Bioengineering

Applied Biochemistry and Bioengineering. Vol. 1: Immobilized Enzyme Principles. Edited by L. B. Wingard, Jr, E. Katchalski-Katzir and L. Goldstein. Pp. xi+364. (Academic: New York and London, 1976.) $29.50; £20.95.

RECENTLY there has been a spate of books on bioengineering in general and enzyme technology in particular. Many are collections of unrelated articles of very variable quality. Therefore it is pleasant to note that this first volume of a new series has a coherent theme which is well treated. The editors do have a particular reason to organise the volume well. Wingard has done much to stimulate interest in enzyme technology, and Katchalski-Katzir and Goldstein were pioneers in the fundamental studies of immobilised enzymes. Appropriately the latter two editors begin the book with a concise survey of developments in the field which serves to introduce subsequent contributors. Goldstein is also co-author (with Manecke) for the second chapter on the chemistry of enzyme immobilisation. The systematic treatment of the available methods with comment on their advantages and disadvantages will be welcomed by anyone who has to make a selection from the bewildering number now available.

Engasser and Horvath deal with diffusion and kinetics of immobilised enzymes. They draw heavily on the results of their collaborative studies in dealing, for example, with the effect of external diffusion limitation on the observed behaviour of enzymes immobilised in porous particles or membranes.

The review of the design and analysis of immobilised enzyme flow reactors by Vieth *et al.* is well documented but the reviewer would arrive at some different conclusions. The authors state that 'batch reactors have limited potential in industrial immobilised-enzyme catalysis.' Most of the semisynthetic penicillins produced industrially in Europe and a growing proportion elsewhere are made by means of batch conversion using immobilised enzyme.

The industrial application of immobilised enzymes and immobilised microbial cells are described with technical and economic details by Chibata and Tosa, whose Japanese company was the first to announce the use of both types of catalyst in modern industrial processes. It is interesting that glucose isomerisation, which originated in Japan but was developed as the largest-scale current use of immobilised cells or enzymes in the USA, is not dealt with in any detail, presumably because it does not have the same economic importance in Japan. **P. Dunnill**

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Synaptic connections

Neuronal Recognition. By S. H. Barondes. Pp. xvi+367. (Plenum: New York and London, 1976.) $33.

THIS collection of eleven essays is concerned with the problem of how neurones establish synaptic connections with certain targets and not with others. As a result of studies on the developing and regenerating nervous system, we now have a reasonable picture of the degree of discrimination in several situations, but not of the underlying cellular and molecular mechanisms. The essays vary from relatively general reviews to quite detailed accounts of work from the authors' laboratories. Together, they provide a good overall view of approaches to the problem.

The existence of specificity, as well as its extent and possible basis, is considered for the retinotectal system (Jacobson), for the neuromuscular junction (Fambrough), for sprouting in the central nervous system (Cotman and Lynch), and for synaptogenesis in tissue culture (Bunge). Morphological information about early events in synapse formation is considered by Pfenninger and Rees, and the current unsatisfactory state of biochemical methods for purifying and fractionating neural plasma membranes is critically reviewed by Morgan and Gombos.

The second half of the book is concerned with attempts to assay and identify molecules involved in cell recognition in various situations. Although there is, as yet, no direct evidence on the relevance of these studies to synapse formation, they are clearly of great interest to students of specificity. Three of these essays are concerned with investigations of cellular aggregation and adhesion in the retinal and retinotectal systems (Moscona; Roth and Marchase; Merrell, Gottlieb and Glaser). The morphogenetic role of extracellular glycosaminoglycans is considered by Toole, and Barondes and Rosen discuss cell surface lectins and cell recognition in slime moulds.

Most of the essays are thoughtful, well organised and often helpfully illustrated. Neurobiology sometimes seems impenetrable to outsiders, but I would strongly recommend this volume to interested investigators in other areas of cellular and molecular biology, as well as to graduate students and specialists in the field. **Jeremy Brockes**

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Fourier transform NMR spectroscopy

Fourier Transform NMR Spectroscopy. By D. Shaw. Pp. xvi+357. (Elsevier Scientific: Amsterdam, Oxford and New York, 1976.) Dfl. 129; $49.75.

FOR a great deal of chemical structural and diagnostic work using proton nuclear magnetic resonance (NMR), a simple continuous wave (CW) spectrometer is entirely adequate, but in cases involving very small molar quantities of sample or for measurements on other nuclei, Fourier transform (FT) spectrometers are needed. The CW spectrometer scans slowly across the spectrum, using a continuous monochromatic radio frequency to stimulate each resonance in turn. In the FT spectrometer, a brief but strong pulse of radio frequency is applied to the sample so as to stimulate all the resonances simultaneously. The response of the nuclear spins after the pulse is collected, and because the components of all the resonances are mixed up together (and in the time domain) a computer is needed to disentangle them and produce the more familiar spectrum (in the frequency domain). Because all the resonances are stimulated simultaneously, there is a substantial gain of signal-to-noise for complex spectra, and because the method uses pulsed radio frequencies, relaxation times are more easily measured than with the CW method.

Dr Shaw has produced an excellent handbook for those spectroscopists who are extending their activities from the CW to FT methods. In chapter 3 the mathematical principles are outlined, not in an attempt to provide rigorous accounts of the theorems, but to ensure that the physical principles are clear and the equations used can be understood. Chapters 4 and 5 give a clear description of the various ways of exciting NMR spectra and their relative advantages; and chapters 6 and 7 explain in some detail the experimental methods available, the equipment required, how it works, and the ways in which it may be used. These chapters form the core of the book and will be of great value to all those who need to use FT spectrometers.

Chapters 1 and 2 give a brief introduction to the principles of NMR spectroscopy; and chapters 8, 9, 10 summarise many of the ways in which NMR spectroscopy can be applied to chemical problems and how the measurable parameters can be obtained. These chapters cover a lot of ground and are useful mainly as a convenient outline and reminder to readers already acquainted with the subject. **R. E. Richards**

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