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UC Berkeley's Hans Bremermann, professor emeritus and pioneer in mathematical biology, has died at 69

by Robert Sanders

Berkeley -- Hans Joachim Bremermann, a pioneering biomathematician whose interests ranged widely from artificial intelligence and the limits of computer computation to the purpose of sexual reproduction, died Feb. 21 of cancer at Alta Bates Medical Center in Berkeley, Calif.

A professor emeritus of biophysics and mathematics at the University of California at Berkeley, Bremermann was 69.

A native of Bremen, Germany, he made significant contributions to many areas of mathematics, most importantly in models of biological processes. He was a pioneer in complexity theory and genetic algorithms, and is well known for his models of parasite-host interactions.

"He was a philosopher of sorts who applied mathematical theory to biological processes," said one of his former students, Russell W. Anderson, currently a consultant on AIDS immunology to the California Department of Health and a professor at the University of Northern California in Petaluma. "He presented some of the very first models of biological processes, many of which we use today, including models of evolution, pattern recognition in the brain and the immune system, and the interaction between parasite and host."

He was one of the original creators of genetic algorithms, computer programs that evolve or change in a manner similar to Darwinian evolution. This work led to the concept known as the Bremermann limit, a theoretical limit to any computation.

His theory of sexual reproduction emerged from theoretical musings on why animals would choose to gamble on sexual reproduction when asexual cloning seems a more certain way of assuring survival of offspring. His conclusion was that sexual reproduction arose as a response to microscopic parasites, a way of slightly altering the offspring's genetics to throw parasites off track and provide an edge in the constant battle with pathogens.

He also applied discoveries about how bacteria locate food and avoid poisons to create the Bremermann optimizer, a "dumb" but efficient way to perform a search. This concept was later applied to learning by neural networks, artificial circuits designed to mimic networks of brain cells.

In the years before his death he worked with immunologists on mathematical models of how HIV interacts with the immune system to cause AIDS. He also was at work on the theory of dreams, which he proposed as the key to the human brain's ability to recognize patterns. He proposed that the shifting images in our dreams are a window into how the brain analyzes and stores visual patterns.

He spoke about his theory of dreams in an invited talk last July at the 60th birthday celebration of the Dalai Lama in India.

Though a member of the UC Berkeley department of mathematics for more than 30 years, he gradually diverged from pure mathematics. He joined the department of medical physics in 1970 and eventually ended up in the division of biophysics and cell physiology in the department of molecular and cell biology. He retired in 1991.

Born in 1926 (Sept. 14), he remained in Bremen with his family through World War II and enrolled in 1946 in the University of Munster, where he studied the mathematics of several complex variables and the theory of computation. After obtaining his doctorate in mathematics in 1951 he was able to arrange two years of postdoctoral studies in the United States, at Stanford and Harvard, and later returned to this country for another three years at the Institute for Advanced Study in Princeton.

The institute was then "the center of the world in mathematics," and Bremermann became involved with programming one of the first computers, MANIAC, constructed by the famous mathematician John von Neumann. It was during this time that he became intrigued by the limits of computing, beginning a life-long interest in developing algorithms or short-cuts for solving complex problems.

He joined the UC Berkeley mathematics department in 1959, and quickly took over a seminar in artificial intelligence. In the 1960s he began to

collaborate with the Panoramic Research Group in Palo Alto, Calif., one of the first artificial intelligence groups.

Last year he received a lifetime achievement award from the Evolutionary Programming Society for his contribuions to the foundations of the field and for his work on genetic algorithms.

He was well known as a warm and patient mentor who nurtured 26 students through their PhDs. Many of these students attended a banquet for Bremermann last year, where he was presented with a Festschrift volume of papers in his honor published as a special issue of the journal BioSystems.

Bremermann is survived by his wife Maribel Bremermann (nee Maria Isabel Lopez Perez de Ojeda), whom he met while at Stanford in 1954. She is a retired professor of romance languages at San Francisco State University.

A memorial service is planned for Sunday, March 17, at 2 p.m., in the Faculty Club on the UC Berkeley campus. Donations in his memory can be made to the American Cancer Society.