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DAVID WRIGHT WILSON

1889—1965

A Biographical Memoir by

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Biographical Memoir

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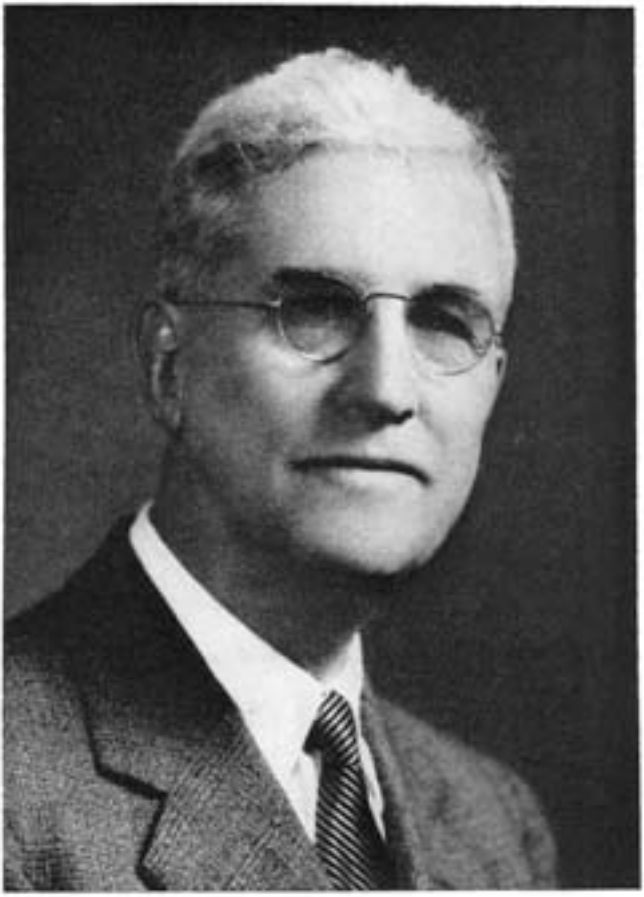

Woodrow Wilson

DAVID WRIGHT WILSON

January 4, 1889–July 13, 1965

BY ERIC G. BALL AND
JOHN M. BUCHANAN

IN HIS LIFETIME David Wright Wilson spanned the period of the birth and maturation of modern biochemistry in the United States. His knowledge of the field was thus intimate and personal and lent much to his perspective and enthusiasm for biochemistry. This knowledge also contributed greatly to his effectiveness as a teacher. He was quick to grasp the significance of important discoveries and often pioneered in their further development.

Wright, as he was known to his friends, was born in Knoxville, Iowa, on January 4, 1889. Both of his parents were descended from Yeates Conwell and were cousins many times removed. Yeates Conwell and his wife, Rebecca Fisher, arrived from the British Isles in 1699 and settled in Delaware. Another early ancestor was Alexander Ewing, who emigrated to the colonies about 1700 from Londonderry, Ireland. Ewing's son, John, an astronomer and mathematician, was pastor of the First Presbyterian Church of Philadelphia and second provost of the University of Pennsylvania (1799-1802). Shortly after Wright became professor and head of the Department of Physiological Chemistry at the University of Pennsylvania, his first child was born and named John Ewing. The death

of this beloved son at the age of eleven was a lifelong grief to him and to his wife, Helene.

Wright himself described his early environment as typical of a happy home in a small town in the Middle West. His father, James Ewing Wilson, was a graduate of Washington College. A Civil War injury had made his father extremely deaf. As a result he was forced to choose a livelihood where hearing was not essential and was employed as a bookkeeper in a bank. Wright's mother was Katherine Wright Wilson. As a boy, Wright enjoyed playing baseball, and fishing with his uncle in a river some three or four miles from his home. His uncle owned a drugstore where Wright worked during school vacations. At an early age he became interested in printing presses and by the time he was in high school he was the proud owner of a foot press which printed a page 10 $\times$ 12 inches. On this he printed the high school paper.

