a particular immobilization technique or biocatalyst choose the most logical biocatalyst support matrix, biocatalyst, and immobilization technique.

Hartmeier deals with the practical aspects of immobilized biocatalysts. Over half the book is dedicated to applications of biocatalyst immobilization, beginning with a chapter on reactors for immobilized biocatalyst and followed by chapters on industrial, analytical, and basic research applications and procedures in biocatalyst immobilization. Hartmeier covers the standard forms of reactor technology, adding a review of "special forms of reactors" (sieve stirrer, rhomboid, and tubular). This chapter lacked references for specific reactor types, (packed bed, loop, membrane, and tubular for example); however, some references were scattered throughout the practical section.

In addition to the four chapters on reactors and applications, the practical section of Hartmeier makes this manual stand out from the two others. Ten experiments are detailed in which the reactors, immobilization methods, and biocatalysts are varied, giving the technologist complete experimental procedures that he can adapt to fit specific applications.

While Hartmeier split his book equally between theory and practice, Tampion concentrates on cell immobilization methods. He devotes 45 pages to entrapment, encapsulation and retention of cells by membranes and gives a 30-page treatise on cell adsorption. This different emphasis is understandable since cell immobilization technology is earlier in its development than is enzyme technology. The references are quite up-to-date, with most between 1980 and 1986. Tampion provides a link between the engineer and biochemist, especially in the final reactor section of the manual. For example, he discusses fluid velocity profile and transverse flux rates in fixed film reactors, and pressure drop and differential mass balance in column reactors. Tampion provides ample discussion of cell biology and an in-depth look at cell viability.

Rosevear intends to provide an overview of enzyme and cell technology as well as a "practical guide on the choice and relative merits of many techniques," focusing on assisting the technologist in his choice of biocatalyst, matrix, and reactor. This work devotes much space to generalizations that could have been eliminated. Instead, coverage of other topics could be expanded—such as the single page about enzymes and cells under the heading of Biocatalyst Types. Rosevear excels, however, in covering membrane reactor technology, covalent binding of biocatalysts to organic and inorganic carriers, and reactor modeling. In all three volumes, the authors mention that despite 20 years of experience with immobilization technology, few processes have found commercial uses. On a positive note, the production of L-amino acids from racemic mixtures using ionically bound L-aminoacylase is a recent milestone, as is the production of l-amino acid from keto acids with a two-enzyme procedure.

Taken together, these books provide a complete and current update of the immobilized biocatalyst field. They made a fine addition to the old immobilization bibles on my shelf.

Richard P. Beaver is a chemist with PPG Industries, Pittsburgh, PA.

PULP NONFICTION FROM CELLULCON '88

***Wood and Cellulosics:* Industrial Utilisation, Biotechnology, Structure and Properties. Edited by J. F. Kennedy, G. O. Phillips, and P. A. Williams. Pp. 664. ISBN 0-7458-0113-7. $100.00 (Ellis Horwood Ltd., Chichester, England: 1987).**

The ubiquitous current and potential uses of wood and wood derivatives ensure continued research and development in this area. This is evidenced by *Wood and Cellulosics*, a compilation of papers presented at Cellulcon-86, the Second Symposium on Cellulose Chemistry and Applications, which was held at the North East Wales Institute of Higher Education, Wrexham, Wales.

This large volume is divided into three parts that deal with: (1) structure and properties, (2) biotechnology, and (3) industrial utilization of wood and cellulosics. Part 1 includes papers that perhaps only experts in this area could fully appreciate—fundamental studies on the structure and characteristics of native and chemically modified celluloses that provide insight into the methods and analytical tools used to obtain such information.

Part 2 consists of research papers that address various aspects of the bioconversion of cellulose, hemicellulose, and lignin to fuels and chemicals. Included is an excellent review on the structure and enzymatic breakdown of wood components, along with specific topics such as enzyme production, cloning of a gene for aryl ether cleavage (lignin breakdown), structural organization of cellulase enzymes, xylanolytic microorganisms, utilization of waste cellulose, and the economics of wood utilization. This part of the book, however, is far from comprehensive and has little direction, organization, or substance.

Part 3 provides a comprehensive set of research papers on the current industrial uses of wood. They deal with pulping, methods of protection and preservation (including shipwrecks brought to the surface after hundreds of years beneath the sea), chemically modified cellulose, biocompatibility of cellulose-containing polyanionic complexes, and the interaction of adhesives with wood. I found this part to be the most enjoyable to read.

A few poster papers are included at the end of the book. They could have been incorporated into any of the three parts of the book described above, and I wondered why this was not done.

With many symposia, the registered attendees usually receive a complimentary copy of the proceedings. Trying to identify others who would find this book directly useful is somewhat more difficult. Clearly the book crosses several cellulosic disciplines, not all of which would be of interest to biotechnologists or cellulose chemists. It is, of course, too specific to be of use as a handbook to obtain general information for students of biotechnology. I do feel, however, that cellulose chemists would benefit greatly from it since it provides a useful reference on cellulose structure and utilization.

Jonathan Woodward, Ph.D., is a staff scientist at Oak Ridge National Laboratory, Oak Ridge, TN.