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In Memoriam: Art Fry, 1921-2011



University Professor Emeritus Arthur Fry of the University of Arkansas died August 20, 2011. He was President of the Arkansas Academy of Science in 1969.

Arthur Fry was a pioneer in the development of the Department of Chemistry and Biochemistry of the University of Arkansas, playing a key role in the establishment of the department's doctoral program.

Arthur James Fry was born on his parents' homestead 13 1/2 miles southeast of Dodson, Mont., on March 10, 1921. The family moved to Dodson in 1924, where Arthur graduated from high school in 1939 as president and valedictorian of his senior class.

He obtained his B.S. degree in chemistry at Montana State College, Bozeman, in 1943. During World War II he served as an electrician's technician in the U.S. Navy from 1943-1946. After the war he worked in nuclear chemistry for two years at Oak Ridge National Laboratory in Tennessee.

He did his Ph.D. research on isotope effect studies on the mechanisms of organic reactions under the direction of Professor Melvin Calvin, a Nobel Prize

winner. He received his Ph.D. in organic chemistry at the University of California, Berkeley, in 1951.

At Oak Ridge, Arthur met and married Lois Marie Gunning, who was also working there as a chemist. The Fry's three children, Gene Richard, Brian Douglas and Marian Gail Fry, were born in Oakland, Calif., while Arthur was in graduate school.

The Fry's moved from Berkeley to Fayetteville, Ark., in 1951, where they spent the rest of their lives. Arthur joined the chemistry faculty at the University of Arkansas in 1951, and played a major role in the establishment of the department's doctoral program. He served as chairman of the Department of Chemistry twice during the 1950s and 1960s. He was a member of numerous local, state, national and international honorary and professional organizations, and was especially active in the local and national governance of the American Chemical Society. He was a consultant to many chemistry departments around the country, looking toward helping them improve their chemistry programs. At the University of Arkansas, he served on and chaired many departmental, college and university committees, and was a president of the University Faculty.

Art gained worldwide recognition as the "father of heavy atom isotope effects in elucidating the mechanisms of organic reactions," for his pioneering research in the use of C-13, C-14, N-15, Cl-37, and O-18 to study the mechanisms of ketone rearrangements and numerous other organic reactions. The focus of his research grew out of his Ph.D. at Berkeley and his work at the University of California Radiation (later Livermore) Laboratory and the Oak Ridge National Laboratory. He directed 25 Ph.D. dissertations and 18 M.S. theses; many of these students have had significant scientific careers in academia, industry, and government.

He perfected processes to insert isotopes (particularly C-14) into specific positions of substrate molecules and to measure the resulting effect upon the rate of a particular substitution, elimination, addition, rearrangement or exchange reaction. The magnitude of the Kinetic Isotope Effects (KIE) depends upon the degree of involvement of the substituted isotopic atom in the rate-limiting step of the mechanism for transformation from substrate to product. Professor Fry's experimental studies earned significant acclaim from colleagues and editors, as well as the Atomic Energy Commission, which awarded research grants of

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over \$1M from 1951-1972 (some supported projects were jointly directed by Professor Fry and colleagues Ray Edwards and R. Fink, with whom he collaborated.) Most of Professor Fry's work during this period consisted of meticulous experiments from which qualitative mechanistic details were intuited and deduced.

By the 1970's computers became available that allowed detailed calculations of reaction rates and KIEs. From 1972-1987, Professor Fry and Professor of Physical Chemistry Leslie B. Sims collaborated on an experimental-theoretical effort to measure and calculate KIEs in order to derive quantitative aspects of reaction mechanisms. This work began with development of a program, BEBOVIB, to calculate KIEs from substrate and assumed transition state structures and bonding (utilizing prevailing Bond Energy – Bond Order relationships to derive structure and force constants needed to calculate VIBration frequencies). The BEBOVIB program was distributed by the Quantum Chemistry Exchange Program at Indiana University and was widely adopted as the basis for a significant expansion of KIE research as a diagnostic tool for organic reaction mechanisms. This productive collaboration resulted in many publications, students jointly trained in theory and practice and significant international collaboration: e.g., student and post-doc exchanges and visiting professorships between Arkansas and Japan, Australia, New Zealand, England, Poland, and India. The research was funded

by National Science Foundation grants of over \$1.5M from 1972-1990.

The reputation of Professor Fry continued to grow, leading to many invited plenary lectures and presentations at international conferences and symposia. In 1985 Professor Fry received the American Chemical Society Southwest Regional Award for research achievement. Art Fry was honored as one of the first University Professors at the University of Arkansas in 1984. In 1987 the Department of Chemistry and Biochemistry established the Arthur Fry Lecture Series in recognition of his many accomplishments and contributions to the Department.

Art Fry retired as a University Professor in 1991 but continued until recently to attend University of Arkansas and Department of Chemistry seminars, lectures, and other events.

Arthur and his family all enjoyed hiking, backpacking, canoeing, and camping. He was a founding member of the Ozark Society, which played a key role in the designation of the Buffalo National River as the first National River in 1972, a component of the U.S. National Parks. He enjoyed participating in the Chemistry Department annual canoe trip on the Buffalo River.

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