Anna Wessels Williams, M.D.

Infectious Disease Pioneer and Public Health Advocate

Women have always figured prominently in immunology and in the American Association of Immunologists (AAI). In fact, two of the 54 charter members of AAI were women. During the first 30 years of the association's existence, a total of 55 women were elected to AAI membership.[1] While women remained a minority within AAI, their numbers rose steadily until, by 1940, they comprised 44 of the society's 350 active members. Among these early women members, Anna Wessels Williams, AAI 1918, like Elise L'Esperance profiled in the January-February issue of the *AAI Newsletter*, is one of a number who stand out for their enduring contribution to immunology and to the foundation of AAI. Her legacy in the burgeoning field of immunology includes breakthroughs in the treatment of diphtheria and the diagnosis of rabies. And texts that she co-authored helped to define how generations of researchers and clinicians would conduct research, as well as assist the general public in understanding infectious diseases. We profile her below. Watch for AAI profiles of other pioneering women immunologists to appear in print and online at aai.org/about/history.[2]

Anna Wessels Williams
(Photo: the Schlesinger Library, Radcliffe Institute, Harvard University)

"Her legacy in the burgeoning field of immunology includes breakthroughs in the treatment of diphtheria and the diagnosis of rabies. And texts that she co-authored helped to define how generations of researchers, clinicians, as well as the general public understood infectious diseases."

Anna Wessels Williams (1863–1954) was already a highly regarded medical and public health researcher at the laboratory of the New York City Department of Health, when she was elected to AAI membership in 1918. Born in Hackensack, New Jersey, into the family of a private-school teacher, Williams is said to have become fascinated by science when she first peered into a school microscope at age 12. After graduating from a local public high school, she enrolled in the New Jersey State Normal School and seemed destined for a career as a school teacher. For the two years following her graduation in 1883, she did, in fact, teach school.

In 1887, however, Williams's life was to change course. In that year, her sister Millie narrowly escaped death, giving birth to a stillborn child. Struck by the ineffectiveness of the medical treatment received by Millie, Williams became intensely focused on a career in medicine. She resigned from her teaching position to enroll in the Woman's Medical College of the New York Infirmary later that year.

Williams received her M.D. in 1891 from the Woman's Medical College and interned at the New York Infirmary, where she remained as an instructor in pathology and hygiene. Although the exact dates cannot be confirmed, Williams is known to have traveled to Europe to continue her medical training in Vienna, Heidelberg, Leipzig, and Dresden during the years 1892 and 1893.

In 1894, after her return to New York City, she volunteered at the recently opened diagnostic laboratory of the New York City Department of Health, where she would work for the next 39 years.[3]

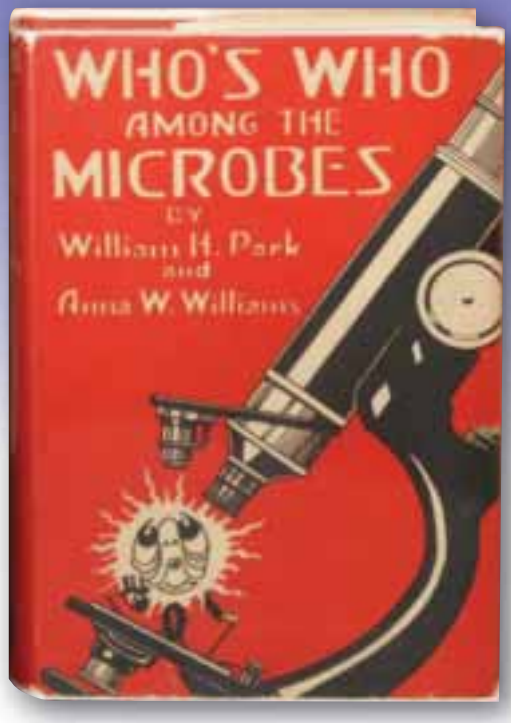
At the time she entered the laboratory, diphtheria had reached near-epidemic levels in the city and was especially high among children from poor families. In her first year at the lab, she began a collaborative research project with the director, William H. Park, AAI 1916 (AAI president, 1918), to eradicate the disease. Their objective was to create a higher-yield antitoxin than was currently available. They would seek to build upon the work of Emil von Behring, who, in 1890, had developed the first successful serum therapy to treat diphtheria.[4] Though the antitoxins that he created were successful—earning him the first Nobel Prize in Physiology or Medicine in 1901—their low yield meant that many patients were still denied access to the therapy.

