History of Biochemistry

Development of Biochemical Concepts from Ancient to Modern Times. HENRY M. LEICESTER. Harvard University Press, Cambridge, Mass., 1974. viii, 286 pp. $15. Harvard Monographs in the History of Science.

One consequence of the emergence of biochemistry (which includes what some prefer to call molecular biology) as a mature scientific discipline, as judged by the adherence of its practitioners to a set of concepts that guide their research and by its favored status in the competition for financial and institutional support, is the growing interest among historians of science in its past development. In this valuable book, Leicester, who has made important contributions to the historiography of chemistry (especially through two source books published in 1952 and 1968), has traced the history of attempts to explain biological processes in terms of material substances.

The text is divided into 20 relatively short chapters, the first seven of which (to p. 80) discuss the period before Paracelsus; according to Leicester, "with Paracelsus the modern science of biochemistry may be considered to have begun." In these early pages there are sketches of the biological and medical ideas of various classical and medieval writers, including Ko Hung and Hildegard of Bingen. The next four chapters (pp. 81–137) bring the story to the beginning of the 19th century, from Paracelsus to Lavoisier, via van Helmont, Sylvius, Stahl, Boerhaave, and Haller (among others). The final nine chapters (approximately 100 pages) trace the development of biochemistry during the 19th and 20th centuries until the 1930's. There is a lengthy list of references (up to about 1970) and indexes of proper names and subjects. It must be noted with regret that the number of misprints in this book seems excessively large.

Leicester clearly set himself the difficult task of compressing into a modest space a story whose complexities increase as it unfolds, especially after 1800. He has, I think, been more successful for the period before Lavoisier than for the subsequent development. I venture to note, however, that as in other accounts of the life-matter problem (for example, in Thomas S. Hall's outstanding *Ideas of Life and Matter* published in 1969), there is no reference to the influence of the skeptical philosophy of Pyrrho, as recorded by Sextus Empiricus, with its emphasis on suspension of speculation in studying natural phenomena (see Jean-Paul Dumont, *Le Scepticisme et le Phénomène*, Paris, 1972). If one accepts Leicester's definition of a biochemical concept as "any hypothesis of bodily function which involves specific substances," the question arises whether hypotheses involving such entities as spirit, phlegm, oil, salt, and earth qualify as biochemical concepts. Is there no historical difference between a hypothetical entity and a specific material substance? After all, as he notes on p. 127, when 18th-century physiologists "needed to fit some material substance into their general theory, they simply assumed that it must exist and have the desired properties." In contrasting this attitude to that of chemists, "who isolate and characterize the specific compounds they find in mixtures and then try to find a mechanism for their function in terms of the properties of the substances which have been found," Leicester appears to have oversimplified a more complicated interplay, in which empirical discovery derived from the practical arts, as well as Pyrrhonian skepticism, seems to have played a considerable historical role.

The latter part of the book, in which Leicester summarizes the development of biochemical concepts during the 19th and early 20th centuries, is regrettably brief. There are clear accounts of the discussion of several important problems, such as the nature of enzymes or the site of biological oxidations in the animal body, but the attempt to describe the complex development of concepts of intermediary metabolism in 11 pages, some of which are devoted to the history of protein chemistry, is less satisfactory. Notably, the concept of the colloidal state of living matter, so popular among biologists around 1900, is not treated adequately. Although the concepts of vitamins and hormones are rightly given separate chapters and it is stated that some of the B vitamins "were found as parts of various coenzyme molecules," the importance of this discovery is not discussed in relation to the emergence of new concepts of biological oxidations during the 1930's. Similarly, the story of the formulation of the Embden-Meyerhof scheme and its relation to the development of ideas about bioenergetics omits mention of the decisive experiments before World War II (especially those of Otto Warburg) on the coupling of oxidation to phosphorylation. The need for compression has led to occasional apparent contradictions, as on p. 211 where it is stated that "once the nitrogen [of amino acids] had been split off, no intermediates were known" but we are told two lines later that Garrod "had shown that in certain rare cases of 'inborn errors of metabolism' some intermediates in the oxidation of a few amino acids are excreted." The book concludes with a brief glimpse of the dramatic post-World War II recognition of the biological role of nucleic acids.

Leicester's book is to be welcomed as a useful brief introduction to the history of biochemistry. It may be hoped that readers will be stimulated by the excellent set of references to enlarge their view of the subject.

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The Pineal Gland

Pineal Chemistry. In Cellular and Physiological Mechanisms. W. B. QUAY. Thomas, Springfield, Ill., 1974. xvi, 430 pp., illus. $24.75. American Lecture Series, No. 894.

This book is probably the first to deal in a comprehensive way with the morphological, physiological, and biochemical aspects of the pineal gland. It presents a concise, thorough, and well-organized summary of the present state of pinealogy.

In the 17th century René Descartes proposed that the pineal organ housed the rational soul. Since then, this small and mysterious organ has attracted the attention of a large number of scientists of different disciplines. During the last two decades the number of publications on the pineal gland has increased almost exponentially, but, despite numerous experiments and speculations, its true function is yet to be elucidated. Quay's research has contributed a great deal toward clarifying the possible function of the pineal gland and melatonin, its putative hormone, and he is most qualified to be the author of such a comprehensive and up-to-date volume on this subject.

The book starts out with introductory chapters on development and anatomy. Then follow 11 chapters dealing with inorganic constituents, lipids, carbohydrates, amino acids, indoleamines, catecholamines, nucleotides and nucleic acids, enzymes, mitochondria and oxidative metabolism, soluble proteins and