

Anomeric Effect: Origin and Consequences: ACS Symposium Series No. 87, edited by WALTER A. SZAREK AND DEREK HORTON, American Chemical Society, Washington, D.C., 1979, xi + 106 pages + Subject Index, \$17.50.

This volume is a collection of seven of the eight papers presented at a symposium devoted to a discussion of the physical origin and chemical consequences of the "anomeric effect" in carbohydrates and other heterocycles, cosponsored by the Division of Carbohydrate Chemistry of the A.C.S. and the Organic Chemistry Division of the Chemical Institute of Canada, at the Second Joint Conference of the A.C.S. and C.I.C., held in Montréal, Québec, May 29–June 2, 1977. Purportedly, the authors of the various chapters in this volume have incorporated new interpretations into their texts as a result of interactions at the symposium.

Classically, the "anomeric effect" is defined as the predisposition of a polar substituent at the anomeric carbon atom of a pyranoid ring to assume the axial orientation, contrary to expectations based merely on steric considerations. The term was introduced two decades ago by Lemieux in a paper presented at another A.C.S. meeting, on the anomeric equilibria of peracetylated pento- and hexo-pyranoses [R. U. Lemieux and N.-J. Chü, *Abstr. Pap. Am. Chem. Soc. Meet.*, 133 (1958) 31N]. The anomeric effect can be rationalized as the consequence of bonding and antibonding orbital interactions between heteroatoms X and Y in X–C–Y molecules, and may be considered to be an example of the more general "gauche effect" phenomenon occurring in X–C–C–Y systems. The "origin and consequences of the anomeric effect" have received the attention of a diverse group of chemists, ranging from the purely theoretical to the purely experimental; indeed, the convening of a symposium on this topic was very timely. Unfortunately, however, this volume is flawed by serious weaknesses that limit its utility as far as the professional scientist is concerned.

Although the first chapter, by David, provides an explanation for the physical origin of the anomeric effect in terms of "Interaction between the Ring-Oxygen *p*-Type Lone Pair and Adjacent σ -Bonds in Pyranose Derivatives", a more comprehensive paper on this subject, by S. Wolfe, M.-H. Whangbo, and D. J. Mitchell, entitled "A Theoretical Study of the Magnitude and Nature of the 'Anomeric Effects' Associated with X and Y in XCH_2YH Molecules", was unfortunately not incorporated into the volume. This paper, which has since been published [in *Carbohydr. Res.*, 69 (1979) 1–26], presented a perturbational, molecular-orbital approach to the rationalization of the "Magnitudes and Origins of the 'Anomeric Effects', 'Exo-Anomeric Effects', 'Reverse Anomeric Effects', and C–X and C–Y Bond Lengths in XCH_2YH Molecules". The calculations reported were able to reproduce the experimentally observed trends in the magnitudes of the anomeric effect and, where other theoretical treatments had failed, accounted for both the lengthening of the C–1–X bond, when X is halogen, and shortening of this bond, when X is oxygen. A conse-

quence of the omission of this paper is the complete absence from this volume of a discussion of the biologically significant "reverse anomeric effect".

It is the stated policy of the ACS Symposium Series that contributions shall not be published elsewhere, in whole or major part. This expectation is not met by at least two of the chapters in this volume, that by Lemieux *et al.* on "The Exo-Anomeric Effect", and that by Paulsen *et al.* on "Aspects of Conformational Analysis of Pentopyranosyl Acetates, Benzoates, and Halides".

In order to hasten publication, papers appearing in this Series are neither edited nor reviewed. Unfortunately, in this particular volume, this policy has resulted in numerous errors in the Tables and Figures, and in syntax, punctuation, and typography. The latter are especially abundant in the chapter by Berry *et al.* on "Proton Spin-Lattice Relaxation: A New, Quantitative (?) Measure of Aglycon Sugar Interactions". This chapter, which discusses the *potential* of proton, spin-lattice relaxation-rates as a measure of the conformational outcome of the *exo*-anomeric effect, would, moreover, appear to fall outside the intended scope of the symposium topic.

Finally, although the anomeric effect is displayed in many types of heterocycles, only one chapter, that by Eliel and Juaristi on "Conformational Interactions in 1,4-Heterobutane Segments", is concerned with non-carbohydrate molecules.

Given the foregoing and other considerations, the value of this volume as a source-book for future research on the "origin and consequences of the anomeric effect" is severely restricted. It cannot be highly recommended for the personal library of the interested professional scientist, and it should be considered for library purchase only.

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