

Sucrochemistry, edited by JOHN L. HICKSON, ACS Symposium Series, Volume 41, American Chemical Society, Washington, D.C., 1977, 379 pages. \$20.00.

It is fair to expect, I believe, that the *déjà vu* phenomenon will recur with increasing frequency as one ages. Such an expectation is re-inforced by reading this book, a collection of 27 papers edited by Dr. John L. Hickson, a consultant and former official of the International Sugar Research Foundation, Inc., which co-sponsored this symposium together with the Division of Carbohydrate Chemistry of the American Chemical Society. Tucked away near the end of the book, in the introduction to the final section headed "Business Aspects", is the statement: "In this ... (section) ... will be discussed another very important aspect of the application of sucrose, namely the promotion of sucrochemistry to the chemical industry". A well-qualified discussant of this subject (A. J. Vlitos) then proceeds, in a paper characteristically for industrial sugar chemists, entitled "Hopes in a Sucrochemical Future" (why not, at least, a heads-up "Expectations"?), to summarize the weaknesses in "sucrochemistry programs". "The program", he says, "is unlikely to convince the giants in the chemical industry to adopt (it)", and "The sugar industry ... seems at the moment to lack the expertise or the entrepreneurship to enter the chemical markets". To this reviewer, the latter statement summarizes the status of sucrochemistry, at least in so far as "business aspects" and financial support are concerned. An industry whose horizon is bounded at one extreme by over two hundred years of periodic appeals for government assistance and at the other by automatic, defensive reactions to fresh ideas, which are perceived mainly as threats to its classical structures, can hardly be expected to be innovative. So let it be recognized that the title of this symposium and book is conceived within the narrow conceptual limits of the sugar industry. These limits do not go much beyond the laic synonymy of sucrose and sugar. Fortunately, however, for those of us interested in chemical progress, there are many broadly based and excellent papers in this volume. Some of these are presented in the multidimensional context we are entitled to expect at this late date in examining the feasibility of industrial utilization of carbohydrates, and their presence should have been recognized, at least, in a sub-title.

The elegant summation paper on selective substitution of hydroxyl groups in sucrose, by Leslie Hough, is a most useful addition to Professor Hough's many contributions to carbohydrate chemistry. His early award of a major prize by the Sugar Research Foundation, predecessor to the ISRF, recognized his excellence. Equally important to the outstanding advances in knowledge of the specific reactivity of sugar structures, an area that holds great promise for commercial application, are the paper on high-resolution n.m.r. spectroscopy by L. D. Hall, K. F. Wong, and W. Schittenhelm, the review by Riaz Khan on chemical modifications of sucrose, and, particularly, an article on the significance of metal chelates in the preparation of selectively substituted derivatives of sucrose, by a group of talented Finnish chemists.

In the applied sections of this volume, the papers that furnish a well-rounded update of the status of sucrose esters are welcome. They should initiate renewed

consideration of these products by industrial groups. In another significant area, the use of sucrose and other sugars and sugar derivatives in coatings and in polyurethanes is surveyed in a group of papers that pay particular attention to the properties required for the applications intended. In polyurethanes, a field that is growing very rapidly, the preferred polyols demand consideration of sugars as organic chemicals, and re-emphasize the critical importance of continuing attempts to eliminate the wall that still separates most of the familiar sugar chemistry from general organic chemistry.

It is this conceptual transformation that Dr. Henry B. Haas had hoped to achieve by introducing the term "sucrochemistry", as he implies in his introductory chapter; but the transformation of regenerable carbohydrates into chemicals in a massive way will very likely be determined by fermentation advances, as discussed in excellent papers entitled "Organic Solvents by Fermentation", by F. W. Hayes, and "Chemicals by Fermentation", by Roger Williams, Jr., and an article that considers sucrose in an especially analytical way as a chemical feedstock competing with hydrocarbons (W. J. Sheppard and E. S. Lipinsky). Although the last of these three papers is completely rational in seeking a purely economic basis for decision, steps that government can take in restructuring the market provide an alternative way to make ethyl alcohol (for example, in Brazil) an extender for petroleum-derived motor fuel. The Hayes paper describes an experiment in Natal, South Africa (a center of the sugar industry), which began, in 1936, to sell a mixture of alcohol and benzene, and which is still in production with alcohol plus low-octane gasoline. Hayes properly emphasizes "not following the worship at the altar of the god of LARGE SCALE" and carefully examining local opportunities. In present-day terms, these alternatives translate into "appropriate technology".

Over the years, the sugar industry has had ample opportunities to consider local needs and developments where raw sugar was produced. To have done so might well have provided the diversification that means survival today. But, with the rapid changes taking place in socioeconomic and technological factors, the industry has moved rapidly toward a sweetener-industry identity. Moreover, this change appears to be outside the control of the sugar industry's traditional structure. "Sucrochemistry" is an interesting and useful collection of papers, but in its over-identification with sucrose, it only emphasizes anew the serious problems of the industry devoted to that one product.

This book is printed in the offset style made familiar by the ACS Symposium Series. Tables and illustrations are well done, and the only errors observed were in the spelling of names in references. One, Michael Doudoroff, misspelled twice, is of special and perhaps great future significance to the sugar industry. W. Z. Hassid and he carried out the first biosynthesis of sucrose and received a Sugar Research Foundation prize for it.

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