In 1906, the year the American Society of Biological Chemists was founded, Wright entered Grinnell College and leaned toward a career as a journalist. Stimulated by Professor Walter Scott Hendrixson, he became interested in chemistry. Professor Hendrixson received his Ph.D. degree in chemistry at Harvard in 1893 and in 1894-1895 studied in Berlin and Göttingen. In his senior year Wright and one other student took a special course in physiological chemistry. In 1910 there could not have been very many opportunities for an undergraduate in the United States to enroll in such a course. The die was apparently now cast, but was it? Upon graduation Wright entered graduate school in the Department of Chemistry at the University of Illinois. There he assisted in teaching and carried out his first research on excessive water drinking with Professor P. B. Hawk. Hawk had come to the University of Illinois in 1907 as professor of physiological chemistry, after serving four years at the University of Pennsylvania as demon-

strator in physiological chemistry. It is interesting to note that Hawk at Pennsylvania served under John Marshall, whom Wright was to succeed in 1922 as head of the Department of Physiological Chemistry. The summer of 1911 was spent by Wright at the University of Illinois completing his work for the master's degree, which he received in the spring of 1912.

The fall of 1911 found Wright earning a living working at the New York Hospital under the supervision of Stanley Benedict. His job there was to carry out food analyses on diets that were fed to cancer patients. This was obviously a year of decision for Wright as to his future career. Excerpts from a line-a-day diary which he kept best illustrate this.

"*October 4*—This morning Dr. Benedict took me over and introduced me to New York Hospital and my laboratory. It's a nice, roomy well equipped laboratory and I'm quite satisfied.

"*November 6*—My work is hard now on account of the food analysis which takes more time than it should.

"*November 10*—I am commencing to get control of my work. Have stopped analyzing the beef tea, oatmeal and potatoes, but am still bothered by the milk.

"*December 2*—A year ago I was almost decided for physiological, now I'm strongly favoring organic."

(During the Christmas vacation Wright went to Baltimore to attend meetings of the Physiological Society and the American Society of Biological Chemists where he met Professor Mendel of Yale. He went on to Washington to attend a meeting of the chemists where he met Otto Folin of Harvard. As a result his interest in physiological chemistry was apparently rekindled, as the following diary entries show.)

"*January 26*—This afternoon I went up and interviewed Professors Morgan and Bogert on physiological chemistry. Professor Morgan advised it quite strongly.

"*February 13*—Have decided to go to Yale next year.

"*March 23*—Dr. Benedict was over and offered me the work for next year at General Memorial Hospital at $1400 or $800 with assistant and chance to work at Cornell Medical for Ph.D. The last sounds good and I'll see about it.

"*April 3*—A letter from Yale announces I have been appointed to a $400 fellowship with free tuition. That is $400 more than I expected. I'll probably take it, but will see Mendel first.

"*April 6*—Professor Mendel came over to the laboratory this morning and talked about plans for next year and research in particular.

"*April 14*—Accepted the Yale fellowship."

Thus it was that Wright began work for his Ph.D. degree in the first laboratory of physiological chemistry in this country, established in 1874 under Russell H. Chittenden. In 1912 Chittenden was still head of the department at Yale, but his duties as Director of the Sheffield Scientific School consumed such a large proportion of his time that Mendel was responsible for instruction and guidance in research. At the time of Wright's arrival at Yale, Mendel, in collaboration with T. B. Osborne, was studying the nutritive properties of various purified proteins and observing the inadequacies of various synthetic diets for the growth of rats. Yet for some reason that is not clear Wright undertook for his thesis work a study of the nonprotein water-soluble nitrogen extractables from the muscles of a variety of marine forms. Perhaps Mendel was looking ahead to the role that he suspected unidentified low-molecular-weight compounds must play in nutrition. But why the use of marine forms? In any case, Wright's training under Benedict on various analytical procedures undoubtedly stood him in good stead in these studies. In the years that followed, Wright was to return from

time to time to studies on muscle extractives from species of both marine and land forms.

