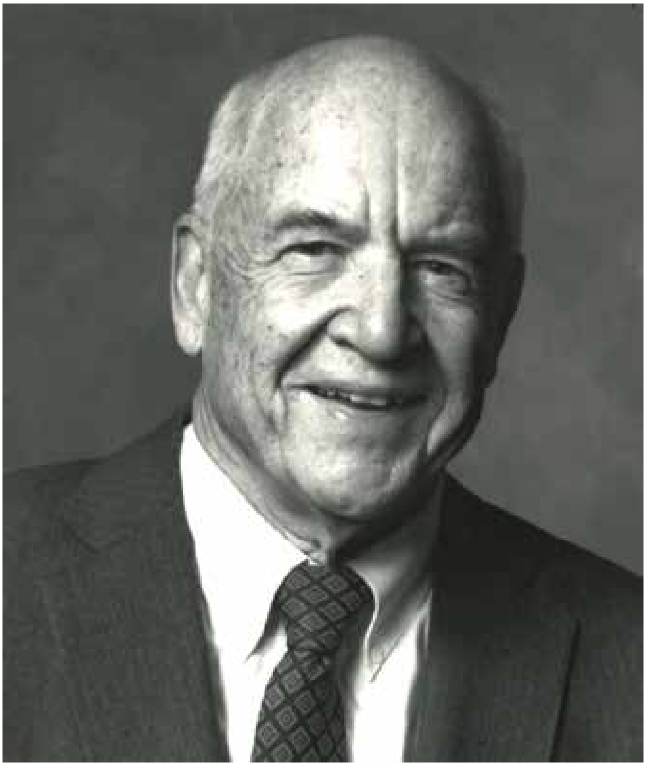

Robert H. Scanlan

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ROBERT H. SCANLAN

1914–2001

Elected in 1987

"For novel, sustained contributions in mechanics applicable to civil, mechanical, and aeronautical engineering, especially in structural dynamics, aeroelasticity, and wind engineering."

BY ROSS B. COROTIS, AHSAN KAREEM, NICHOLAS P. JONES, AND EMIL SIMIU[1]

ROBERT HARRIS SCANLAN, a leading founder of aeroelasticity theory, died May 27, 2001, at his home in Lawrenceville, New Jersey, at the age of 86. Working in the United States and abroad and in academia, government, and industry, his career covered a broad spectrum of mechanics, aerodynamics, and acoustics, with a principal focus on aeroelasticity and wind engineering. His early work in aircraft vibrations, his comfort with sometimes abstruse branches of applied math, and his boundless curiosity shaped both his career and his fields of research.

Born August 15, 1914, in Chicago, Bob was proud of his Chicago public school education, which prepared him to earn bachelor's (1936) and master's degrees (1939) in mathematics from the University of Chicago, and his PhD in physics and mathematics from the Massachusetts Institute of Technology (1943).

During World War II he served the country as an aeronautical engineer, starting at Fleetwings in Bristol, Pennsylvania, then at Republic Aviation (in Farmingdale on Long Island, New York), where he became chief of aeroelasticity. After the war he worked for the Civil Aeronautics Administration (precursor

[1] The authors are indebted to Bob Scanlan's daughter Karen Budlong for very thoughtful contributions to this tribute.

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of the Federal Aviation Administration) and was a professor in the Aeronautical Engineering Department at Rensselaer Polytechnic Institute, where his research in aeroelasticity led to publication in 1951, with Robert Rosenbaum, of *Introduction to the Study of Aircraft Vibration and Flutter* (MacMillan). The book became a classic text in aeroelasticity, ran to multiple editions, and was translated into several languages.

Also in 1951 he was honored with a fellowship from the National Advisory Committee for Aeronautics (NASA's predecessor) to pursue research at the École Nationale Supérieure de l'Aéronautique in Paris. His work, sponsored in part by the Centre National de la Recherche Scientifique (CNRS), led to a second doctoral degree, in mechanics, in 1956. He continued to work in France, at CNRS and the Office National d'Études et de Recherches Aérospatiales (ONERA), until 1958, when he accepted a position at the Schlumberger Corporation in Houston, working on vibration issues related to the oil industry.

In 1960 Bob returned to academia, with professorships at Case Institute of Technology (now Case Western Reserve University), where he headed the mechanics group, then 20 years at Princeton University, where he was director of structures and mechanics, and finally, starting in 1984, at the Johns Hopkins University, where he was Homewood Professor.

