

Sewall Wright (1889–1988)



SEWALL WRIGHT on the occasion of his 90th birthday celebration in Madison. (Photograph by HILDEGARD ADLER.)

SEWALL WRIGHT'S untimely death occurred shortly after midnight on March 3. He died of complications from a fractured pelvis, the result of his slipping on an icy spot during one of his daily long walks. It may seem strange to regard a death in his 99th year as untimely, but not for WRIGHT. He was eagerly looking forward to participating in this summer's International Congress of Genetics in Toronto and enjoying banter about what to do in his second century. Only a few hours before his death he was discussing his most recent paper, wondering whether his reprints had arrived, signing a check for the coming month's rent, and wondering how he could handle his income tax from the hospital. Yet, in many ways, a sudden death was a blessing. A long confining illness would have been very hard for one accustomed, as he was, to a high level of physical and mental activity. Walking and, when possible, swimming were very important to him, and he couldn't read in a hospital bed.

WRIGHT's death marks the end of an era. He had been for many years the sole survivor among those who established genetics as a solid science starting about 1915, a group that included MULLER, STADLER, STURTEVANT, BRIDGES, FISHER, and HALDANE. With the latter two he founded the subject of population

genetics and gave natural and artificial selection a quantitative basis.

WRIGHT's life and work are abundantly documented. There is a full-length biography (PROVINE 1986), a reprinting of 42 of his 212 papers (WRIGHT 1986), and several shorter articles (CROW 1982, 1987, 1988). PROVINE has taped more than 120 hours of interviews and has preserved virtually all of WRIGHT's voluminous correspondence. There is also an oral history. Future historians will have a plethora of material. Because so much has been written about his professional life, and much more will be, I have elected to give a more personal account of this amazing man.

WRIGHT's first paper was published in 1912 and his last in 1988, a span of 76 years. WRIGHT's four-volume series (1968, 1969, 1977, 1978) was written in his late 70s and 80s. His last paper, appearing in the January, 1988 issue of the *American Naturalist*, was a spirited rejoinder to one part of PROVINE's book, which WRIGHT generally liked. But he thought that PROVINE took too literally his metaphorical peaks-and-valleys model, and said so clearly and forcefully.

He retained his intellectual vigor until the end. Although his eyesight deteriorated badly, he learned to read with a machine that projected the printed

page onto a television screen. He always liked history and biography, but only in recent years did he have the leisure to indulge this interest. In his last few weeks he read biographies of JEFFERSON, TCHAIKOVSKY, EINSTEIN, and the KENNEDYS and FITZGERALDS. And he could discuss them in detail. He was dissatisfied with the EINSTEIN biography, and asked for a book with less personal life and more relativity. At first he found the machine difficult to use, so that he could read only for short periods. A few weeks ago he said that he still didn't read very long at a stretch. With that twinkle that always signaled something amusing, he said that, having mastered the mechanics of the reading machine, he could no longer use that as an excuse; he would simply have to admit, he said, that his attention span wasn't what it used to be.

WRIGHT's intellectual life extended far beyond the normal range in both directions. He was also a precocious child. At age seven, before starting school, he wrote a pamphlet entitled "The Wonders of Nature"; it still exists. It included sections about constellations, squashes, ants, dinosaurs, bees, marmosets, and the story of a wren that could not be dissuaded from nesting in the family mailbox. His report on the chicken gizzard is typical:

Have you ever examined the gizzard of a fowl? The gizzard of a fowl is a deep red color with blue at the top. First on the outside is a very thick muscle. Under this is a white and fleecy layer. Holding very tight to the other. I expect you know that chickens eat sand. The next two layers are rough and rumply. These layers hold the sand. They grind the food. One night when we had company we had chicken-pie. Our Aunt Polly cut open the gizzard, and in it we found a lot of grain, and some corn.

SEWALL wrote the letter z backwards, so there is some uncertainty as to whether "gizzard" was correctly spelled.

WRIGHT also knew arithmetic before starting school, and astonished his first-grade teacher by saying that he knew how to extract cube roots. The teacher was so impressed that she had him demonstrate this skill to the eighth-grade class. He could barely reach the chalk board, he said, and the main consequence of his demonstration was instant unpopularity with the other students. He decided then and there to volunteer as little as possible in school.

