need for medical students to have the relevance of preclinical studies made clear, so as to increase their motivation and learning capacity. However, it is apparent that already we have outstripped the abilities of the human memory to deal with the conceived and possible data load, so choices have to be made. This volume illustrates one very important route which has the advantage of having medical history on its side. Other choices could be made in relation to common medical disorders but the interest may not be as great to a biochemist. The emphasis placed on enzyme reactions is perhaps too great and this is its major thrust. Perhaps we should consider more the mechanisms of cell and organ failure as was briefly illustrated in the presentation of myocardial infarction.

Overall this is an important contribution which shows to medical students the links of biochemical knowledge to the practice of medicine. The idea of using it with standard texts is to be applauded and this enables the student to learn to integrate his own knowledge. It will certainly help to keep a very large area within manageable proportions and will undoubtedly be consulted by preclinical students now and in future.

John Anderson

Plant Organelles

Methodological Surveys (B) Biochemistry, Volume 9

Edited by E. Reid
Ellis Horwood; Chichester, 1979
x + 232 pages. £18.50

The principles of quantitative subcellular fractionation and of the correct use of marker enzymes were formulated many years ago and were summarised in detail by de Duve in 1971 (J. Cell Biol. 50, 520–550). These principles are only just beginning to penetrate into general biochemical practice. How often have detailed studies on, for example, liver 'mitochondria' been carried out on fractions contaminated with lysosomes, peroxisomes and other organelles! We have recently been exposed to the embarrassing discovery that β-oxidation of fatty acids in animal tissues, which generations of students have memorised as occuring only in mitochondria, actually occurs partially in the peroxisomes.

Correct fractionation techniques, accompanied by appropriate balance sheets, are even more rarely used upon plant tissues. It is often widely assumed, without checking, that markers developed for animal tissues can be applied freely to plants or that the localisation of enzymes will be the same in different plant tissues. Plant Organelles reports the proceedings of a meeting held at the University of Surrey in 1978 at which these problems were critically examined. For example, Hall and Taylor (chapter B5) conclude that there is no reliable marker enzyme for the plant-cell plasma membrane.

The book discusses the isolation methods for plant-cell mitochondria, chloroplasts and their envelopes, peroxisomes, vacuoles, microtubles, plasma membrane and Golgi apparatus. Each chapter critically evaluates the purity of the fractions so obtained and how the quality of the preparation may be assessed. The editor has appended brief notes of the discussions that took place after each paper had been presented, although a more extensive reporting of the discussion might have been helpful. The book ends with an excellent summary (page 207) of suitable and unsuitable marker enzymes for plant organelles.

Overall, I found the book to be excellent and I would recommend it to anyone contemplating enzyme localisation work on plant tissues or even studies on a single isolated organelle, so that they can at least know what they are getting in their preparation. Nevertheless, the book has some irritating faults apart from the paucity of reported discussion. It has been reproduced from camera-ready copy, but the

quality of page layout varies from reasonably acceptable to appalling (e.g., see pages 27 and 48). Many of the chapters fall between two stools in that they give too much detail for the general reader but not enough for those actually attempting to perform the experiments, who would probably have to go to original papers or to Methods in Enzymology.

Nonetheless, I remain convinced that this book should be closely read by all workers in the field of Plant Biochemistry. Its price is not excessive in view of its information content.

B. Halliwell

Energetics and Structure of Halophilic Microorganisms

Edited by S. R. Caplan and M. Ginzburg
Elsevier/North-Holland; Amsterdam, New York, 1978
xxii + 672 pages. $78.00, Dfl 160.00

This book summarizes a workshop on Halophilism, sponsored mainly by the European Molecular Biology Organization, at the Weizmann Institute, Rehovot in May 1978. It contains 24 invited papers, most followed by group discussions, 32 contributed papers (presumably representing posters) and 2 roundtable discussions and represents the work of some 100 participants. Space limitations preclude naming individual contributors, but a good representation of all those scientists studying halophilic and salt-tolerant microorganisms took part.

As the editors point out, a great deal of interest (and support) for studies of extremely halophilic bacteria comes from the discovery in the 'purple membrane' of the halobacteria of the retinal protein, bacteriorhodopsin (BR), a fascinating proton pump which can convert light to chemical energy. The treatment of this subject, occupying almost half the book, is detailed and specialized. The contributors are mainly concerned with the coupling of the BR photocycle with proton translocation and with possible changes in BR conformation during this process. Retinal proteins are also involved in the behavioural response of an extreme halophile to light.

Interesting as the BR system is, extreme halophiles can live very well without it and there is still much uncertainty about its role in halophilic life in the laboratory and in Nature. Fortunately, the book contains much material on other aspects of such life. Discussions of the physical chemistry of highly concentrated solutions and of the state of water and solutes in halophiles, with which it begins and ends, are especially pertinent. There are valuable sections on transport, metabolic systems, enzymes and enzyme regulation and on the highly unusual lipids, cell surface components and ribosomes of the halobacteria. For some years the need for very high salt concentrations to prevent denaturation limited the work that could be carried out on these enzymes. Affinity chromatography and other chromatographic techniques now make it possible to obtain some enzymes in a state of high purity and to re-examine earlier explanations of salt effects based on kinetic data alone.

The chemical peculiarities of the extreme halophiles are not necessarily connected with their salt requirement. Their ether-linked phospholipids, or similar compounds, have recently been found in methanogenic and thermo-acidophilic bacteria and hence may point to a common evolutionary origin of these unusual but physiologically distinct groups of microorganisms. The protein-synthesizing systems of halobacteria do require high salt concentrations but also have certain properties (initiating sites, sequences of certain ribosomal proteins and of ribosomal RNAs) which seem closer to eucaryotic than to most procaryotic cells. In cell surface components and in ferrodoxins, halobacteria also seem to have evolutionary links to eucaryotic cells.

Of special interest (to this reviewer) were short chapters on other halo-tolerant and halophilic bacteria, yeasts and algae, which include material on mechanisms of osmotic regulation, effects of antibiotics and bacteriophages.

As might be expected, the book does contain some