Book Reviews

Franklin and Newton. An inquiry into speculative Newtonian experimental science and Franklin's work in electricity as an example thereof. I. Bernard Cohen. American Philosophical Society, Philadelphia, 1956. 657 pp. $6.

The appearance of I. B. Cohen's *Franklin and Newton* is an event of considerable importance in the history of science. Few works of comparable stature have been produced in the history of science by an American historian.

Cohen has, with this volume, demonstrated the detailed and extraordinary influence of Newton's *Opticks* on the speculative and experimental sides of 18th-century science. Few historians have realized that Franklin was, in any major respect, the heir of Newton, since "Newtonianism" is commonly equated with the mathematical mechanics of large bodies. It is the contribution of this volume to show in considerable detail that "Newtonianism," for the scientist of the 18th century, was much more the speculations and experiments of the *Opticks* than the formal mechanics of the *Mathematical Principles*. That is to say, the "Newtonianism" of the *Opticks* became the starting point in the 18th century for a rich speculative and experimental investigation of the electric, thermal, chemical, optical, and certain physical properties of bodies. "The *Opticks* provided a mechanical basis for understanding the phenomena of matter in the great tradition of Bacon and Boyle and it was appreciated as such by those who upheld the latter tradition," such as Diderot, Richard Bentley, and numerous others. The popularity of the *Opticks* rested on a number of factors: its nonmathematical character, its free use of hypothesis and speculation, its "special appeal to those physical scientists who were attempting to construct physical rather than mathematical theories that might explain (coordinate and predict) experimental phenomena in such fields as electricity, heat, chemistry, animal physiology."

In describing the "Newtonianism" of the 18th century, Cohen has gone far beyond a literal interpretation of the title, *Franklin and Newton,* for he explains at length the rise of electricity as a Newtonian science prior to Franklin and also the consequential reception of Franklin's theory after his time. Furthermore, Cohen has investigated and presented numerous examples of Newtonian experimental and speculative science between his two terminal masters. Thus, he examines for us the "Newtonian" views of Boerhaave, s'Gravesande, Desaguliers, Gauger, and Hales.

We are not to think, however, that Cohen slights the two central figures themselves in favor of their influence, for he has given us stimulating chapters on "Franklin's scientific reputation" and on "The scientific personality of Franklin and Newton" as well as a fairly detailed study of the scientific achievements of these two distinguished men of science. His epitomization of the contrasting personality of these two figures is neat: "It would be difficult to conceive two personality types as different as Franklin and Newton. One is a happy extrovert, with a wife and three children, who craved the company of women and was gregarious and self-assured. The other was a tortured introvert, who remained a bachelor all of his life, and had—at the height of his powers—what we would call today a 'nervous breakdown.'" Cohen goes on to provide us with a keen analysis of the effect of the personalities of these two men on the way in which they worked and lived.

The volume is concluded by two interesting appendixes. The first deals with the varied way in which Newton used the word *hypothesis,* in connection with the controversy over the celebrated phrase *Hypotheses non fingo.* It is shown that nine different meanings or shades of meaning were given to the word in different contexts: a system of the world, a mathematical premise, a nonproved mathematical proposition, a philosophic or physical premise, an unproved physical proposition, a contrary-to-fact condition, a mechanism to explain laws or phenomena, a "philosophic romance," and axioms and postulates. The second appendix is concerned with originality in scientific discovery, particularly with regard to Franklin's concept of electric fluid. Cohen's conclusion is that "Franklin's originality did not consist in inventing out of whole cloth the idea of an electric matter so much as to give the idea the needed precision, to see the implication of a conservation principle, and to apply this concept in strikingly new ways." The appendixes are followed by a detailed bibliography of almost 50 pages.

Thanks must certainly be given to the American Philosophical Society for the fine physical appearance of this volume, both with regard to type and to illustration. I have only one criticism in regard to the makeup of the book. The notes that cite sources are at the end of each chapter but with title in a shortened form. Hence, one has to look further to the bibliography for the rest of the citation. This is a minor fault to be sure, and I certainly want to leave the prospective reader—historian and scientist alike—with the assurance that he has a rewarding experience ahead of him.

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The Biochemistry of Vitamin B_{12}. A symposium held at the London School of Hygiene and Tropical Medicine on 19 Feb. 1955. Biochemical Society Symposia No. 13. R. T. Williams, Ed. Cambridge University Press, New York, 1955. 123 pp. Illus. $3.75.

In the eight chapters of *The Biochemistry of Vitamin B_{12}* are concisely discussed the isolation and chemistry of vitamin B_{12} and related nutritional factors; the methods of measuring vitamin B_{12}; the absorption and excretion of vitamin B_{12} in man, together with the role of intrinsic factor; and the metabolic functions of vitamin B_{12} in animal and microorganisms. Because of the rapid advances made in this field of study since the book was published, the information provided in these well-written chapters is no longer complete. For example, the complete chemical structure of vitamin B_{12} is now postulated, interesting data on the hitherto not recognized route of excretion of B_{12} in man have been reported, the role of intrinsic factor is more fully understood, and chemical substances capable of enhancing the absorption of vitamin B_{12} by nonpernicious anemia patients have been discovered. In like manner, the physiological functions of vitamin B_{12} are now better understood. This fact merely shows the intense interest of many investigators in this fascinating field. However, this book does provide basic information up to 1955.

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