**3730** *Obituary Notice.*

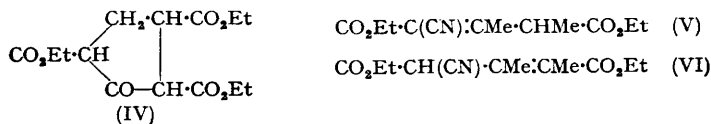# OBITUARY NOTICE.

EDWARD HOPE.

1886—1953.

EDWARD HOPE was born on December 19th, 1886, at Lowton, Lancashire, and died on February 7th, 1953, at Caterham, Surrey. He was educated at Leigh Grammar School and Manchester University, where he received his chemical training under W. H. Perkin, jun.

Some of his early researches were with problems which had a direct bearing on the work of Perkin and his school on the synthesis of terpenes. In a study of some applications of the Michael reaction (*J.*, 1911, **99**, 762) ethyl crotonate was treated with ethyl sodiocyanoacetate and the product condensed with ethyl bromoacetate with the formation of ethyl 2-cyano-3-methylbutane-1 : 2 : 4-tricarboxylate, which, on hydrolysis and decarboxylation, gave 3-methyl-butane-1 : 2 : 4-tricarboxylic acid, $CO_2H \cdot CH_2 \cdot CH(CO_2H) \cdot CHMe \cdot CH_2 \cdot CO_2H$, identical with an acid obtained by Perkin (*J.*, 1911, **99**, 743) by the oxidation of 6-methyl*cyclo*hex-3-enecarboxylic acid (I). Treatment of the ethyl ester of this tribasic acid with sodium, and hydrolysis of the product, led to 2-methyl-4-oxo*cyclo*pentanecarboxylic acid, from which, by reduction to the alcohol, conversion into the corresponding bromide, and subsequent esterification, the compound (II) was obtained. When this ester was heated with diethylaniline and then hydrolysed, the product was mainly a mixture of 2-methyl*cyclo*pent-3- and -4-enecarboxylic acids as expected, but a small amount of 2-methyl*cyclo*pent-2-enecarboxylic acid (III) was also present as the result of an isomeric change. Pentane-1 : 2 : 4-tricarboxylic acid, $CO_2H \cdot CH_2 \cdot CH(CO_2H) \cdot CH_2 \cdot CHMe \cdot CO_2H$, was obtained similarly from ethyl methylacrylate, $CH_2 : CMe \cdot CO_2Et$, and converted into 3-methyl-4-oxo*cyclo*pentanecarboxylic acid.
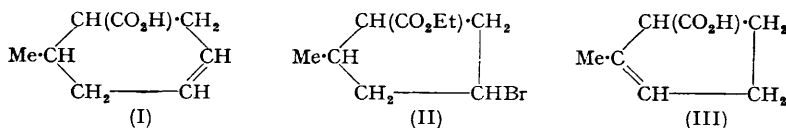
The condensation of ethyl citraconate, $CO_2Et \cdot CMe : CH \cdot CO_2Et$, with ethyl sodiomalonate was investigated in the light of work by Michael and his collaborators. Contrary to earlier belief, the reaction in ether or benzene gave ethyl butane-1 : 1 : 2 : 3-tetracarboxylate, $(CO_2Et)_2CH \cdot CH(CO_2Et) \cdot CHMe \cdot CO_2Et$. In cold alcohol, ethyl butane-1 : 2 : 4 : 4-tetracarboxylate, $CO_2Et \cdot CH_2 \cdot CH(CO_2Et) \cdot CH_2 \cdot CH(CO_2Et)_2$, was obtained, apparently through change of the citraconate into ethyl itaconate, $CH_2 : C(CO_2Et) \cdot CH_2 \cdot CO_2Et$. This substance is no doubt an intermediate in the formation, at a higher temperature, of the compound, $C_{14}H_{20}O_7$, which Michael (*Ber.*, 1900, **33**, 3758) had regarded as a *cyclo*butane derivative, but Hope (*J.*, 1912, **101**, 892) showed to be ethyl 3-oxo*cyclo*pentane-1 : 2 : 4-tricarboxylate (IV).