In 1914 Wright completed his work for the Ph.D. degree and accepted a position with Walter Jones in the Physiological Chemistry Department at the Johns Hopkins Medical School. He immediately displayed there an interest in the application of biochemical methods to the solution of clinical problems, an interest which was to remain with him throughout his life. This interest took many forms, from active collaboration in investigations to the encouragement and support of research by his clinical colleagues. During his years at Johns Hopkins he was a member of a group which called themselves "The Riders and Drivers Club." Wright was apparently the only non-M.D. in a group of young physicians who, as one of them has stated, recognized "no barriers between the basic science departments and the clinical departments." At that time the group included such well-known names of today as A. R. Dochez, James L. Gamble, George A. Harrop, Robert F. Loeb, and Walter W. Palmer, among others.

While at Johns Hopkins, Wright worked one summer for the Federal Bureau of Fisheries at Muscatine, Iowa, some hundred miles east of his birthplace. There he studied the chemical composition of fish blood. Another summer he worked at the Mayo Clinic, Rochester, Minnesota, where he discovered the first spontaneously crystallizable Bence-Jones protein. It is interesting to note that during his period at Johns Hopkins, Wright apparently did not become actively engaged in the field of nucleic acid in which his chief, Walter Jones, was one of the leading investigators of the day. Many years later Wright did take up investigations in the field of purines and pyrimidines.

World War I interrupted Wright's sojourn at Johns Hopkins. On June 11, 1917, he started work at New Haven

as Junior Physiologist in the Bureau of Mines at a salary of $1500. There he joined his former teachers, F. P. Underhill and Yandell Henderson, in an investigation on poisonous gases for the Army and Navy. On October 1 he was promoted to the rank of Assistant Physiologist at a salary of $2400. Late in the fall of 1917 a method had been worked out for the relief of edema following chlorine inhalation. In order that he might be sent abroad to try out the treatment, Wright applied for a commission in the U.S. Army. On January 11, 1918, he accepted a commission as First Lieutenant in the Sanitary Corps of the Army.

On February 8, 1918, Wright embarked for England; he landed in Liverpool eight days later and was immediately transferred to Blois, France. It was here that the clearing-house for all casual officers was located. On March 1 he reported to Paris, the center of gas warfare activities for the Allies. His diary records that here he met Walter B. Cannon of Harvard and Haldane, Douglas, and Barcroft of the British school of physiologists, among others. Two weeks later he was sent to Porton, the center of research activities on gas warfare in England. During this period he had volunteered along with others to try out suits designed to protect soldiers from mustard gas in a wood heavily contaminated with the gas. He incurred severe gas burns and because of his devotion to duty was recommended for special distinction. He returned briefly to Chaumont, France, after the Armistice and was discharged on January 9, 1919, with the rank of Captain.

In 1922 he was appointed head of the Department of Physiological Chemistry at the University of Pennsylvania. The chair he occupied there, originally called the Chair of Chemistry and Toxicology, and named after Benjamin Rush, was the oldest in the Medical School of the University of

Pennsylvania. It had been separated into two seats—one occupied by Dr. John Marshall and the other by Dr. Alonzo E. Taylor. With the appointment of Dr. Wilson the decision was made to return to a one-man administration. The quarters occupied by the department were located in the basement and were far from spacious or luxurious. Wright proceeded to build up a young and well-balanced staff. Among the appointments made during the early years were James C. Andrews, physical chemistry; W. D. Langley, organic chemistry; James H. Jones, Nutrition; and George E. Simpson, who had received his Ph.D degree in physiological chemistry at Yale in 1920.

