

Book reviews

Sugar: Science and Technology, edited by G. G. BIRCH AND K. J. PARKER, Applied Science Publishers Ltd., London, 1979, xii + 475 pages, \$80.00.

Sugar: Science and Technology is a book having a "product mix" that promises to puzzle more than one reader. This reviewer found it helpful to treat these proceedings, of an Industry-University co-operative Symposium held at the University of Reading in April, 1978, as a report of a gathering of a family and its intimate friends, the family being the famous and internationally respected Tate & Lyle Ltd. Considered in this context, the 22 papers presented at the Symposium and recorded in the book reflect, as might be expected, the interests of the company. With this approach, it is easier to accept the appearance, in a single volume, of the details of sugar technology, pure and applied sucrochemistry, a sugar-in-food-technology overview (along with some specific, commercial, sugar-usage aspects), a description of taste perception, and a discussion of sugar and health issues. Papers on non-sucrose, carbohydrate sweeteners are also included, but one wonders at the expansion of the definition of the term "sugar" by representatives of the normally conservative, sugar industry to accommodate D-glucose syrups and xylitol.

The Introduction, by E. J. Rolfe, strikes a note that might be considered to be the theme of the Symposium, namely, concern over the association of sucrose with a number of health and nutrition problems. However, except for passing reference to these internationally recognized problems in succeeding chapters, their surfacing for detailed discussion must be awaited until the last section of the book, starting on page 415. Even here, the treatment seems somewhat casual, being introduced by Ian MacDonald's brief sketches of alleged roles of sucrose in such diseases as diabetes and obesity, and concluding with a brief, defensive treatment of sucrose and dental caries by Suikerstichting Nederland's W. Visser. Visser's paper deserves some comment, for he takes an adversary stand in this discussion, a one-sided view typical, but the opposite, of that taken by anti-sugar-consumer advocates and some government agencies in the U.S.A., and it is certainly not an admirable approach to the single health problem wherein sugar is definitely involved. John Yudkin, a long-time, outspoken enemy of sucrose, who authored the chapter on "Sucrose and Coronary Thrombosis", suggests that it is time that the sugar industry "... turned its critical scientific attention to the effects of sucrose on the human organism, since it is a dietary component that now constitutes a higher proportion of our diet than does any other single food".

Papers by Abrams and Ramage on "Sugar Refining", Kort on "Colour in the Sugar Industry", and Dutton on "Control and Standardization of Sugar" go deeply into many aspects of cane-sugar refining, and the emphasis carries over into two papers on the sugar-beet industry.

The long-time devotion of Tate & Lyle to studying the fundamental chemistry of, and developing industrial, non-food uses for, sucrose is underlined in John Hickson's paper on "The Potential for Industrial Uses for Sucrose", and in the presentation by Riaz Khan on "Advances in Sucrochemistry". Khan references many of the achievements of Professor Leslie Hough, who has, throughout the years, developed the chemistry of sucrose in a rigorous, imaginative manner, and displays the results of his own vigorous campaign in this field. Hickson describes the birth, life, trials, and tribulations of sucrochemistry in as fine a treatment of the topic as is available. He attributes the near demise of sucrochemistry to various economic pressures. It is amazing that today he can look to a successful future for such products as sucrose surfactants with the same ebullience and optimism he showed for essentially the same future some twenty-five years ago. Professor A. J. Vlitos of the Tate & Lyle group seems determined to produce fruit from the sucrochemistry seeds planted by H. B. Haas and nurtured with considerable care by Hickson. One can only wish them luck.

Food applications are essential to the survival of a sugar refiner, and W. M. Nichol of Tate & Lyle briefly examines the various food uses for sugar in his paper on "Sucrose and Food Technology", and also describes several physical properties that make sugar useful in foods, but, to the reader's disadvantage, his depth of knowledge is not apparent in this short piece. He cautions against relying on relative sweetness values determined on dilute solutions of pure sweeteners, a point often disregarded in discussions of sweetness.

