



IN MEMORIAM

Walter Monroe Fitch
Professor of Ecology and Evolutionary Biology
UC Irvine
1929 - 2011

Walter Monroe Fitch was born on 21 May 1929 in San Diego, California, where he attended primary and secondary school. He went to the University of California, Berkeley, where he received an A.B. in chemistry (1953) and a Ph.D. in comparative biochemistry (1958). After a series of postdoctoral appointments, in 1962 he joined the Department of Physiological Chemistry at the University of Wisconsin Medical School in Madison, where he was Assistant Professor (September 1962- August 1967), Associate Professor (September 1967- August 1972) and Professor (September 1972- September 1986). In 1986, Walter returned to his native California as a professor in the Department of Biological Sciences at the University of Southern California in Los Angeles. Three years later, he moved to the Department of Ecology and Evolutionary Biology at the University of California, Irvine (UCI), where he was a professor from 1989 until 2009 and professor emeritus until 2011.

In the second half of the decade of the 2000s, Walter's health deteriorated owing to various ailments, leading to his retirement in 2009, although he continued to come to his office and to write. He passed away peacefully in his sleep in the early morning of March 10, 2011. The family held a memorial service at UCI's University Club on 8 April 2011. UCI's School of Biological Sciences held a memorial on 26 May 2011, at the Beckman Center of the National Academies in Irvine. Walter Fitch is survived by his wife, Chung Cha, formerly Ziesel, two daughters and one son, two step- daughters, and seven grandchildren.

Walter Fitch is acknowledged as the founder of the discipline of molecular phylogenetics, the reconstruction of evolutionary phylogeny using molecular data, which is now an enormously active field of research and publication, perhaps the most intensely used method of ascertaining the evolutionary history of living organisms and the one method that can incorporate all sorts of organisms, from bacteria and protozoa to plants and animals, using a single all- encompassing trait, a chosen DNA sequence or protein molecule. Thus, Fitch also counts as one of the earlier pioneers of the now enormous field of molecular evolution, currently represented by scores of journals and treatises, thousands of scholarly papers, dozens of academic departments and hundreds of courses in universities and other institutions of higher learning, and thousands of research scientists.

The emergence of molecular phylogeny as a major field of study can be traced to the publication in 1967 of a paper in *Science* ("Construction of Phylogenetic Trees," Fitch and Margoliash, 1967), a paper that would impact forever how the evolutionary history of living organisms is investigated. Margoliash, a distinguished biochemist at the Abbott Laboratories in North Chicago, had obtained for several species the amino acid sequence of cytochrome c, a small protein involved in cell respiration, consisting of about 104 amino acids. In collaboration with Walter, Margoliash extended the sequences to a total of 20 species from yeast, through insects, fish, reptiles, birds, and mammals to humans. The reconstruction of the evolutionary history of

organisms that had shared the last common ancestor more than one billion years ago, “remarkably like the classical phylogenetic tree that has been obtained from purely biological data” (p. 279), on the evidence obtained from a small protein, was an outstanding achievement. More significant yet was the formulation of concepts, algorithms, and statistically reliable methods of wide applicability in the investigation of molecular evolution.

Walter’s contributions to the conceptual and methodological development of molecular evolution extend throughout his career, with a bibliography consisting of more than 180 peer- reviewed papers. One long paper, chock full of new ideas, precisely defined terms, algorithms, and specific methodologies, is “The Usefulness of Amino Acid and Nucleotide Sequences in Evolutionary Studies” (Fitch and Margoliash, 1970). Walter developed increasingly sophisticated methodologies to evaluate the molecular clock, that is, the relative constancy of molecular evolution.

Notable also are Fitch’s investigations of the evolution of the influenza virus, which became of great consequence in the development of flu vaccines. Early papers were “Evolution of Influenza A Viruses over 50 years,” published in *Science* (Buonagurio et al., 1986a) and “Epidemiology of Influenza C Virus in Man; Multiple Evolutionary Lineages and Low Rate of Change,” published in *Virology* (Buonagurio et al., 1986b). Notice also “Positive Darwinian Evolution in Human Influenza A Viruses,” published in the *Proceedings of the National Academy of Sciences* (Fitch et al., 1991), and “The Variety of Human Virus Evolution,” published in *Molecular Phylogenetics and Evolution* (Fitch, 1996). All important for the development of flu vaccines are several papers co- authored with UCI’s Robin M. Bush and others, such as “Predicting the Evolution of Human Influenza A,” published in *Science* (Bush et al., 1999) and “Effects of Passage History and Sampling Bias in Phylogenetic Reconstruction of Human Influenza A Evolution,” in the *Proceedings of the National Academy of Sciences* (Bush et al., 2000). One of his last published papers, published in the *Proceedings of the National Academy of Sciences*, is “A Statistical Phylogeny of Influenza A H5N1” (Wallace et al., 2007).

Shortly after his joining in 1989 the Department of Ecology and Evolutionary Biology at UCI, Walter and Francisco J. Ayala embarked on the planning of four colloquia sponsored by the U.S. National Academy of Sciences. The colloquia were held at the Arnold and Mabel Beckman Center of the National Academies, next to the UCI Campus, and the colloquium papers were published in the *Proceedings of the National Academy of Sciences*, and as separate books published by the National Academies Press. The four colloquia were: “Tempo and Mode in Evolution” (Fitch and Ayala, 1994), “Genetics and the Origin of Species” (Ayala and Fitch, 1997), “Variation and Evolution in Plants and Microorganisms” (Ayala et al., 2000) and “Systematics and the Origin of Species” (Hey et al., 2004).

Just before his death, Walter finished a book on a favored topic during the last decade of his teaching, *The Three Failures of Creationism. Logic, Rhetoric, and Science*, published a few months later by the University of California Press (Fitch, 2012).

Walter Fitch received distinguished honors throughout his career, including, among numerous others, election to the three most honorific societies for scientists in the United States: the National Academy of Sciences in 1989; the American Academy of Arts and Sciences in 1991; and the American Philosophical Society in 2000. He was elected a Foreign Member of the Linnean Society (London) in 1994, and received a Doctor Honoris Causa degree from North Carolina State University in 2001, and in 2005, the UCI Medal. The “Walter M. Fitch Award” given each year by the Society for Molecular Biology and Evolution to the most deserving young scientists working on molecular evolution recognizes his lasting legacy.

Walter Fitch was a scientific genius: creative, original and incisive, with enormous analytical powers. He was also energetic as well as humorous, occasionally inclined to play a practical joke and always ready to tell amusing stories, fictional or not. He was also a wonderful colleague who at UCI served in a variety of offices and committees. He was chairman of the Department of Ecology and Evolutionary Biology from July 1990 to June 1995.

Brandon Gaut
Francisco J. Ayala