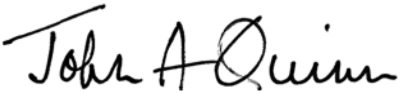

JOHN A. QUINN

1932–2016

Elected in 1978

"Pioneering research in mass transfer, particularly phenomena associated with transport through interfaces and membranes."

BY JOHN L. ANDERSON AND STEPHEN L. MATSON

JOHN ALBERT QUINN, professor emeritus of chemical and biomolecular engineering at the University of Pennsylvania and a lifelong student of mass transfer at interfaces, died February 8, 2016, at the age of 83.

John was born in Springfield, Illinois, on September 3, 1932, to Marie and Edward Quinn; he was the youngest of seven children. He received his BS in chemical engineering in 1954 from the University of Illinois at Urbana-Champaign and his PhD from Princeton in 1958. He returned to UIUC to join the faculty and was promoted to full professor in 1966—the same year he received the Allan P. Colburn Award for Excellence in Publications by a Young Member from the American Institute of Chemical Engineers (AIChE).

In 1971 he moved to the University of Pennsylvania, where he remained for the balance of his career. He chaired the Department of Chemical and Biomolecular Engineering from 1980 to 1985.

He gathered further recognition and honors along the way. He was selected for the university's S. Reid Warren Jr. Award for Distinguished Teaching in 1974, and in 1978 named to the Robert D. Bent Professorship. That year he also received AIChE's Alpha Chi Sigma Award for Chemical Engineering

Research and was elected to the National Academy of Engineering. He was elected to the American Academy of Arts and Sciences in 1992.

The richness of John Quinn's legacy can be appreciated along three dimensions: in his contributions to chemical engineering science; in his early vision, now uniformly accepted, that chemical engineering principles and methods would prove indispensable to addressing problems and enabling opportunities created by advances in modern biology; and in the personal and professional relationships that he cultivated.

A hallmark of John's early research was the design of simple, elegant experiments aimed at elucidating the role of the gas-liquid or liquid-liquid interface in mass transfer across phase boundaries. Prior to his work, the topic of interfacial effects in mass transfer had—oddly, in view of its practical significance—attracted the attention of only a few chemical engineering investigators (albeit some notable ones), thus presenting John with the opportunity to do some important and highly visible chemical engineering science. In particular, he set out to test the prevailing assumption of interfacial equilibrium that was (and is) deeply embedded in the film and penetration theories of mass transfer—namely, that the fluid-fluid interface itself presents no intrinsic interfacial resistance to transport.

With his students, John developed ingenious experimental methods featuring a novel moving-band absorber and colaminar jets of immiscible liquids that enabled measurement of interphase mass transfer rates for interfaces that were only milliseconds (or less) old, thus avoiding long-standing problems of interface contamination. Through a series of experiments, he and his students demonstrated conclusively that any interfacial resistances to mass transfer are negligible in industrial processes.

Although John's objective was to prepare "clean" interfaces for these studies, he often encountered the complication that surface-active species tended to rapidly accumulate at fresh interfaces, sometimes forming essentially insoluble yet fluid monolayers that acted like ultrathin membranes. Gradually, his interests shifted toward such membranes, with a focus on transport across them in a physiological or biological context.

To study the permeability of exquisitely thin and delicate films, John recognized that he needed first to immobilize them on or in highly permeable, rigid substrates of known microstructure. His search for suitable supports led him to a method for creating membranes with uniform, parallel, and cylindrical pores as small as 25Å in radius. These track-etched membranes, made from mica sheets less than 10 mm thick, in turn led to novel research to test theories of hindered transport of large molecules in small pores in both liquid and gas phases. Applications of his work on restrictive transport in nanopores ranged from heterogeneous catalysis and gas separations to kidney dialysis and biologically selective membranes.

