



Merrin Rodwood

MARVIN CHODOROW

1913–2005

Elected in 1967

“For microwave tube research and development.”

BY JAMES F. GIBBONS AND CALVIN F. QUATE

MARVIN CHODOROW, Emeritus Professor of applied physics and electrical engineering, who had been at Stanford since 1947, died peacefully at his home on campus on October 17, 2005, of natural causes. He was 92 years old.

Chodorow was born in Buffalo, New York, on July 16, 1913. He received his bachelor’s degree in physics from the University of Buffalo in 1934. In 1936, while in graduate school at the Massachusetts Institute of Technology (MIT), he met a social worker, Leah Ruth Turitz, whom he married in 1937. He obtained his doctorate in physics from MIT in 1939. His thesis introduced what is now known as the “Chodorow potential,” which is recognized as a seminal solution of Schroedinger’s equation for electrons in metals.

Chodorow’s early career was spent as a research associate at Pennsylvania State College (1940–1941), physics instructor at the College of the City of New York (1941–1943), and senior project engineer at Sperry Gyroscope Company (1943–1947), where he worked with Sigurd and Russell Varian, Ed Ginzton, Bill Hansen, Myrl Stearns, Don Snow, and Fred Salisbury. In 1948, this small group of engineers and physicists founded Varian Associates in Palo Alto, California.

In 1947, Chodorow left Sperry for Stanford, where he joined the Physics Department as an assistant professor; he became an associate professor in 1950 and a professor in 1954. Beginning in 1954, he also held a professorship in the Department of Electrical Engineering. From 1959 to 1978, he directed the Microwave Laboratory (renamed the Edward L. Ginzton Laboratory in 1976).

From 1962 to 1968, Chodorow was executive head of the Division of Applied Physics at Stanford. In 1968, at the instigation of Chodorow and Hugh Heffner, a separate Department of Applied Physics was created, with Chodorow as department chair; at the same time, he maintained his position as director of the Microwave Laboratory. In 1975, he became the Barbara Kimball Browning Professor of Applied Physics.

Chodorow was a major contributor to the development of the klystron tube, a device that generates and amplifies high-frequency electromagnetic waves. Klystron tubes are essential components for radar systems, particle accelerators, satellite communications systems, and many medical devices. In describing Professor Chodorow's contribution, Wolfgang K.H. Panofsky, Director Emeritus of the Stanford Linear Accelerator Center (SLAC) and a close friend of Chodorow's, said:

Marvin was the leading figure in transmitting the lore of klystrons [from Sperry] to the Stanford community. In doing this, he deserves most of the credit for the spectacular increase in klystron tube power, which was achieved during the 1940s, from watts to megawatts. He supervised Ph.D. students for about four decades, with most of the students still serving Stanford or the local industrial community. He was a person of enormous kindness, willing to help anyone who approached him for assistance. He is clearly one of the "godfathers" of the whole field of microwave technology at Stanford.

The main focus of Chodorow's research was on the theory and design of microwave and traveling-wave tubes. His work led to the development of a series of devices crucial to the most sophisticated radar systems built in the United States and

throughout the world. Later versions were used as power sources for the two-mile-long SLAC atom smasher and for medical accelerators currently used to treat 100,000 cancer patients each day in the United States alone. “The linear accelerator and storage rings that are the heart of SLAC’s research still today rely critically on the use of very high power klystrons,” said current SLAC Director Jonathan Dorfman. “The legacy remains central to the success of accelerator research worldwide.”

Chodorow also worked in microwave acoustics and quantum electronics with professors Calvin Quate and Bertram A. Auld, building an acoustic microscope that uses sound waves (instead of light or electromagnetic waves) to provide images of living cells in action.

Although he continued to conduct research and teach well past the then-mandatory retirement age of 65, Chodorow was feted at a “retirement” party in 1978. On that occasion, Stanford vice president and Provost William F. Miller called him “one of those who brought on the first blooming of the university after World War II [leading] Stanford to national and international standing as one of the great universities of the world.”