Further studies (*J.*, 1922, 2223) included the action of hydrogen cyanide, particularly in aqueous alcohol in the presence of potassium cyanide (compare Lapworth, *J.*, 1903, **83**, 995), on ethyl α-cyano-β-methylglutaconate, $CO_2Et \cdot CH(CN) \cdot CMe \cdot CH \cdot CO_2Et$, and its two methyl derivatives (V) and (VI). The first-named gave ethyl αβ-dicyano-β-methylglutarate, from which β-methyltricarballylic acid, $CO_2H \cdot CH_2 \cdot CMe(CO_2H) \cdot CH_2 \cdot CO_2H$, was obtained on hydrolysis (*J.*, 1912, **101**, 892), while the esters (V) and (VI) both gave ethyl 1 : 2-dicyano-2-methylbutane-1 : 3-dicarboxylate, $CO_2Et \cdot CH(CN) \cdot CMe(CN) \cdot CHMe \cdot CO_2Et$, from which αβ-di-methyl- and αβγ-trimethyl-tricarballylic acid were prepared.

$CO_2Et \cdot C(CN) : CMe \cdot CHMe \cdot CO_2Et$ (V)

$CO_2Et \cdot CH(CN) \cdot CMe : CMe \cdot CO_2Et$ (VI)

While in Manchester Hope collaborated with Sir Robert Robinson in some notable investigations into the synthesis of alkaloids of the *iso*quinoline group which arose from the observation by Perkin and Robinson (*J.*, 1911, **99**, 775) that α-gnoscopine [(±)-narcotine; (X)] could be obtained in small yield by the condensation of cotarnine (VII; R = OMe) with meconine (VIII; R = H) in boiling alcohol. The analogous anhydrocotarninephthalide was obtained in rather better yield under similar conditions from phthalide, but a nitro-derivative was pre-

pared from 5-nitrophthalide (IX) almost quantitatively. When the nitro-group was eliminated from the product *via* the corresponding amine and hydrazine, a substance which appeared to be a stereoisomeride of anhydrocotarninephthalide was obtained. These modifications arise

(VII)   (VIII)   (IX)
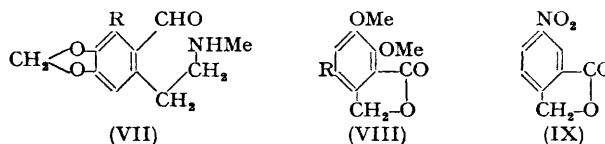
from the presence of two dissimilar asymmetric carbon atoms in the structures involved (*J.*, 1911, **99**, 1153). Similarly nitromeconine (VIII; R = NO$_2$) gave an excellent yield of a nitro-compound from which β-gnoscopine, stereoisomeric with (±)-narcotine, was obtained (*P.*, 1910, 228; 1912, 16). The β-form, like the α-, and natural (−)-narcotine, gave cotarnine and opianic acid on oxidation with dilute nitric acid, and narceine when its methosulphate was boiled with dilute aqueous potassium hydroxide, while a partial conversion into the α-form occurred when it was heated for a long period in aqueous alcohol at 100°. Iodomeconine (VIII; R = I) and cotarnine, however, gave iodo-α-gnoscopine, which was reduced in alcoholic solution to α-gnoscopine by amalgamated aluminium (*J.*, 1914, **105**, 2085). Although Perkin and Robinson (*loc. cit.*) were able to convert α-gnoscopine into (+)- and (−)-narcotine, attempts to resolve the β-form, or one of its substitution products, were unsuccessful. Application of these synthetical reactions to hydrastinine (VII; R = H) resulted in differences in stereochemical detail (*P.*, 1912, 17; Hope, Pyman, Remfry, and Robinson, *J.*, 1931, 236). With nitromeconine the product was a mixture of two nitro-compounds subsequently reduced to the amines, which were separated. When the corresponding hydrazines were oxidised, only (±)-hydrazino-hydrastine-*a* gave a good yield of the hydrastine [(±)-hydrastine-*a*]. The other gave a little (±)-hydrastine-*b*, the main product being (±)-didehydrohydrastine, formulated as (XI). Condensation of hydrastinine with iodomeconine also gave a mixture of two substances. The relation between the synthetical bases and natural (−)-hydrastine remained obscure, but this problem was later examined in detail by Marshall, Pyman, and Robinson (*J.*, 1934, 1315). There was further work on the condensation of cotarnine with many other substances containing reactive methyl or methylene groups (*J.*, 1911, **99**, 2114; 1913, **103**, 361).