As a consequence of his initiative to extend chemical engineering research to previously unexplored domains, John became familiar with the two largely separate worlds of synthetic and biological systems—and he was intrigued by the potential for bridging them. For instance, it was not lost on him that the living cell's bilayer lipid membrane was the epitome of the interfacial films he tried to make synthetically. Moreover, he had long been fascinated by the structure and functional versatility of the cell membrane as a biochemical reactor/separator, and he envisioned the creation of synthetic counterparts. He was thus ideally positioned to broaden his research to encompass transport in complex media and functional membranes, especially those pertinent to reactive and/or biological systems.

The idea that "biology informs engineering," which is taken for granted today, was advanced by John Quinn 40 years ago. His embrace of this idea is vividly demonstrated in the evolution of his research from studies of mass transfer across unsupported fluid interfaces, to fabrication and characterization of nanoporous membrane supports, to facilitated diffusion of carbon dioxide across immobilized liquid films, and ultimately to the creation and development of membrane reactors. Early prototypes of multilayer enzyme membrane reactors proved capable of exerting an unprecedented degree of control over reactant and product fluxes, prompting John and his students to participate in establishing the specialty pharmaceutical company Sepracor Inc. (now Sunovion) to commercialize the technology for the enzymatic resolution of chiral drug intermediates.

The focus of John's research would shift yet one more time—away from mimicking biological membrane structure and function (e.g., facilitated transport and enzyme membrane reactors) toward the application of chemical engineering tools and methods to better understand and exploit a range of biological phenomena, particularly those involving interactions between the living cell and its environment. For example, transport across the skin, diffusiophoresis (i.e., particle motion in response to a solute concentration gradient), chemotactic transport of motile bacteria, the attachment of cells to ligand-coated surfaces, the migration of cells on surfaces—these and other (bio)membrane-mediated interfacial phenomena captured John's attention, and he made substantial contributions to enhance understanding of them.

Today the importance of chemical engineering is taken for granted not only in classical bioprocess engineering but also in support of modern biotechnology, in biomedicine and drug discovery, and in partnership with the basic biological sciences. But this was far from apparent as John Quinn embarked on his academic career in 1958. He became convinced that modern biology constituted a new frontier for chemical engineering. He acted on this conviction, dramatically expanding the scope of opportunities for modern chemical engineers in practice and theory and helping to redefine the chemical engineering curriculum to include concepts of biology and physiology.

It can be fairly stated that John was one of the leading academicians responsible for adding the "B" to ChE departments across the country, even as he resolutely held the view that the basic principles of chemical engineering are absolute, no matter what the branding.

As a testament to both his influence and his students' high regard, each year since 2004 they have convened at the University of Pennsylvania for the John A. Quinn Lecture in

Chemical Engineering, a series hosted in his honor by the Chemical and Biomolecular Engineering Department thanks to generous support from former students and colleagues. John took great pleasure in choosing the speaker to be sure the lecture was about new thinking in the evolving fields.

John Quinn's vision for chemical and biomolecular engineering was hardly the only thing "big" about him. Known to his students as "Big John" or "the Big Kahuna," he was a large man in physical as well as intellectual stature. His physical presence was imposing, his cursive handwriting was bold, and his handshake bordered on crushing. But his equally big heart and engaging sense of humor (which featured an ample portfolio of bad jokes) made everyone comfortable in his presence.

His personal interests were varied, ranging from woodworking to crossword puzzles to campy movies (Mel Brooks was a favorite); and he was an avid reader of everything from the sports pages to the history of science, especially biographies of the physical scientists whom he regarded as forerunners of chemical engineering.

John took particular pride in the achievements of those in his orbit, whether student or colleague; he always felt that the education and success of his students were the most important result of the research he conducted. He actively maintained contact with many of his students to discuss what they were doing, share news, and invite them to his homes in Philadelphia and on Cape Cod.

John is survived by his wife of nearly 60 years, Frances (née Daly), daughters Sarah Quinn Christensen (Steven) and Becket Quinn McNab (Andy), son John Edward Quinn, and grandsons Bradford, Christopher, Edward, and John, as well as an extended academic family of devoted students, friends, and colleagues.