On the Symmetry of (−)-1,3,5,7-Tetrakis[2-(1*S*,3*S*,5*R*,6*S*,8*R*,10*R*)-D_3-trishomocubanylacetoxymethyl]adamantane

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Summary The highest symmetry attainable by the title compound is D_2, not T as previously claimed.

IN a recent report[1] describing the synthesis of the title compound, it was asserted that the latter represented the first optically active organic molecule with T symmetry. However, the interposition of the acetoxymethyl ($CH_2CO_2CH_2$) groups destroys all threefold symmetry inherent in the four 2-D_3-trishomocubanyl groups and in the adamantane skeleton, and T symmetry is *ipso facto* unattainable for any conceivable conformation. The title compound therefore belongs in the same class with McCasland's pentaerythritol tetra-(−)-menthyloxyacetate:[2] in both molecules, four asymmetric units (menthyloxyacetoxymethyl groups in McCasland's compound and 2-D_3-trishomocubanylacetoxymethyl groups in the title compound) of like chirality and of known absolute configuration are attached at the four vertices of a tetrahedral frame (methane in McCasland's compound and adamantane in the title compound), and the highest attainable symmetry is D_2.[3] Although neither molecule possesses T symmetry, when viewed as non-rigid systems both belong to the molecular symmetry group (C_1)[4] $\wedge$ T, a group of order 12 which is isomorphic to the point group T,[4] and which may be represented by the alternating group of permutations A_4.

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