It was in the fall of 1926 that one of the authors of this memoir (E.G.B.), intent upon obtaining a Ph.D. degree in physical chemistry but short of financial means to attain this goal, accepted a position as research assistant to Wright. The new assistant, though reasonably competent at quantitative techniques, was totally ignorant of physiological chemistry. Encouraged by Wright to attend seminars and the lectures in biochemistry to medical students, the research assistant found himself enthusiastically enrolled as a graduate student by the end of the first year.

These were exciting and stimulating years for a young person to be in the department. Plans were well along for a new building which would house physiological chemistry and anatomy. Though Wright was knee-deep in blueprints, he always found time to discuss, in his typically quiet and relaxed manner, whatever problems arose. He made you feel that your problems were all-important. Contact with the clinical areas was afforded through Wright's continuing interest in fostering relationships between these areas and biochemistry. David L. Drabkin, an M.D., was appointed to the staff in 1926, and during this period Charles Johnson, a young sur-

geon, was a postdoctoral fellow and Joseph Stokes, a pediatrician, was mastering the techniques of total base determinations.

The years 1930-1940 were a period of steady and consistent growth of the new department. During this time the nature of the research problems began to change considerably in emphasis. Whereas acid-base studies had received primary attention in Wright's laboratory prior to 1930, in this later period he revived an earlier interest in nitrogenous extractives of muscle. In 1931 he spent a sabbatical leave in the laboratory of Dr. Barger at the University of Edinburgh. Over the next decade a number of papers appeared on the occurrence, isolation, and structure of octopine, carnosine, and anserine and on the chemical synthesis and metabolism of l-methyl histidine.

In 1936 Dr. Samuel Gurin joined the staff of the Department of Physiological Chemistry and was to have a considerable influence on the direction of the laboratory, first as a close friend and colleague of Wright Wilson, then as the Chairman of the Department at Wright's retirement, and finally as Dean of the Medical School. Soon after his arrival on the campus a fruitful collaboration was established with Wright and Carl Bachman of the Department of Obstetrics-Gynecology for the isolation of a gonadotrophic hormone from pregnancy urine. This research investigation was profitable at both the scientific and clinical levels. To quote from a letter from Dr. Bachman: "Over the ensuing six years the above enterpsise eventually involved about twelve members of the two departmental staffs. More than twenty-five reports were published in the periodical literature of our respective scientific and clinical fields. The program was terminated only when, in 1942, the exigencies of World War II necessitated curtailment. Whatever benefits Wright and his group may have

obtained from these joint activities, there can be little doubt that the rewards for our own group were both substantial and enduring. . . . Of paramount importance was the beneficial influence that the enterprise had—and continues to have—on the conduct of the clinical, teaching and investigative activities of our group in obstetrics-gynecology. Our staff continues to approach all assignments in the spirit of academic medicine."

This program illustrates in best form the type of collaboration between clinicians and biologists that Wright hoped for upon coming to the University of Pennsylvania, and finally achieved.

A similar cordial relationship also existed with the Department of Research Surgery headed at different times by Dr. I. S. Ravdin and Dr. Jonathan Rhoads. Many projects were jointly undertaken by staff members in this department and the Biochemistry Department, possibly because Dr. Harry Vars occupied quarters in the latter department and enjoyed appointments in both. One of the most unexpected fruits of this cordial relationship was a collaborative effort between Dr. Gurin, Dana Crandall, and Robert Ravdin, the son of Dr. I. S. Ravdin. In 1945 Bob Ravdin spent a year in the Biochemistry Department after obtaining his M.D. degree, to gain experience in research under the direction of Crandall and Gurin. Together they were able to isolate and characterize the enzymatic system for the oxidation of tyrosine first to homogentisic acid and then to fumaric acid and acetoacetic acid. This project, which was a major accomplishment in the study of intermediary metabolism, was certainly a by-product of the academic atmosphere which Wright had helped so much to establish.