Professor Edward L. Ginzton, then chairman of the board of Varian Associates, pointed out that the Varian Physics Building and Hansen Laboratories at Stanford had been paid for largely with royalties from klystron. Ginzton added: “Microwaves are indispensable to our society for communications, television, the navigation of ships and aircraft, and for defense. Most of these systems would not be practical today were it not for the contributions [Chodorow] has made.”

“Marvin was a visionary,” said Theodore H. Geballe, Theodore and Sydney Rosenberg Professor of Applied Physics and Professor of Materials Science and Engineering, Emeritus. “With humor and charm, he left an indelible mark on the university by creating a whole new department.

Chodorow foresaw the arrival of the golden age of solid-state (now condensed-matter) physics and tried to convince his colleagues to make new appointments in the field of solid-state physics. Geballe continued his tribute to Marvin with the following anecdote:

As he told Mac Beasley and me one day while driving to a faculty retreat, he was finally given authorization, but only for one billet. His problem was that he had two promising candidates and couldn't choose between them. In order to comply with the Physics Department's strict limit of only one appointment in physics, he was given permission to make both appointments, but the second would have to be in a new division (of applied physics). Marvin did just that. His two promising candidates were Art Schawlow, winner of the 1981 Nobel Prize in Physics, and Cal Quate, renowned, among other things, as a developer of the atomic force microscope. In 1961, Art went to Physics and Cal to the new division.

In succeeding years, Chodorow recruited other luminaries, including Arthur Bienenstock, Walter Harrison, and Geballe. "Marvin's intense interest in his colleagues and his undisguised pleasure in their achievements made the Ginzton Lab a special place and a strong contributor to Stanford throughout the '60s and '70s," Geballe recalled. "His colleagues, both in Applied Physics and beyond, had a deep affection for Marvin for his personal contributions to the lives of every person he touched."

Professor Chodorow remained a consultant to Varian Associates from its founding until his retirement. One of the first companies in what was to become Silicon Valley, Varian specialized in manufacturing high-powered klystrons that enabled the research and development of linear accelerators around the world and the successful treatment of cancer through radiation.

Chodorow was a lecturer at the Ecole Normale Supérieure in Paris (1955–1956) and a Fulbright Fellow at Cambridge University (1962–1963). The University of Glasgow gave him an honorary doctor of laws degree in 1972. His other awards include the W.R.G. Baker Award from the Institute of Radio Engineers (1962) and the Lamme Medal from IEEE (1982). Chodorow was co-author, with Charles Susskind, of *Fundamentals of Microwave Electronics*, published in 1964, and about 40 technical articles. He also held at least a dozen patents.

Chodorow was a fellow of IEEE, the American Physical Society, and the American Academy of Arts and Sciences, and a member of the National Academy of Engineering, National Academy of Sciences, American Association for the Advancement of Science, American Association of University Professors, American Association of Physics Teachers, and Sigma Xi.

Marvin's influence reached far beyond the university. He was an advisor to the Office of Naval Research and a consultant to the U.S. Department of Defense, MIT Lincoln Laboratory, RAND Corporation, and other companies. He was also an active supporter of human rights for exiled Soviet scientists and for arms control.

In addition to his scientific and academic contributions, collegueship, and many close professional friendships, Marvin had wide-ranging interests. He brought an endless engaged curiosity to colleagues in a large variety of fields and loved to talk about almost anything. He was especially interested in politics, history, and economics, fields in which he had many good friends. He was a self-educated connoisseur of wine and food, an enthusiastic and knowledgeable world traveler, and an accomplished bridge and poker player. He was a passionate follower of Stanford football and basketball. He had a wonderful sense of humor.

He is survived by his wife, Leah Ruth Turitz Chodorow, an active community leader, volunteer, and well-known gracious and beloved hostess; daughters, Nancy Julia Chodorow, a psychoanalyst, of Cambridge, Massachusetts, and Joan Elizabeth Chodorow, an actress, of Venice, California; and two grandchildren, Rachel Chodorow-Reich of Oakland, California, and Gabriel Chodorow-Reich of Washington, D.C.

Note: This tribute borrows heavily from a more detailed article written by Ms. Dawn Levy for the *Stanford Report*. The authors are grateful to her for permission to use substantial portions of her work.