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IN MEMORIAM: Robert Katz (1917–2011)

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Dr. Robert (Bob) Katz, emeritus professor of physics at the University of Nebraska, author of the Katz Model, a deceptively simple but profound parametric model of the action of charged particles on physical and biological systems, died peacefully at his home at Lincoln, NE, on March 12, 2011, after a brief illness. Bob, born in New York City in 1917, and his sister Gladys, were of immigrant Russian Jewish descent. Their parents owned a delicatessen in the Bronx, not far from the Yankee Stadium, where, as Bob recalled, Babe Ruth stopped by for hot dogs, a huge man driving a little sports car, and where Bob saw the New York Giants' Carl Hubbell pitching a 15-inning shutout at the Polo Grounds, and when double-headers cost $1.

Robert Katz earned his B.A. from Brooklyn College in 1937 and his M.A. in physics from Columbia University in 1938. Over the years 1943–1946 he worked as a civilian physicist at Wright Field in Dayton and then from 1946–1949 as a research associate at the University of Illinois. In 1949 he received his Ph.D. at the University of Illinois, Urbana, for work on radioactive disintegration of Te and Eu isomers, with Robert Hill as advisor. While at Wright Field, he designed and patented strain insulators and ''pigtails'' on aircraft that eliminated radio interference by dissipating excess static electricity. He also developed X-ray techniques to identify fatigue fractures in airplane castings and later, while at Kansas State University, applied and patented soft X-ray techniques for assessing grain insect infestations and testing grain density. He joined Kansas State University as Assistant Professor in 1949, became Professor of Physics in 1956, and worked there until 1966, also holding several summer teaching positions at the University of Illinois, Columbia University, the University of Connecticut and Harvard University. While at Kansas State University, Dr. Katz received the 1962–1963 Distinguished Graduate Faculty Award for his outstanding teaching and research. In 1962 he coauthored with Henry Semat a very popular physics textbook, and in 1964 he published *An Introduction to the Special Theory of Relativity*, a widely recognized book

translated into Spanish, Polish and Italian. At the time, Dr. Katz's interest in the study of particle tracks in emulsion was stimulated by his search for evidence in cosmic rays of a magnetic monopole in high-altitude balloon exposures of nuclear emulsion stacks.

In 1966 Dr. Katz moved to the University of Nebraska to a tenured position of Professor of Physics. In the years 1968–1973 Dr. Katz was elected Vice-Chairman of Physics Department at the University of Nebraska–Lincoln. Despite his intensive teaching and administrating duties, over some two decades Robert Katz had fully developed his model of track physics, started by the classical paper of Butts and Katz (*1*), while maintaining interest in many other research topics. In a paper ''Standing waves on the Moon'' published in *Nature* in 1969 (*2*), Katz and coauthors postulated that the Moon has enough solidity for impacts on its surface to set up standing waves. This was indeed confirmed several months later as the Apollo XII lunar mission jettisoned the Lunar Module on the surface of the moon, setting up seismic standing-wave ringing that lasted nearly an hour. In 1972 Dr. Katz spent half a year as a research scholar at the Medical Research Council Hammersmith Hospital in London, England where he shared his views on radiobiology and radiotherapy with Prof. John F. (Jack) Fowler, Dr. Tikvah Alper, and many other experts. The Katz Model, developed at that time for solid-state detectors and for cell cultures, relates the action of energetic ions with the radial distribution of dose due to δ rays around the ion's path and is in effect a theory of radiobiological effectiveness (RBE) (*3*). The model is able to yield quantitative predictions of the response of physical or biological detectors after their irradiation by energetic ions once the parameters characterizing the detector and the ion species and its energy are known. No other radiobiological model has so far been able to match these features. The model, with its fluence-based approach to radiation dosimetry, suggests changes to long-standing paradigms of radiotherapy and radiation protection. The Katz Model brought its author international recognition and respect, controversies notwithstanding. The list of U.S. and international collaborators and friends of Bob Katz is the roster of the world's experts in microdosimetry, radiation physics, radiation protection and cancer radiotherapy – fields to which the Katz Model has contributed and will very likely contribute in the future.

Dr. Robert Katz retired in 1988. An international conference was held at the University of Nebraska on this occasion (*4*). Most of Dr. Katz's publications are now publicly available from UNL's Digital Commons repository (*5*). In retirement in Lincoln, NE, Dr. Katz also enjoyed membership in the Polemic Club and the Torch Club, where he gave a series of thought-provoking presentations. To his surprise and delight, his work became widely distributed through the UNL Digital Commons site. He was also recently featured in a UNL publication, The Scarlet, ''A Century of Achievements,'' a look back at 16 outstanding University of Nebraska professors.

Dr. Katz's work on track structure attracted several long-term foreign visitors and collaborators to Lincoln, one of whom, currently working on applying the Katz Model in hadron radiotherapy, has coauthored this note. The other coauthor has worked with Dr. Katz on applying the Katz Model approach in the development of a radiation risk calculation for NASA space missions, a collaboration that lasted until the very end of Bob's life.

He is survived by his special friend Harriet Turner, sons Steven Joseph Katz and John Hewitt Katz, daughter-in-law Ileana Luisa Soto, nieces Joan Field Lakin and Elaine Field, and nephews Ken Field and Richard Field. His former wife, Mildred Popov Katz, and his sister, Gladys Field, predeceased him.

Bob Katz will be well remembered for his enthusiasm and strong personality. In a scientific dispute, few indeed could match his wit or his sense of humor or survive the cutting logic of his arguments. To those who had appreciation for his science and his personality, he was truly a great scientist and a master teacher. There are many people around the world who will remember Bob Katz for what he offered them and for the way he showed them what truth in science is.

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