

IN MEMORIAM Jerrold R. Zacharias

On July 16, 1986 Jerrold R. Zacharias died unexpectedly at his home in Belmont, Massachusetts in his 81st year. Dr. Zacharias' career spanned several areas of physics during his extraordinarily productive life. In the context of time and frequency control his work on the radio frequency spectra of atoms and his superb competence at experimental work led to the successful development of the first atomic clocks and their subsequent manufacture. During the era beginning in the mid 1940's, prior to the space-age, he foresaw the possibility of testing Einstein's theory of relativity with atomic clocks and began working on clock concepts that directly led to the present cesium devices. He was truly the godfather of the atomic clock.

Dr. Zacharias was born in Jacksonville, Florida in 1905. He entered Columbia University at the age of 17 and he received the AB in 1926, the M.A. in 1927, and his doctorate in 1932, all from Columbia. Subsequent to his degree, his work with Prof. I.I. Rabi at Columbia led to many very important publications on the fundamental properties of atomic nuclei and, at Rabi's suggestion, led to the eventual development of the first practical atomic clock.

In 1940 he went to the Massachusetts Institute of Technology to head the Radiation Laboratory's Division on radar transmitter components. He continued his wartime career by going to Los Alamos to serve as director of the engineering division of the Manhattan Project. He returned to M.I.T. in 1946 to head the Nuclear Science Laboratory and continue his pre-war investigation on the properties of atomic nuclei using molecular beams techniques, work that led to the first cesium beam atomic clock.

In the late 1940's Dr. Zacharias was called on to head or participate in a number of studies important to the national defense, including Project Lexington (1948 nuclear powered flight), Project Lamplight (1954, continental defense), and Project Lincoln, from which the Distant Early Warning (DEW) line to guard our northern frontier was conceived. He was associate director of this project in 1954, which grew to become M.I.T.'s Lincoln Laboratory.

Dr. Zacharias was a member of the President's Science Advisory Committee for nine years between 1952 and 1964. For his services to national defense he was awarded the President's Certificate of Merit in 1948 and the Department of Defense Certificate of Appreciation in 1955.

Dr. Zacharias, or "Zach" as he was known to students and staff, was an extraordinarily gifted teacher who could describe complicated and arcane aspects of quantum mechanics in well understood and accurate analogies. He was, first of all, an experimental physicist who could conceive and design experimental apparatus with a clear understanding of the engineering involved and contribute directly to projects so that they could be built efficiently and work effectively.

The backwardness of physics teaching in secondary schools and the lack of laboratory experience in the education of high school students prompted Dr. Zacharias in 1956, the year before Sputnik, to form the Physical Sciences Study Committee. This committee revised the program of physics teaching and included many sophisticated experiments that could be done with very easily obtained hardware. By 1957, the program involved eight schools, and the following year 360



schools. By 1979, more than 200,000 students in 5,000 schools were involved. The program was carried on in 1958, and later, by Educational Services, Inc. (ESI) with Dr. Zacharias as director for academic affairs, and grew to include other aspects of teaching at all grade levels. In 1967, ESI merged with the Institute for Educational Innovation to become the Educational Development Center, Inc. with Dr. Zacharias as its vice president and founding trustee. In 1984 he was honored by the International Commission for Physics Education for "long and distinguished service to physics education" and for being "a teacher of teachers."

In particular, we remember him at the 1986 presentation of the I.I. Rabi award "for technical excellence and outstanding contributions in the fields relating to atomic and molecular frequency standards." Other awards include the Oersted Medal of the American Association of Physics Teachers (1961) and the National Science Teachers Association Citation for Distinguished Service to Science Education (1969). He received honorary degrees from Tufts University, Oklahoma City University, St. Lawrence University, Lincoln University, and Brandeis University.

In 1966 M.I.T. named him Institute Professor, a faculty title reserved for colleagues of special merit and distinction. He retired from the faculty in 1970, continuing as Director of M.I.T.'s Educational Research until 1972.

He was a fellow of the American Association of the Advancement of Science, and the Institute of Electrical and Electronic Engineers, a member of the National Academy of Sciences, the American Academy of Arts and Sciences, the American Physical Society and the American Association of Physics Teachers.

Those who were fortunate enough to work with him will remember Zach's extraordinary gifts of leadership, the joyous way in which he immersed himself in his work, and his genius and intuition at seeing the core of situations. His high spirited and energetic way of life was contagious and continues to influence large numbers of his students and associates.

Dr. Zacharias is survived by his wife, Leona (Hurwitz), two daughters, Susan and Johanna, and three granddaughters.

A service of remembrance of Dr. J.R. Zacharias will be held at the Massachusetts Institute of Technology, Cambridge, Mass., in Auditorium 10-250 at 4:00 P.M. on Friday, October 24, 1986.