In "Perspective of Carbohydrate Sweeteners in Soft Drinks", D. Hicks of Beecham Products offers a refreshingly practical explanation of why different sweeteners are used in a number of carbonated beverages. His detailed attention to the technical aspects of carbohydrates for this use includes a description of sweetener properties that are brought to bear in solving technical problems. This paper is quite informative, pays attention to some of the health aspects of sugar as found in soft drinks, and probably qualifies as one of the best papers available on the subject. Howling's chapter on "The General Science and Technology of Glucose Syrups" contains little new information for anyone acquainted with the products. One wonders why reference was not made to the work done at Natick under Reese on conversion of cellulose into D-glucose, why such short shrift was given to high-fructose corn-syrups (which have severely cut into the market for sucrose), and why the claim is made that D-fructose must be isomerized to D-glucose in the body before it can become a source of energy. "Novel Hydrogenated Glucose Syrups" by Kearsley and Birch contains a wealth of information on the manufacture and characterization of a spectrum of hydrogenated D-glucose syrups. The information essentially duplicates that in a publication [*Staerke*, 29 (1977) 425] by the authors, but was, nevertheless refreshing to read. Hydrogenated D-glucose syrups are not new, but information on their preparation and characterization has not been made publicly available, except for the Lycasin® brand; because the company did not see fit to publish, neither Kearsley nor Birch could have been aware that CPC-International had similar syrups

well in hand over twenty years ago. The chapter in these proceedings is a worthwhile contribution to sweetener technology.

The papers by the Xyrofin representatives on D-fructose and xylitol are outright "sales pitches" and thus are, expectedly, hyperbolic in some of the claims, exemplified by the statement by Vanninen and Doty that "from the point of view of the food industry, fructose is so similar to sucrose that it can be used without difficulties in most food instead of sucrose". Fair questions are: why no attention was given to the FASEB report to the U.S. Food and Drug Administration regarding the lack of utility of D-fructose as a sweetener in foods for special dietary purposes, and why mention of toxicity problems with xylitol was made only in response to a question from the floor, rather than in the text of the paper on xylitol.

The scope of the book is extremely broad. Some of the papers, on sugar technology, hydrogenated syrups, and soft-drink usage, are detailed, whereas others, such as those dealing with food technology (Nichol) and general health aspects (MacDonald) are superficial. Most of the presentations have a sound scientific basis, although caution is advised when those dealing with D-fructose, xylitol, and dental caries are consulted. Many of the authors comment that their offerings are necessarily abbreviated, and give references to more-detailed treatment of their respective subjects; in such cases, the reference lists seem quite adequate.

The typography of the book encourages rapid reading. There are relatively few typographical errors, those observed being misspellings of names of reference authors. Tables and Figures are well set, and easy to follow, although the Tables in Chapter 13 are not referenced for source; Table 2 in this Chapter seems irrelevant to the text. Formulas in a collection of papers derived from a symposium usually suffer from a disturbing lack of conformity. Riaz Khan did not show the proper ${}_3T^4$ conformation on page 183; in Table 1 of Chapter 14, all of the configurations, except that for D-fructose, are wrong.

The volume is quite up to date, especially where Tate & Lyle representatives and their professional colleagues are concerned, although the grouping of some of the papers could be questioned. For a multi-author volume, the almost inevitable overlap is not only at a minimum, but it appears that there had been some purposeful integration, suggesting excellent coordination on the part of the convenors of the Symposium. The wide scope of the book is such that one is hard put to compare it with similar publications. However, for \$80.00, a volume or two dealing more deeply within much narrower boundaries of subjects could be purchased. The book could be of service in public and school libraries, but further distribution is not recommended. It might be suggested to J. A. C. Hugill, who authored a delightful, short history of the sugar industry for this Symposium, that the World Sugar Research Organization (of which he is Director General and Secretary) could serve the industry well by reproducing and distributing copies of these papers.