

Industry Representation in Early AAI

The American Association of Immunologists (AAI) benefits now, as at its founding, from the participation and contributions of researchers in academia, government, and industry. Although AAI members throughout the association's 102-year history have been based largely in academia, a smaller, but significant, portion of members has worked in government and industry. All three member segments have provided leadership and vision shaping the association of today. In this article, AAI reflects upon the vital contributions of industry members in the organization's first three decades—1913–1943.

These early members were scientists from for-profit, commercial institutions with research laboratories. Some worked in establishments for the medical treatment of people convalescing from a chronic illness and others were employed by pharmaceutical companies.

Of the original 52 AAI charter members in 1913, nine were employed by sanatoria or pharmaceutical companies, including Cragmor Sanatorium, H. K. Mulford Company, and Parke-Davis and Company. By 1943, at least 21 of the then 310 active members had spent at least some of their careers in industry at such companies as Lederle Laboratories, E. R. Squibb & Sons, and Eli Lilly & Company, to name a few.¹

Sanatorium Movement and AAI

In the nineteenth century, tuberculosis remained a leading cause of death in industrialized countries. The disease was, in fact, the leading cause of death in the United States, accounting for one out of every five deaths in the country from 1800–1870. The

disease afflicted young and old, men and women, urban and rural, and rich and poor.²

The German response to this centuries old scourge was to establish sanatoria predicated upon the importance of “fresh air, rest, good food, and regulated exercise.”³ The first was a private facility was opened by Hermann Brehmer in 1854 in the mountains of Silesia. Because some patients enjoyed dramatic improvement in this setting, the German government funded a number of public sanatoria (Volksheilstätten) in the 1870s.⁴ The ranks of public sanatoria quickly swelled as disability insurance funds became available to fund treatment for most tuberculosis.⁵



Tuberculosis camp in Ottawa, Illinois, ca. 1908

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Sanatorium in Lysin, Switzerland, ca. 1890

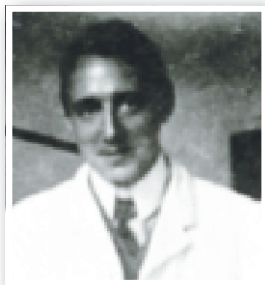
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The emerging U.S. public health movement, coupled with the growing progressive reform movements of the late nineteenth century made the United States fertile ground for sanatoria.⁶ Following New York physician Edward L. Trudeau's opening of his Saranac Lake facility in 1884, a number of U.S. sanatoria were established, albeit with little consensus on effective therapies.⁷ The

1. When the AAI Constitution and Bylaws was adopted in 1917, the only membership category was “Active.” In 1935, an Honorary membership category was created. It was very similar to the current AAI Emeritus member classification.
2. Sheila M. Rothman, *Living in the Shadow of Death: Tuberculosis and the Social Experience of Illness in American History* (Baltimore: The Johns Hopkins Press, 1995), 2.
3. Alan. Kraut, “Plagues and Prejudice,” in *Hives of Sickness: Public Health and Epidemics in New York City*, ed. David Rosner (New Brunswick, NJ: Rutgers University Press, 1995), 77.
4. For more information on the first sanatoria in Germany, see Peter Warren, “The Evolution of the Sanatorium: The First Half-Century, 1854-1904,” *Canadian Bulletin of Medical History* 23, no. 2 (2006): 457–76; Volksheilstätten (“sanatoria for the people”) were also known as Arbeiterheilstätten (“sanatoria for the workers”).
5. Larry Frohman, “Association Prevention, Welfare, and Citizenship: The War on Tuberculosis and Infant Mortality in Germany, 1900–1930,” *Central European History* 39, no. 3 (2006): 441.
6. The terms “sanitarium” and “sanatorium” were used nearly interchangeably in the late nineteenth and early twentieth centuries. The small distinction between the two terms is that sanatoria were generally considered more health retreats/resorts, whereas sanatoria carried more of a hospital connotation. We are using “sanatorium” except when the proper names of an institution dictate the use of sanitarium.
7. Kraut, *Hives of Sickness*, 77.