The war years brought their inevitable restriction on fundamental research. Teaching of medical, dental, and vet-

erinary students was accelerated and a research program on decontamination of foodstuffs by war gases was undertaken. However, several events occurred during this time that were eventually to have important repercussions on the future academic progress of the department. In the first place, the University of Pennsylvania was fortunate to be able to provide a scientific home for the great German biochemist and physiologist, Dr. Otto Meyerhof, who was forced to flee his native country with the rise of the Nazis to power. Through the efforts of the Rockefeller Foundation and of Dr. A. N. Richards and Wright Wilson, Dr. Meyerhof came to Philadelphia in 1940 and was appointed research professor in the Department of Physiological Chemistry at the University of Pennsylvania, where he carried on his work until his death in 1951.

Also, by 1940 the way was clear for one of the greatest breakthroughs in methodology that was to revolutionize biochemistry and, once and for all, establish it as a mature science in its own right. Investigators at Columbia University had demonstrated the immense power of the isotopes deuterium and N^{15} in the study of intermediary metabolism. The stable isotope of carbon, C^{13}, was soon proved to be even more useful, but, unfortunately, only small amounts were available through limited and private production. Gurin and Wilson were farsighted enough to realize the strategic importance of producing small amounts of this valuable substance. With the collaboration of the Physics Department a gas exchange apparatus was constructed for the concentration of C^{13} as $C^{13}O_2$, and a mass spectrometer was built. A whole range of problems in intermediary metabolism was open to exploration. As his bibliography shows, Wright with his students and colleagues studied the oxidation of fatty acids and acetoacetate, the metabolism of lactic acid and alanine in the

phlorhizinized animal, and the precursors of the purine and pyrimidine bases of nucleic acids. Wright's main contributions were primarily concerned with the reactions of the biosynthesis of the pyrimidine compounds. He himself considered that one of his more important lifetime contributions was the finding that labeled CO_2 was incorporated into position 2 of the pyrimidines, because it is not thus incorporated into purines of the same nucleic acids.

Wright took a great interest in the training of graduate students. Unfortunately, the names of many of those who carried out their thesis work with him do not show in his bibliography. This is because the University at one time required the independent publication of a thesis by a Ph.D. candidate and also required him to submit a number of printed and bound copies of it. In order to save his students this extra cost Wright directed them to publish their theses in a scientific journal without his name attached and to submit reprints of the published article to the University. This was only one of the many manifestations of the consideration and kindness that Wright and his wife, Helene, displayed to the graduate students in the department.

At the conclusion of the war the graduate program in biochemistry was reorganized to accommodate students whose education had been interrupted by the hostilities. Dr. William C. Stadie, a long-time friend and colleague, shared with Wright the responsibility of the chairmanship of the Graduate Department of Biochemistry in the School of Arts and Sciences. His robust personality and good humor were much in evidence on the one day a week he visited the department for lunch and consultation. The curriculum in biochemistry for graduate students was revised to include lectures by Dr. Seymour Cohen in the new area of bacteriophages and nucleic acids. These lectures were well received by the students

and were forerunners of a new discipline of biochemistry, namely molecular biology. Also, when Dr. Britton Chance became head of the Johnson Foundation, a strong program in biophysical chemistry was available for students in this important discipline. Thus, through these efforts, a comprehensive graduate program in biochemistry was developed on the campus of the University of Pennsylvania.

In 1948 there was a reorganization of the Health Sciences on the Pennsylvania campus. Dr. David Drabkin became Chairman of the Graduate Department of Biochemistry in the Medical School and Dr. James Jones the head of Biochemistry in the Veterinary School. The medical course, however, was always Wright's primary responsibility and concern. No laboratory instructor was more watchful and conscientious than Wright himself. He was particularly anxious that the medical students learn proper laboratory technique. One of the first experiments in the course was the Kjeldahl distillation. Lacking experience in setting up apparatus, the medical students frequently contrived jerry-built platforms for support of their receiving flasks. In gentle but no uncertain terms Wright lectured each unsuspecting victim on the proper method of constructing his apparatus. Obviously this small measure of discipline left no scars on his students, since they affectionately referred to him as "The Great White Father."

