

The 2013 Kailath Lecture

Friday, April 5, 2013, 4:00 – 5:00 pm

Mackenzie Room , Huang Engineering Center, Stanford University

Program details will be posted on <http://kailathlecture.stanford.edu/>

Elwyn Berlekamp, 2013 Kailath Lecturer

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Title: **Some Common Misconceptions**

Abstract: In the second half of the 20th century, communications and computer engineering changed from an analog paradigm to a digital one. But the probabilistic relationships between continuous random variables and their quantized versions remain widely misunderstood by the general public, by our beginning students, by financial folks, and by many other influential people with whom we must communicate. This talk will explore some of my interesting encounters with some of these widespread misunderstandings.

After BS and MS degrees in 1962 and his PhD in 1964 in Electrical Engineering from MIT, Elwyn Berlekamp became an Assistant Professor of Electrical Engineering at UC Berkeley and a consultant to the Space Communications Section of Caltech's Jet Propulsion Lab. From 1966 to 1971, he was a member of the Mathematics Research Department of Bell Telephone Labs, after which he returned to Berkeley as Professor of Mathematics and Electrical Engineering-Computer Science. In 1983 he reduced his faculty appointment to half-time to pursue entrepreneurial ventures. The first was Cyclotomics, which was initially a consulting firm of "experts in error-correcting codes"; it was later acquired by Eastman Kodak and became Kodak Berkeley Research. Later ventures included Cylink, an early provider of cryptographic equipment, and Axcom, a financial management company that pioneered algorithmic trading in the late 1980s through 1990. Axcom initially managed the Medallion Fund, which became the world's most successful hedge fund and the flagship of Jim Simons' Renaissance Technologies.

Berlekamp's work on statistical coding theory includes fundamental limits of block codes, with and without feedback, and of sequential decoding schemes for convolutional codes. He also devised several algorithms for decoding algebraic codes, notably the Berlekamp-Massey and Welch-Berlekamp algorithms for Reed-Solomon codes and the Berlekamp algorithm for factoring polynomials. He held 12 patents (now all public domain), mostly dealing with algorithms and devices for error-correction and synchronization. Some of his algorithms Reed-Solomon codes are widely used on compact disks; others are NASA standards for deep-space communications. He has more than 100 publications, including two books on coding theory and six books on the mathematical theory of combinatorial games.

The best-known of these are the 4-volume treatise "Winning Ways", coauthored with John Conway and Richard Guy, and the popular introductory booklet, "The Dots and Boxes Game". In 1994, Berlekamp and Wolfe published a book entitled "Mathematical Go", whose Japanese translation outsold the original English language edition. Berlekamp later devised a variation of the game, called "Coupon Go". Some of the world's leading professional Go players competed in Coupon Go tournaments in Seoul in 2007 and in Beijing in 2010.

His many honors include the IEEE Hamming Medal, the Shannon Award of the IEEE Information Theory Society, and election to the National Academy of Engineering, the National Academy of Sciences and the American Academy of Arts and Sciences.

Berlekamp is active in several non-profit organizations. He serves on the Finance Committees of both the National Academy of Engineering and the National Academy of Sciences, and on the Governing Board of the Mathematical Sciences Research Institute at Berkeley. He is also Chairman of Gathering for Gardner (G4G), an organization which encourages curiosity-driven mathematical research by people of all ages.