Bernard Gold

BERNARD GOLD

1923–2005

Elected in 1982

"For development of digital signal processing theory and processors and their applications to speech compression and pattern recognition."

BY WALTER E. MORROW JR.

BERNARD GOLD was born in New York City in 1923. After attending primary and secondary schools, he entered City College, from which he graduated with a Bachelor of Electrical Engineering in 1944. He went on to receive a Masters of Electrical Engineering from the Polytechnic Institute of Brooklyn (now called Polytechnic University). In 1948, he received a Doctorate of Electrical Engineering from that same institution.

After working briefly for a small Manhattan company (Avion Instrument) on the theory of radar range and angle tracking, he joined the Hughes Aircraft Company in Culver City, California, where he did research on statistical problems associated with missile guidance. In 1953, he became a staff member at the Lincoln Laboratory at Massachusetts Institute of Technology (MIT); his initial focus was on the application of probability theory to problems in communications.

In 1954, Ben received a Fulbright Fellowship to spend a year in Italy, where he lectured, in Italian, on the response of linear dynamic systems to random noise stimuli. Upon returning to Lincoln Laboratory in 1955, he began research on the development of an automatic recognition device that could translate hand-sent Morse code transmissions into text. In 1958, his research came to fruition. This was one of the first practical applications of what later became known as artificial intelligence.

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Ben's success in translating Morse code led to an early effort in automatic machine recognition of speech using an early advanced digital computer (TX2) at Lincoln Laboratory. The focus of this early work was on the precision detection of speech pitch, an important component of early speech-compression devices, called Vocoders, as well as early speech-recognition systems.

In 1965, Ben was invited to work with MIT Professor Ken Stevens on the theory of digital-signal processing, which became a central capability in many subsequent applications, including speech recognition, radar, sonar, communications, seismology, and biologic systems. While on the MIT campus, Ben taught what is believed to be the first course on this subject. His pioneering research continues to have an enormous impact on modern electronic devices and systems. In 1969, he published (with Charles Rader) *Digital Processing of Signals*, the first treatise, and seminal text, on this topic. He then focused his attention on human-speech perception and related topics. In 1975, he published (with Lawrence Rabiner) a comprehensive textbook on digital-signal processing, *Theory and Applications of Digital Signal Processing*. Finally, in 2000, he published (with Nelson Morgan) *Speech and Audio Signal Processing*.

In his later career, Ben played a leading role at Lincoln Laboratory in the development of customized, very-high-speed digital-signal processors designed for specialized fast-Fourier transform operations, and digital filtering. These designs led to a number of important applications, including coherent Doppler radar processors, very-high-speed packet speech processors, and clutter rejection in air traffic control radar. These specialized computational processors achieved speeds far in excess of the speed of conventional, nonspecialized processors. Ben published more than 20 significant papers on applications of digital-signal processors.

In 1988, at the age of 65, he retired from research at MIT Lincoln Laboratory, although he continued to conduct research on the MIT campus on speech synthesis, speech recognition, human auditory systems, and related areas. He also taught courses on these topics at the University of California, Berkeley, for several years.

Ben was a member of the National Academy of Engineering, a fellow of the Acoustic Society of America, and a fellow of the Institute of Electrical and Electronic Engineers (IEEE). In addition to these honors, he received a Fullbright Fellowship in 1955. His numerous awards include IEEE Achievement Award (1986) and IEEE Society Award from the Acoustic, Speech, and Signal Processing Society (1985). In 1997, he and Rader shared the first Kilby Signal Processing Medal awarded by IEEE.

Ben Gold was one of a small group of creative individuals who laid the theoretical foundations for the electronic devices and systems we use today.

Ben spent many years creating collages, which have been exhibited at various venues; he also painted with oil. He was a voracious reader and walker.

Ben leaves his wife of 60 years, Sylvia; two daughters, Laura and Lisa and their partners Collette and Karen; two grandchildren, Matthew and Rebecca. He was predeceased by a son, Daniel.