

Thomas K. Caughey Dynamics Award



Ali Hasan Nayfeh

*University Distinguished Professor
Virginia Polytechnic Institute and State University*

*For seminal analytical and experimental contributions to
nonlinear dynamics and structural mechanics*

Professor Ali Hasan Nayfeh was born in Shuwaikah, Jordan, on 21 December 1933. After enrolling in 1959, he received B.S. in Engineering Science in 1962, M.S. in Aeronautics and Astronautics in 1963, and Ph.D. in Aeronautics and Astronautics in 1964, all from Stanford University and all in a period of five years. After graduation, he worked at Heliodyne Corporation and Aerotherm Corporation. He then joined the faculty of Virginia Polytechnic Institute and State University (Virginia Tech) in 1971, and has been a University Distinguished Professor of Engineering since 1976.

Professor Nayfeh has been at the forefront of research in the field of vibrations in four decades. His early work was concerned with the development of analytical methods for the solution of nonlinear ordinary and partial differential equations and the use of these methods to discover and explain many of the amazing and often counter-intuitive characteristics of nonlinear dynamic systems. When the theory far outstripped the experimental corroboration, he became a highly regarded experimentalist. Early in his career, he worked on the nonlinear analysis of ablation. When NASA was engaged in developing quieter jet engines, he studied the influence of mean-velocity profiles and liners on the transmission of sound through engine exhaust ducts. This work was mostly theoretical, but did include one experimental study. Subsequently, he worked on the emission and reflection of sound from submerged bodies. He then turned to the nonlinear structural dynamics and ship motions, explaining analytically and experimentally many mechanisms responsible for intermodal transfers of energy. Early work led to the discovery of the saturation phenomenon and to the development of nontraditional control strategies that exploit, not avoid, nonlinear behavior. The results led to innovative ways to limit the pendulations of cargo being hoisted by deck-mounted cranes on ships at sea and to eliminate flutter by introducing nonlinearity in the controller that suppresses the flutter-causing instability. Recently, he has made seminal contributions to micromechanics and machining.

He has also made lasting contributions to education. Among his large number of scholarly publications are several widely used monographs and textbooks, including *Perturbation Methods*, and (With D.T. Mook) *Nonlinear Oscillations*, both reissued as Wiley Classics. He chaired a committee of 35 US educators that established the College of Engineering at King Abdulaziz University in Jeddah. While on leave in 1980-4, he established the College of Engineering at Yarmouk University in Jordan and served as its Dean; he also served as the Vice-President of Engineering.

Professor Nayfeh received honorary doctorates from the Marine Technical University, Saint Petersburg, Russia in 1996; the Technical University of Munich, Germany in 1999; and the Szczecin University of Technology, Poland in 2004. He is a fellow of the American Physical Society (APS), the American Institute of Aeronautics and Astronautics (AIAA), the American Society of Mechanical Engineers, the Society of Design and Process Science, and the American Academy of Mechanics (AAM). He received AIAA's Pendray Aerospace Literature Award in 1995; ASME's J. P. Den Hartog Award in 1997; the Frank J. Maher Award for Excellence in Engineering Education in 1997; ASME's Lyapunov Award in 2005; the Virginia Academy of Science's Life Achievement in Science Award in 2005; and the Gold Medal of Honor from the Academy of Trans-Disciplinary Learning and Advanced Studies, in 2007.

The Thomas K. Caughey Dynamics Award is established in 2008 and is conferred in recognition of an individual who has made significant contributions to the field of nonlinear dynamics through practice, research, teaching, and/or outstanding leadership.