Spreading it out

R. H. Tredgold

An Introduction to Ultrathin Organic Films: From Langmuir–Blodgett to Self-Assembly. By Abraham Ulman. *Academic: 1991. Pp.442. $65, £46.*

ORGANIC chemists have learned to make progressively larger and more complex molecules but are not so good at assembling such molecules in ordered ways to perform specific functions, as living things do. This is hardly surprising considering the difficulties involved. Polymer chemists have produced one-dimensional polymeric systems; even so, their monomeric precursors are usually quite small and simple. The assembly of ordered planar two-dimensional systems seems an obvious first step towards forming multimolecular functional systems. Over the past decade, there has been much work in this field, which this book aims comprehensively to review.

Of the various techniques available, the Langmuir–Blodgett method of forming ordered monolayers and multilayers has attracted most attention. Here a monolayer of insoluble amphiphilic molecules is spread on an aqueous subphase and is thence transferred to a solid substrate. Under suitable conditions, progressive raising and lowering of the substrate through the air–water interface leads to the deposition of a succession of bilayers on the substrate. The rather misleadingly named self-assembly method of forming ordered multilayers has also recently become popular. This technique has a marked similarity to the Merrifield method of peptide synthesis and involves immersing the substrate in a succession of different reagents so that a succession of monolayers are deposited on one another, linked vertically by covalent bonds. Ulman's own research is largely into self-assembly.

The first three parts of the book deal with diagnostic techniques, Langmuir–Blodgett films and films formed by self-assembly. In the fourth part, computer modelling of monolayers is discussed. So far, the approximations that have to be made render the predictions of modelling of dubious value. In the last section, several applications of ordered multilayers are discussed. This topic has already been overworked elsewhere and coverage here could well have been omitted.

The field of ultrathin organic films is now too large to be explored in both breadth and depth in a monograph of this kind. So Ulman has gone for breadth. Nonetheless, he has overlooked several important papers, even in his own field. But this is not a serious criticism: it would be a superhuman task to provide a comprehensive list of relevant references for, say, the past ten years. The book will provide an excellent introduction to the subject and a valuable quarry for workers in the field anxious to widen their horizons. □

R. H. Tredgold is in the Department of Physics, University of Lancaster, Lancaster LA1 4YB, UK, and also in the Department of Chemistry, University of Manchester, Manchester M13 9PL, UK.

Burial laws

Douglas Palmer

The Processes of Fossilization. Edited by Stephen K. Donovan. *Belhaven/Columbia University Press: 1991. Pp.303. £45, $55.*

THE *post-mortem* processes that act on cadavers can transform them beyond recognition and often remove all traces of their previous existence. It is no wonder that the general recognition of fossil petrifications as the remains of once living animals and plants did not happen until the late seventeenth century. Perhaps more surprising is that it has taken so long to understand the processes of fossilization. This book helps to explain the delay and demonstrates why multifactor processes such as fossilization are not easily reducible to models or formulae.

To begin with, there is the question of what sort of sample of the fossil record is available. With more than 1.5 million living species and assuming an average species duration of 10 million years, over the more than 600 million years of life on Earth one would expect quite an extensive fossil record. Yet only about 150,000 fossilized species have so far been described. Just how representative this sample is has been a matter of concern from well before Darwin's time. The first third of the book reviews the problem and there is a brief attempt to put geological completeness into the broader context of information theory. It remains to be seen how much of the information loss really is redundant background noise.

Leaves of the sumac tree, *Rhus stellariaefolia*, preserved in a shale, laid down in a freshwater lake some 40 to 50 million years ago. From the new edition of *Fossils: The Key to the Past* by R. Fortey, published by the British Museum (Natural History)/Harvard University Press. £12.95 (pbk), $29.95 (hbk).

The word 'taphonomy' was coined by I. A. Efremov in 1941 for the study of the 'laws' governing the transition of organic remains from the biosphere to the lithosphere. These 'laws of burial' are difficult to define. An important approach to the problem has been that of the German 'actualist' or neontological tradition of studying how organic remains are 'recruited' into the sedimentary record. The work goes back to Otto Abel at the beginning of this century but was not fully appreciated until the 1972 publication of the English edition (Oliver and Boyd) of W. Schäfer's *Aktuo-Paläontologie nach Studien in der Nordsee* (W. Kramer, 1962). Inevitably these studies were biased towards the classic sedimentary environments and biota of northern European seas. This kind of research has now been extended into other important sedimentary environments, an example being A. K. Behrensmeyer's work on African vertebrate taphonomy.

K. M. Parsons and C. E. Brett review the concept of 'taphophacies' or groupings of assemblages based on similar taphonomic histories and its usefulness for interpreting ancient depositional environments. The next step is to examine the relationship between predicted death assemblages and the actual accumulated fossil record as seen in temporal sequences at specific localities. This will require a large and probably expensive programme of coring through from the contemporary sediment surface to below the so-called 'taphonomically active zone'. Only then can we finally cross the boundary between the actualist studies and those of fossil assemblages.

More than half of the book is devoted to the taphonomy of different fossil groups, from soft-bodied animals in general, through plants and foraminifera to vertebrates. All this is useful for those interested in this fascinating interface between neontology and palaeontology. 'Taphonomy' may be a bit young for my edition of the *Oxford English Dictionary*, but it is certainly here to stay. □

Douglas Palmer is at the National Museum of Wales, Cathays Park, Cardiff CF1 3NP, UK.