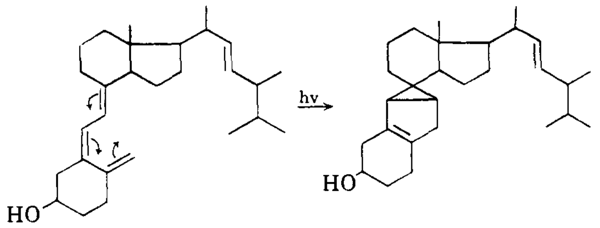
is both exocyclic to a six or larger membered ring originally containing the cyclopropane-ene system and conjugated to a ketone in a six or larger membered ring.

The most likely structure which could arise from vitamin D_2 and contain the structural requirements is shown below.



WILLIAM G. DAUBEN
IAN BELL
THOMAS W. HUTTON
GEORGE F. LAWS
ALFRED RHEINER, JR.
HANS URSCHELER

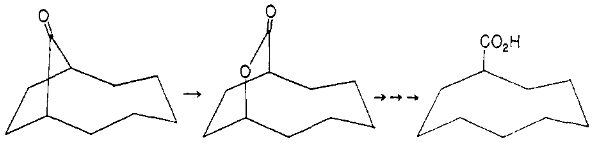
DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA
BERKELEY 4, CALIFORNIA

RECEIVED MAY 26, 1958

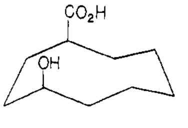
A NEW METHOD FOR THE SYNTHESIS OF BRIDGED RING KETONES AND MEDIUM SIZE RING COMPOUNDS

Sir:

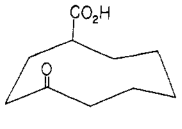
Seventeen years ago a brief report from the Leverkusen laboratories appeared[1] in which the reaction between cyclohexanone and 1,4-bisdiazobutane was described as yielding a C_{10} product with a terpene-like odor. The structure of this material now has been established as 10-ketobicyclo[5,2,1]decane (I) by this series of reactions: Compound I, prepared in *ca.* 25% yield by the *in situ* ring enlargement procedure[2] from N,N'-dinitroso - N,N' - dicarbethoxy - 1,4 - diaminobutane[3] and cyclohexanone, m.p. 113–115° (clear at 120°), $\bar{\nu}_{\max}^{\text{liquid}}$ 1735 cm.$^{-1}$ (C═O in 5-membered ring), (*anal.* found for $C_{10}H_{16}O$: C, 78.63; H, 10.37) was converted to the lactone II with peroxytrifluoroacetic acid,[4] m.p. 96–98° (*anal.* found for $C_{10}H_{16}O_2$: C, 70.89; H, 9.38; saponif. equiv. 167.9). The lactone (II) was heated with thionyl chloride in benzene solution,[5] treated with ethanol, and subjected to catalytic hydrogenation (one mole equivalent absorbed). The resulting product was saponified, converted to the acid chloride, and treated with aniline to yield the anilide of the known cyclononanecarboxylic acid,[6] m.p. 140–141° (*anal.* found for $C_{16}H_{23}NO$: C, 78.36; H, 9.39). Thus, the presence of a 5-membered ring (infrared) and a 9-membered ring taken in conjunction with a simple interpretation of the course of the reaction[2] leaves structure I as the most reasonable one. Further support for I is provided by the facile formation of a dibromide, m.p. 134–135° (*anal.* found for $C_{10}H_{14}Br_2O$: C, 39.05; H, 4.77) and by the base-catalyzed exchange of two hydrogen atoms for deuterium atoms. These latter reactions indicate the compound to be readily, a fact not unexpected from a consideration of the molecular model of I, although this structure resides at the edge of Bredt rule territory.[7] The ring enlargement of cycloalkanones with bis-diazoalkanes provides a method for the synthesis of certain bicyclic systems (carbobicyclo[5,2,1] systems apparently have not been prepared previously) as well as a method for the synthesis of medium size carbocyclic ring compounds. The potentiality of the latter is suggested by the conversion of II to 4-hydroxycyclononanecarboxylic acid (IV), m.p. 86–87.5° (*anal.* found for $C_{10}H_{18}O_3$: C, 64.68; H, 9.58) and to 4-ketocyclononanecarboxylic acids (V), m.p. 33–35° (*anal.* found for $C_{10}H_{16}O_3$: C, 64.81; H, 8.55). Accompanying I are other materials, the structures of which have yet to be elucidated.



I II III



IV



V

Acknowledgment.—This research was supported, in part, by grants-in-aid from the National Science Foundation and the Office of Ordnance Research.

---

[1] Petersen, U. S. Dept. of Commerce, Office of Technical Service Report PB 694 (1941).

[2] C. D. Gutsche, "Organic Reactions," Vol. VIII, John Wiley and Sons, Inc., New York, N. Y., 1954, p. 364.

[3] C. M. Samour and J. P. Mason, THIS JOURNAL, **76**, 441 (1954).

[4] W. D. Emmons and G. B. Lucas, *ibid.*, **77**, 2287 (1955).

[5] J. Cason, C. E. Adams, L. L. Bennett, Jr., and U. D. Register, *ibid.*, **66**, 1764 (1944).

[6] K. Schenker and V. Prelog, *Helv. Chim. Acta.*, **36**, 896 (1953). We are indebted to Professor Prelog for carrying out the melting point and infrared comparisons with our sample.

[7] F. S. Fawcett, *Chem. Rev.*, **47**, 219 (1950).

C. DAVID GUTSCHE
TERRILL D. SMITH
MARTIN F. SLOAN
JOHN J. QUARLES VAN UFFORD
DONALD E. JORDAN

DEPARTMENT OF CHEMISTRY
WASHINGTON UNIVERSITY
ST. LOUIS 5, MISSOURI

RECEIVED JUNE 12, 1958

DEPENDENCE OF THE OPTICAL ROTATORY POWER OF PROTEINS ON DISULFIDE BONDS

Sir:

It has been known for a long time that most of the native proteins are levorotatory and that their rotation on denaturation increases considerably in the levo direction. An increase in levorotation also has been observed when the helical form of polyamino acids in non-polar solvents was converted into a random coil form by adding increasing amounts of a polar solvent.[1,2] It has been suggested,[3,4] therefore, that the decrease in levorotation

---

[1] P. Doty, J. H. Bradbury and A. M. Holtzer, THIS JOURNAL, **78**, 947 (1956); P. Doty, A. M. Holtzer, J. H. Bradbury and E. R. Blout, *ibid.*, **76**, 4493 (1954).

[2] E. R. Blout and M. Idelson, *ibid.*, **78**, 497 (1956).

[3] J. T. Yang and P. Doty, *ibid.*, **79**, 761 (1957).

[4] G. Markus and F. Karush, *ibid.*, **79**, 134 (1957).