While still a volunteer, Williams experienced a breakthrough in the search for a higher-yield antitioxin. Working alone in the lab, with Park away on vacation, she isolated and identified a new strain

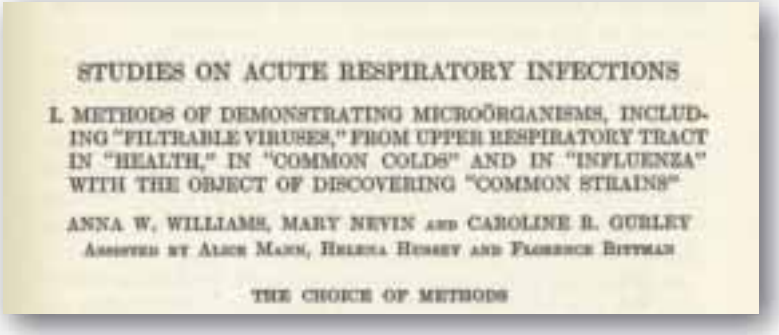
1. AAI memberships comprised just two categories in these early years—Active and Honorary. Both were elected. All members were practicing or retired researchers and clinicians. The majority of the members had either an M.D. or Ph.D. degree. The Trainee membership category was first formally offered in 1983.
2. All membership statistics are taken from election information on AAI Council reports. As no election records exist for 1919, the above statistics are inclusive for 1913–1918 and 1920–1942. AAI Archives.
3. The New York City Department of Health's laboratory was originally opened in 1892 as a temporary emergency laboratory for a cholera outbreak in the city. Laboratory operations were continued and expanded the following year, and it officially became the first municipal laboratory in the United States.
4. In 1884, Friedrich Loeffler discovered the causative organism (*Corynebacterium diphtheriae*).

from a mild case of tonsillar diphtheria. The strain, later to be named Park-Williams No. 8 (commonly called Park 8), proved crucial to the development of effective high-yield antitoxin.[5] Within just one year, the antitoxin was in mass production and public health departments were distributing it free of charge to physicians in the United States and Great Britain. Although it was Park who was given the recognition for the discovery of the Park-Williams No. 8 strain, Williams stated that she had no regrets about the presumed credit going to her mentor and collaborator, as she was "happy to have the honor of having my name thus associated with Dr. Park."[6]

In 1895, Williams was hired as a staff member of the laboratory and, in 1896, was able to take a sabbatical to carry out research on an antitoxin for scarlet fever at the Pasteur Institute. In Paris, her work on scarlet fever yielded no dramatic results, but the trip was fruitful in another area of research. Having spent some of her time at the Pasteur involved in its rabies research, she returned to New York intent upon improving rabies prevention and diagnostics. By 1898, she was able to create an effective vaccine that could be mass produced in the United States. This was a major step in the prevention of rabies, but many patients were still succumbing to the disease because of the lengthy, 10-day-or-longer diagnostic period.



Cover for the 1937 edition of* Who's Who among the Microbes *(Photo: The Reluctant Bookseller)



STUDIES ON ACUTE RESPIRATORY INFECTIONS

I. METHODS OF DEMONSTRATING MICROÖRGANISMS, INCLUDING "FILTRABLE VIRUSES," FROM UPPER RESPIRATORY TRACT IN "HEALTH," IN "COMMON COLDS" AND IN "INFLUENZA" WITH THE OBJECT OF DISCOVERING "COMMON STRAINS"

ANNA W. WILLIAMS, MARY NEVIN AND CAROLINE B. GURLEY
Assisted by Alice Mann, Helena Hussey and Florence Bittman

THE CHOICE OF METHODS

Anna Wessels Williams's first published scientific article in* The JI (*J.Immunol.* 1921. 6(1): pages 5–24); *one of a series of papers from the laboratory of the New York City Department of Health concerning the etiology and prevention of the pandemic influenza

Williams turned her attention to a search for some means of detecting the disease much earlier in its occurrence and began studying the brains of infected animals. Her work led to a rabies diagnostic breakthrough within the decade resulting from her discovery of abnormal brain cells in rabid animals. She was not, however, to be generally recognized for this important stride forward, as she was not the first to publish a journal article about the brain cell abnormalities. At the same time that she was performing her research in New York, Adelchi Negri, an Italian pathologist, was studying the same phenomenon in his lab at the University of Pavia. Although it is held that Williams was the first to recognize this distinct brain-cell structure in rabid animals, she is said to have "cautiously waited" to publish her results.[7] Meanwhile, Negri published his seminal paper in 1904 and became widely recognized for the breakthrough.[8] The abnormal cells, known as Negri bodies, bear his name.

Williams continued her rabies research, focusing on the use of brain tissue stains in diagnostics. In 1905, she developed a diagnostic test that yielded results in minutes rather than days.[9] Williams's test quickly became the standard rabies test and remained so for the next 30 years. It was not to be improved upon until the late 1930s.

In 1905, Williams was promoted to the position of first assistant director of the diagnostic laboratory. In her position, she directed research on a range of urgent public health issues, including influenza, venereal diseases, polio, and trachoma. During the First World War, with the laboratories of top American researchers focused intensely on influenza, Williams was one of a very few female scientists working to identify the pathogen

5. For a modern study of Park-Williams 8 strain see Lesley M. Russell and Randall K. Holmes, "Highly toxinogenic but avirulent Park-Williams 8 strain of *Corynebacterium diphtheriae* does not produce siderophore," *Infection and Immunity* 47, no. 2 (1985): 575–578.
6. National Institutes of Health, "Dr. Anna Wessels Williams," *Changing the Face of Medicine*, National Library of Medicine, www.nlm.nih.gov/changingthefaceofmedicine/physicians/biography_331.html (accessed 7 February 2011).
7. Elizabeth D. Schafer, "Anna Wessels Williams," *American National Biography Online*, www.anb.org (accessed 7 February 2011).
8. Adelchi Negri, "Contributo allo studio dell'eziologia della rabbia," *Bollettino della Società medico-chirurgica di Pavia* 2 (1904): 88–115.
9. Anna Wessels Williams and May Murray Lowden, "The Etiology and Diagnosis of Hydrophobia," *Journal of Infectious Diseases* 3, no. 3 (1906): 452–448.

