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ROGER J. WILLIAMS  
1893—1988

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*A Biographical Memoir by*  
DONALD R. DAVIS, MARVIN L. HACKERT, AND  
LESTER J. REED

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*Biographical Memoir*

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Roger J. Melin

# ROGER JOHN WILLIAMS

*August 14, 1893–February 20, 1988*

BY DONALD R. DAVIS, MARVIN L. HACKERT, AND  
LESTER J. REED

**R**OGER J. WILLIAMS WAS A noted organic chemist who became an internationally acclaimed biochemist and a pioneer in the study of vitamins, promoting the importance of nutrition and the concept of biochemical individuality. Roger and his students and collaborators discovered or characterized the B vitamins pantothenic acid, folic acid, pyridoxal and pyridoxamine (forms of vitamin B<sub>6</sub>), as well as lipoic acid and avidin. They also developed a commercial synthesis of vitamin B<sub>12</sub>, and did pioneering work on inositol. Roger was the author or coauthor of nearly 300 articles and 21 books. He devoted much of his later years to educating the public about the benefits of complete and proper nutrition to good health, presented in such popular books as *Nutrition Against Disease*, *Biochemical Individuality*, *The Wonderful World Within You*, and *The Prevention of Alcoholism*.

Roger received his bachelor's degree from the University of Redlands in 1914, and master's and Ph.D. degrees from the University of Chicago in 1918 and 1919, respectively. After several years at the University of Oregon and Oregon State College, he joined the University of Texas at Austin in 1939. There he founded the Biochemical Institute in 1940 with funding provided by Benjamin Clayton and the Clayton Foundation. He believed that the best approach

to understanding biochemical issues related to health and disease would come from elucidating the biochemistry of normal cells. Toward this goal he fostered the efforts and collaborations of individual investigators to succeed in their particular areas and contributed to the fundamental understanding of such substances as amino acids, proteins, enzymes, vitamins, and nucleic acids. He was elected to the National Academy of Sciences in 1946 and was president of the American Chemical Society in 1957. He died on February 20, 1988, at the age of 94.

#### PERSONAL HISTORY

Roger John Williams was born on August 14, 1893, in Ootacumund, India, as the youngest of six children of American missionary parents. His parents brought him to the United States at two years of age by ship across the Pacific. After a brief stop in Oakland, California, his father acquired an 800 acre ranch in Greenwood County, Kansas, about 12 miles outside Eureka. At four years of age Roger attended a one-room country school about 2 miles from their home. The family soon moved to California, where his father took a small pastorate at Otay, near the Mexican border. They moved back to their ranch about four years later, and eventually they settled in nearby Ottawa, Kansas.

In school Roger was a good student. It was discovered later that he had severe aniseikonia, an eye condition that caused eyestrain whenever he read for more than a short time. Aniseikonia was unknown until about 1930. His condition was corrected with only moderate success by special glasses in 1941, but by that time he was already nearly 50 years old. Rather than feel sorry about his condition, Roger would state that his affliction gave him more time to think when others might be reading.

Roger's interest in chemistry was due to the influence of his oldest brother, Robert, whom he always admired and who also became a member of the National Academy of Sciences. Robert, who was eight years older than Roger, saw firsthand the effect of nutritional deficiency diseases while growing up in India. In 1910 when Roger was just 17 years of age, Robert learned that a syrup made from rice polishings could cure beriberi. Twenty-six years later Robert isolated and synthesized vitamin B<sub>1</sub>, which he named thiamine.

During Roger's undergraduate years focused on chemistry, he also considered a future in medicine, the ministry, and writing. As a junior in college he was elected editor of the monthly college publication. His talents as a future author were recognized in his senior year, when he won a \$20 essay prize that was open to all students. Although he had the "writing bug," he had the practical sense to know that writing would probably not afford him a decent livelihood.

Roger received his B.S. degree from the University of Redlands in 1914 and a high school teacher's certificate in 1915 from the University of California, Berkeley. However, his first job offer out of college was as the foreman of a small nursery. He was qualified for the nursery job because he had worked as a "nursery rat" while living in Ottawa. He learned to bud deciduous fruit trees; two thousand young trees per 10-hour day to earn one dollar. However, at the last minute a teaching job opened up at Hollister, California. Roger would later refer to this as "the hardest work I ever did." He taught three subjects—chemistry, physics, and general science—besides acting as a guardian and referee in several study halls. He came home thoroughly exhausted each evening.

During his first year of teaching, on August 1, 1916, he married his college sweetheart, Hazel Elizabeth Wood. They were married for 35 years, until her death in 1952.