U.S. sanatoria evolved as three types based on three different funding models: public facilities owned and operated by local or state municipalities; privately funded, non-profit facilities with costs of patient care supported by charitable organizations such as workers' unions or immigrant groups; and private, for-profit institutions to serve the wealthy who could afford to finance their own cutting-edge care.⁸ These sanatoria for the wealthy were among the first to have laboratories,

although by the 1910s, most public sanatoria, Catawba Sanatorium in Virginia, for example, included at least a basic laboratory for research.



Gerald B. Webb, 1906

The American Association of Immunologists Collection, Center for Biological Sciences Archive, UMBC

Two eminent tuberculosis researchers were among the early AAI members associated with private, for-profit tuberculosis sanatoria: the first president of AAI, Gerald B. Webb (AAI '13, president 1913–1915), and Karl von Ruck (AAI '13). Webb lent his national

renown as a tuberculosis physician and researcher to the emergence of Colorado Springs as a center for tuberculosis research and sanatoria.⁹ Having also helped craft the initial scope and membership of the association during the founding meetings, Webb became its first president.¹⁰

Karl von Ruck was founder of the Winyah Sanatorium (1888) and the von Ruck Research Laboratory for Tuberculosis (1895) in Asheville, North Carolina. With both of these institutions playing important roles in establishing that city as a haven for convalescence, the laboratory became a magnet for early-career researchers. Among others there, Jules Freund (AAI '24, president 1955–56) and Louis Dienes (AAI '24), became AAI members soon after their arrival at the von Ruck Laboratory. Both published their clinical and laboratory tuberculosis research in *The Journal of Immunology* (*The JI*).

Other sanatoria-based researchers among early AAI members included Amelia L. Gates (AAI '13), Gates Sanitarium in San Jose, California; Francis M. Pottenger, Sanitarium in San Jose, California; Francis M. Pottenger,



Winyah Sanitarium, Asheville, North Carolina

North Carolina Collection Photographic Archives, University of North Carolina at Chapel Hill

Sr. (AAI '13), Pottenger Sanatorium for Diseases of the Lungs and Throat in Monrovia, California; G. Burton Gilbert (AAI '13), Laboratory of the Cragmor Sanatorium, in Colorado Springs; and Silvo von Ruck (AAI '13), Winyah Sanatorium in Asheville, North Carolina.¹¹

Although Webb, as AAI president, held the highest office on the AAI masthead, many sanatoria scientists actively participated in annual meetings, nominated potential new members, and published much of their research in *The Journal of Immunology*, making *The JI* one of the leading repositories of literature on the understanding and treatment of tuberculosis, until the introduction of streptomycin and isonicotinic hydrazide brought the disease under control following the Second World War.¹²

Biologics in Early Pharma

In the early twentieth century, the pharmaceutical industry was undergoing a phase of rapid expansion that coincided with the growth in biologics—and with the founding of AAI. Growth of the largest drug industry trade association provides a useful index to the growth in pharma. That group, the American Drug Manufacturers' Association, was founded in 1912 with 29 companies, but within 10 years, the membership had expanded to 54 companies.¹³

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8. Ibid., 77–78. For more information on the German sanatoria system, see Frohman, "Association Prevention, Welfare, and Citizenship," 431–81.

9. For information on how Webb helped Colorado Springs emerge as a center for tuberculosis research and sanatoria, see Helen Clapesatt, *Dr. Webb of Colorado Springs* (Boulder, CO: Colorado Associated University Press, 1984).

10. See "The Founding of AAI," AAI Newsletter (May/June 2012), 24–29.

11. The Gates Sanitarium, founded by Amelia Gates and her husband Howard, was in operation from 1898 through the early twentieth century. The Pottenger Sanatorium for Diseases of the Lungs and Throat, founded by Francis M. Pottenger, Sr. (1869–1961), was in operation from 1903 to 1955. Cragmor Sanatorium, today part of the University of Colorado at Colorado Springs, was founded by Edwin Solly and in operation from 1905 to 1962.