PHILIP WRIGHT, SEWALL's father, was a polymath and was on the faculty of tiny Lombard College in Galesburg, Illinois. He taught mathematics, astronomy, surveying, economics, physical education, and English composition. He loved poetry and music and was disappointed that SEWALL did not take to them. He had a printing press on which he printed his poems, as well as the College bulletins. SEWALL, and his brothers, QUINCY and THEODORE, printed the first poems of CARL SANDBURG, who was a student in their

father's composition class. PHILIP WRIGHT later moved to Harvard and the Brookings Institution where he published a number of books on economics. One of them, *The Tariff on Animal and Vegetable Oils*, included an appendix by SEWALL. QUINCY went on to become a distinguished scholar in the field of international law, while THEODORE was chief engineer at Curtis-Wright, a Civil Aeronautics commissioner, and acting president of Cornell University. He is said to have turned down the presidency because he didn't like raising money.

SEWALL WRIGHT was born December 21, 1889, in Melrose, Massachusetts, but grew up in Galesburg, Illinois, where he attended Lombard College. He took several courses from his father, including surveying and mathematics through calculus. His interest in genetics was kindled by WILHELMINE KEY and he learned about the subject by reading PUNNETT's account of Mendelism in the *Encyclopedia Britannica*. Although biologists regard WRIGHT as a formidable mathematician, he never took any advanced courses; his math, beyond what he learned from his father, was self-taught.

Between his third and fourth years of college, he made use of his surveying and mathematical skills by working with a crew surveying for a railroad line in the Standing Rock Reservation in South Dakota. It was an exciting time for him, in the Old West tradition with cowboys, Indians, mule skinnners and outlaws; and he loved to tell about it. Late in the year he developed a lung infection and had to stay in a caboose. He was not too ill, however, to climb on the roof to see Halley's comet. Regrettably, his diminished eyesight prevented his seeing it for a second time last year. While confined to the caboose, he read TAIT's (1890) book on Quaternions. After his death I found what must be the same book, with many of the problems checked, these presumably being the ones that he had worked. It appears that he got about half way through the book. Curiously, J. B. S. HALDANE also read TAIT under strikingly similar circumstances—while recovering from wounds in World War I. As far as I know, neither of them made use of this technique in his later work. One consequence of WRIGHT's lung infection was that he was refused life insurance by New England Mutual, something he found increasingly amusing as his age advanced far beyond the usual life expectancy.

Upon graduation from Lombard, he received a fellowship at the University of Illinois. During this year WILLIAM CASTLE visited the campus and, after an interview with WRIGHT, hired him on the spot as an assistant. WRIGHT's Ph.D. from Harvard came in 1915. His thesis was on coat colors in guinea pigs, but he also worked out ways to measure inbreeding during this time.

From 1915 to 1925 he was senior animal husband-

man in the United States Department of Agriculture. During this period he did his classical studies on inbreeding and factor interaction in guinea pigs, the analysis of livestock breeds, and the method of path analysis. The last was a novel method for interpreting correlations in complex causal systems. His original paper on path analysis, "Correlation and Causation," was rejected by the Bureau of Animal Industry, but was later published, thanks to the intercession of his colleague G. N. COLLINS, a leading maize geneticist. WRIGHT also had trouble with the publication of his monumental analysis of corn and hog correlations. It was rejected by the officials in the Department of Agriculture on the grounds that an animal husbandman had no business writing about economics. HENRY WALLACE, later to become Vice President, eventually learned of the paper and, through the influence of his father, then Secretary of Agriculture, arranged for its publication. This may well have been the zenith of the HARDING administration.

In 1926 WRIGHT moved to the University of Chicago where he continued his guinea pig studies and wrote his influential papers on evolutionary theory. There he had several graduate students who went on to distinguished careers. Curiously, only one did a thesis in population genetics and none in mathematical theory; WRIGHT's emphasis at the time was on developmental and physiological genetics. At age 65 he retired from Chicago and was for 5 years Professor at the University of Wisconsin. Frugal Wisconsin never paid him a full salary, only a supplement to his Chicago retirement annuity. For this, the University got more than 30 years of WRIGHT-quality work—surely the best bargain Wisconsin ever had.

An aspect of WRIGHT's life that is not fully appreciated was his great service to others. While at the United States Department of Agriculture he answered, fully and conscientiously, numerous letters from farmers and breeders. He had heavy teaching responsibilities at the University of Chicago, often two courses in the same term. His lectures were always carefully prepared and he was in the labs himself.

