

interesting to read the latter, since the subject is quite important and frequently overlooked. What makes the reading worthwhile despite the overlap is the perspective of each author: Cooney is trained as a biochemical engineer, while Fiechter is trained as a biologist, with a strong orientation in continuous culture.

I found the "fundamentals" referred to in the volume title to be very fundamental indeed. Certainly if one obtains a degree at the baccalaureate level, some basic biology course must have been taken. I found italicized words in statements such as "yeasts are



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eukaryotic organisms which belong to the *fungi*" unnecessary and distracting.

The section on microbial metabolism was well done by Horst Doelle (Queensland, Australia), and provided ample literature citations—a feature I feel is lacking in most other chapters. Doelle omits the biosynthesis of lysine in both prokaryotic and eukaryotic organisms though the catabolism of lysine is discussed. A chapter by Juan Martin and Paloma Liras (Leon, Spain) on secondary metabolism is included, but we will have to wait until Volume Four for an in-depth treatment.

I would have enjoyed a chapter here on the historical perspective of biotechnology. One of my favorite texts is *Plant Physiology*¹, which features scientists who have made historically important contributions to the subject. I feel a comprehensive treatise, such as this one, should have included an overview of the work of Raistrick, Weizmann, Lipmann, and Waksman. It should also have described the significance of the Boyer and Cohen work to modern biology.

Biotechnology is an important work making a valuable contribution to the field. It enables one to learn basic microbiology, biochemistry, and engi-

neering. It also emphasizes the discipline's commercial potential by including separate chapters on patents and sources of microorganisms (very important information to those not in the field). The driving force of biotechnology—recombinant DNA technology—is handled in a straightforward manner, making this a recommended work for those wishing to learn various aspects of the field. ■

1. Salisbury, F. B. and C. W. Ross. *Plant Physiology*. Belmont, CA, Wadsworth Publishing Company; 1979.

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BIOCATALYSIS

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Industrial Enzymology: The Application of Enzymes in Industry. Edited by Tony Godfrey and John R. Reichelt. Pp. 582. ISBN 0-94-3818-1. (The Nature Press: 1983.) \$77.00.

The purpose of this new book is to assemble information on the industrial application of commercially available enzymes to serve as a useful reference source for those in industry as well as academia. *Industrial Enzymology* does an excellent job of achieving this goal. The combined practical experience of the 18 contributors to this volume is considerable, making the book a most valuable addition to the literature on applied enzymology.

A chapter on practical enzyme kinetics useful in the design and operation of industrial enzyme reactors is presented. The discussion provides helpful insights into the use of enzyme kinetic data to screen and select the most suitable enzyme for a given industrial application. A chapter on legislation and regulation is essentially a guide to the current legislative status of enzymes in the various member states of the European Community, Canada, and the U.K. Also included is a list of enzymes and sources currently being recommended for use in food in the U.K., and lists of enzymes and sources which have already been approved for food use in the U.S. and Canada. Some of the most recent thinking regarding toxicological studies for microbial food enzyme preparations is discussed. Health and safety considerations in handling and use of industrial enzymes are also presented.

Most of the volume is devoted to the use of enzymes in 17 different industries. Industries included are alcohol (both potable and fuel), analytical applications, baking, brewing,

dairy, detergents, effluent, flavoring and coloring, fruit juice, leather, paper, plant tissues, proteins, starch, textiles, and wine. Special enzyme processing considerations resulting from the industrial experiences of the authors are prevalent throughout the text. Schematic flowsheets for typical processes are presented. Representative process parameters are frequently discussed, including indications of substrate and enzyme use levels.

A comparison of key enzyme characteristics of 85 industrial enzymes is presented, including mode of action, reaction optima, sensitivity to inhibitors and activators, and, where available, stability under practical reaction conditions.

Several summary data indexes are included at the end of the book as "data indices." These indices contain a wealth of tabulated information which greatly enhances the value of this volume as a reference source. Data Index 2, for instance, gives a comprehensive listing of 66 enzyme supplier companies, including addresses and types of enzymes supplied. Data Indices 3 and 4 list available enzymes in all forms including product data provided by many of the enzyme suppliers. Data Index 5 tabulates current industrial enzyme assays and unit definitions for selected enzymes. Practical biochemical data for industrial enzymes are presented in Data Index 6.

A number of minor errors appear throughout the text. For example, the Michaelis-Menten constant, K_m , includes the units of concentration, but Table 2.1 states that K_m values are expressed in micromoles. Unequal and equal signs are sometimes missing in the text of the second chapter. Occasionally, a reference is missing from the list of references at the end of a chapter. On the positive side, the editors have done an excellent job of cross-referencing.

This volume is an up-to-date guide and useful reference source for those working in the area of industrial enzymology and those seeking to learn more about the practical applications of enzymes in industry. Until publication of this book, there has been relatively little detailed published work in this important area. The continuing development of recombinant DNA technology will most certainly encourage the commercial production of a number of potentially useful enzymes. In the future, the industrial use of enzymes can be expected to expand into many more areas than can be illustrated by examples in a single volume. ■

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