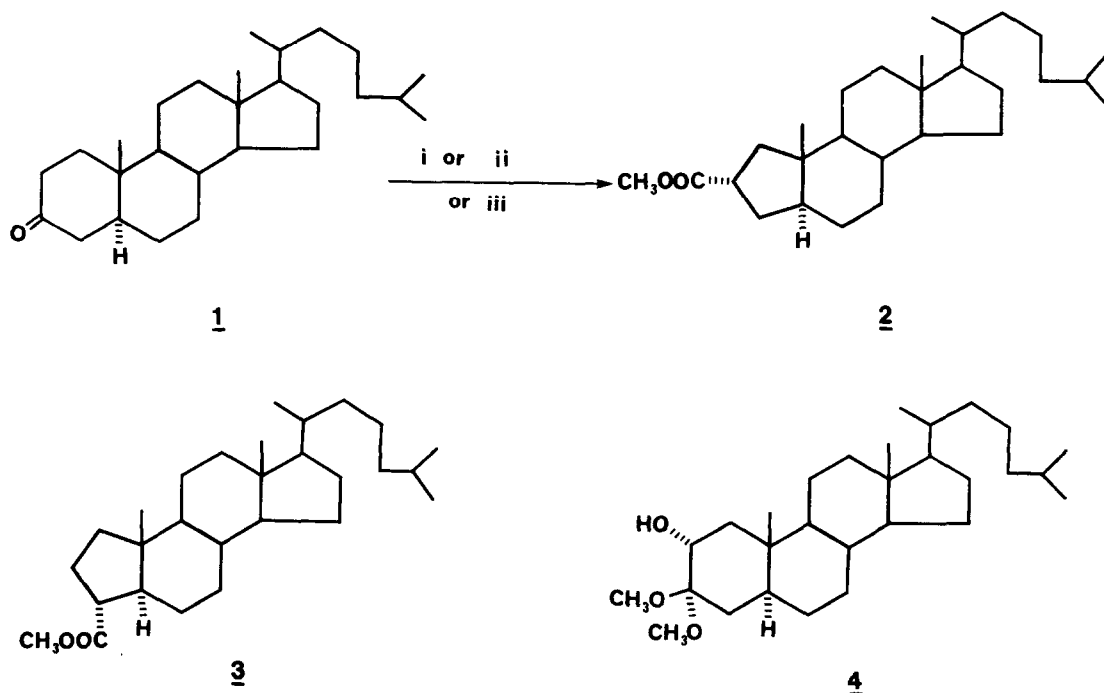




KOH/MeOH/ THF or  $C_6H_5IO_2$  - KOH/MeOH/THF yielded 2 $\alpha$ -carbomethoxy-A-norcholestane (2) in 60% yield by direct isolation from the reaction. Thin-layer chromatographic examination of the reaction product indicated 90% of 2 and 10% of the isomeric 3 $\alpha$ -carbomethoxy-A-norcholestane (3).<sup>2</sup> 2 $\alpha$ -Hydroxy-3,3-dimethoxycholestane (4) was not observed.



i.  $C_6H_5I(OAc)_2$ -KOH/MeOH/THF

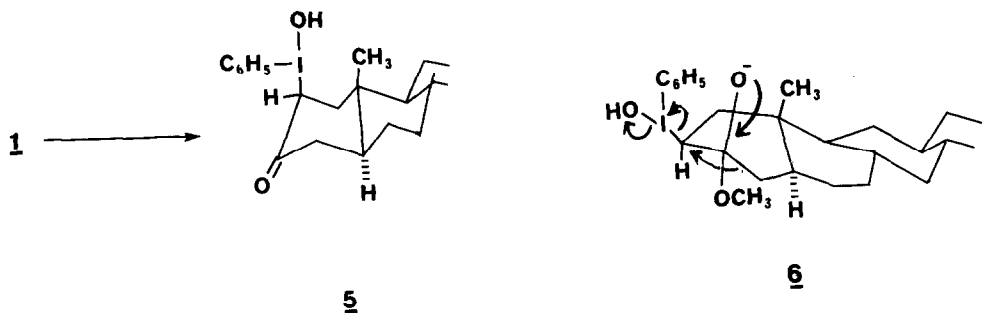
ii.  $o$ -OIC $_6$ H $_4$ COOH-KOH/MeOH/THF

iii.  $C_6H_5IO_2$ -KOH/MeOH/THF

This result may be discussed within the mechanistic framework established for the reaction of enolates with hypervalent iodine (Scheme 1). In the first step hyperiodination of the enolate system occurs with  $C_6H_5I=O$  (formed *in situ*). Then  $CH_3O^-$  adds to the carbonyl group and the thus formed alkoxide anion displaces intramolecularly iodobenzene with reductive elimination (A  $\rightarrow$  B; Scheme 1).