Wright's interest in isotopes involved him in several early activities to organize and foster research in this area. He was chairman of the Biological Section of the Isotope Research Committee, a national committee which was formed in 1945 for the purpose of sponsoring and aiding biochemical research with carbon and other isotopes by institutions and responsible individuals. The list of its membership in 1945 reads today like a *Who's Who* of the pioneers in the de-

velopment of this important tool of biochemical research. One of the functions of this committee was the publication of a series of papers by leading investigators of this field on the topic "Preparation and Measurement of Isotopic Tracers." The Houdry Process Corporation collaborated with the Isotope Research Committee to supply investigators with C^{13} enriched compounds. Although this goal was never fully realized, the Houdry Process Corporation through the generous help of Dr. Sidney Weinhouse did perform many isotopic analyses for the group at the University of Pennsylvania.

By 1946 the first, small quantities of $C^{14}O_2$ were produced in the reactor at Oak Ridge National Laboratories. Wright was one of five scientists to receive a sample. Later he became the first chairman of the Radioactive Safety Committee at the University of Pennsylvania.

Wright received many honors in recognition of his accomplishments and service to his discipline of biochemistry. He was Secretary (1924-1925), Vice President (1952-1953), and President (1953-1954) of the American Society of Biological Chemists. He was a member of the Editorial Committee of the *Journal of Biological Chemistry* between 1939 and 1955 and a member of the Council of the Federation of American Societies for Experimental Biology. He was one of the founders of the Philadelphia Biochemists Club. In 1955 he was elected to the National Academy of Sciences.

In the same year he retired as the Chairman of the Department of Physiological Chemistry and became Emeritus Professor in 1957. His release from administrative responsibilities permitted greater attention to two of his hobbies, gardening and painting. Although the latter avocation was taken up rather late in life, he rapidly acquired a skill to match his real talent as a painter. Unfortunately, in the winter of

1957 Wright suffered an accidental injury from which he never fully recovered. In spite of this severe handicap he continued his research. Two papers were published in his later years with his wife, Helene, and a third paper with his son. Throughout this time he never lost his confidence or his good humor. No doubt the ministrations of a loving and gracious wife sustained his spirits in what otherwise were very trying times for him physically.

Wright was the father of Thomas Hastings Wilson, who is now Professor of Physiology at Harvard Medical School, and of Juliet Wilson Welch of California. In addition, he had seven grandchildren.

In the academic community his progeny are many. On the occasion of his sixty-fifth birthday Wright was honored at the meetings of the Federation of American Societies for Experimental Biology with a dinner by his students and colleagues. This gathering was undoubtedly a high point in his career. Upon retirement he was also honored with the presentation of his portrait, which now hangs in the Medical School of the University of Pennsylvania. As skillful as the artist was, he could not include on a single canvas the many facets of Wrights's personality that endeared him to his family, friends, and colleagues.

Finally on July 13, 1965, a courageous and youthful spirit departed an ailing body that could not longer support life. Undoubtedly Wright's greatest heritage was his own example to those who had the privilege of associating with him. A biography catches only a glimpse of the real man, with omissions of important events in his life and the failure to include the contributions of many close friends and associates. The effort of the two biographers was greatly aided by Helene Wilson, who has devoted many hours to gathering the factual information needed for this report.

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KEY TO ABBREVIATIONS

Am. J. Physiol. = American Journal of Physiology
Bull. Johns Hopkins Hosp. = Bulletin of the Johns Hopkins Hospital
Federation Proc. = Federation Proceedings
J. Am. Chem. Soc. = Journal of the American Chemical Society
J. Biol. Chem. = Journal of Biological Chemistry
Proc. Soc. Exp. Biol. Med. = Proceedings of the Society for Experimental Biology and Medicine

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