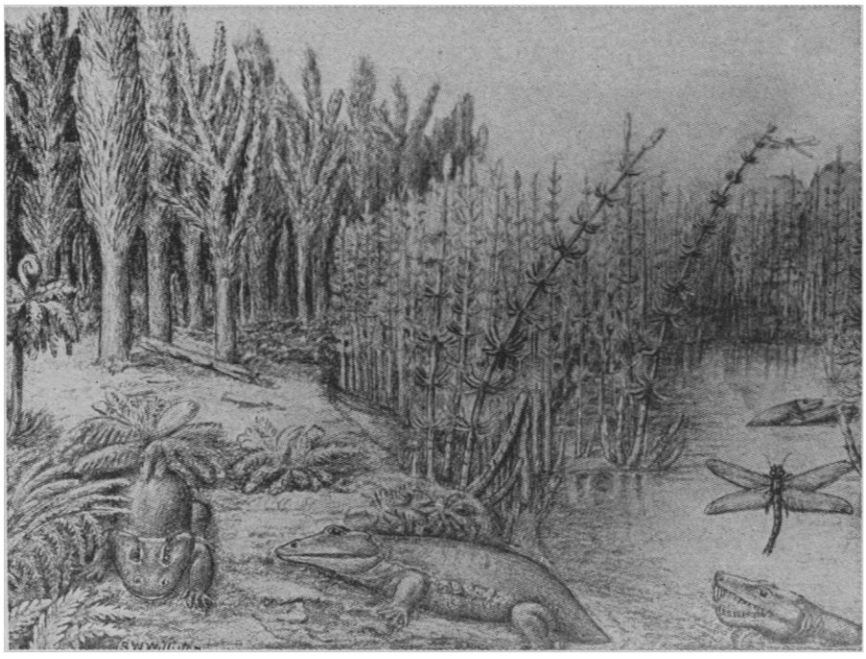

A rendering by S. W. Williston of a Permocarboniferous landscape, with two *Eryops* in the foreground. [From *Fossils and Flies*]

not that the people exist for them. The kind of education that the people demand must be given to them, and not what we in our pedantry think they ought to have." These wise words were spoken in 1902 by a man not especially known outside of his own academic institutions as an educational philosopher, but well known and highly respected for his original research contributions and counsel among his scientific peers and medical colleagues—Samuel Wendell Williston. That statement, excerpted from a speech made before the Kansas chapter of Sigma Xi, suggests only one of many previously little-known facets of this remarkable man that are recorded in Elizabeth Shor's biography of Williston.

Samuel Williston was one of those rare men who seem to succeed at everything they attempt. He was preeminent in his chosen field of vertebrate paleontology and evolution, contributing more than 150 papers and monographs on fossil vertebrates. He was equally prominent as an entomologist, although he pursued this subject only as a hobby during most of his active life. Nevertheless, he published more than 100 papers, chiefly on the Diptera, including a *Manual of the Families and Genera of North American Diptera*, which he saw through three editions and which was revised again after his death. Williston's bibliography also includes numerous articles on zoology, ornithology, archeology, evolution, pollution, public health, teaching, and educational philosophy.

Williston undertook formal medical training while serving as research assistant to Yale's paleontologist O. C. Marsh, receiving his M.D. from Yale in 1880. During his tenure at the University of Kansas he had little time for practicing medicine, but he was instrumental in the founding of the medical school there (in which he subsequently taught courses in comparative anatomy, physiology, and histology—in addition to his regular courses in geology and paleontology). He ultimately was appointed dean of the medical school. Williston also served on the Kansas Board of Health, in which capacity he was a major force in establishing the board as a permanent agency and drawing up criteria for the training, examining, and licensing of physicians in the state and in promoting public health regulations.

