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OBITUARY
Sheldon C. Reed, Ph.D. (November 7, 1910–February 1, 2003): Genetic Counseling, Behavioral Genetics

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Sheldon Clark Reed was born on November 7, 1910, in Barre, Vermont, and died on February 1, 2003, at age 92. He was one of the small group of geneticists who started their careers as biologists and later shifted into human genetics. In that second career, he became best known for his work in genetic counseling and his support for behavioral genetics.

In 1932, Sheldon graduated from Dartmouth College, having published, in his junior year, a paper (with George Snell) on harelip, a new mutation in the house mouse (Reed and Snell 1931). He proceeded to Harvard University, where he studied under William Castle and completed nine more genetics papers on mice and rabbits. These included an extensive paper on the embryological development of harelip in the mouse and a comparison with data about the genetics of clefting in humans (Reed 1936). After receiving a Ph.D. in 1935, he spent one term in the laboratory of Sewall Wright, at the University of Chicago.

As an instructor in genetics at McGill University (1936–1940), Sheldon instituted the first course in biometry to be given there and turned his research direction toward

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what he called the "coming struggle concerning morphogenesis." Using a modified technique for growing embryonic tissues as heteroplastic grafts in newborn mice, he studied the period in development during which hair structure and pigmentation are determined (Reed 1938). These experiments were completed in the laboratory of Ross Harrison, at Yale University, in the summer of 1940.

In 1940, Sheldon accepted an appointment as faculty instructor at Harvard University and changed the direction of his research once again. Dobzhansky and Patterson had separated strains on the basis of inversions of *Drosophila* by discovering inversions in their salivary chromosomes, but Sheldon wanted to devise new techniques for separating species by physiological means. He combined forces with Carroll Williams (then a graduate student), and, together, they succeeded in separating wild species of *Drosophila* by means of the frequency of wing beats, as measured by the stroboscope (Reed et al. 1942), arguably an early example of what would later become "behavioral genetics." Apparently, this set off a vigorous discussion between Dobzhansky and Sturtevant as to what constitutes a "species."

World War II intervened, and Sheldon spent 1942–1945 in London working as a civilian scientist in the headquarters of the United States Fleet and with the British Admiralty. (One of his coworkers was William Shockley.) The work ranged from statistical studies about war-related technology to interrogation of captured German scientists. He also wrote many technical and popular articles, which were distributed as Fleet publications.

On his return to Harvard, Sheldon became acquainted with Elizabeth Wagner Beasley, who was working as an assistant professor of biology. Her husband, Jim, had been a geneticist working on cotton (and had known Sheldon), but he had died during the war. In 1946, Sheldon married Elizabeth and became stepfather to John Beasley and, then, father to Catherine Reed and William Reed. Sheldon and Elizabeth had many interests in common, and she played a significant part in his research work, both at Harvard and in Minnesota.

Sheldon's last three *Drosophila* studies involved natural selection in laboratory populations. For these, Sheldon devised "population bottles" consisting of two half-pint milk bottles connected by a section of radiator hose (with a ventilation hole plugged with cotton). These proved to be quite effective for studying competition between two genotypes to study the components of natural selection (Reed and Reed 1948).

In 1947, Sheldon's research interest and activities took a sharp turn when he was invited to serve as director of the Dight Institute for Human Genetics at the University of Minnesota. The Dight had been formed in 1941, with the support of an endowment from Dr. Charles F. Dight, an eccentric Minneapolis physician who had a strong interest in public health and in genetics as it applied to humans. Clarence P. Oliver served as the first director and carried out the three main functions stipulated by Dr. Dight in his will: to provide courses and public lectures on human genetics, to initiate research studies, and to provide consultation and advice on questions related to human genetics. In 1946, Oliver chose to return to the University of Texas in Austin.

Immediately upon his arrival in Minneapolis, in August 1947, Sheldon began to receive questions from physicians about genetic problems they had encountered. One of these led to a paper, in which Sheldon's contribution was to use a statistical method to adjust the data for ascertainment bias (Lowe et al. 1949), that confirmed the recessive inheritance of cystic fibrosis. As a wide range of questions continued, he kept looking for a term that would describe what he was doing but rejected "genetic hygiene" as being associated with toothpaste and deodorants. At the next meeting of the Dight advisory committee he suggested "genetic counseling" as a much more appropriate description. The members were not overly enthusiastic, but they accepted it, not having anything better to offer.

Sheldon expanded his views of genetic counseling in several issues of the Dight Institute Bulletin and also presented the concept at the First International Congress of Human Genetics, in Copenhagen, in 1956. It was his hope that genetic counseling would continue to be of help to individual families and that it would not become the tool of any governmental population program. He also thought that its future would be of the greatest interest, particularly in relation to ethical concepts (Reed 1974).

Sheldon personally handled well over 4,000 cases of genetic counseling. When individuals or families came to him, he listened carefully and spoke simply to give them the information they would need to make their own decisions. He insisted that the presentation of this genetic information "must be compassionate, clear, relaxed, and without a sales pitch." He believed that the counselor also could help to alleviate some difficulties associated with genetic problems: quarreling between husband and wife as to the "blame" for an abnormality in their child and a sense of shame owing to the social stigmas that often accompany hereditary diseases. Maternal guilt is an emotional reaction that should be watched for. On the other hand, one usually *can* explain to parents the chances of another abnormal child, so that they can adjust well to the facts.

