Receptors and Recognition

Series A, Volume 3

Edited by P. Cuatracases and M. F. Greaves
Chapman and Hall; London, 1977
166 pages. £ 6.00 (paperback), £ 10.00 (hardback)

This is the third book in the fast expanding 'Series A' of volumes devoted to recent research on cellular interactions and recognition processes. Each contains four to six articles covering a wide range of topics concerned with biochemical, cellular and evolutionary aspects of cell–cell interactions, using as a central theme the notion that these interactions depend upon the recognition of chemical signals and their interpretation by receptor-mediated processes. This series of short essays is complemented by 'Series B', each volume of which is devoted to a more specialised topic treated in greater depth. This is well illustrated by the first volume of Series B (The Specificity and Action of Animal, Bacterial and Plant Toxins) and by those in preparation (Intercellular Functions and Synapses in Development; Microbial Interactions).

Volume 3 of Series A is devoted to four short reviews: J. Lindstrom on 'Antibodies to Receptors for Acetylcholine and other Hormones'; Marjorie Crandall on 'Mating-type Interactions in Micro-organisms'; H. Furthmayr on 'Erythrocyte Proteins' and M. Silverman on 'Specificity of Membrane Transport'. These exemplify the wide coverage of the series, which is intended to illustrate the need for an integrated and multidisciplinary approach to the understanding of cell–cell communication.

Lindstrom's essay on antibodies to receptors (38 pages, 143 references) provides an exciting introduction to the recent explosion of knowledge of the structure of the nicotinic acetylcholine receptor, and the role of autoimmune antibodies to it in the pathogenesis of myaesthenia gravis. The author explains how antibodies to the cholinergic receptor may be used as sensitive probes of its function and cellular localisation, as well as providing a detailed summary of his prolific work up to mid-1976 on the use of cholinergic receptor antibodies for the production of an experimental myaesthenia condition in mammals. The need for copious shorthand abbreviations sometimes makes the text a little puzzling ('The amount of anti-rat AChR in the serum of a rat with chronic EAMG – typically 5×10^{-10} mol of αBGT binding sites – was far more . . .') but on the whole it is admirably clear, and is well illustrated with diagrams and photomicrographs. The novice, such as myself, would probably benefit more if the latter were properly labelled.

Furthmayr (28 pages, 68 references) gives a concise summary of the still rather fragmentary knowledge of the structure of human erythrocyte membrane proteins. Regrettably, he does not have sufficient space to expand in much detail on the experimental methods and problems involved in the search for structure and its relationship to function. His analysis of the extrinsic detachable membrane proteins (located principally on the inside surface of the cell membrane) and of those proteins which extend throughout the membrane bilayer (the 'transmembrane' proteins such as the well-studied carbohydrate-containing 'glycophorins' which appear to be involved in transport processes) show that the commonly accepted fluid-mosaic model of protein/lipid association might also, like previous membrane models, be only of limited application.

Silverman (31 pages, 73 references) provides a wide-ranging and well illustrated introduction to membrane transport processes, focusing particularly on sugar transport in the proximal tubule of the dog kidney, as well as on sugar transport in tissue culture and its modification by insulin. The final essay in this volume, by Crandall (46 pages, 213 references), is a very detailed summary of present understanding con-

cerning the biochemical and physiological basis for the recognition process which precedes 'mating' of micro-organisms such as bacteria, algae and fungi.

I hope that these comments illustrate the very wide scope and interest of this attractively produced handbook. Certainly it serves as a valuable and accessible introduction to the recent literature on these topics (although, of course, all the fields are expanding very rapidly) and on the whole is clearly written. One could obviously quibble with the necessary omissions that have had to be made, and with the rather large number of typographical errors that have slipped through. Yet I think that the paperback version at £ 6 will prove to have wide appeal for biological scientists and perhaps also to postgraduates who wish to keep abreast of developments in the field of cell–cell communication.

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Living Systems as Energy Converters

Edited by R. Buvet, M. J. Allen and J.-P. Massue
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x + 347 pages. Dfl 72.00, $ 29.50

This text documents the impending threat to mankind's survival on earth as pressures on renewable energy resources mount and the limited supplies of fossil fuels dwindle at an accelerating pace. Certainly, by the turn of this century, a life style sustained by the profligate consumption of energy will have largely disappeared. It is also clear that alternative sources of, so-called, high-grade forms of energy will have to be developed before then simply to meet the minimal demands of the present population let alone the population projected on present demographic trends.

The aim of the work is to review current research into the way biological systems harness and utilise energy for their own purposes and to identify those processes that could be developed to provide useful forms of high-grade energy on a commercial scale. The book originates from a meeting held under the auspices of the Parliamentary Assembly of the Council of Europe in collaboration with the Commission of European Communities and consists of 25 chapters each contributed by a participant of the meeting. The text is divided into three sections of about equal length, dealing with energy in biological molecules, biological membranes as energy transducers and energy in cells, organisms and populations. The theme is established in an excellent introduction by G. Porter and useful résumés are included at the end of each section.

The progress to date in our understanding of energy conversions that take place in biological systems such as the photolysis of water, the evolution of hydrogen and oxidative phosphorylation is impressive but there is still some distance to go before the precise mechanisms are fully resolved. Attempts to derive high-grade energy in the form of hydrogen gas from photosynthetic systems coupled to iron–sulphur hydrogenase are reported but many problems remain especially in achieving stable and productive systems. Understandably much space is devoted to energy conversions involved in photosynthesis, indeed there is a considerable overlap in the treatment of this topic. Diagrams illustrating electron transfers in photosynthesis, for example, feature on no less than six occasions throughout the text. Despite this, and the emphasis that is placed upon the efficiency with which radiant energy is transduced in the photosynthetic process, no mention is made of photorespiration which is often responsible for considerable reductions in net yield particularly in plants that fix carbon dioxide by the C_3 Calvin cycle.

An often expressed criticism of multi-author works of this type is the unevenness of presentation and this book is not exceptional in this regard. Possibly stronger editorial intervention could have helped in matters like the standardisation of units according to the S.I.