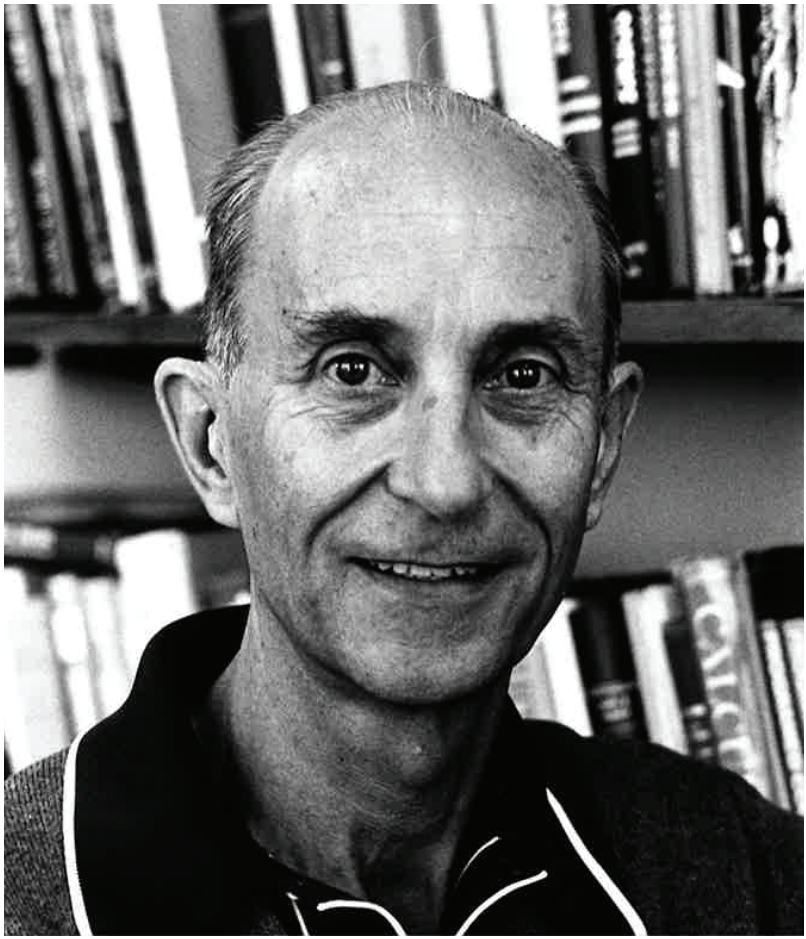

VICTOR H. RUMSEY

1919–2015

Elected in 1980

"Research in practical applications of electromagnetic theory, especially in design of radio antennas insensitive to frequency and polarization."

BY PETER ASBECK

VICTOR HENRY RUMSEY, an internationally recognized expert in the design of antennas, died March 11, 2015, in Forestville, California, after an extended period of declining health. He was 95.

He was born November 22, 1919, in the West Country village of Devizes in Wiltshire, England. His academic ability was recognized by a perceptive teacher, and he was steered to the University of Cambridge, where he earned his BA degree in mathematics (with distinction; 1941) and later his PhD degree in physics (1973). During World War II (1941–45) he worked on radar at the Telecommunications Research Establishment in the United Kingdom and at the US Naval Research Laboratory in Washington, DC. He then spent 3 years at the Canadian Atomic Research Laboratory (in Chalk River, Ontario), where he met George Sinclair, who in 1948 persuaded him to go to the Ohio State University to direct the Antenna Laboratory.

The Antenna Laboratory had been in existence since 1942, established during the war to develop antennas for aircraft and to calculate radar cross-sections. Rumsey became supervisor of the laboratory in 1948 and had a major influence on its subsequent development. He was a brilliant theoretician and inspiring teacher and attracted a large number of excellent graduate students, mostly veterans of World War II. Five

of these students (Thomas E. Tice, Curt A. Levis, Edward M. Kennaugh, Carlton H. Walter, and Leon Peters Jr.) eventually became lab directors, as did Robert A. Fouty, who was hired by Rumsey as research manager.

