replacement of the 4 and 5 carbon atoms with carbonyl groups. The 4-oxygen, 11-hydrogen interaction resulting from this substitution can be relieved by twisting the carbonyl groups into coplanarity, giving the symmetrical conformation of 75 shown in Figure 7.

Additional conformations of 33 and 75 can be derived by using the known conformation (Figure 2) of cyclo-nonane (12) as a starting point. Examination of a model of 12 reveals that there are four possible sites where carbon-hydrogen bonds are suitably oriented for replacement by a 1,3-ethylene bridge without disrupting the conformation. Substitution across either the 1-3 or 2-9 carbon atoms of 12 (Figure 2) leads to the conformation type A shown in Figure 8. The substitution can be made with little or no changes in bond angles; however, the original transannular non-bonded interactions between the 1-7 and 3-7 or 2-5 and 5-9 hydrogens in Figure 2 are replaced by two carbon-hydrogen interactions of the ethylene carbon atoms with the opposing hydrogen atom. In Figure 8 this is seen as the interaction between the 5-hydrogen and the 9 and 10 carbon atoms. Further replacement of the 4-5 carbons with carbonyl groups affords the possible cis-diketone 75 conformation of type A shown in Figure 9. Although the carbon-hydrogen interactions of the hydrocarbon 33 are removed, they are replaced by a