

The Pharmaceutical Sciences in America, 1852-1902

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The second half of the 19th century was a period of revolutionary change in the biomedical sciences. The development of the germ theory of disease and the establishment of fields such as bacteriology, pharmacology, and physiological chemistry laid the groundwork for significant advances in medicine and pharmacy. The extraordinary growth of the biomedical sciences also made its impact felt on medical and pharmaceutical education.¹

Science in Pharmacy Education

The amount and level of science in the pharmaceutical curriculum in the United States before the Civil War was not very high. Glenn Sonnedecker has concluded, for example, that the *materia medica* and pharmacy lectures in this period often had "little scientific content, in the sense of the theoretic and systematic study of natural phenomena relating to the various phases of pharmacy."² In Sonnedecker's view, chemistry formed the scientific core of early American pharmaceutical education. In fact, he went so far as to say that, "for a long time chemistry was the only subject taught in American pharmacy schools that can even be called scientific." Nevertheless, even chemistry was taught only through lectures. There was no laboratory instruction in any of the subjects taught in American pharmacy schools before the Civil War.³ It was not until pharmacy schools began to become affiliated with state universities, beginning in the 1860s, that science came to play a much more important role in pharmaceutical education. The pharmacy program established at the University of Michigan in 1868, under the leadership of physician-chemist Albert Prescott, made the study of pharmacy essentially a full-time occupation for the 2 years of the curriculum. It also introduced extensive laboratory training in the basic sciences. Other schools of pharmacy eventually adopted this model, beginning with the University of Wisconsin, which established its pharmacy program in 1883.

Wisconsin lured a first-rate pharmaceutical scientist to head its program. Frederick B. Power graduated from the Philadelphia College of Pharmacy in 1874 and earned a PhD in 1880 from the University of Strassburg in Germany. Power remained at Wisconsin for

10 years, establishing the pharmacy curriculum on a firm scientific footing and beginning a tradition of scientific research in the pharmacy program through his own investigations in phytochemistry. His successor, Edward Kremers, continued and even expanded upon the scientific direction that Power had given the program.⁴

Glenn Sonnedecker has examined the experimental work associated with American schools of pharmacy in the 19th century. In the period before 1870, the vast majority of experimental work of any significance occurred at the Philadelphia College of Pharmacy, with the emphasis being on plant chemistry. With the introduction of pharmacy curricula based more on laboratory science in the last few decades of the century, there was a substantial increase in research activity, especially at the schools associated with state universities. Sonnedecker has concluded, however, that many of the papers resulting from research at the state universities in this period were not obviously related to pharmacy and were not published in pharmaceutical journals. A substantial number of these papers were written by chemists and botanists on the pharmacy faculty, or even by individuals affiliated with the pharmacy school who actually held university chairs in fields such as geology or mineralogy.⁵

A crucial factor in the advance of scientific research in pharmacy schools was the introduction of graduate programs, which did not occur until the 20th century. The first doctoral degree for work in a pharmacy school was awarded in 1902 - at the very end of the period under consideration in this article - at the University of Wisconsin. Even then, however, the degree had to be awarded through the Department of Chemistry, because the Department of Pharmacy did not acquire the administrative authority to grant a PhD degree until 1917.⁴

Chemistry and pharmacognosy dominated the pharmaceutical sciences in colleges of pharmacy at first. Pharmacology was slower to gain a foothold in pharmaceutical education. Courses in pharmacology did not replace *materia medica* courses until well into the 20th century at most American schools of pharmacy. Although research was carried out on pharmaceutical subjects that we would now consider to be a part of pharmaceutics (such as problems related to drug delivery), pharmaceutics did not

actually become established as a science in this country until about the middle of the 20th century.