They had three children: Roger John Williams Jr. (b. 1918), Janet Elizabeth Williams (b. 1920), and Arnold Eugene Williams (b. 1927). They decided to make a break after his next year of teaching and continue his graduate work at the University of Chicago, where his three older brothers had graduated. At Chicago, Roger met Prof. Julius Stieglitz, who greatly influenced his thinking in the field of organic chemistry. His undergraduate studies in organic chemistry left him discouraged about his potential as a chemist. He would later say that Stieglitz "lifted organic chemistry out of the hopeless state (for me) of being merely something to memorize" to exciting science. This epiphany led nine years later to Roger's first textbook on organic chemistry. It was ultimately adopted by nearly three hundred universities and colleges and published in five editions.

Roger was awarded his M.S. degree in 1918 and his Ph.D. (*magna cum laude*) in 1919 for his work in biochemistry with F. C. Koch. His thesis was titled "The Vitamine Requirement of Yeast," and it attracted more than an average amount of attention. Roger would later say that he was always very glad that he was attracted to the rich field of biochemical investigation at that time. After the University of Chicago, he worked as a research chemist for the Fleischmann Co. He then took an academic position as an assistant professor in 1920 at the University of Oregon, rising in the ranks to professor in 1928. From 1932 to 1939 he was a professor at Oregon State College.

During his time in Oregon, he discovered and characterized pantothenic acid. This proved to be a major scientific contribution. Patents on its synthesis were given to Research Corporation. Royalties amounted to many hundreds of thousands of dollars per year, a substantial portion of which was ploughed back into scientific research each year. Roger felt it was fortunate when investigators could concentrate on

their scientific work and forget about “the million dollars” their contributions were going to yield.

In Oregon, Roger learned to trout-fish. He spoke fondly of wading in clear mountain streams, even if there were no fish to catch. Music was another important aspect of Roger’s life. He had absolute pitch and could tune and play the violin or piano by ear. While at Oregon, Roger also took up golf and found that it suited his temperament well. He recalled that the first time he broke 80 on a regulation golf course was on Friday, the 13th of September 1940. On that memorable day the Clayton Foundation began support of his work at the University of Texas at Austin. He shot a 76 that day.

As noted earlier, in 1939 Roger accepted a professorship in the Department of Chemistry at the University of Texas at Austin. The following year, with the support of Benjamin Clayton, he founded the Biochemical Institute (later named the Clayton Foundation Biochemical Institute) and served as its director for 23 years. After Hazel died in 1952, Roger married Mabel Phyllis (Foote) Hobson the following year. Phyllis had been widowed in 1950 and had one son, John Wallace Hobson (b. 1929). Roger and Phyllis traveled extensively nationally and internationally. Even after 80 years of age, he presented over 80 lectures and seminars on his concepts of biochemical individuality and the importance of nutrition in health and medicine. Phyllis Williams died in June 2004.

#### VITAMINS AND NUTRITION

In his early research work at the University of Chicago, University of Oregon, and Oregon State University, Roger developed the methodology for the quantitative determinations of chemicals essential for the growth of yeast. Of greater importance was his concept of the universality of the basic

biochemistry of all living organisms. This concept led him to apply his research on the nutritional requirements of yeast to the search for vitamins, which were then unknown animal nutritional factors being related to human disease. He pursued his research with yeast despite attempts by outstanding biochemists of that period to persuade him to work with animals. This persistence led to his discovery of the yeast growth factor, pantothenic acid, which he announced in 1933, and led to the subsequent acceptance of this compound as an essential cog in the biochemical machinery of all cells and as a vitamin for many species. The consequence of this work, and related work of one other laboratory, was that microbial systems attained a leading role in the discovery of new nutritional factors as well as in the development of biochemical genetics and intermediary metabolism.

This major transition to the use of microbial systems in biochemistry was occurring at the time Roger moved to the University of Texas at Austin. In developing his new Biochemical Institute he provided a working atmosphere in which young scientists and faculty associated with the institute had the opportunity to develop their full potential. Some of his early colleagues in the institute were Robert Eakin, Esmond Snell, William Shive, and Lester Reed. The success of the Biochemical Institute and the faculty associated with it is evidenced by the awards and honors bestowed upon them, and a legacy of vitamins and biochemicals whose names were created by them (e.g., pyridoxal, pyridoxamine, folic acid, lipoic acid).

Roger was highly regarded not only for his intuitive concepts but also for his ability to communicate. An interesting sidelight with respect to his scientific work was his flair for coining words. He had written successful textbooks in organic and biochemistry courses. When new names or words were needed, he simply created them. He had named his new vi-

tamin pantothenic acid (Greek *pantothēn*, from all sides). He continued with folic acid, the vitamin isolated from spinach leaves (Latin *folium*, leaf), and avidin, the egg-white protein that tenaciously binds to biotin (Latin *avidus*, to covet). Other words created by Roger for concepts are nutrilitite, isotelic, propetology, and genetotrophic. The word nutrilitite came to him in a dream. Roger and his brother were discussing (in his dream) the need for a word comparable to vitamin that would apply in plant as well as animal physiology. In his dream he proposed the word nutrilitite. In the dream his older brother Robert agreed that it sounded good, and with his dream approval, Roger published the suggestion in *Science* (67[1928]:607).

