If, therefore, we make the concentrations of the mixed substrates equal and in excess of that required to saturate the enzyme, the initial velocity of the mixed substrates so obtained will assume a value intermediate between the maximum initial velocities of each substrate alone, thus dividing the difference between them into two intercepts, the ratio of which is equal to the ratio of the Michaelis constants. Thus, in the accompanying graph, the ratio AB/BC is equal to OM/ON , the ratio of the Michaelis constants. This method enables us to find K_m/K_m' in a single experiment; it is merely necessary to determine the enzymic rate of reaction of S , S' and $S + S'$ side by side with excess substrate and a constant amount of enzyme. It should be noted, however, that the method is rather sensitive to errors in V , V' and V_m , and is unsuitable if either $V - V_m$ or $V_m - V'$ or both are small.

V. P. WHITTAKER
D. H. ADAMS

Department of Biochemistry,
University of Oxford,
London Hospital,
London, E.1.
July 4.

¹ Thorn, M. B., *Nature*, **164**, 27 (1949).

² Adams, D. H., and Whittaker, V. P., *Biochim. et Biophys. Acta* (in the press).

Structure of Thujic Acid (‘Dehydroperillic Acid’)

‘DEHYDROPERILLIC acid’ ($C_{10}H_{12}O_3$) is an optically inactive acid which has been isolated from the heartwood of western red cedar (*Thuja plicata*). It possesses only a low fungicidal activity. Anderson and Sherrard¹ attributed to this acid the structure I, which is closely related to that of perillic acid, mainly on account of its easy conversion to cuminic acid (II) with dilute hydrochloric acid.

The ultra-violet absorption, however, is incompatible with this assumption² (maxima: 220 m μ , $\log \epsilon = 4.27$; and 280 m μ , $\log \epsilon = 3.60$ in ethanol). These results suggest the presence of a larger conjugated system. The acid does not react normally with maleic anhydride. On catalytic hydrogenation, Anderson and Sherrard obtained a liquid hexahydro derivative believed to be an isomeride of Markownikoff’s solid hexahydro cuminic acid of m.p. 94–95°³. Both hexahydro cuminic acids are now known, and a direct comparison of their *p*-bromo-phenacyl esters (m.p. 85° and 108° respectively) showed that they cannot be identical with the acid obtained from hexahydro ‘dehydroperillic acid’ (m.p. 65–66°). Moreover, ‘dehydroperillic acid’ yielded dimethyl malonic acid (IV) on oxidation with permanganate, indicating the presence of a *gem*-dimethyl group.

We now propose the structure III for ‘dehydroperillic acid’, and base our conclusion on the results of degradations of the hexahydro acid by two different methods to the known β,β -dimethyl adipic acid (V) and β,β -dimethyl pimelic acid (VI) respectively. This structure is also in agreement with the results of the $(C)-CH_3$ estimations on the acid itself and its derivatives.

Since it has now been conclusively proved that ‘dehydroperillic acid’ has no relation to perillic acid, the name previously suggested is misleading. Dr. A. Anderson agrees with us that the name ‘dehydroperillic acid’ should be abandoned and changed to ‘thujic acid’.

Thujic acid is closely related to eucarvone. The rearrangement to cuminic acid (III $\rightarrow$ II) is analogous to the thermal rearrangement of eucarvone into carvacrol⁴.

It is believed that thujic acid represents a new type of natural compound.

A complete account of this work will be published shortly in *Acta Chemica Scandinavica*.

HOLGER ERDTMAN
JARL GRIPENBERG

Institute of Organic Chemistry,
Royal Institute of Technology,
Stockholm,
and

Department of Chemistry,
Finland Institute of Technology,
Helsingfors.

¹ Anderson and Sherrard, *J. Amer. Chem. Soc.*, **55**, 3813 (1933).

² Erdtman and Gripenberg, *Nature*, **161**, 719 (1948).

³ Markownikoff, *J. prak. Chem.*, [2], **57**, 95 (1898).

⁴ Baeyer, *Ber.*, **27**, 812 (1894).

Cholest-6-en-3(β)-ol

Plattner, Heusser, Troxler and Segre¹ have recently described the preparation of an interesting new cholesten-3(β)-ol, the acetate of which was said to be formed by the pyrolysis of 3(β)-acetoxycholestan-7-(α)-yl benzoate. On the basis of chemical evidence, the most important aspects of which were the oxidation to 7-ketocholestan-yl acetate by chromic acid and the rearrangement by attempted hydrogenation in acetic acid solution to a further new cholesten-3(β)-yl acetate, Plattner and his collaborators considered that their compound had the ethylenic linkage at the 7(8)-position. We have already given² what we consider to be a proof of the correctness of the formulation of γ -type stenols as 7(8)-unsaturated, and therefore we cannot accept the views of Plattner and his associates. A more detailed discussion on this aspect of the situation is given elsewhere³.

It was first suggested to us by Prof. L. F. Fieser, of Harvard, that Plattner’s new stenol might, in spite of the published chemical evidence, be substantially cholest-6-en-3(β)-ol. We were very grateful for this suggestion, for we have now proved it to be correct. In our hands a repetition of Plattner’s experiment