

Professor Paul Kazuo Kuroda 1917–2001

OLIVER K. MANUEL

University of Missouri, Rolla, MO 65401, U.S.A.



Professor Paul Kazuo Kuroda was born on 1 April 1917 in Fukuoka Prefecture, Japan, as Kazuo Kuroda, and died at his home in Las Vegas, Nevada on 16 April 2001. He received bachelors and doctoral degrees from the Imperial University of Tokyo. He studied under Professor Kenjiro Kimura, who discovered uranium-237 and the symmetric mode of fission prior to WWII. A special lecture by Francis William Aston, in Japan to

observe the solar eclipse in 1936, may have sparked Kuroda's future interest in combined studies of radio- and cosmo-chemistry. His first paper was published in 1935 and he had published over 40 papers, mostly on the chemistry of hot springs, when he became the youngest faculty member at the Imperial University of Tokyo in 1944.

His interest in nuclear studies was not diminished by the use of this energy source as a weapon of mass destruction in August of 1945. Despite the ban on radiochemistry in occupied Japan and the confiscation of all uranium and thorium minerals and reagents at the university, Kuroda continued his studies of radioactive nuclides in thermal water, volcanic fumaroles, and rain until 1949, when he sailed to America. En route, he received the Christian name, "Paul", from Reverend Ohtani.

On arriving in San Francisco in August of 1949, he visited Glenn Seaborg at the University of California, Berkeley. Kuroda received the Pure Chemistry Prize of the Chemical Society of Japan that year, but as a Japanese national he was not eligible to work on nuclear studies that involved U.S. national security. His 1950–1952 postdoctoral studies at the University of Minnesota with Professors E. B. Sandell and I. M. Kolthoff were in analytical chemistry, but he returned to the study of natural and artificial radioactivity after he became an Assistant Professor of Chemistry at the University of Arkansas in 1952.

Fate was kind to Kuroda in this interim period. He met Louise Morren, his lovely Dutch wife-to-be, at the University of Minnesota and he met a nuclear chemist, Dr. Raymond R. Edwards, chair-

man of the Chemistry Department at the University of Arkansas, at the first combined International Symposia of UPAC and ACS in September 1951.

Following his move to Arkansas and his marriage to Louise, he became a US Citizen in 1955. At the University of Arkansas he trained 64 Ph.D. students, several postdoctoral associates, and he befriended many undergraduate students. He became the first Edgar Wertheim Distinguished Professor of Chemistry in 1979, he officially retired from the University of Arkansas in 1987, but he remained active in research. He was the author or co-author of almost 400 publications.

In the scientific community Kuroda is perhaps best known for having predicted, in 1956, that self-sustaining nuclear chain reactions could have occurred naturally in Earth's geologic history and for having predicted, in 1960, that Plutonium-244 ($t_{1/2} = 82$ Ma) had been present in the early solar system. On 25 September 1972, the French Atomic Energy Commission announced the discovery of evidence that a natural nuclear reactor had occurred at Oklo in the Republic of Gabon, Africa, and the presence of excess xenon in the Pasamonte meteorite from the fission of ^{244}Pu was first detected in his laboratory at the University of Arkansas in 1965. Glenn Seaborg and Walter Lovelend selected both of Kuroda's papers on these subjects as 2 of the 85 *Benchmark Papers in Nuclear Chemistry* (Benchmark Papers, Vol. 5, Hutchison Ross Pub. Co, Stroudsburg, PA, 1982).

His students remember Kuroda for his deep personal commitment to the spirit of scientific inquiry, excellence in teaching, genius at seeing

trends in data that others overlooked, love for his family, admiration and paternal kindness for his current and former students, and the sukiyaki dinners that he prepared when we were invited to his home.

In addition to the Pure Chemistry Prize, Professor Kuroda received the University of Arkansas Distinguished Faculty Achievement Award (1963), the American Chemical Society Southwest Regional Award (1970), the American Chemical Society Southern Chemist Award (1973), the American Chemical Society Midwest Regional Award (1977), the American Chemical Society Nuclear Applications in Chemistry Award (1978), and the Shibata Prize of the Geochemical Society of Japan (1991). He was the Honor Initiate of Alpha Chi Sigma Fraternity at its Forty third Biennial Conclave in 1996.

Potentially important scientific findings by Kuroda that have not yet received acclaim include reports that a) the $^{244}\text{Pu}/^{136}\text{Xe}$ ages of lunar samples and meteorites indicate formation of the solar system started 5.1 Ga ago, soon after the explosion of a supernova, and b) the breakup of meteorite parent bodies occurred 4.55 Ga ago, the age generally *assumed* for the solar system in attempts to interpret experimental data of older lead/lead and K/Ar ages. These findings are summarized in the recently published Proceedings of the Symposium that Glenn Seaborg organized on the *Origin of Elements in the Solar System: Implications of Post-1957 Observations*. See <http://www.wkap.nl/book.htm/0-306-46562-0> for information on this book, a list of contributors, and the Table of Contents.