These are only a few of the activities recounted by Elizabeth Shor as she traces Williston's life from early boyhood in Manhattan, Kansas, his contacts with Benjamin Mudge and later with O. C. Marsh at Yale, his return to Kansas as professor of geology, and finally his appointment as professor of paleontology at the University of Chicago. Shor has drawn liberally on family records and correspondence, newspaper accounts, and documents in the archives of the several institutions at which Williston worked or studied and on recollections and tributes written by his co-workers. But *Fossils and Flies* is more than a biography. It is in large part Williston's autobiography, for Shor has included large portions of Williston's "Recollections"—his own account of his first 40 years. Williston's scientific achievements and honors are historical facts that have been compiled and well presented here by Shor, but it is Williston's own recollections of himself that will be of greatest interest to most readers. Shortly after his death in 1918, a group of his close friends and colleagues formed the Williston Memorial Committee, one objective of which was the publication of Williston's "Recollections." For a variety of reasons this was never realized by the committee, despite the efforts of many individuals over many years. Now, a half century later, those of us for whom the name Samuel Wendell Williston holds very special significance are grateful to Elizabeth Shor for accomplishing this.

Considering the recent and still current public discontent with many institutions of higher learning, it seems that Academia has not remembered, as Williston predicted it would, that they exist for the public. Would there were more men today with the breadth, versatility, and vision of Samuel Wendell Williston.

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Cytoplasmic Structures

Origin and Continuity of Cell Organelles. J. REINERT and H. URSPRUNG, Eds. Springer-Verlag, New York, 1971. xiv, 342 pp., illus. $19.80. Results and Problems in Cell Differentiation, vol. 2.

It is refreshing to pick up a book entitled *Origin and Continuity of Cell Organelles* and find something more than a discussion of mitochondrial and plastid semiautonomy. This collection of review articles contains some information on virtually all eucaryotic cell cytoplasmic organelles and provides a useful perspective on a variety of problems related to cell growth, intracellular turnover, and embryonic and evolutionary cell diversification. The articles by Baxter, Stubbe, and Schnepf and Brown adequately outline the by now familiar schemes of plastid and mitochondrial inheritance and the "en-

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 platelike 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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Books Received

Coronary Heart Disease and Physical Fitness. A symposium, Copenhagen, Sept. 1970. O. Andrée Larsen and R. O. Malmborg, Eds. University Park Press, Baltimore, Md., 1971. 280 pp., illus. $17.50.

Cyclic AMP. G. Alan Robison, Reginald W. Butcher, and Earl W. Sutherland, with contributions by Th. Posternak and Joel G. Hardman. Academic Press, New York, 1971. xii, 532 pp., illus. $17.50.

Darwin Retried. An Appeal to Reason. Norman Macbeth. Gambit, Boston, 1971. vi, 178 pp. $6.95.

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

The Development of Physical Theory in the Middle Ages. James A. Weisheipl. University of Michigan Press, Ann Arbor, 1971. 92 pp. Paper, $1.95. Reprint of the 1959 edition.

Dimensions of Change. Don Fabun, assisted by Kathy Hyland and Robert Conover. Glencoe (Macmillan), Beverly Hills, Calif., 1971. x, 230 pp., illus. $8.95.

Drugs and Cell Regulation. Organizational and Pharmacological Aspects on the Molecular Level. A symposium, Buffalo, N.Y., September 1970. Enrico Mihich, Ed. Academic Press, New York, 1971. xxii, 394 pp., illus. $19.50.

Encounter: Group Processes for Interpersonal Growth. Gerard Egan. Brooks/Cole, Belmont, Calif., 1970. xvi, 424 pp. Paper, $4.95.

Encyclopedia of Polymer Science and Technology. Plastics, Resins, Rubbers, Fibers. Vol. 14, Thermogravimetric Analysis to Wire and Cable Coverings. Norbert M. Bikales, Herman F. Mark, and Norman G. Gaylord, Eds. Interscience (Wiley), New York, 1971. xiv, 806 pp., illus. $50.

Environment and Good Sense. An Introduction to Environmental Damage and Control in Canada. M. J. Dunbar. Sponsored by the Canadian Society of Zoologists. McGill-Queen's University Press, Montreal, 1971. viii, 92 pp., illus. Cloth, $C4.50; paper, $C2.25.

Enzymes. An Introduction to Biological Catalysis. Alan D. B. Malcolm. Methuen Educational, London, 1971 (U.S. distributor, Barnes and Noble, New York). vi, 74 pp., illus. Paper, $2.50 Methuen Studies in Science.

Explanation in Archeology. An Expli-

(Continued on page 966)