



*Aaron Wyner*

## AARON WYNER

*1939-1997*

BY DAVID SLEPIAN

AARON WYNER was born in the Bronx, New York, on March 17, 1939. His early education was in the public school system, and he graduated from the Bronx School of Science in 1955. It was apparent even at an early age that he was a talented, unusually intelligent young man. He then completed a five-year joint engineering program with Queens College of the City University of New York and Columbia University, receiving a B.S. degree in mathematics and physics from Queens and a B.S. degree in electrical engineering from Columbia, both in 1960. In 1963 he received his Ph.D. in electrical engineering from Columbia University, and after a summer job at the IBM Thomas J. Watson Research Center, he joined the Bell Telephone Laboratories at Murray Hill, New Jersey, as a member of the technical staff. He became head of the Communications Analysis Research Department there in 1974. These laboratories (now part of Lucent Technologies) remained his main technical home until his untimely death on September 29, 1997, at the age of fifty-eight. Aaron was a victim of cancer.

Aaron had been a major figure in information and communication theory research for thirty-four years. During his career he published eighty-five papers in the leading technical journals of his field. This research spans so many specialties—including channel coding theory, source coding theory, optical communications, algebraic coding, cryptography, and stochastic process

theory—that I cannot hope to comment on them all here. I limit myself to a few of his most important contributions.

Aaron's doctoral thesis worked out the first mathematical theory for what are now called convolution codes, a class in wide-spread use today. He gave the first physically meaningful characterization of the band-limited Gaussian Channel and the first comprehensive study of the limitations of “bounded distance” decoding.

In the 1970s and 1980s he played a major role in the explosion of multiple-user information theory research. In 1975 he invented the “wire-tap channel” and also worked out virtually its complete theory. He showed the then-surprising fact that one could obtain perfect secrecy without the advance exchange of secret keys provided that the legitimate receiver enjoys a better channel from the sender than does the wire-tapping opponent. This work, which preceded the introduction of public-key cryptography, has had a steadily increasing influence on developments in cryptography. Again, in the area of secrecy, Aaron invented (and patented) a secure voice-scrambling scheme that does not expand the bandwidth of the signal. He also developed a new precise characterization of “common information” as needed in multiuser systems.

As head of the Bell Labs Department for Communication Research, he had an active involvement in the work of its members and gathered around him a strong team of young researchers. The department served as consultants to many areas in Bell Labs involved with communication systems in use or under development. Particularly strong was the involvement with underwater systems, microwave transmissions, satellite communications, and the cellular systems now so widely in use.

In 1993 at his own request, Aaron gave up the direction of this group and returned to his own research on a full-time basis. There then appeared a succession of papers mostly devoted to data-compression. Many were published jointly with Jacob Ziv, Aaron's closest technical associate for many years. They studied the Lempel-Ziv data-compression system and its applications in great detail and succeeded to show that it is asymptotically optimal.

It is difficult to find anyone who has worked as unselfishly as Aaron Wyner for the advancement of the engineering profession, in particular for the interests of the Institute of Electrical and Electronics Engineers (IEEE) Information Theory Society. He has held every possible service position (editor of the IEEE Transaction on Information Theory, associate editor, president of the society, twice cochairman of the IEEE International Symposium on Information Theory, workshop cochairman, member of the board of governors, etc.) and discharged these duties extraordinarily well. His editing (jointly with N.J.A. Sloane) of the collected papers of C.E. Shannon recently culminated in the publication of these papers as an IEEE book of about 1,000 pages, for which every serious worker in the field owes Aaron a debt of gratitude.

Aaron had concurrent teaching leaves to many universities and received various honors. Among these he served as full and part-time faculty member in the Department of Electrical Engineering at Columbia University (1963 to 1972); Guggenheim Fellow (1966 to 1967) spent as visiting scientist at the Technion in Haifa, Israel; visiting scientist in the Department of Applied Mathematics at the Weizmann Institute of Science, Rehoboth, Israel (1969 to 1970); adjunct professor of electrical engineering at the Polytechnic Institute of Brooklyn (1971 to 1975); and visiting lecturer in electrical engineering at Princeton University. He (with J. Wolf) received the IEEE Information Theory Group Prize Paper Award (1977). Other IEEE honors include the Centennial Medal Award (1984) and the Claude E. Shannon Award (1994). He was elected to the National Academy of Engineering that same year.

A word about the man. Aaron was open and affable. He was generous with his time—always available to fellow workers for his help. He took his position as department head seriously and was a natural leader. In addition to his intense interest in science, Aaron had another passion—his family. His office was adorned with pictures of his wife, his four children, and his six grandchildren. He was truly deeply devoted to them all. He was also much interested in Israel and in Judaism. In his later years, he greatly enjoyed opera.

I cannot leave this tribute to Aaron without talking about the remarkable courage he showed in the face of his final illness. With me he talked freely about it, but always in a detached scientific way. Although he was frequently in pain, there was never a word of self-pity or complaint.

With the passing of Aaron Wyner, the engineering profession has lost a great contributor. For those who have known Aaron, the loss is even deeper.