(X)   (XI)   (XII)
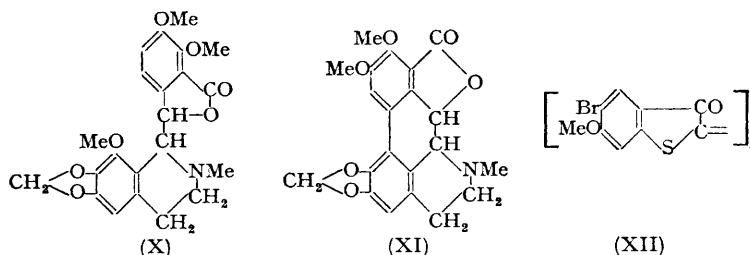
Perkin moved to Oxford in 1913, and the Dyson Perrins Laboratory, newly erected for him, was ready for occupation by Easter, 1916. British Dyes, Ltd., organised a team of chemists to investigate, under Perkin's direction, various problems in the manufacture of dyes and their intermediates which arose as a result of the first world war. Hope came to Oxford as a member of this team and was among the first to work in the new laboratory. At the conclusion of hostilities the chemistry school at Oxford entered upon a period of rapid expansion and development. Not only were the numbers of undergraduates very much greater than before the war, but the University had added a fourth year (the research year) to the normal chemistry course, and this was obligatory for those who wished to obtain a Class in the Final Examination. In 1919 Hope accepted an appointment as a lecturer and demonstrator in the Dyson Perrins Laboratory, and in the same year he was elected to a Fellowship at Magdalen College and became tutor in chemistry there. The change was a drastic one. After several years devoted almost entirely to research, Hope found himself confronted with heavy teaching duties, both in the laboratory and in College. He took a leading part in planning new courses of practical instruction for undergraduates and in solving the many problems which arose in the new organic chemistry department.

Although time for work at the bench was now severely restricted, Hope maintained an

active interest in research and, in conjunction with his pupils, studied several problems in the indigo group of dyes. In particular, our knowledge of the complex products which can be obtained by benzoylating indigo under various conditions was greatly extended, and structural formulæ were suggested which accounted for many of the reactions involved (*J.*, 1932, 2783; 1933, 1000; 1936, 1474). The synthesis of 5 : 5'-dibromo-6 : 6'-dimethoxy-2 : 2'-bis(oxy-thionaphthen) (XII) gave a product which was indistinguishable in colour from Helindone Scarlet R, obtained by the dibromination of 6 : 6'-diethoxy-2 : 2'-bisoxythionaphthen (Helindone Orange R), from which the constitution of the latter was inferred (*J.*, 1925, **127**, 990). There were also detailed studies of the products formed by the chlorination of benzoyl chloride under certain specified conditions (*J.*, 1922, **121**, 2510; 1923, **123**, 2470), and of the benzoylation of isatin 2-anil (*J.*, 1929, 1191).

With examining work of various kinds added to his teaching duties, Hope found comparatively little time for relaxation in the ten years which followed the first world war, but he enjoyed an occasional round of golf and was fond of walking and cycling in the country round Oxford whenever the opportunity arose. He was a lover of music and a regular attender at Oxford concerts. At the end of this period Hope showed signs of the ill-health which increasingly cast a cloud over the last twenty years of his life, and compelled him to restrict his activities. He found it necessary to give up his tutorial work at Magdalen in 1933, but he remained a Fellow, and, as he never married, continued to reside in the College, where he filled various offices and ultimately became Senior Fellow. He was fortunately able to continue as a University Demonstrator and Lecturer at the Dyson Perrins Laboratory until he reached the normal retiring age at the end of September 1952. He was for many years the editor of the "Chemists' Year Book."

As a tutor Hope was both popular and successful, and gained the affection and esteem of the Magdalen men who were his pupils. In the Dyson Perrins Laboratory he came into contact with a wider circle of undergraduates to whom, as a demonstrator, he was ever ready to extend a helping hand. He combined a wide experience of practical organic chemistry with a friendly and sympathetic approach, and very large numbers of Oxford chemists remain indebted to him for the encouragement and inspiration which they received from him in the laboratory.

S. G. P. PLANT.