In 1954 Rumsey moved to the University of Illinois at Urbana-Champaign to head the Antenna Laboratory there, where he led the successful development of frequency independent antennas. In 1957 he was persuaded by John Whinnery to join him at the University of California, Berkeley, where he stayed until 1965, when he was approached by Henry Booker to join the recently formed Department of Applied Electrophysics at the new University of California, San Diego (founded in 1960). Rumsey stayed at UCSD until his retirement 20 years later.

In addition to his technical contributions, he helped to set the strategic directions for the growing department and served as chair (when it was known as the Department of Applied Physics and Information Science, en route to its present name, Department of Electrical and Computer Engineering). He advised and mentored a host of students, several of whom later became professors; one (Bill Coles) followed in his footsteps as department chair at UCSD.

Over a productive career lasting more than 45 years, Rumsey had a major impact on the theory and practice of electromagnetics and antenna design. One of the highlights among his many technical contributions was the pioneering concept of frequency independent antennas. Prior to his work, experience showed that all antennas were selective to frequency, with radiation patterns that invariably changed as frequency was raised—major beams sharpened and minor beams became more numerous. The discovery of frequency independent antennas overturned these empirical laws and produced a radical improvement in the technology of radiating systems.

His 1996 book *Frequency Independent Antennas* (Academic Press) both explained and popularized the new designs. Based on the insight that antennas defined by angles rather than lengths would be naturally less frequency dependent, he demonstrated that frequency independent antenna design

should obey a scaling principle (shape should be invariant to a change in scale) as well as a truncation principle (antenna current should be attenuated more rapidly than the inverse of the distance from the terminals). In related work, he pioneered the design of receiving antennas capable of recording simultaneously all states of polarization.

His designs and concepts have been applied in the Parkes 64-meter dish radio telescope in Australia and the Arecibo 305-meter dish in Puerto Rico. A more recent application of his concepts is in the wideband feeds for the Allen Telescope Array at the Hat Creek Radio Observatory in California.

Another highlight of Rumsey's work was development of the reaction concept in electromagnetic theory. This concept brings to bear reciprocity analysis for problems in radiation scattering and diffraction and has been regarded as one of the few really novel concepts introduced in the late 20th century. Rumsey defined the "reaction" as a measure of the effect of one set of electric and magnetic currents on another set defined in the same electromagnetic environment, and used it to simplify the formulation of boundary value problems. To illustrate its value, he used the reaction formulation to obtain results for scattering coefficients, transmission coefficients, and aperture impedances in a variety of geometries. The concept has since been used for computer-based calculations in multiple electromagnetics problems.

In his later years, Rumsey turned his attention to propagation of waves through turbulent media. Using space-time analysis of radio waves in random media, he made a series of contributions that quantified the scintillation characteristics of the transmitted waves. He was one of the first to bring attention to the importance of refractive effects and to show how they modulate the diffractive scattering previously analyzed. These advances have been applied to optical and radio communications through the atmosphere, ionosphere, and interplanetary medium, and have contributed to understanding of solar wind.

Victor Rumsey was widely recognized as a superb theoretician, an exceptional instructor, and an inspiring advisor and mentor. He received the IEEE Morris N. Liebmann Memorial

Award (1962) for "basic contributions to the development of frequent independent antennas"; an honorary PhD degree from Tohoku University, Sendai, Japan (1962); a Guggenheim Fellowship in the field of applied mathematics (1964); the George Sinclair Award at Ohio State University (1982), "In recognition of his oustanding leadership in research and graduate education which enabled the Antenna Laboratory (now the ElectroScience Laboratory) to expand into an institution whose excellence in electromagnetic research and its application is internationally recognized"; and the IEEE John Kraus Antenna Award (2004) for "his creative and innovative development of frequency independent antennas." He was also named an Outstanding Educator of America (1971).

He was predeceased by his wife, Doris, in 1999 and is survived by their children, John, Peter, and Anne; four grandchildren; five great-grandchildren; and countless very grateful students. His students, their students, and their students in turn carry on his legacy of fundamental research and patient, thoughtful advising, in universities, observatories, and laboratories all over the world.