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Obituary

Motoo Kimura, 1924–1994

Motoo Kimura, evolutionist and population geneticist, died on his seventieth birthday (November 13, 1994) in Shizuoka, following a long illness caused by amyotrophic lateral sclerosis, popularly known in the U.S.A. as "Lou Gehrig's Disease." One of the strongest voices in molecular evolution was thus prematurely stilled.

Motoo was born November 13, 1924 in Okasaki. He reminisced at length about his life in two articles (*Japanese Journal of Genetics* 63:1–10, 1988 and *Genome* 31:24–31, 1994). He says that in 1944, when he was a student in the 8th National High School, he was told that Professor Kihara of Kyoto University was doing world-famous research on genome analysis of wheat. "This aroused my interest in cytogenetics . . . upon graduation I came across Sewall Wright's famous 1931 paper on 'Evolution of Mendelian Populations'." This interest led to Motoo's career as a population geneticist. He went to the University of Wisconsin for two years (1955–1956) for his Ph.D. with Dr. James Crow; he described this period as "one of the most happy and fruitful times in my academic life." He returned to Japan and the National Institute of Genetics in Mishima 1956–1993, where he became head of the department of population genetics until his retirement. Crow and Kimura published a book, *An Introduction to Population Genetics Theory* in 1970. Motoo was a foreign member of the National Academy of Sciences, USA.

Motoo was elected to foreign membership in the Royal Society of London in 1993, after receiving its Darwin Medal in 1992. Among his other awards were the Weldon Memorial Prize, Oxford University 1965, Japan Academy Prize, 1968, and Chevalier de l'Ordre National de Mérite, France, 1986.

Motoo published a short article, "Evolutionary Rate at the Molecular Level" (*Nature* 217:624–626, 1968) in which he concluded that "many of the mutations involved" in evolution "must be neutral ones." This was based on evolution of hemoglobin, cytochrome *c*, and triosephosphate dehydrogenase. Elsewhere (*Perspectives in Biology and Medicine* 34:473–485, 1991) I have reviewed the early development of the neutral theory. Noboru Sueoka noted in 1962 that in enzymes of identical function the active site may be similar "but the dispensable parts of the molecule will be quite different." Ernst Freese said in 1962 that, during evolution "most of the DNA base pairs can be changed with no, or an insignificant selective advantage." Kimura's note to *Nature* was followed by a long article by Jack King and myself, "Non-Darwinian Evolution" in *Science* 164: 780–798 (1969). It was our article, rather than Kimura's, that drew criticism and wrath by pan-selectionists, although Motoo said the objections to the neutral theory "caused him much anxiety."

From then on, Motoo devoted his scientific life to what he called "my neutral theory" in many publications and a textbook, *The Neutral Theory of Molecular Evolution* in 1983 (Cambridge University Press). Sometimes, he sent me his manuscripts for comment, and I joined him in publishing "Evolutionary Constraints and the Neutral Theory" (*Journal of Molecular Evolution* 21:90–92, 1984). His final manuscript was communicated to *Proceedings of the National Academy of Sciences (USA)* one day before his death (*Proceedings of the National Academy of Sciences (USA)* 92:2343–2344, 1995).

Motoo's textbook has extensive forays into mathematics, and also vigorously defends the neutral theory against criticism. Motoo was friendly and enthusiastic, quick to commend work that he admired and to rebut opponents. His collaboration with Tomoko Ohta was outstandingly fruitful, and lasted for many years. I treasure his friendship, which he expressed to me in his correspondence.

Motoo's death from such a crippling disease was untimely and saddening, but he accomplished a great deal during his life, and his energy and industry are an example to all of us.

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