12. Kraut, *Hives of Sickness*, 77.

13. National Association of Manufacturers of Medicinal Products, *Proceedings of the First Annual Meeting*, February 6–7, 1912 (1913), 4; American Drug Manufacturers' Association, *Proceedings of Tenth Annual Meeting*, April 11–14, 1921 (1922), 372–3.

Karl von Ruck: A biographical sketch

Karl von Ruck (AAI '13) was one of the early pioneers of the sanatorium movement in the U.S. Although the movement took many forms, von Ruck was one of the first to build an influential research laboratory alongside his sanatorium to enhance the understanding and treatment of tuberculosis. Born in Istanbul in 1849 to a German diplomat, Karl von Ruck studied under Felix von Niemeyer and graduated with a degree of doctor of medicine from the University of Tübingen in 1877, and, after immigrating to the United States, earned an M.D. from the University of Michigan in 1879. Von Ruck returned to Europe for his post graduate studies, where he conducted research in the laboratories of Rudolf Virchow and Robert Koch—and was present when Koch presented his discovery of the tubercle bacillus on March 14, 1882 at the meeting of the Berlin Physiological Society.¹ After returning to the States, von Ruck spent a few years in private practice in Ohio before focusing exclusively on tuberculosis research. Seeking a more favorable location to conduct research, he decided on Asheville, North Carolina,² in the Blue Ridge Mountains.

In 1888 he established Winyah Sanitarium, one of the first private tuberculosis treatment



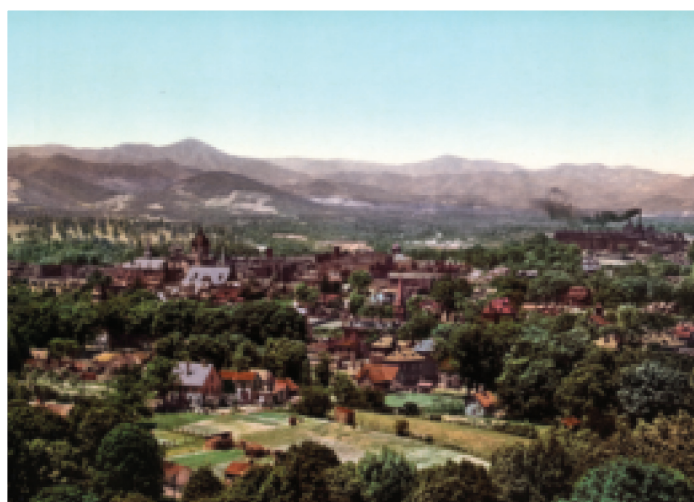
Karl von Ruck
North Carolina Collection, Buncombe County
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institutions in the United States.³ At Winyah, which was closely modeled on German sanatoria, von Ruck believed he could develop a biological means for controlling the disease, including possible immunization. In order to conduct more laboratory research, he established the von Ruck Research Laboratory for Tuberculosis in 1895 on the grounds of Winyah and, in 1910, promoted his son, Silvio von Ruck (AAI '13), to medical director of the hospital thereby freeing his days to focus on research. It was in his laboratory that Karl von Ruck and his colleagues advanced tuberculosis treatment by introducing “the watery extract of tubercle bacilli, a modification of Koch’s first tuberculin,” and developing a serum “consisting of a protein and lipid extractions of tubercle bacilli

which was used in treatment and with which he hoped to immunize children.”⁴ Patients came from across the country for treatment, including U.S. Senator John W. Kern (D-IN). In addition to creating a pioneering research laboratory, von Ruck founded and co-edited *The Journal of Tuberculosis* with

Silvio and helped establish Asheville as a national center for the treatment of tuberculosis and other respiratory diseases.⁵

Karl von Ruck died in Asheville on November 5, 1922, of complications from chronic nephritis and hypertension.⁶ Both Winyah and the von Ruck Laboratory continued to operate for a number of years after his death,⁷ contributing to his influence in the rapid growth of sanatoria in North Carolina and elsewhere in the South.