He was often called on to review manuscripts, difficult ones especially. He was one of the most frequent reviewers for GENETICS. Many a published paper is better for WRIGHT's attention. Once, as an anonymous reviewer, he spent an enormous amount of time re-analyzing the data in a paper on mouse genetics, and reached the opposite conclusion. The author simply rewrote the conclusion. WRIGHT's reputation as a reviewer was so great that he was sometimes credited with reviews he didn't write. This happened with a paper by VISCONTI and DELBRÜCK (1953), for which an anonymous reviewer wrote a long, mathematical review. (I think it can now be

revealed that the reviewer was KIM ATWOOD.) DELBRÜCK, much impressed, asked the editors to thank SEWALL WRIGHT for such a thoughtful review.

WRIGHT spent a great deal of time helping other people analyze their data. Sometimes this led to very important results, such as his papers with DOBZHANSKY. He also spent countless hours analyzing Linanthus data for CARL EPLING, delaying the writing of his own books. The DOBZHANSKY collaboration lasted longer than WRIGHT would have preferred and PROVIN (1986) has described WRIGHT's efforts to get out of this entangling alliance. These are only two examples; there are many more. I have often thought that his time would have been better spent on his own research, but this was not in character for this patient, unselfish man, unselfish to a fault.

WRIGHT was quiet, shy, introverted, and uneasy with small talk. He liked to talk, but only when there was substance. Conversations were often strained until the right button was pressed; then he was off on what was typically a long monologue. He liked to talk about his ancestors (for example, JUDGE SAMUEL SEWALL, of Salem witchcraft fame), the connections between some of these ancestors and characters in SHAKESPEARE's historical plays, his childhood, his days on the railroad surveying crew, his travels, his guinea pigs, his not too sanguine view of FISHER, and, of course, his theory of evolution. All who heard him as a lecturer and teacher have vivid, affectionate memories of his crowding an enormous amount of factual information into a lecture; his talking and writing at breakneck speed; his note-cards, illegible to all but him, and even to him in his later years (this being a major cause of his recent reluctance to accept speaking engagements); his covering the blackboard with symbols and his clothes with chalk, and erasing the board with any object at hand (although he denied the story of his using a guinea pig for this purpose); and, above all, his invariably running overtime. His wife LOUISE repeatedly reminded him to confine his lecture to the allotted time. He duly promised, but simply found it impossible to omit details.

One of his most striking characteristics was his refusal to speculate about anything he had not previously thought through. While WRIGHT was still in Chicago, my then-student NEWTON MORTON and I traveled there to ask him some questions about effective population number. To each question he answered that he didn't know, and the whole conversation was over in a few minutes. On the way back to Wisconsin, MORTON, who neither then nor now was inclined to understate his opinions, said that if this was one of the world's greatest geneticists the subject was in a sad state. But a few days later, in response to written questions, we got a 14-page, handwritten letter with *everything*. Every question was answered carefully, with full derivations.

WRIGHT has had an abundance of medals, prizes and awards, essentially all for which a population geneticist is eligible. These include the Elliott and Kimball Awards from the National Academy of Sciences, the Lewis Prize of the American Philosophical Society, the Weldon Medal from Oxford University, the Darwin Medal of the Royal Society of London, and the National Medal of Science from the United States. Most recently, he received the Balzan Prize, for which he traveled to Italy. He has had a number of honorary degrees although, as he liked to say, far fewer than HERBERT HOOVER. He has been president of the Genetics Society of America, the American Society of Zoologists, the Society of Naturalists, the Society for the Study of Evolution, and the Tenth International Congress of Genetics. To mention one more, he was the only geneticist ever to be elected a fellow of the Econometric Society. His method of path analysis, which uses correlations to analyze complex interrelationships in nonexperimental data, has recently become de rigueur in some social sciences. At WRIGHT's 90th birthday banquet a Wisconsin sociologist said that WRIGHT's contributions were such that the Sociology Department was prepared to offer him an assistant professorship.

WRIGHT married LOUISE WILLIAMS, who had taught genetics at Smith College, in 1921. In contrast to her husband, she was an easy conversationalist and made friends readily. She especially liked to travel, and encouraged him to take long automobile trips which they both enjoyed. She died in 1975 leaving him very lonely, although this was not apparent; he was not one to share such feelings with others. They are survived by three children (RICHARD, ROBERT and ELIZABETH), five grandchildren and three great grandchildren.

I have saved till the last my favorite anecdote. It has been told often, but it so epitomizes this modest, unselfish man with his self-deprecating wit that I want to repeat it. While writing his books he received a modest stipend from the National Science Foundation and during this time the Foundation offered to provide an inflationary adjustment to his pay. He was in his late 80s at the time. When I brought him this good news, he replied that, according to his careful calculations, his productivity was declining at exactly the same rate as the value of the dollar and he didn't deserve any salary increase. He never accepted it.

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