

THE MOLECULAR STRUCTURE OF ASPIDOSPERMINE

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(Received 3 July 1959)

THE alkaloid aspidospermine obtained from the bark of Aspidosperma quebracho blanco and first studied by Ewins<sup>1</sup> in 1914 has been the subject of active chemical study since 1947. It has proved to be a member of that increasingly large body of natural products whose molecular structure eludes unambiguous determination by degradative methods.

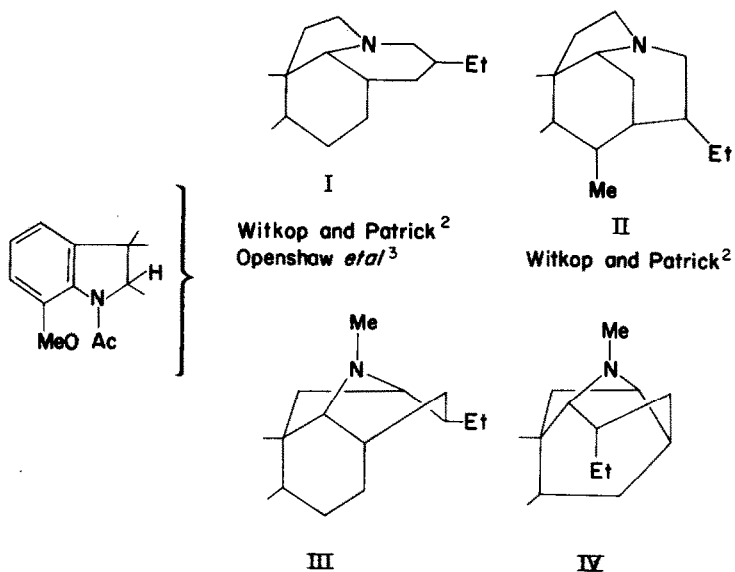
The molecular structure has now been unequivocally established by a three-dimensional X-ray analysis of crystals of (-)-aspidospermine-N(b)-methiodide kindly supplied by Dr. G. F. Smith of Manchester University. The crystals belong to the orthorhombic system,  $a = 24.3$ ,  $b = 8.5$ ,  $c = 11.1$  Å, space group  $P2_12_12_1$ , four molecules,  $C_{23}H_{33}N_2O_2I$ , to the unit cell.

The iodide ions were used for establishing phases by the usual heavy-atom technique and three-dimensional electron density plots were calculated on DEUCE through the courtesy of the English Electric Co. Ltd. Because of the slow refinement of noncentric crystal structures due attention was paid in the first instance to the four currently acceptable molecular structures. Although the analysis could have proceeded without this

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<sup>1</sup> Ewins, J. Chem. Soc., 2738 (1914).

knowledge the refinement was considerably speeded up by its use. At the commencement of the structure analysis the structures borne in mind were:



Towards the end of the refinement Conroy and co-workers,<sup>5</sup> unaware of our X-ray work, withdrew their two molecular structures III and IV which alone contain N-methyl groups.

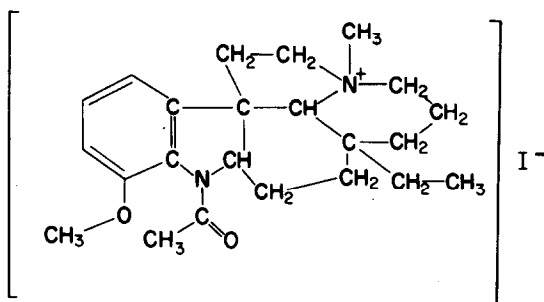
<sup>2</sup> Witkop and Patrick, *J. Amer. Chem. Soc.* 76 5603 (1954).

<sup>3</sup> Openshaw, Smith and Chalmers, 13th International Congress on Pure and Applied Chemistry. Abstracts, p. 223 (1953).

<sup>4</sup> Conroy, Brook, Rout and Silverman, *J. Amer. Chem. Soc.* 79, 1763 (1957).

<sup>5</sup> Conroy, Brook, Rout and Silverman, *J. Amer. Chem. Soc.* 80, 5178 (1958).

X-ray analysis has proved that the major part of the structure is correctly given by I above. The ethyl group however is not located as shown but is attached to one of the two quaternary carbon atoms in the hexahydrocarbazole system. The molecular structure of the methiodide is:



A full account of the analysis and of the detailed stereochemistry will be published elsewhere.