Asheville, North Carolina
Library of Congress, Prints and Photographs Division, Detroit Publishing Company Collection

1. Edward W. Shoenheit, “Asheville’s Pioneers: Karl von Ruck, M.D., 1849–1918,” *Chest* 3, no. 6 (1937): 6.
2. In the late nineteenth through early twentieth century, Asheville became a major destination for convalescing patients. It was believed that the clean mountain air, altitude, and temperate climate had healing properties. The first privately operated tuberculosis sanatorium opened in Asheville in 1871.
3. “Dr. Carl von Ruck Dies,” *New York Times*, November 7, 1922.
4. Shoenheit, 6; In 1913 the von Rucks unsuccessfully campaigned to have the Public Health Service verify what they maintained was a serum for treating tuberculosis. See “Biographical Note,” Karl and Silvio von Ruck Papers 1907–1915, National Library of Medicine, Bethesda, MD
5. Shoenheit, 24; *The Journal of Tuberculosis* was published from 1899 to 1903 in Asheville, N.C.
6. Shoenheit, 24.
7. The closing dates for Winyah Sanitarium and the von Ruck Laboratory could not be determined.

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At the time AAI was founded, the expansion of pharmaceuticals was driven by three major currents from the late nineteenth century: the invention of the tableting machine, standardization of drugs by chemical assay, and the first successful use of diphtheria antitoxin and subsequent growth of biologics. Tableting machines ushered in mass production of medications. The use of chemical assays in laboratory testing enabled companies to verify their claims of drug purity.¹⁴ Third, Emil von Behring's discovery of a successful diphtheria antitoxin in 1890 triggered drug manufacturers to enter biologics. Doing so required companies to construct commercial biological laboratories, prompting them either to hire highly trained researchers or associate with a trusted academic or medical institution to guarantee the quality of their products.

As is the practice today, biomedical researchers moved frequently between academia and the pharmaceutical industry. Scientists commonly split their time equally between positions in industry and academia. Because little data exist on early AAI members' institutional affiliations, it is difficult to determine the length of time an AAI member spent in a particular company. We do, however, know that AAI members who enjoyed some affiliation with the pharmaceutical industry

during their careers made contributions, large and small, to shape the association during its formative years.¹⁵

For example, E. C. L. Miller (AAI '13) served on the first nominating committee and recruited three of his former colleagues from Parke-Davis, and John F. Anderson (AAI '18), former director of the



Extraction of diphtheria serum from horse blood, Marburg, Germany, ca. 1895

Images from the History of Medicine, National Library of Medicine

Hygienic Laboratory of the United States Public Service (redesignated the National Institutes of Health in 1930), director of the Research and Biological Laboratories, and vice president of E. R. Squibb & Sons, served on



Bottle of diphtheria antitoxin, 1895

Images from the History of Medicine, National Library of Medicine

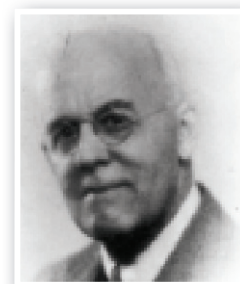
the Board of Editors of *The JI* (1916–1935).

Two early members, Arthur F. Coca (AAI '16) and A. Parker Hitchens (AAI '13), both served as directors at two pharmaceutical companies and left an enduring legacy on the association.

Arthur Coca was the driving force behind the founding of *The JI* and served as its first and long-time editor-in-chief (1916–1948), serving also on the Board of Editors (1916–1919) and as an assistant editor (1948–1952). It was Coca, who, as president of the New York Society of Serology and Hematology (SSH), laid the groundwork for a "*Journal of Immunity*" and in the spring of 1915, requested the cooperation of AAI in founding a journal for the burgeoning field of immunology. In the fall of 1915, delegations from AAI and SSH reached an agreement to jointly publish the new journal, *The Journal of Immunology*, and unanimously elected Coca as editor-in-chief.¹⁶ As editor-in-chief, Coca guided the journal through the tumultuous editorial and financial problems of its first few decades, establishing the processes and policies that have made *The JI* the pre-eminent peer-reviewed journal in the field. He also served the organization as a councillor (1916–1918), secretary-treasurer (1918–1946), secretary (1946–1948), and, uniquely, honorary president of AAI (1949–1960). During his 43 years of service to AAI, Coca continuously served on ad hoc committees and recruited new AAI members.

