## Book Reviews

# A Biomedical Pioneer

**Otto Folin.** America's First Clinical Biochemist. SAMUEL MEITES. American Association for Clinical Chemistry, Washington, DC, 1989, xx, 428 pp. + plates. $55; to AACC members, $45.

Otto Folin (1867–1934) was born in southern Sweden, the youngest of 12 sons followed by a single daughter. Their father, Nils, a tanner described as brilliant but unstable, became increasingly unable to support his family, who came to depend for support on the mother, Eva, a stable person of high vitality and a professional midwife. Recognizing Otto's promise, his parents sent him at 14 to Stillwater, Minnesota, to join his brother Axel and other relatives and get a better education.

At the end of his life Folin was professor of biological chemistry at Harvard Medical School, was famous for developing widely used methods for determining important substances in blood and urine, and had taught a whole generation of medical students and fostered the research of younger associates who achieved high eminence.

Such, in outline, were the first and last years of Otto Folin. In this book Samuel Meites, a clinical chemist, has written the first full-length biography of Folin, covering those years and the years between. It is clearly based on extensive research.

Moving from Sweden to Stillwater was certainly a difficult adjustment for the boy, with the need to master English and to earn money to repay his brother, who had advanced the money for his passage. Entering high school at 19, he completed a four-year course in two years, with very good grades, and in 1888 he enrolled at the University of Minnesota.

Meites provides an excellent picture of the university in that era and of Folin's friendships and activities there. Choosing to follow a career in chemistry, Folin entered the University of Chicago in the year it opened (1892) with many of the buildings still under construction. He soon came to know Jacques Loeb, eight years his senior, with whom he established a lifelong friendship. His research, however, was in organic chemistry, under Julius Stieglitz, and he was Stieglitz's first Ph.D. Deciding that he wanted to enter the new field of physiological chemistry, which scarcely existed as yet in the United States, Folin realized that he must go to Europe for further training.

For the years in Chicago and Europe, Meites has been able to draw on the correspondence between Folin and Laura Grant, who was later to become his wife. The letters as quoted by Meites give an attractive picture of both of them, showing deep affection and much good sense in facing difficult situations. In Europe Folin went first to Sweden to revisit his family and worked with Olof Hammarsten, the foremost Swedish physiological chemist. Soon, however, he moved on to Germany, the center of activity in the field, working first with Ernst Salkowski in Berlin and later with the eminent Albrecht Kossel in Marburg. He evidently had a prodigious capacity for work; in the two months he spent in Berlin he greatly improved a difficult analytical method for uric acid, and the resulting paper was published under his name only. His comments to Laura about his mentors are shrewd and often sharp, though his most biting criticism is directed toward the distinguished Willy Kühne in Heidelberg and his younger associate R. H. Chittenden of Yale, who became the first professor of physiological chemistry in the United States. Kühne and Chittenden's work dealt with breakdown of proteins by enzymes into smaller products called albumoses. Folin did some work along the same lines and concluded that their work was fallacious. Chittenden, he wrote, "seems to be a man totally innocent of all exact scientific ideas, and what is more, does not even seem to be aware of his own limitations" (p. 88). At the same time, as a young man in search of a job, he was writing to Chittenden, among others, to explore possible openings. One may add that Folin's judgment about albumoses was correct; the work led nowhere as an approach to understanding the structure of proteins, though Kühne did other work that was important.

"Otto Folin in the 1920s, lecturing on a favorite topic. Blackboard: 'Explain the metabolic origin of creatine.' " [From *Otto Folin: America's First Clinical Biochemist*]

On his return to Chicago there was a difficult period when Folin had no satisfactory job; this ended with a year, just after his marriage, at West Virginia University in Morgantown, where he discovered a gifted student, Philip A. Shaffer, who was to become a distinguished biochemist and a close friend. Then Folin went, for seven years, to the McLean Hospital near Boston, a well-known psychiatric institution, where he developed methods for analysis of important constituents of urine. The hope that patterns of urinary excretion might throw light on mental disease was not fulfilled, but Folin's contributions to quantitative biochemical analysis were impressive. Harvard was looking for a suitable person to become the first professor of biological chemistry at the medical school, and Folin was chosen. There he remained, working indefatigably, for the rest of his life.

