of material are treated at 100° with HNO_3 (d 1·4) in presence of 1 ml. of $0·02N$-$AgNO_3$. After oxidation is complete the diluted liquid is titrated with KCNS using Fe alum as indicator. Within limits the method is applicable for Br as well as Cl, but not for I. Sources of error in Bang's method are indicated. NUTR. ABS. (m)

Absorption apparatus for micro-determination of volatile substances. III. Micro-determination of chloride with application to blood, urine, and tissues. E. J. CONWAY (Biochem. J., 1935, **29**, 2221—2235).—Cl', contained in the outer chamber of the apparatus of Conway *et al.* (A., 1933, 654), is oxidised by acid $KMnO_4$ to Cl_2, which liberates I from the KI contained in the inner chamber. The I liberated is a measure of the Cl' content, and with amounts of Cl' $\not< 0·035$ mg. may be titrated with $0·05N$-$Na_2S_2O_3$. Lower amounts, $\not< 0·007$ mg., are determined colorimetrically, and still lower amounts can be determined colorimetrically after adding 0·5 ml. of 0·2% starch. The application of the method to the determination of Cl' in protein-free filtrates of blood, undiluted urine, and tissues is described. The method is independent of the presence of I' and of $\not> 1$ mg. of protein. E. A. H. R.

Determination of iron in biological materials. G. E. FARRAR, jun. (J. Biol. Chem., 1935, **110**, 685—694).—The material is ignited with $CaCO_3$, the residue dissolved in HCl, and after oxidation the Fe is determined colorimetrically as $Fe(CNS)_3$ in amyl alcohol. Sources of error have been eliminated, including interference of pyro- and ortho-phosphates.
J. N. A.