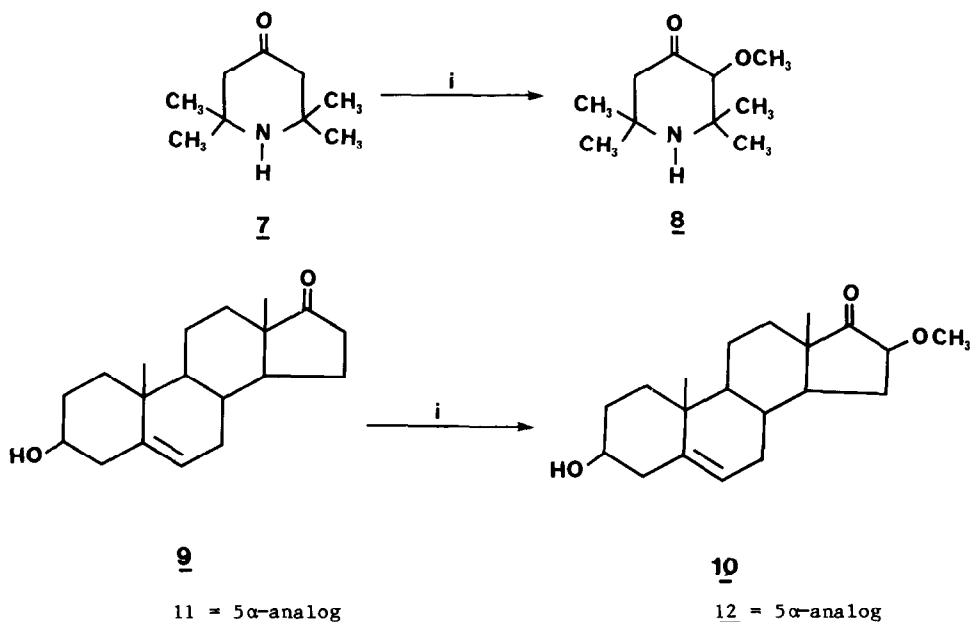
The formation of 2 (and not 4) may be explained upon conformational and steric

grounds. We propose initial C(2) axial hyperiodination 1 + 5. This intermediate converts torsionally to a twist boat-form (5 + 6). The C-I(III) is now stereoelectronically incorrect for intramolecular epoxide formation but it does have the correct stereoelectronic relationship with the C(3)-C(4) bond in the C(3) tetrahedral intermediate (6) for migration

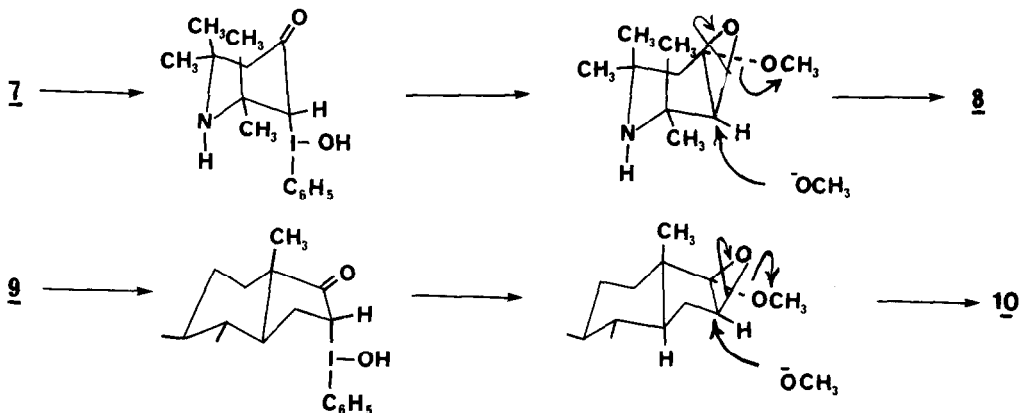


of the C(3)-C(4) bond. This occurs with inversion of configuration at C(2) to yield the observed 2 $\alpha$ -carbomethoxy-A-norcholestane (2). The overall course of the reaction, ring-contraction rather than the  $\alpha$ -hydroxydimethylacetal formation, is not unexpected based upon these stereoelectronic considerations.