Folin's great work continued to be the development of sound and convenient analytical methods, and increasingly he concentrated on colorimetric methods. Those were the days of visual colorimetry; photoelectric techniques were far in the future, and one had to match color intensities by eye. The newer methods required far smaller amounts of material, making it possible to do routine analysis of blood, which was far more important than urine. Folin had numerous coworkers, of whom two were specially important: first Willey Denis, a woman of outstanding ability and energy, and later Hsien Wu from China. The Folin-Wu system of biochemical analysis became standard for years. Wu later returned to China and did distinguished research at the Peking Union Medical College, but came back to America after the Communists took over. The Folin-Wu room at Harvard Medical School contains an excellent portrait of Folin, with his colorimeter beside him.

Folin's only conceptual contribution to biochemistry proved illusory: namely his idea that there were two kinds of metabolism, exogenous and endogenous. The latter was supported to proceed steadily, at a constant rate, independent of diet and activity. Although this scheme was taught, especially in many American medical schools, for about 30 years, it was swept away when Rudolf Schoenheimer and his associates at Columbia began to use isotopic labeling in metabolic studies about 1935. Folin's analytical methods, however, had an immense influence, and he was a devoted teacher. Eminent biochemists grew up in his department. In addition to those already mentioned, the most notable were J. B. Sumner, who later was the first to crystallize an enzyme, urease, and Cyrus Fiske, who, with his gifted collaborator Yellapragada Subbarow, discovered phosphocreatine and adenosine triphosphate; the latter was discovered independently by Karl Lohmann in Germany, who has generally, but unfairly, received most of the credit.

In addition to the main text Meites has provided, in 60 pages of small print, a detailed study of the chemistry of Folin's analytical methods and procedures. Most readers will skip this, but it is there for those who have occasion to use it. The most serious deficiency in the book is the lack of an index, which is badly needed to trace the various characters who appear and reappear.

This book provides a helpful complement to the recent biography of Walter B. Cannon (to 1917) by Saul Benison, Clifford Barger, and Ellin Wolfe (Harvard University Press, 1987). Cannon and Folin worked closely together for a quarter century, in the teaching of first-year medical students, in matters of educational policy, and occasionally in research. It is good that we now have studies of both of them.

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## The Technological Past

**Nuts and Bolts of the Past.** A History of American Technology, 1776–1860. DAVID FREEMAN HAWKE. Harper and Row, New York, 1988. xii, 308 pp., illus. $18.95.

Historians of technology have reason to rejoice that there is an apparently broad and deep popular interest in their subject. The subject is intrinsically interesting, and there is a growing realization that it may even have important potential public benefits: that technology assessment should include a historical dimension and that "technological literacy" might be better served by a course in the history of technology than yet another in mathematics or "how things work."

There is as yet, however, only a corporal's guard of professionally trained historians of technology, and most of them have not ventured into the problematic waters of addressing the public on their subject. The public's interest in the field therefore is met, if at all, by popularizers who, at their worst, treat the hardware as a black box and perpetuate and elaborate myths about the personalities and institutions that are the other parts of the technological enterprise.

David Hawke's *Nuts and Bolts of the Past* is the latest in this sorry genre. The 262 pages of text are divided into 42 subsections, one treating "the founding fathers," another the sewing machine, yet another the Franklin Institute. Each chapter is typically based on one or two scholarly articles (perhaps a book in some cases) salted with some popular works of a previous generation and a smattering of published contemporary sources. The book represents no attempt at original research.

Nor does it offer new insights. Despite his clear dependence upon a few excellent recent studies, Hawke takes from them details rather than interpretations. The analytical contribution of the book is that some leading American technologists were "dirty fingernail people" and others were "song-and-dance men," that is, some inventors were