# Frank Ruddle (1929–2013)

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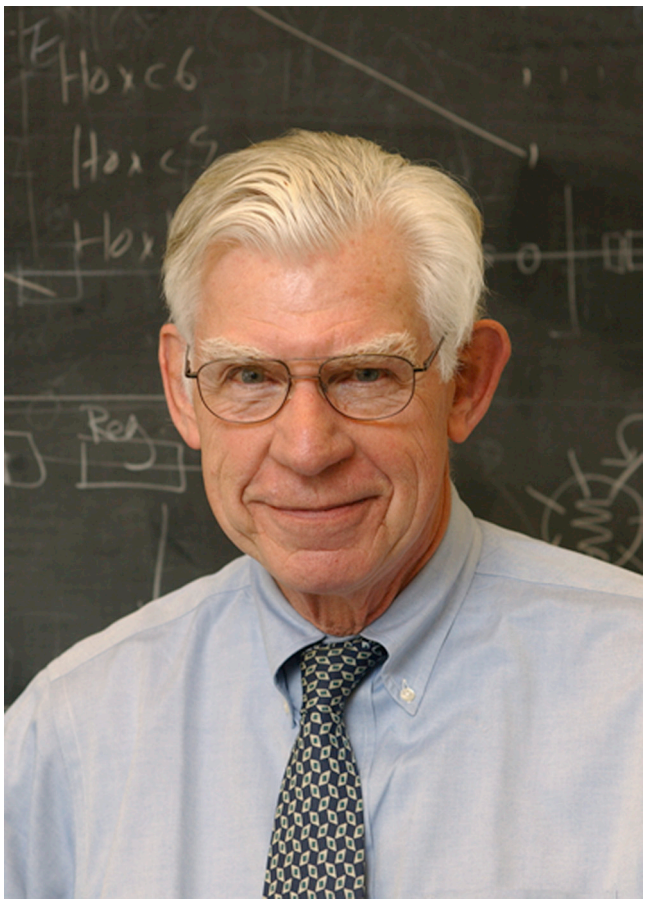


**Frank Ruddle**
Photograph courtesy of Nancy Ruddle.

Frank Ruddle, a pioneer in science and versatile in human gene mapping, transgenic technology, and several other fields in biology, has left a significant legacy.

Frank was born August 19, 1929, in West New York, New Jersey, to parents who emigrated from the United Kingdom. He dropped out of high school to join the Air Force, where he served with distinction from 1946 to 1949. Like many other veterans at that time, he was eligible for benefits afforded by the GI Bill (Servicemen's Readjustment Act of 1944), and Frank used these and obtained his B.A. and M.S. degrees from Wayne State University in 1953 and 1955, respectively. He then obtained his Ph.D. in zoology from the University of California at Berkeley in 1960. While at Berkeley, he trained with Morgan Harris and learned mammalian cytogenetics. Frank went on to do postdoctoral work at the University of Glasgow in Scotland and worked with John Paul from 1960 to 1961. He was recruited to a faculty position in the Biology Department at Yale University, where he remained throughout his career. Frank rose through the ranks at Yale, where he became a full professor in 1972. He held different named endowed chairs, and one of which he was very proud was the Ross Harrison Chair. The Biology Department at Yale had the tradition of rotating chairs, and Frank was chair of the department twice, first from 1977 to 1983 and second from 1988 to 1992. Frank supported the initiation of the Human Genetics Department at Yale Medical School, and he had a joint appointment there until his retirement. Frank was an active member of the American Society of Human Genetics and served as its president (1985) and was the recipient of the William Allan Award in 1983.[1]

In the late 1960s and early 1970s, less than a handful of genes had been mapped to the human genome. At that time, the use of somatic cell hybrids in mapping genes was a very active area of genetic research. Although Frank did not discover the use of somatic cell hybrids for human gene mapping, his lab was at the forefront of this work. He brought together diverse technologies and considerable skill and was prolific in his contributions to the field. His scientific contributions culminated in more than 900 publications over his long and productive career.