Honors and awards accorded Roger include the Mead-Johnson Award of the American Institute of Nutrition (1941), Chandler Medal from Columbia University (1942), Southwest Regional Award of the American Chemical Society (1950), Arthur M. Sackler Foundation Award for Nutrition (1983), and honorary D.Sc. degrees from the University of Redlands (1934), Columbia University (1942), and Oregon State University (1956). Roger Williams was a member of numerous scientific organizations, including the National Academy of Sciences, American Chemical Society (president, 1957), American Society of Biological Chemists, American Institute of Nutrition, Biochemical Society of London, American Association for Cancer Research, American Association for the Advancement of Science (fellow), Society of Experimental Biology and Medicine, and American Association of Clinical Chemists. He was a member of many honor and professional groups, such as Phi Beta Kappa (honorary), Phi Kappa Phi, Phi Lambda Upsilon, Alpha Chi Sigma, and Sigma Xi. He served on many editorial and advisory boards and committees, such as the Food and Nutrition Board of the National Research Council (1949-1953); Committee on Problems of

Alcohol; President's Advisory Panel on Heart Disease (1972); and Editorial Board, Archives of Biochemistry, as well as on research and medical advisory boards or committees of the National Multiple Sclerosis Society, Muscular Dystrophy Association of America, and the American Cancer Society. He was one of the founders (with Albert Szent-Gyorgyi, Linus Pauling, and Arthur M. Sackler) of the Foundation for Nutritional Advancement.

#### LASTING CONTRIBUTIONS

Although many will remember Roger J. Williams as the discoverer of pantothenic acid and as a contributor to knowledge about the B vitamins generally, Roger himself felt that his most important and far-reaching contributions were embodied in his books *The Human Frontier, Free and Unequal*, and *Biochemical Individuality: The Basis for the Genetotropic Concept*.

Roger's concepts of biochemical individuality began to develop when postoperative morphine had an "opposite-than-expected" effect on him. His initial scientific studies along this line were concerned with individual differences in the taste of creatine, a work published in 1928. Later work in this area demonstrated the broad role of inborn differences in creating unique biochemical individuality. In several books he stressed that these inborn individual differences are widespread, of varying magnitude, and are crucial to the understanding and solving of most human problems: *The Human Frontier*, 1946; *Free and Unequal*, 1953; *Biochemical Individuality*, 1956; *You Are Extraordinary*, 1967; and *Rethinking Education: The Coming Age of Enlightenment*, 1986.

Roger was a leading advocate of the role of biochemical individuality in various disease processes and of the merit of using nutritional science in both traditional medicine and preventive medicine: *What To Do About Vitamins*, 1945; *Alco-*

*holism: The Nutritional Approach*, 1959; *Nutrition in a Nutshell*, 1962; *Nutrition Against Disease: Environmental Prevention*, 1971; *Physician's Handbook of Nutritional Science*, 1975; *The Wonderful World Within You*, 1977; and *The Prevention of Alcoholism Through Nutrition*, 1981.

His concepts have received recognition throughout the world, and several of his books have been translated into other languages. His ideas helped inspire the founding in 1975 of a medical clinic in Wichita, Kansas—Center for the Improvement of Human Functioning International—where all new patients receive a copy of *The Wonderful World Within You*.

His basic idea was that human differences (differences between individual human beings) are widespread, often of great magnitude, and demand careful and extended study and attention, in order that human understanding may progress and better human relations be accomplished. These differences, he contended, are politically extremely important because they are the basis for our love of freedom. Their appreciation is essential to goodwill, tolerance, human communication, and human understanding. In medicine, preventive medicine and psychology are important because many medical and other human problems can never be solved until these differences are carefully studied and fully appreciated.

Roger felt strongly that biochemistry was destined to play the crucial role in ushering in a new era of human understanding. He believed that the many measurable biochemical differences between individuals will prove to be the keys to the solution of a host of human problems. Once the principle was established that genetically determined human differences are highly important and required study, he believed the results of such studies would carry conviction and that the resulting momentum would guarantee that these subjects

would be pursued with vigor. These differences (biochemical and otherwise) are substantial. He felt that medicine had been inordinately concerned with how “the human body” functions, and had paid very little attention to the striking genetic and individual metabolic pattern differences.

Roger, in summing up his scientific work, recognized that it was of a diverse nature and called himself one of those specialists who specialize in having broad interests. He listed biochemistry, genetics, pharmacology, nutrition, psychology, anthropology, social science, and medicine among his broad interests. He also listed other things of great importance: his family, his friendships, his colleagues, his students, religion, and enjoyment of music, shows and other recreations, fly fishing, golf and card playing. Roger was an accomplished storyteller and the anecdotes he loved to tell will be long remembered. He felt that it was appropriate for a scientist to attempt to understand the whole world. His intuitive ideas and concepts broadened the frontiers of science and education, and the rich legacy of his writings, from which there is still much to be gleaned, will long endure.

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