philosophical approach to science, it will not be necessary to commend this book. For those who do not, or think that they do not, it will certainly be profitable to give an articulate proponent of this point of view a sympathetic hearing. For all, it will be an illuminating self-revelation of one scholar's intellectual progress.

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Scientific Contributions of Selman A. Waksman. Selected Articles Published in Honor of His 80th Birthday, 22 July 1968. H. BOYD WOODRUFF, Ed. Rutgers University Press, New Brunswick, N.J., 1968. xxii + 392 pp., illus. $15.

The scientific career of Selman A. Waksman, Nobel Laureate in Physiology or Medicine in 1952, is a classic version of the American dream of the poor boy who makes good by fulfilling the Calvinistic ethic of hard work. His story is made even more American because he came to this country as a young lad to escape the hazards and difficulties for Jews of life in Czarist Russia. His 80th birthday festschrift, edited by one of the closest of his former students, is devoted principally to the reprinting of selected articles on the many subjects in microbiology on which Waksman and his students worked: soil microbiology, in which he became the principal American authority; microbial enzymology and physiology, which he helped launch as sciences; sulfur bacteria; marine microbiology; taxonomy; and last, antibiotics, where his studies on isolation and characterization culminated in the discovery of streptomycin and the Nobel award.

The book is well illustrated both with plates from the representative published works and with photographs of Waksman, his colleagues, and his students. Particularly enjoyable reading is the tribute by Boyd Woodruff, summarizing Waksman's career and describing with sensitivity the warm personal qualities which have made him such an inspiring mentor to his students.

This volume should be of value in department libraries for the benefit of the current generation of graduate students in microbiology.

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Neural Function and Evolution

Primitive Nervous Systems. THOMAS L. LENTZ. Yale University Press, New Haven, Conn., 1968. xii + 148 pp., illus. $7.50.

It is now 50 years since the publication of G. H. Parker's *The Elementary Nervous System.* In that influential book Parker developed a coherent account of the evolutionary origin of nervous systems, based on his own experimental observations with lower invertebrates and the neurohistology available at that time. In the years since Parker's book appeared a number of workers, especially those who have concerned themselves with lower invertebrates, have proposed modifications of his ideas. The most recent of these is Lentz.

Lentz's account is a short book, shorter than its pagination indicates since nearly half of its pages (68 out of 148) are occupied by figures and facing pages, indices, and an extensive bibliography. The introductory chapter reviews theories on the origin of nervous systems. This is followed by a description of the behavioral physiology and neuronal organization of sponges, hydra, and flatworms. The emphasis here is on results from electron microscopy and histochemistry, areas in which Lentz has made valuable contributions. The structure and ultrastructure of the animals considered are illustrated with drawings of exceptional clarity. The final chapter is a speculative treatment of the origin of nerve cells. Lentz suggests that the primitive nerve cell was a secretory cell which released biologically active material in response to stimuli. It is proposed that the product of such cells modulated the activity of otherwise independent effectors. Neurons as they are found today resulted from specialization of receptive, conductile, and secretory processes in these cells. Unfortunately the arguments presented for this view are not very compelling, principally because of limitations in the kinds of animals Lentz has chosen to consider. Sponges, hydra, and flatworms are rather poor material on which to base a theory on the functional evolution of nervous systems since so little is known about neural function in each. There is considerable doubt as to whether sponges have nerve cells at all. Nothing in their behavior suggests the kind of neural coordination characteristic of higher animals. Hydras clearly do have nerve cells, but because of the probable occurrence of both nervous and nonnervous conducting mechanisms the role of the nervous system in determining their behavior is uncertain. In fact, with hydras the evidence is better for the participation of the nervous system in growth and regeneration than it is for its involvement in any particular behavioral act. Among cnidarians the structure and function of the nervous system are better known in anemones and scyphomedusae than in hydras, but these organisms are barely mentioned by Lentz. Although flatworms are now widely used in learning research they are not very encouraging material for electrophysiological methods and have been scarcely touched by modern techniques. Finally, the total neglect of ctenophores, strategically placed in terms of complexity between the cnidarians and the flatworms, is a serious omission.

This book will serve as a source of information on neurochemistry and ultrastructure in some lower invertebrates, but because of these limitations it will probably have little impact on contemporary thought about the early evolution of nervous systems.

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The Concept of the Atom

Atoms and Elements. A Study of Theories of Matter in England in the Nineteenth Century. DAVID M. KNIGHT. Hutchinson, London, 1967, 30s; Hillary House, New York, 1969, $4.50. vi + 168 pp., illus. The History of Scientific Ideas.

A critical history of atomism is one of the most important tasks of the history of science, whatever one's philosophical point of view may be. Together with Lasswitz's great work, Kargon's study of 17th-century atomism, and Thackray's investigations of 18th-century theory of matter (in preparation), David Knight's book completes the chain up to 1870. It is thus a work of first importance.

Atoms and Elements reviews briefly the traditions ruling in 1800: corpuscularean Newtonianism, chemical Newtonianism (theory of affinities), and Boscovichean theory of matter. The author considers Boscovich an anti-Newtonian, and an early field physicist, whose influence on both Davy and Faraday is beyond doubt. The Eulerian theory of matter, and Euler's most important disciple in England, Thomas Young, whose work initiated the far-reaching