Although he began his professional career in academia, Coca is best known for the 18 years (1931–1949) he served as the medical director at Lederle Laboratories. At the time of his arrival to that company, Lederle was producing antitoxins, vaccines, and other biologics. During his tenure there, Lederle developed new biologics, including pituitary and thyroid extracts and sulfa drugs; manufactured penicillin during the Second World War; and isolated and produced the revolutionary antibiotics Aureomycin and Achromycin.

Although not as well known as Coca, A. Parker Hitchens left an equally profound impact on AAI. He served in multiple leadership positions in the nascent years of the



Arthur F. Coca

The American Association of Immunologists Collection, Center for Biological Sciences Archive, UMBC

14. Parke-Davis and Company developed the standardization by chemical assay in 1879. Verification by chemical assay was carried out either by the manufacturers in their own laboratories or by associated university laboratories. See Milton L. Hoefle, "The Early History of Parke-Davis and Company," *Bulletin for the History of Chemistry* 25, no. 1 (2000): 30.

15. AAI members in major cities, such as Philadelphia and New York, that had large and small pharmaceutical companies were not included unless they supplied a known street address for a commercial institution. For this reason, all industry member counts are conservative, as we only counted members whom we could conclusively determine worked for a commercial institution.

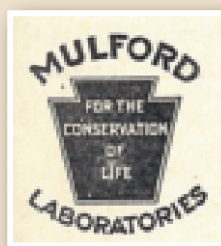
16. For more information on the founding of *The JI*, see "The Founding of *The Journal of Immunology*," *AAI Newsletter* (December 2011), 17–18.

Diphtheria antitoxin and the growth of biologicals: Mulford and Lederle Laboratories

In 1890, Emil von Behring announced that he had created a successful diphtheria antitoxin. News quickly made the trans-Atlantic journey and came as a relief to many citizens of U.S. cities, especially New York City. In 1887, one of the largest diphtheria epidemics in the history of the city was responsible for 4,509 deaths.¹ Pharmaceutical companies saw antitoxin as a new opportunity for expansion of their businesses into biologics. H. K. Mulford Company and Lederle Laboratories became large producers of effective diphtheria antitoxins. The two companies, however, achieved their leading market positions by different means.

H. K. Mulford Company

Incorporated in Philadelphia in 1891, H. K. Mulford Company initially mass-produced some 800 different medical products. Their largest seller was a water-soluble pill made possible by their patented tableting machine.² With von Behring's diphtheria antitoxin discovery, however,



H. K. Mulford Company logo, 1922

from *The Journal of Immunology* 7, no. 4

the owners recognized the potential for a lucrative new venture in biologics. The change in the business model towards biologics required new hires. In 1894 Joseph McFarland, a noted bacteriologist and pathologist at the University of Pennsylvania, became the first major hire for this new endeavor, and a year later Mulford produced the first commercial diphtheria antitoxin in the country.³ The antitoxin was an immediate commercial success and the company quickly began expanding the business to other biologics. This expansion included constructing new laboratories for biological, vaccine, and veterinary research, hiring trained scientists—including physicians, pharmacists, chemists, veterinarians, and botanists—and relocating to a larger property. In 1896 the company moved to a 200-acre farm in Glenolden, Pennsylvania, eight miles outside the city limits, and by 1920 the new site had nearly 1,000 employees and 52 buildings, including stables and barns for the hundreds of horses, cows, and smaller animals.⁴ During the 1920s Mulford specialized in human and veterinary serums, antitoxins, and vaccines, and in 1929 they merged with Sharpe & Dohme, Inc. of Baltimore.