A second mode of reaction of ketones with  $C_6H_5IO/KOH/MeOH$ , in which steric effects control the course of reaction, is illustrated by 7 + 8,<sup>3</sup> 9 + 10,<sup>4</sup> and 11 + 12<sup>5</sup> in which cases an  $\alpha$ -methoxyketone is formed:



In these cases ring-contraction does not occur; however because of steric crowding, attack of methoxide anion on **B** (Scheme 1) occurs in the alternate sense with **7**, **9**, and **11**. Importantly, the unmethylated analog of **7**, namely, 4-ketopiperidone itself, yields the  $\alpha$ -hydroxy dimethylacetal derivative under standard reaction conditions in 42% yield with no  $\alpha$ -methoxyketone formation.<sup>6</sup>



Finally, the more highly hindered systems hecogenin acetate (**13**), friedelin (**14**) and **17**, **20**; **20**, **21** - bismethylenedioxyprog-5-ene-3,11-dione 3-dioxalane (**15**) were essentially unreactive under the standard reaction conditions.

In conclusion, Favorski type rearrangement as well as  $\alpha$ -methoxylation are expected reaction pathways based upon the general mechanism (Scheme 1) operating in the presence of determinative steric interaction.

**Acknowledgement** We thank the USAMRDC and the Petroleum Research Fund for support of this work.

#### References

1. R. M. Moriarty, H. Hu and S. C. Gupta, *Tetrahedron Lett.*, **22**, 1283, (1981); R. M. Moriarty, L. S. John and P. C. Du, *J. Chem. Soc., Chem. Commun.*, 641, (1981); R. M. Moriarty, S. C. Gupta, H. Hu, D. R. Berenschot and K. B. White, *J. Am. Chem. Soc.*, **103**, 686, (1981); R. M. Moriarty and H. Hu, *Tetrahedron Lett.*, **22**, 2747, (1981); R. M. Moriarty and K. C., Hou *Tetrahedron Lett.*, **25**, 691, (1984). In this latter paper the advantage of using *o*-iodosylbenzoic acid in this oxidation reaction is described.
2. 3-Cholestanone yields 2 $\alpha$ -carbomethoxy-A-norcholestane, 60%, m.p. 97-98°C [Lit. 97.2-98°C; H. M. Hellmann and R. Jerussi, *Tetrahedron*, **20**, 741 (1964)], ir(KBr): 1715 cm<sup>-1</sup>; pmr (CDCl<sub>3</sub>)  $\delta$ : 3.67 (s, 3H, COOCH<sub>3</sub>); m/z 416.6 (34)<sup>M+</sup>.
3. 2,2,6,6-tetramethyl-4-piperidone yields 3-methoxy-2,2,6,6-tetramethyl-4-piperidone, 20%, m.p. 65-66°, ir (KBr) cm<sup>-1</sup>: 3320 (NH stretching), 1680 (>C=O), pmr (CDCl<sub>3</sub>)  $\delta$ : 1.33-1.65 (m, 14H), 3.55 (s, 3H, OCH<sub>3</sub>), 5.66 (s, 1H, CH), m/z 185 <sup>M+</sup>.
4. **10**: 10%, ir (KBr) cm<sup>-1</sup>: 1720 (>C=O), 3480 (OH); pmr (CDCl<sub>3</sub>)  $\delta$ : 4.1 (br, OH), 3.57 (s, 3H, OCH<sub>3</sub>); m/z 320 (29) <sup>M+</sup>.
5. **12**: 10%, ir (KBr) cm<sup>-1</sup>: 1735 (>C=O), 3440 (OH); pmr (CDCl<sub>3</sub>)  $\delta$ : 3.4 (s, 3H, OCH<sub>3</sub>); m/z 318 (93) <sup>M+</sup>.
6. To be published *Tetrahedron Letters* 1984.

(Received in USA 25 July 1984)