

dosymbiotic theory" of organelle origin. Whaley, Dauwalder and Kephart, Morré, Mollenhauer, and Bracker, and Buvat focus on the circulation of membranes among intracellular compartments. Campbell and Campbell discuss the formation and persistence of some of the ultrastructurally distinctive cell junctions (desmosomes, tight junctions). Fulton provides an exceptionally well organized and useful review of the ambiguities of centriole and basal body reproduction and function, and Tilney surveys some interesting recent literature on microtubules. A chapter by Mahowald on the origin and continuity of polar granules and a speculative review by Clowes on organelle differentiation during development round out the contributions and provide the embryological perspective appropriate to the series of volumes on cell differentiation of which this book is a part.

Aside from the work on plastids and mitochondria, most progress seems to have been made on membrane circulation. There remains relatively little doubt that the rough endoplasmic reticulum (ER) contributes membrane to the smooth ER and Golgi apparatus, that material from the Golgi region can become incorporated in the cell surface, and that membrane-delimited vesicles can bud from the cell surface and fuse with lysosomes; some would also argue that the outer mitochondrial membrane and the membranes surrounding plant vacuoles derive directly from the ER, although the evidence for these propositions remains somewhat ambiguous. Much research is now under way on questions related to the quantitative aspects and to the rates and mechanisms of membrane circulation, but several important questions still lack clear answers. For example, since there are differences in overall enzymatic properties and composition among the different compartments that seemingly contribute membranes to one another, mechanisms are being sought for alterations or selective loss and gain of membrane molecules or for selective transport of special membrane regions from one compartment to another. Similarly, it remains to be determined whether virtually all membranes arise by growth or transfer of preexisting membrane or whether other, more subtle, assembly mechanisms also exist.

The situation with respect to the centriole-cilia-microtubule group of organelles is dominated to a significant

extent by the lack of definitive information on the chemistry and modes of functioning of centrioles and basal bodies. Some key questions are in the process of being answered (for example, do the tubules of cilia grow from the tip or the base?), and much important work has been done on the chemistry, interactions, and probable mechanisms of function of microtubules. But, beyond increasingly clear descriptions, little is understood, for example, of the ways in which procentrioles form or the details of mechanisms by which microtubule distribution, assembly, and disassembly are controlled.

As might be expected, the developmental questions have proved most intractable. For the cell biologist, the contact the book provides with these problems is likely to prove quite stimulating, although a bit frustrating. On the whole, the contributors have done reasonable jobs in raising appropriate questions and putting issues and evidence in focus; the chapters also serve as a useful reminder of the distance yet to be traveled and the availability of fascinating experimental material. Thus, the special cell division behavior of the embryonic cells that come to contain polar granules or similar material is tantalizing (how are such cells in some species protected from chromosome elimination and how do they differentiate into a population that undergoes meiosis?). But present general understanding of cell division is inadequate to provide really useful clues to the underlying mechanisms, and the chemistry of polar granule material is poorly understood. How can we demand a molecular explanation for the formation of desmosomes or tight junctions when we still do not have adequate knowledge of the architecture and turnover of plasma membranes? And, even with the growing body of information on mitochondrial biogenesis, we have available little more than ingenious hypotheses to explain why, for example, the mitochondria of Protozoa or of the adrenal cortex differentiate with tubular cristae as opposed to the more typical plate-like structures.

As always, it is easy to find a few things to criticize in a book of this type; for example, there is substantial unevenness in quality and there is too much repetition in the coverage of some topics. The book would probably benefit from more detailed analysis of mechanisms of assembly of

microscopic structures from macromolecules and from more extended discussions of several aspects of molecular and organelle turnover. An index would also be useful. Reproduction of photomicrographs is surprisingly adequate. Overall, the volume certainly is well worth reading for many different types of biologists.

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**Deuterium Labeling in Organic Chemistry.** Alan F. Thomas. Appleton-Century-Crofts, New York, 1971. xvi, 518 pp., illus. \$29.95.

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**Explanation in Archeology.** An Explan-

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**Freud and the Americans.** The Beginnings of Psychoanalysis in the United States, 1876-1917. Nathan G. Hale, Jr. Oxford University Press, New York, 1971. xvi, 574 pp. \$15. Freud in America, vol. 1.

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**Functional Groups in Organic Compounds.** Walter S. Trahanovsky. Prentice-Hall, Englewood Cliffs, N.J., 1971. x, 150 pp., illus. Cloth, \$8.95; paper, \$4.95. Foundations of Modern Organic Chemistry Series.

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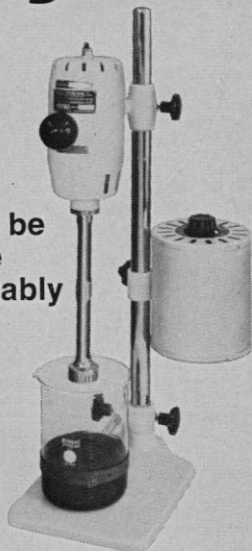
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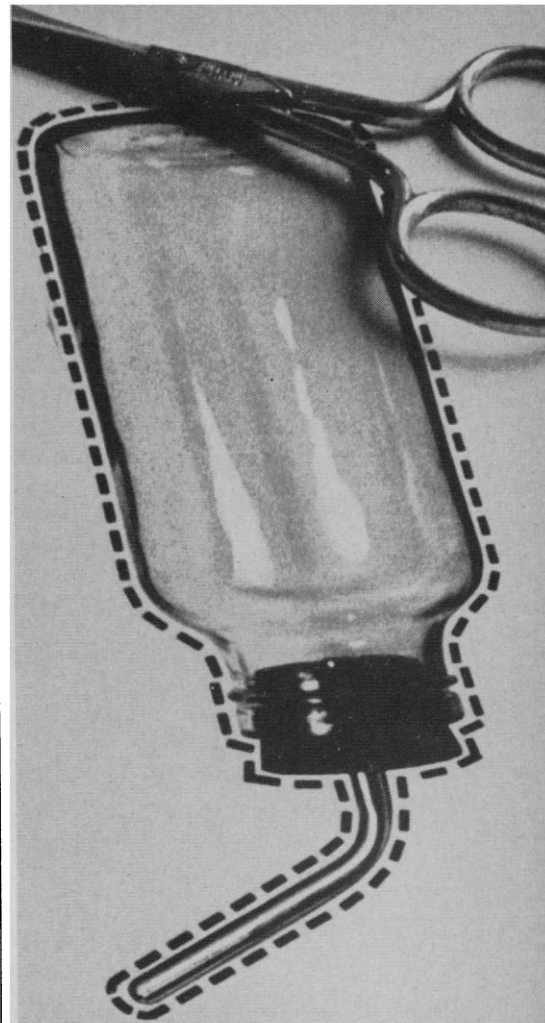
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