1. Gretchen A. Condran, "Changing Patterns of Epidemic Disease in New York City," in *Hives of Sickness: Public Health and Epidemics in New York City*, ed. David Rosner (New Brunswick: Rutgers University Press, 1995), 31.
2. Louis Galambos and Jane Eliot Sewell, *Networks of Innovation: Vaccine Development at Merck, Sharp & Dohme, and Mulford, 1895-1995* (New York: Cambridge University Press, 1995), 11.
3. Galambos, 13, 17.
4. Galambos 18; Robert F. O'Neil, "Recalling the Heyday of Pioneering Drug Firm the H. K. Mulford Co. of Glenolden Produced a Breakthrough Diphtheria Antitoxin," *Philadelphia Inquirer*, December 27, 1992.

association—first as council chair (1914–1917) and then as a councillor (1918–1921).¹⁷

It was in his role as council chair at the first AAI annual meeting in 1914 that Hitchens became responsible for important facets of organizational governance, including the creation of a constitution and bylaws.¹⁸ It was a responsibility that Hitchens took to heart through the many drafts of each until they were adopted on April 6, 1917. Meanwhile, Hitchens assumed other leadership roles. At the second AAI annual meeting (1915),



A. Parker Hitchens
The American Association of Immunologists Collection, Center for Biological Sciences Archive, UMBC

he was appointed by AAI President Webb to a committee to "influence physicians whose qualifications entitled them to membership in the Association."¹⁹ After membership issues were discussed, Hitchens reported that SSH, led by Arthur Coca, was considering the creation of a *Journal of Immunity* and recommended that AAI help with its founding. In quick order, Hitchens was elected to "represent the society in negotiations with Dr. Coca, with authority to render all possible aid, looking to the publication of the journal."²⁰

17. Council chair was an ad hoc position created in 1913 when AAI was founded. The chair was responsible for the operation of the five-member council—the president, vice-president, and secretary were initially ex officio members of the council. Initially, the council was responsible for considering member nominations, selecting a date and site of the annual meeting, and other general policies, such as determining the amount of the annual dues. When the first constitution and bylaws were enacted in 1917, the position of council chairman was discontinued.

18. The American Association of Immunologists, *Minutes of First Annual Meeting*, June 22, 1914. AAI Archives.

19. Ibid.

20. The American Association of Immunologists, *Minutes of Second Annual Meeting*, 10 May 1915. AAI Archives.

Lederle Antitoxin Laboratories

Lederle Antitoxin Laboratories was founded by former health commissioner of New York City Ernest Joseph Lederle in 1906 to produce diphtheria antitoxin.

Lederle, a trained chemist, had a strong interest in chemical and bacterial testing as it applied to public health and in 36 years at the New York City Department of Health rose in the ranks from milk inspector (1866) to health commissioner (1902). Three years after von Berhing's discovery, Lederle was influential in the creation of the NYC Department of Health bacteriology laboratory under the direction of William Hallock Park (AAI '16, president 1918–1919). The lab focused on methods to identify, control, and prevent communicable diseases.⁵ In 1894, Park and Anna Wessel Williams (AAI '18) isolated the Park-Williams No. 8 strain of diphtheria and used it to create a highly effective antitoxin that was made available to the public the following year.⁶ The antitoxin was produced by the Health Department and provided at no cost to physicians in the city and sold at a nominal cost to health departments in other cities. In 1903, however, with the higher standards of commercial



Diphtheria toxin, Lederle Laboratories, ca. 1951

National Museum of American History, Smithsonian Institution

antitoxins available and pressure from drug manufacturers to cease their anti-free market production, a Health Department directive forced Park's lab to cease production and distribution of the antitoxin.

The following year, 1904, Lederle stepped down as health commissioner after city elections intensified the challenges of the health department's lab, bringing back into power the longtime political machine. Lederle saw opportunity in customers' continuing to request the Park antitoxin following the 1903 interruption in production and resolved to answer the demand. Over the next three years, Lederle recruited scientists and past board colleagues, and, in 1906, founded Lederle Antitoxin Laboratories to produce the diphtheria antitoxin. The new company quickly began taking large orders from across the country. The small and "highly skilled" scientific staff made sure the antitoxin maintained the high standards that Park had produced.⁷ Large sales volumes required an expansion of the laboratories and a relocation from New York City to a 99-acre farm in Pearl River, New York. In those pre-Depression growth years, Lederle Laboratories touted its highly trained scientists working in their modern laboratories to produce bacteriologically sophisticated products.⁸ In the decades that followed, Lederle Laboratories became one of the leading pharmaceutical companies in the United States. Today, after multiple acquisitions, the company is part of Pfizer, Inc.