Sheldon's wry Vermont sense of humor sometimes came to the fore. He noted that many people point with pride to their descent from passengers who came to America on the Mayflower but ignore their other ancestors. Hence, the tendency to accept the concept of heredity for traits we admire and reject it for the traits we reject could be called the "Mayflower myth." In a similar way, some of the counselor's clients might want to be told that albinism is *not* hereditary and that their albino child is just an "exaggerated Scandinavian."

His classic work, *Counseling in Medical Genetics,* summarized his experience, with case histories at the end of each chapter (Reed 1955). Later editions appeared in 1963 and 1980. The second edition was also published as a paperback (*Parenthood and Heredity*) to make it more accessible to the general public, and an Italian translation (*Consulenza in Genetic Medica*) was printed by the Vatican Press. In 1958, Pope Pius XII quoted favorably from the book, in discourses at international congresses on blood transfusion and hematology.

Shortly after his arrival in Minnesota, Sheldon made arrangements for the transfer of files of the eugenics record office from the Cold Spring Harbor Biological Laboratory to the Dight Institute. The material included ~40,000 pedigrees and a cross index of >2 million cards. Much of the material seemed trivial and useless; three sets of records, however, were of significant research value:

1. A 1913 manuscript by E. B. Muncey had extensive records of "Huntington's chorea" in "old American families" (mainly of English origin) that went back to the 1600s. This was duplicated and made available to professionals working with affected individuals and families.
2. Another set of data had been carefully collected on the families of persons who were in the institution for the mentally retarded at Faribault, MN, from 1911 to 1918.
3. The third project had been carried out on the families of psychiatric patients who were at Warren State Hospital, in New York, from 1913 to 1916.

The latter two data sets provided the unusual opportunity to trace descendants and, thus, carry out the prospective studies that are essential for analyzing reproduction and fertility (including any male-female differences) and related issues in population genetics. The field workers had been well trained and had collected extensive information about the probands and their relatives. (It might be noted that one of the field workers, although not on these two projects, was Wilhelmina Keys, who taught Sewall Wright his first biology at Lombard College and persuaded him to go on to further education.)

The first of these two studies involved 549 probands and ~80,000 descendants of the probands' grandparents (Reed and Reed 1965). Elizabeth played a major role in collecting the life histories (and IQ data, when possible), and she was first author of the publication. Probably the major scientific contribution of this study was the resolution of "Cattell's paradox," the puzzle arising from the observation that a negative correlation between the size of a family and the average IQ of the children did not lead to a gradual decline in IQ level, as might be predicted. In previous studies, however, the childless members of each generation were never included. Data from the new study confirmed the negative correlation, but when the childless members were included, the differential fertility disappeared (Higgins et al. 1962). Apparently, Cattell's paradox was the result of ascertainment bias.

The second study was based on 18,000 relatives of the 99 probands who had a diagnosis of psychotic disorder (Reed et al. 1973). The original diagnoses were reviewed, together with information from the later life experiences, an option that is available only in a prospective study. In the data analysis, considerable attention was given to population dynamics. Excluding the probands, 80% of schizophrenic relatives had normal parents. From these and other data, it is clear that people with psychotic illness do not reproduce at a rate high enough to replace themselves in the population, yet the rates of illness are essentially constant. Alternative explanations were considered.

Sheldon spent much time and energy working with graduate students and finding support for them. A human genetics training grant had been available since the early 1960s, but Sheldon wanted to develop the emerging field of behavioral genetics, as well. In July 1996, a behavioral genetics training grant was awarded to Sheldon and to David Lykken, in psychology. (Similar training grants were also awarded to the Institute of Behavioral Genetics at the University of Colorado and to the University of Texas in Austin, at about the same time.) Irving Gottesman was invited back from North Carolina to serve as codirector, working with the new students, and, 6 years later, Jack Sheppard was recruited from the Institute of Behavioral Genetics to add a biochemical dimension.

Over the following years, ~60 students who were supported by these grants, or who were otherwise affiliated with the Dight Institute, earned their Ph.D.s. It was Sheldon's policy to encourage these students to choose their own research topics. Frequently, this meant that the students worked in other laboratories, but he stayed in close touch with them and was always available to discuss research or other questions.

While at Minnesota, Sheldon maintained his contacts with other geneticists, attending both national meetings and international congresses. In 1955, he served a term as president of the American Society of Human Genetics.

Sheldon retired from academic life in 1978, but he continued with old interests and added new ones. His short history on the development of human genetics in the United States during the first half of the 20th century contains many interesting facts and opinions about the persons and issues that gave substance and color to the field in those years (Reed 1979). He gave more time to breeding new varieties of African violets, a hobby he had started in the 1950s. He also worked with orchids, some of which were sold to nurseries for propagation, whereas others were given to friends or sold at church sales. Another major interest began when his church sponsored a Hmong family. Sheldon soon became one of a handful of Minnesotans who learned to read and speak Hmong, a language that had been put into writing only a few decades earlier. He went on to teach young Hmong students how to read their own language and tutor some of them in math.

Sheldon Reed loved genetics, and he had a strong desire to be helpful to other people. In his own way, he was a Renaissance person, moving from one project to another but always adding a new twist or insight. His professional life had two underlying themes: his belief in the importance of biometry, and his drive to understand evolution, including the dynamics of human populations. His students and colleagues will honor his memory.

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