responsible for the pandemic. The women researchers were largely limited to lab work, analyzing specimens forwarded by male scientists from military bases. Williams, however, was the exception. With Park, she was summoned to Camp Upton on Long Island in September 1918 to investigate the disease on the front lines of a new outbreak. [10]

Anna Wessels Williams (Photo: the Library of Congress)

On another front, her research on trachoma resulted in a more accurate diagnostic test and opportunity to spare the eyesight of many schoolchildren infected by the disease. As with diphtheria, her work on trachoma proved greatly beneficial for the urban poor. [11]

Outside of the laboratory, Williams lived a life far removed from the cautious calibrations and sometimes mundane routine of the laboratory. She seems to have invited risks, as she was known to love being a passenger in pre-First World War airplanes, especially with stunt fliers. And she appeared determined to replicate the excitement felt for a scientific discovery in the thrill of speeding in her car through the streets of New York City—or so the many documented speeding tickets would suggest.[12]

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In 1934, despite an outpouring of support and a petition campaign by scientists, clinicians, and other public health professionals, Williams was forced to step down from her position at the bench and enter retirement. At 71, she had exceeded the established mandatory retirement age of 70 for city employees.[13]

Beyond her achievements in the laboratory, Williams co-authored two books with Park that helped define the way contagious diseases were to be understood: *Pathogenic Micro-organisms Including Bacteria and Protozoa: A Practical Manual for Students, Physicians and Health Officers* (1905) and *Who's Who among the Microbes* (1929). The former was so widely referenced that it was known among researchers and clinicians alike simply as "Park and Williams."

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By 1939, 11 editions of the text had been published. (At last, one of her contributions to science would bear her own name.) Their second text, *Who's Who among the Microbes*, was one of the first biomedical reference books written for the general public.

Throughout her long career, Williams served in leadership roles and received numerous honors and awards. Among them were her posts as president of the Woman's Medical Association (1915) and as the first female chair of the American Public Health Association's Laboratory Section (1932). Through her position at the diagnostic laboratory, Williams made seminal discoveries that advanced the medical understanding of diphtheria and rabies and, in doing so, saved countless lives. With her election to AAI in 1918, she not only was accorded recognition by her peers, but she also lent honor to the young organization.

Although she may have never received the renown granted a male researcher for the same discoveries, Williams's research and publications informed the work of generations of scientists, male and female. And her distinction in her career inspired confidence for the growing number of female researchers and clinicians entering the field. Upon her retirement, New York City Mayor Fiorello LaGuardia accurately summed up Anna Wessels Williams's career: She was "a scientist of international repute."[14]

10. For more detail on Williams's influenza research during the First World War, see John M. Barry, *The Great Influenza: The Epic Story of the Deadliest Plague in History* (Penguin Books: New York, 2005).
11. Trachoma is an eye infection characterized by a telltale roughening of the inner surface of the eyelid, and, if left untreated, causes blindness. In turn of the century America, trachoma was designated a "dangerous and contagious disease" by the surgeon general. As such, beginning in 1905, all immigrants were screened for it upon entering the country, and those who had it were sent back to their country of origin. As it was highly communicable, trachoma was also a growing problem in the poor and immigrant communities, especially among children. Quote from Howard Markel, *When Germs Travel: Six Major Epidemics That Have Invaded America and the Fears They Have Unleashed* (Vintage: New York, 2004), 88. See also Alan M. Kraut, *Silent Travelers: Germs, Genes, and the "Immigrant Menace"* (Johns Hopkins University Press: Baltimore, 1994); Anna Wessels Williams, "A Study of Trachoma and Allied Conditions in the Public School Children of New York City," *The Journal of Infectious Diseases* 14, no. 2 (1914): 261–337.
12. Barry, 272–273.
13. *The New York Times*, "Physicians Plead for Dr. Williams," 28 March 1934; *The New York Times*, "City Acts to Oust Woman Scientist," 14 March 1934.
14. *The New York Times*, "94 Retired by City; 208 More Will Go," 24 March 1934. For additional resources see: Schafer, "Anna Wessels Williams"; National Institutes of Health, "Dr. Anna Wessels Williams"; Marilyn Bailey Ogilvie, Joy Dorothy Harvey, eds., "Anna Wessels Williams (1863–1954)," *The Biographical Dictionary of Women in Science: L-Z* (Routledge: New York, 2000), 1380–1381; *The New York Times*, "Anna W. Williams, Scientist, Is Dead," 21 November 1954; King-Thom Chung, *Women Pioneers of Medical Research: Biographies of 25 Outstanding Scientists* (McFarland & Company, Inc: Jefferson, NC, 2010), 48–51.