5. Jonathan M. Liebenau, "Scientific Ambitions: The Pharmaceutical Industry, 1900-1920," *Pharmacy in History* 27, no. 1 (1985): 4; "In Honor of William Hallock Park," *Science* 84, no. 2177 (1936): 261.

6. The Park-Williams strain was also referred to as "American strain #8."

7. Liebenau, 7.

8. Liebenau, 10.

Hitchens was the logical choice. Not only was he a strong advocate for AAI to help found a journal for the field, but also, his involvement in the founding of two other journals, *The Journal of Bacteriology* and *Abstracts of Bacteriology*, gave him insight and experience in the business and editorial management of a new journal. Throughout his professional life, Hitchens continued his service to AAI by helping to organize annual meetings, serving on ad hoc committees, and nominating many future members.

At the time of his involvement in the founding of AAI, Hitchens was biological director of the H. K. Mulford Company. Having joined the company in 1901, as



Package of dried antitetanic serum (ca. 1907) and vial of tetanus antitoxin (ca. 1970)

Images from the History of Medicine, National Library of Medicine

it was expanding research staff to develop antitoxins and vaccines, Hitchens presided over his lab's efforts to develop more effective smallpox and rabies vaccines and production of bacterins and serobacterins and their increases in purity and yield of their diphtheria antitoxin. Hitchens left Mulford in 1918 to enter the U.S. Army Medical Reserve Corps during the First World War and remained in the army as a researcher and teacher for the remainder of his career.²¹

The number of AAI members from industry increased following the Second World War. In 1946, seven of the 37 new members were from the pharmaceutical manufacturers, including American Cyanamid Company,

21. Louis Galambos and Jane Eliot Sewell, *Networks of Innovation: Vaccine Development at Merck, Sharp & Dohme, and Mulford, 1895–1995* (New York: Cambridge University Press, 1995), 21–27.

Eli Lilly & Company, and Lederle Laboratories. Throughout the years, the growth and evolution of the pharmaceutical and biotech industry have been reflected in AAI members and leaders. Some, such as Roger M. Perlmutter (AAI '83, president 1999–2000),²² have moved from academia to industry; others, such as Lewis L. Lanier (AAI '80, president 2006–2007),²³ have moved from academia to industry and back again to academia. Today, AAI members in industry participate actively as speakers at the annual meeting, lecturers at the courses, reviewers and editors for *The JI*, and members of various committees. They also serve as mentors to early-career scientists on industry-focused panels and roundtable events at the annual meeting—important resources through which scientists-in-training can explore the variety of opportunities for scientists within industry.

Just how many members AAI may have had from industry is difficult to say. Few AAI members before 1946 provided institutional affiliations, and most changes in institutions were either never recorded or have been lost. There can be little doubt, however, about how AAI has benefited from the participation and leadership of industry members since its founding. ■

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Katlyn Burns, AAI History Intern, contributed to this article.

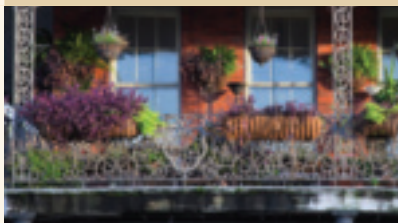
22. Roger M. Perlmutter was a professor (1984–1997) and chairman (1989–1997) in the Department of Immunology, University of Washington, before moving into industry. He was previously at Merck Research Laboratories (1997–2001) and Amgen, Inc. (2001–2012) before taking his current position as executive vice president of Merck & Co. and president of Merck Research Laboratories.

23. Lewis L. Lanier began his professional career as a research assistant professor (1981) in the Department of Pathology, University of New Mexico School of Medicine. He then worked for Becton Dickinson (1981–1991) and DNAX Research Institute for Molecular and Cellular Biology, Inc. (1991–1999) before taking his current position as professor, Department of Microbiology and Immunology and the Cancer Research Institute, University of California San Francisco in 1999.

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