



*James E. Bailey*

# JAMES E. BAILEY

1944–2001

Elected 1986

*“For research leadership in fundamental kinetic models, and for innovative basic measurements of genetically engineered cells and immobilized enzyme biocatalysts.”*

BY HARVEY BLANCH

JAMES EDWARD BAILEY was a pioneer in biochemical engineering and a leader in the development of metabolic engineering. His many contributions focused on the application of engineering to biological systems. He died on May 9, 2001, in Zurich aged 57.

The only child of Jim “Mac” and Doris Bailey, Jay grew up in Rockford, Illinois. He was an avid guitar player and played in his own band in high school. He studied chemical engineering at Rice University, and earned his BA in 1966 and PhD in 1969. His doctoral thesis with Fritz Horn was on the dynamics of chemical reactions with periodic operation.

After graduation Jay worked for a short period with Shell Development before joining the Chemical Engineering Department at the University of Houston in 1971. His initial research activities examined the behavior of chemical reacting systems in response to forced and autonomous oscillations. His research interests shifted toward the application of chemical engineering to biological systems. His early publications were on microbial population dynamics, development of tools such as flow microfluorimetry for characterizing dynamics of bacteria and yeast, and the behavior of immobilized enzyme reactors. His coauthored text *Biochemical Engineering Fundamentals*, with David Ollis (McGraw-Hill, 1977), brought

engineering rigor to a field that had seen significant changes with the advent of recombinant DNA technology, and represented a landmark in biochemical engineering education and industrial biotechnology applications.

In 1980 Jay moved to Caltech, where he established a program in biochemical engineering that embraced opportunities in the new field of genetic engineering to manipulate cell metabolism and advance industrial biotechnology. He recognized the potential impact of incorporating entire metabolic pathways, rather than single genes, into microorganisms to produce a much broader range of microbial products.

This was the genesis of *metabolic engineering* and Jay played a key role in its development. He studied the regulation of complex biochemical pathways and their carbon flows. Jay expanded the application of metabolic engineering beyond industrial microorganisms to encompass mammalian cells and tissues and medical applications. The second edition of his textbook, published in 1986, highlighted the engineering aspects of recombinant DNA technology. The fundamental approaches he established are central to industrial biotechnology today.

At Caltech, Jay mentored a large group of graduate students, many of whom have had exceptional careers in academia and in industry. But science was not all work and no play: his research group's legendary Friday afternoon "Ho Ho's" at Caltech's Rathskeller combined free-flowing discussions with the best products of fermentation.

In 1992 Jay moved to Switzerland as professor of biotechnology at the Swiss Federal Institute of Technology, Zurich (ETHZ), where he established a large, multidisciplinary group that benefited from state-of-the-art instrumentation and computational capabilities to conduct groundbreaking studies on metabolic engineering and microbial physiology. He was an early proponent of quantitative biology and was quick to adopt experimental tools that permitted new measurements. His research output was exceptional and he continues to be widely cited.

Jay's educational legacy is profound—he, perhaps more than any other, incorporated modern molecular biology into

biochemical engineering, demonstrating the strengths of both fields.

Jay advised over 100 graduate students and postdoctoral fellows over his 30-year career. His impact in fostering their independence, creativity, and passion for research is apparent. He engaged with them on a personal level, following and guiding their careers.

Jay received many honors for his research contributions, including the Alan P. Colburn Award for Excellence in Publications by a Young Member of the Institute and the Food, Pharmaceutical, and Bioengineering Division Award in Chemical Engineering Award of the American Institute of Chemical Engineers. He is remembered today by the Society for Biological Engineering's James E. Bailey Award for Outstanding Contributions to the Field of Biological Engineering, established in 2005. The award description recognizes Jay's professional and educational impact in a fitting tribute:

James Bailey's educational legacy touched many modern biochemical and biological engineers in the profession today. The award is presented to an individual who embodies the spirit of James Bailey, one that is a pioneer, a mentor, an innovator, an integrator of biology and engineering, a teacher, and whose achievements have provided a major impact to the field of biological engineering.

Jay is survived by sons Michael Sean Bailey and Sgt. James Howard Bailey. Sean decided on a career in the movie business and is now president of Walt Disney Studios Motion Picture Production. He was recently appointed a trustee of Caltech. James, 25, is a helicopter crew chief in the US Army.