Immobilized Enzyme Principles (*Applied Bioehemistry and Bioengineering*, Volume 1), edited by L. B. WINGARD, JR., E. KATCHALSKI-KATZIR, AND L. GOLDSTEIN, Academic Press, New York, San Francisco, and London, 1976, xi+364 pages. $32.50, £23.05.

This volume is the first in a Series designed to portray a new endeavour—technological development of recent discoveries in biology. The particularly fruitful developments of recent years that warrant initiation of this Series are explained in terms of the underlying common denominator of biochemistry, as current work in biology is heavily involved with research at the molecular level. Engineering practice is essential to these developments. Thus, the Series (and each volume) is planned to be based upon the productive interaction of biology with engineering as related by biochemistry.

The editors have selected immobilized enzymes as the topic of the first volume because of the extensive international effort currently under way on investigating the utilization of enzymes as special catalysts for use in industrial processing, analytical chemistry, and medicine. Successful technological developments have already been demonstrated in these areas, but the rapid proliferation of immobilization methods, support materials, and reactor designs points to the need for in-depth summaries and experienced guidance to aid in the development of still newer applications of immobilized enzymes. Volume 1 stresses the critical summary of immobilization methods and supports, the kinetic characterization of immobilized-enzyme systems, the manner in which these factors are utilized in the design of immobilized-enzyme reactors, and the description both of the early work and some of the industrial processes that employ immobilized enzymes.

The volume places a major emphasis on the chemistry and the practical aspects of preparation of enzyme-support systems, on the effects caused by the concurrent phenomena of enzyme-catalyzed reaction-kinetics and mass-transfer resistances, and on how these phenomena may be incorporated into the design of enzyme-catalyzed reactor-systems. An additional chapter describes some examples of the practical application of immobilized enzymes.

Carbohydrate chemists and biochemists who have read this far may be wondering why such a book should be reviewed in *Carbohydrate Research*. The book will only be of importance to those carbohydrate chemists and biochemists who are interested either in some modern uses of polysaccharides and their derivatives, or in some modern applications of carbohydrate-directed enzymes. To such persons, the considerable attention devoted to agarose, cellulose, dextran, and starch and their derivatives (including products from cyanogen bromide treatment) and to α-amylase, β-amylase, β-D-fructofuranosidase, β-D-galactosidase, glucoamylase, D-glucose isomerase, D-glucose oxidase, and lysozyme is directly relevant.

Because of its wide application, the book is also claimed to be useful to the analytical chemist, biologist, biochemist, chemical engineer, and microbiologist involved in pharmaceutical manufacturing, analytical and diagnostic chemical and

medical devices, food processing, food science, petroleum processing, immunology, polymers, separation and purification, fermentation, and medical research.

Department of Chemistry,
University of Birmingham,
Birmingham, U.K.

JOHN F. KENNEDY

Immobilized Enzymes for Industrial Reactions, edited by R. A. MESSING, Academic Press, New York, San Francisco, and London, 1975, xiv+232 pages, $14.75, £10.50.

The title of this book is somewhat ambiguous in that the greatest proportion is devoted to the preparation and properties of immobilized enzymes rather than to an explanation of how to go about using immobilized enzymes to carry out reactions at the industrial level. The stated intent of the book is "to guide the engineer and scientist along the path toward the industrial application of immobilized enzymes". The work claims to be neither a comprehensive review of the literature on immobilized enzymes nor a basic text for enzyme chemistry and engineering. The book is, in fact, an amplified course for engineers and scientists on the production of immobilized enzymes and their application to industrial processing.

Following an introduction and general history of immobilized enzymes, a limited review of enzyme chemistry is presented. Subsequent chapters describe the derivatization of a variety of matrices, including glass for enzyme immobilization, and set out the principles involved in immobilization of adsorption, inorganic-bridge formation, covalent attachment, and entrapment. Separate chapters are devoted to a comparison of the characteristics of free and immobilized enzymes, and to immobilized co-enzymes. The penultimate chapter, on design and operation of immobilized-enzyme reactors, considers the importance of performance, mass transfer, electrostatics, heat transfer, pressure drop, and financial phenomena. The final chapter, on applications of immobilized enzymes, describes various viable and existing uses of immobilized enzymes.

The relevance of the book to carbohydrate chemists is the same as that in the foregoing review, and key words are: agarose, cellulose, dextran, starch, α-amylase, β-amylase, cellulase, α-D-galactosidase, glucoamylase, D-glucose isomerase, D-glucose oxidase, (invertase), (lactase), lysozyme, and pectinase.

Immobilized-enzyme technology is truly representative of a multidisciplinary science and, as for the other book, this book is relevant to a spectrum of professionals.

Although produced by a rapid, manuscript-reproduction process, the typewriter presentation of the book is clear and bold. The handy, not-too-large size will aid the commendation of the work as a useful handbook for teaching purposes, both