The production of somatic cell hybrids involved bringing the genomes of two cells together. Frank became interested in introducing defined segments of genomes into mammalian cells and worked on different technologies, including the use of microcell hybrids and chromosome transfer, to accomplish this goal. This work led to the idea of using DNA in gene transfer, and in 1980, Frank's lab created the first transgenic mouse and thus transformed mouse genetics and paved the way for utilizing the mouse as a model suitable for studying the functions of many human genes and genetic diseases. In fact, he and a postdoctoral fellow, Jon Gordon, coined the term "transgenic."

In 1985, while he was on sabbatical in Switzerland in the laboratory of Walter Gehring, his good friend and former colleague at Yale, Frank was involved in the successful cloning of the mouse homolog of a *Drosophila* homeotic gene. Research on the mammalian homeotic genes and

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their evolution was a large focus of his laboratory for the remainder of his career.

Beyond his technical skills, Frank also had the great foresight to help create the infrastructure for building the human genome maps by bringing together individuals from various disciplines and supporting information technologies. He recognized that the generation of a comprehensive and integrated map of the human genome would require collaborative efforts involving many disciplines, including human genetics, statistical genetics, and information technology. In 1974, he organized the first Human Gene Mapping Workshop, and it was supported by the March of Dimes Foundation. That workshop attracted scientists of different disciplines and from many countries. There were many such workshops in subsequent years, and this tradition found its way into the Human Genome Project and helped develop comprehensive genetic, cytogenetic, and physical maps, which in turn helped with human genome sequencing. Frank also recognized very early that information technologies were going to play a very important role in the assembly of human gene mapping data, and he developed the first database that served as the repository of much of the human gene mapping data that eventually became an important public resource.

In addition to making his own contributions to move the field forward, Frank, along with Victor McKusick of Johns Hopkins University, started a new journal to record the development of several fields related to gene mapping in 1986. Frank's long-term friend Tom Roderick of Jackson Laboratory suggested a name for this new journal, Genomics. Of course, the name Genomics now defines an entire field in itself.

Frank was an excellent mentor to so many during his long career. He encouraged exploration and was always open to new ideas and approaches. He was quick to give credit, and he took an active role in fostering the advancement of his trainees. As a consequence of his major role in organizing the gene mapping meetings, his trainees were always aware of the state of progress being made in human gene mapping and related fields. Frank took many of his lab members to the meetings that he helped organize, and he encouraged his trainees to work in this arena. The ability to meet and interact with leaders in the field was very informative for junior people and helped them form lifelong contacts with other scientists. Frank truly enjoyed science and felt privileged to have been able to have such an interesting and constantly challenging occupation. It was never just a job to him, and that attitude became engrained in his trainees, much to the betterment of all.

For all of these contributions, Frank received numerous honors, including election to the National Academy of Sciences (1976), the Institute of Medicine (1985), and the American Academy of Arts and Sciences (1977). In recognition of his substantial achievements in human genetics, Frank was awarded the William Allan Memorial Award by the American Society of Human Genetics in 1983.[1] His service to the scientific community was enormous. He was president of the Society for Developmental Biology in 1971, of the American Society of Human Genetics in 1985, and of the American Society of Cell Biology in 1987. His involvement in these diverse biological societies and his contributions to them demonstrate his versatility. Several institutions, including Lawrence University in Wisconsin, the Weizmann Institute of Science in Israel, and his alma mater, Wayne State University, awarded him honorary degrees.

Frank was an imposing figure both physically and in his scientific stature. Nevertheless, he was very approachable and was a true role model. He helped advance the careers of many people who had the good fortune to work with him. A remarkable and uniform feature of the associations of all the people who worked with him is that they admired him for his generosity and friendship in the process. Frank made a great impact on science and on the lives of many individuals, and although we mourn his loss, we will retain his memory for many years to come.

Frank leaves his beloved wife, Nancy, his two children, Kate and Amy, and their families, which include three grandchildren.

## Reference

1. Ruddle, F.H. (1984). The William Allan Memorial Award address: Reverse genetics and beyond. Am. J. Hum. Genet. *36*, 944–953.