Science in the Pharmaceutical Industry

Science also began to enter the American pharmaceutical industry in the second half of the 20th century. With few exceptions, original research remained unorganized and rare in American pharmaceutical companies before the 20th century, as contrasted with the situation in Germany, where research laboratories became common in the major drug firms in the late 19th century. It is true that many of the American companies did establish laboratories in the second half of the 19th century. The goal of these facilities, however, was not research aimed at the development of new drug entities or innovation in general, but rather the standardization of the quantity and quality of ingredients and the potency of existing products. They were largely concerned, in other words, with quality control. Nevertheless, for the first time these firms began to hire chemists, pharmacists, and physicians for analytical work. These analytical laboratories also sometimes became involved in aspects of the control of manufacturing processes.⁶ As Jonathan Liebenau has noted, science was at first more superficial than a driving force in the American pharmaceutical industry. Companies that could promise to deliver standardized preparations had an edge in winning the confidence of the public and the health professions. Thus, in 1861, Parke, Davis and Company hired physician Albert B. Lyons to establish a systematic program of assaying alkaloidal drugs and fluid extracts. In the mid-1880s, Eli Lilly and Company established a Scientific Department, largely an analytical laboratory at first, with pharmacy graduates Josiah K. Lilly and Ernest G. Eberhardt as chemists.⁷

The earliest organized research programs in the American pharmaceutical industry were established in the 1890s by Parke Davis in Detroit and H. K. Mulford Company in Philadelphia in connection with their production of diphtheria antitoxin. Here again, concerns over standardization, in this case biological rather than chemical, were instrumental in persuading the companies to hire staff with expertise in areas such as bacteriology and pharmacology and to establish special laboratories. The scientists who were involved with the production and biological standardization of the antitoxin,

however, were soon devoting time to research in new procedures and products. In 1902, once again at the end of the period under consideration in this article, Parke Davis opened what is widely believed to be the first separate building erected by an American drug firm for research.⁸

Science and the American Pharmacists Association

The American Pharmacists Association (APhA), founded in 1852, also played a role in the development of the pharmaceutical sciences in the United States. One of the original objectives of the Association, as stated in its constitution, was to improve both the art and science of pharmacy by diffusing scientific knowledge, fostering pharmaceutical literature, and encouraging discovery and invention. By the second annual meeting of the organization, scientific papers became an established part of the program and prizes were soon thereafter being offered for the best papers to encourage members to undertake scientific investigations. In 1874 APhA began awarding the Ebert Prize for scientific research, which continues today to be a badge of recognition for significant research contributions to pharmaceutical science.

In 1887 four sections were established within APhA, one of which was the Section on Scientific Papers (renamed the Scientific Section in 1913). In addition to providing a forum for scientific papers at the annual meeting, the Section encouraged research through the awarding of prizes (beginning in 1892, for example, it assumed responsibility for the Ebert Prize).

In George Griffenhagen's analysis of the papers given before the Section on Scientific Papers, he noted that in the years before the Section on Practical Pharmacy was created in 1900, a great many of the papers were concerned with matters of compounding, incompatibilities, drug standards, and the like. In the first 5 years of the Section, about 40% of the papers were devoted to these types of topics. About 30% of the papers in this period could be classified as pharmacognosy, and another 25% as pharmaceutical chemistry.⁹

Griffenhagen's analysis also showed that in the initial 5-year period about half of the papers were contributed by practicing pharmacists who had no association with either industry or a school of pharmacy. It seems fair to assume that most of the papers

identified by Griffenhagen as dealing with the more pragmatic topics, such as compounding and incompatibilities, were delivered by practicing pharmacists, who had no venue at the annual meeting to report on their work before the creation of the Section on Practical Pharmacy. Although many practicing pharmacists were carrying out at least rudimentary scientific investigations in the late 19th century, the pharmacy shop did not become a major center for highly significant scientific research. Even in the case of the "Father of American Pharmacy," William Procter Jr., Gregory Higby has concluded that "the quality of Procter's scientific work does not appear exceptional."¹⁰ Unlike Europe, the United States has never produced practicing pharmacist-scientists of the caliber of Carl Scheele or Joseph Pierre Pelletier, who made important discoveries in the laboratories associated with their pharmacies. It should be noted, however, that the sciences were becoming increasingly specialized by the second half of the 19th century, and the tradition of the apothecary-scientist was on the wane even in Europe by this time. John Parascandola, PhD, is the Public Health Service Historian, Department of Health and Human Services.

George Griffenhagen selected the illustrations accompanying this APhA Sesquicentennial column from the APhA Foundation Archives.

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