

Correlation of morphology with chemical composition

Electron Probe Microanalysis in Biology. Edited by D. A. Erasmus. Pp. 248. (Chapman and Hall: London, 1978.) £15.

OFFERING the capability of chemical analysis *in situ* at a subcellular level, electron-probe X-ray microanalysis is an exceptionally effective means for the correlation of morphology and chemical composition. Although the importance of the technique in biology is now well established, there are few texts giving the newcomer all-around guidance in its biological use. Indeed, aside from the volume under review, only the 1977 book by John Chandler comes to mind.

The editor's introduction is followed by a capable exposition by J. C. Russ of physical fundamentals and limits of performance. The next two chapters are by J. A. Chandler ("The application of X-ray microanalysis in TEM to the study of ultrathin biological specimens—a review") and by A. J. Morgan, T. W. Davies and D. A. Erasmus ("Specimen preparation"). Although there is considerable overlap between these sections, Chandler's chapter features a very extensive coverage of the literature on biological applications, whereas Morgan *et al.* provide a much fuller comparison of a variety of preparative procedures. The chapter by T. C. Appleton ("The contribution of cryo-ultramicrotomy to X-ray microanalysis in biology"), is mainly a good up-to-date presentation of the difficult procedure of preparing ultrathin cryosections of quench-frozen material. In the following chapter ("The application of X-ray microanalysis to histochemistry"), I. D. Bowen and T. A. Ryder give a critical review of precipitation techniques with particular attention to enzyme localisation. The final section, "X-ray analysis applied to the study of renal tubular fluid samples" by H. O. Garland, J. A. Brown and I. W. Henderson, describes the special techniques used for the quantitative analysis of

tiny samples of fluid obtained by micropuncture and documents the effectiveness of the electron-probe method in this field.

Two limitations of the text should be noted. Firstly, as the editor states, "The field is . . . enormous and in order to follow certain aspects in depth, the contents of this book have been restricted essentially to the analysis of specimens in the transmission electron microscope." Nevertheless, although the emphasis on transmission microscopy is plainly evident, much of the contents, especially with regard to specimen preparation, applies equally well to studies based on scanning electron microscopy, and indeed the published X-ray analyses of micropuncture specimens have generally been done with scanning-type instruments.

Secondly, as an over-view, the text is very limited in the area of studies associated with cryotechniques, the

quantitative analysis of diffusible elements, and the attempt to control radiation damage by means of low temperatures. Although Appleton's chapter gives an excellent summary of procedures for preparing cryosections, major results from several laboratories on the quantitative analysis of diffusible elements in cryosections have been published too recently for inclusion.

However, the analysis of diffusible elements in cryosections is a field still in its infancy, and in any case requires specialised facilities. For the biological electron microscopist whose EM column is fitted with X-ray microanalytical facilities, the book gives a good idea of what can be done relatively readily, and how to begin doing it.

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Selective controlled fusions of membranes

Cell Surface Reviews. Vol. 5: Membrane Fusion. Edited by G. Poste and G. L. Nicholson. Pp. 862. (North-Holland: New York and Oxford, 1978.) \$120.

SELECTIVE, controlled fusions of membranes have long been recognised as major features of cellular and subcellular interactions in living organisms but only in recent years has any concerted effort been made to establish their significance and to identify the molecular events involved. A comprehensive treatment both of the phenomena and of attempts to account for them at the molecular level is thus both opportune and welcome.

Poste and Nicholson have made excellent choices of topics and authors to provide this comprehensive coverage, and the individual authors (with one or two exceptions) have poured all they had into it. The result is a rather large book that takes a long time to read, but the articles and their extensive reference lists (with titles) provide a reservoir of information which those directly involved in fusion studies will explore with relish and at which those with more limited interests will nibble with profit.

Most of the book is inevitably taken up with descriptions of the circumstances and conditions in which membrane fusion takes place both *in vivo* and *in vitro*. Fusion events involved in fertilisation in invertebrates (chapter 1) and in vertebrates (chapter 2) are

discussed in largely phenomenological terms. Somatic and sexual fusions in myxomycetes and in fungi (chapter 5) are more amenable to studies of control factors, as also are myoblast fusion (chapter 3) and macrophage fusion (chapter 4). The latter can be studied in culture conditions as well as *in vivo*. Plant cell protoplasts also provide a useful system for the study of the conditions required for cell fusion (chapter 8) now that effective means of removing cell walls have been devised. Fusion events which transfer both vesicle-enclosed material and membrane itself through the intracellular system during endocytosis and/or exocytosis are also extensively covered (chapters 9–12).

Detailed descriptions of chemically induced (chapter 6), virus-induced (chapter 7) and Ca^{2+} -induced (chapter 8) fusions *in vitro*, provide a basis for speculations concerning factors which may contribute to fusion processes *in vivo*. Throughout the book there are repeated references to possible influences of the nature and distribution of lipid components, the nature and distribution of protein and glycoprotein components and levels of Ca^{2+} ions on a variety of fusion processes, and there is a final chapter on problems in the physical interpretation of membrane interactions and fusion.

Thus this volume provides an authoritative, detailed and up-to-date assessment of studies relating to membrane fusion which will contribute substantially both to our understanding of and experimental approach to the problem.

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Erratum

● The review of *A Review of Amino Acid Transport Processes in Animal Cells and Tissues* (*Nature*, 4 January; 277, 73, 1979) was by C. W. I. Owens, who is Lecturer in Clinical Medicine, and not as stated.