techniques as nuclear magnetic resonance, circular dichroism, and other spectral tools.

In the first three chapters, Bovey considers the configuration of vinyl polymer chains, the deduced statistics and mechanisms of polymerizations that derive from configurational analysis, and the use of model compounds. In the last two chapters we are treated to an examination of conformational analysis of polypeptides. Bovey develops his approach by discussing the foundations of the spectral techniques from which stereochemical assignments are made. In the last chapter he applies these to systems with which he and his associates have worked.

This book contains much useful information. It is possible to ascertain from this volume how the stereochemical analysis of polystyrene, polyvinylchloride, polyacrylates, polymethacrylates, and polypropylene was developed. The use of model compounds for stereoregular placements in a vinyl polymer chain is clearly discussed and interpreted. In like manner, Bovey uses model compounds, spectroscopy, and stereoviews to explain the structure of polypeptides.

This book is a personal expression of the author's research interests and as such represents a living and developing document. In these days when so many books are editors' compilations, I find it refreshing to see an author tie the various aspects of his own research interests together so well.

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Cells and Molecules

Handbook of Molecular Cytology. A. LIMA-DE-FARIA, Ed. North-Holland, Amsterdam, and Interscience (Wiley), New York, 1969. xvi, 1508 pp., illus. $78. Frontiers of Biology, vol. 15.

"By having in one book most of the information available on the evolution of DNA, the ultrastructure and biochemistry of chromosomes, and the ultrastructure and biochemistry of cytoplasmic organelles, the reader may be in a better position to get a general picture of the molecular interactions within the cell, to see the areas which are least developed, and to find out where new and significant trends in research lie," writes the editor of this volume. The editor is not unmindful that "in a number of cytological fields our knowledge has not yet reached the molecular level."

The book is really a collection of review articles (53 in all) that deal either with molecular biology or with the ultrastructure of the cell, but virtually none of these articles comes to grips with the molecular biology of ultrastructure. Those in the first category hardly deal with ultrastructure; those in the second category hardly deal with molecular events. The hybridization of molecular biology and cytology thus takes the form of mixing articles from the two fields within the same volume. But this mixing has the virtue of pointing up the molecular phenomena that have to be rationalized by the ultrastructural events and the ultrastructural phenomena that have to be rationalized in molecular terms.

The quality of the reviews is generally high. The reviewer found the chapters of the following authors eminently readable and informative: S. A. Henderson (on chromosomal pairing, chiasmata, and crossing-over), J. H. Subak-Sharpe (the doublet pattern of virus nucleic acid), H. D. Berendes and W. Beermann (biochemical activity of interphase chromosomes), A. Forer (chromosome movements), B. J. Stevens and J. André (the nuclear envelope), H. Swift and D. R. Wolstenholme (genetics of mitochondria and chloroplasts), P. Favard (Golgi apparatus), R. Wattiaux (lysosomes), P. Baudhuin (peroxisomes), B. A. Afzelius (ultrastructure of cilia and flagella), and J. D. Robertson (biological membranes).

As one surveys in this volume the ultrastructural account of the structures and phenomena that underlie the hereditary process (chromosomes, meiosis, mitosis, spindle, nucleolus, the nuclear envelope) it comes as a shock that this vital area of biology is *still* a no-man's-land. The molecular logic of the structures of the hereditary apparatus and the operational principles of the hereditary process are almost completely unknown. The structures and the interpretation of the events are largely inferences from what we already know from molecular biology and genetics.

The only examples we have of a successful transition from the ultrastructural to the molecular level are those in which the ultrastructural components can be isolated, purified, and characterized biochemically. Then significant correlational studies can be carried out, as in the elucidation of the mechanism of muscular contraction by H. Huxley.

As long as ultrastructure is examined largely or exclusively in a descriptive way, by electron microscopy alone, the transition to the molecular level is virtually excluded. Electron microscopists have examined the cell membrane for 20 years and speculated on its molecular structure. But the solution of the structure in terms of the protein crystal model of G. Vanderkooi came by way of membrane models and the fitting of biochemical and physical data to the models. The point to be made is that those who are to succeed in rationalizing ultrastructure in molecular terms will have to be practitioners of several disciplines—of biochemistry and molecular biology in addition to electron microscopy. The integration of approaches will have to be internal, not external.

The *Handbook of Molecular Cytology* is a compilation of the thousands of pieces of information that eventually will have to be fitted into a grand molecular design. For those who are intrigued with this undertaking, the *Handbook* is a treasure of information, highly to be recommended.

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Attachment

Adhesion in Biological Systems. RICHARD S. MANLY. Academic Press, New York, 1970. xvi, 302 pp., illus. $15.50.

This book, which stems from an AAAS symposium held in 1967, concerns itself almost entirely with the nature of adhesions between biological and nonbiological compounds in the presence of moisture. A more accurate title might therefore have been "Adhesion in Semibiological Systems." The 17 chapters, each by different authors, cover a broad area ranging from the adhesion of gingival epithelium to teeth, and of barnacles to polytetrafluorethylene, all the way to cyanoacrylates as hemostatic agents in surgery and the effects of repeated application and removal of surgical tapes on human skin. This diversity, rather than detracting from the book, is its greatest strength. Investigators in other areas and interested students will find the volume ex-