While in academia he developed his second major career emphasis, wind engineering. His work in this area started in collaboration with John Tomko at Case Western, on the aeroelasticity of suspension bridges, and continued at Princeton and Johns Hopkins. His experience in aeronautics led to the development of the field of aerodynamics and aeroelasticity of large civil engineering structures, such as cooling towers and long-span bridges, areas in which he remained actively engaged until his death.

Bob was quickly recognized as a leader in wind engineering, especially for his comprehensive insight into aeroelastic and buffeting response and vortex-induced vibration, and introduction of the concept of flutter derivatives and their relation to the response of long-span bridges to turbulent wind.

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Methods he pioneered for the analysis of long-span bridges under wind loading are now in common use among researchers and practitioners around the world.

Most things vibrate in response to external stimuli—pipe extraction from old oil wells, flow vibrations in power plant piping, or even musical instruments (as an accomplished flutist, Bob was much interested in musical acoustics). Many vibrations are unnoticeable, some benign, even pleasurable (think Mozart's Flute Concerto), but when the stimulus reaches critical levels, consequences can range from unpleasant to dire (think room acoustics, the 1940 Tacoma Narrows Bridge disaster, the 1959 Lockheed Electra vibration failure, nuclear power plant behavior in wind and earthquakes). Much research has been done to characterize these critical levels, but Bob's skill as both a fearless field tester and an expert analyst enabled him to formalize some of these fields in a novel manner and propose new tools for measuring them.

The Tacoma Narrows Bridge failure mode was one of Bob's particular interests and initiated decades of bridge research, full-scale and model testing, data gathering and analysis, and, in his words, "helping design bridges so they *don't* fly." His work led to techniques for characterizing bridges to assess their vulnerabilities to wind effects using nondimensional coefficients (indicial functions) that could be used across many types of bridge cross-sections to predict responses to local stimuli.

Some very large world bridges were designed or retrofitted in accordance with Bob's vulnerability coefficients (sometimes called the "Scanlan coefficients"). For example, he was principal aerodynamic consultant on the reconstruction plans for the San Francisco–Oakland Bay Bridge after the 1989 Loma Prieta earthquake, the Golden Gate Bridge (retrofit), and the Kap Shui Mun Bridge in Hong Kong.

He also served in leadership roles on technical committees of the the American Society of Civil Engineers (ASCE), chairing the Committee on Dynamics for the Engineering Mechanics Division, the Task Committee on Wind Forces,

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and the executive committee of the Engineering Mechanics Division.

His work and research led to the publication of *Wind Effects on Structures: Fundamentals and Applications to Design* (coauthored with former student Emil Simiu and translated into Russian and Chinese; Wiley-Interscience, 1996, 3rd ed.), still a key reference in the field. He was also coeditor of *A Modern Course in Aeroelasticity (Mechanics: Dynamical Systems)* (Springer, 1978), and in the book's 5th, revised edition (2015) was honored with the following dedication: "The authors would like to pay tribute to Robert H. Scanlan, a superb aeroelastician, an inspiring teacher, and a consummate mentor and friend. He is greatly missed."

Bob Scanlan received numerous awards, prizes, and citations from his peers. In addition to his NAE membership, he was an elected fellow of the American Academy of Mechanics and T.R. Higgins Lecturer of the American Institute of Steel Construction. From ASCE, of which he was an honorary member, he received the Theodore von Kármán Medal (2000), J. James R. Croes Medal (1988), and Nathan M. Newmark Medal and Arthur M. Wellington Prize (both in 1986).

He was noted for his clarity of presentation and transparency of method, for making difficult concepts clear and understandable, and for his highly ethical approach to life. Throughout his career he was an exemplary scholar, engineer, teacher, advisor, mentor, friend, and role model for dozens of undergraduate and graduate students as well as his colleagues.

Bob was survived by his wife of 62 years, Elizabeth (née Collette), whom he married in 1939 (she died February 2, 2014); daughters Kate Budlong of Manhattan Beach, California, and Jean Sachs (Klaus) of Wharton, NJ; sons Robert N. Scanlan (Joanne Baldine) of Belmont, MA, and Glenn Scanlan (Audrey) of Harrisburg, PA; eight grandchildren; and many great-grandchildren. In Bob's and Beth's house all questions were welcomed, adventures and experiments encouraged, and loving support always at hand.

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