

## In Memoriam: Ali Hasan Nayfeh



**Ali Hasan Nayfeh  
(1933–2017)**

Dr. Ali Hasan Nayfeh, University Distinguished Professor Emeritus of Virginia Tech, Blacksburg, VA, passed away rather suddenly on Mar. 27, 2017, at the age of 84, in his home at Amman, Jordan. The communities of applied mechanics, nonlinear dynamics, vibration and control, and applied mathematics have lost a premier scientist and engineer, who has been an extraordinarily influential scholar over the past five decades.

Professor Nayfeh was born in Shuwaikah, a small village near Tulkarm in Palestine, on Dec. 21, 1933. He entered Stanford University in 1959 as a freshman and graduated 5 years later with

his doctoral degree. He received a B.S. degree in Engineering Science in 1962 and M.S. and Ph.D. degrees in Aeronautics and Astronautics in 1963 and 1964, respectively. His graduate research work laid the foundation for his seminal work in perturbation techniques, and especially, the Method of Multiple Scales, which he developed in great depth.

In his next phase, Dr. Nayfeh first worked in the aerospace industry (Heliodyne Corporation, Richmond, CA and Aerotherm Corporation, Mountain View, CA) for 7 years, while at the same time developing further perturbation techniques and applying them to various fields in physics and engineering. Dr. Nayfeh then started a long association with Virginia Tech, where he was a faculty member from 1971 to 2008. He was appointed as one of the first three University Distinguished Professors at Virginia Tech in 1975. After retirement, he maintained a high level of research activities by supervising Ph.D. students and writing papers and books.

Professor Nayfeh's contributions to engineering and science have been exemplary, at all scales and levels. Throughout his career, Professor Nayfeh was at the forefront of nonlinear dynamics. Through his research, he contributed to a deeper understanding of an extensive range of physical phenomena exhibited by nonlinear systems. His contributions cover the whole spectrum of nonlinear vibrations, ranging from regular periodic oscillations to complex dynamics associated with nonlinear modal couplings for controlling nonlinear vibrations in discrete and continuous systems including microelectromechanical systems. Professor Nayfeh recognized the importance and need for a complete and deep understanding of the mathematical tools for the analysis of dynamical systems that are governed by nonlinear ordinary-differential equations and partial-differential equations. He perfected the art and science of the method of multiple scales and other perturbation techniques and made them accessible to generations of students and researchers.

Professor Nayfeh has authored ten books in nonlinear dynamics and perturbation methods. Several of them became the most respected and fundamental references in the fields, translated into many languages including Russian, Chinese, and German, taught as textbooks in top schools, and cited extensively tens of thousands of times. He authored more than 480 articles in referred journals and contributed more than 36 book chapters. He also founded and served as an Editor-in-Chief for two prestigious journals, namely, the *Nonlinear Dynamics* and the *Journal of Vibration and Control*. Professor Nayfeh has educated 69 Ph.D. students, many of whom have become prominent scholars, department chairs, and deans in top ranked institutions around the globe.

In additions to the impact he has had through his papers and books, Professor Nayfeh has also had direct influence on educational institutions in many parts of the world. In 1976, Professor Nayfeh led a group of scientists to establish the College of Engineering at the King Abdel Aziz University in Jeddah in Saudi Arabia. In 1980, Professor Nayfeh took a leave of absence to establish

an Engineering College in Yarmouk University, Jordan and served as its Dean, and as Vice-President for Engineering Affairs at the university for 4 years. In 2002, Professor Nayfeh helped establishing a new graduate and internationally reputable program in Mechanics in Tunisia. In his final years after retiring from Virginia Tech, Professor Nayfeh volunteered to work at the University of Jordan, where he helped engineers, scientists, and researchers and provided valuable advice and consultation. Last, but not least, Professor Nayfeh has been establishing and fully funding a modern school in his birth-village of Shuwaikah in Palestine to provide the best education and nurture the next generation of brilliant scientists.

Professor Nayfeh has been recognized in the science community with more than 30 awards. The American Society of Mechanical Engineers (ASME) recognized Professor Nayfeh with the ASME *J. P. Den Hartog Award* in 1996 in recognition of his lifetime contributions to the teaching and practice of vibration engineering. In 2005, Professor Nayfeh was honored by ASME as the first recipient of the *Lyapunov Award* for his lifelong contributions to the field of nonlinear dynamics. In 2008, ASME named him the first recipient of the *Thomas K. Caughey Award* for his significant contributions to the field of nonlinear dynamics. Outside ASME, Professor Nayfeh received the *Pendray Aerospace Literature Award* from the American Institute of Aeronautics and Astronautics (AIAA) in 1995 for his seminal contributions to perturbation methods, nonlinear dynamics, acoustics, and boundary-layer transition. In 2008, Professor Nayfeh received the *Academy Gold Medal of Honor* from the Academy of Transdisciplinary Learning and Advanced Studies. The most notable recognition came in 2014, when Professor Nayfeh received the *Benjamin Franklin Medal* in Mechanical Engineering, one of the high honors in engineering to join the likes of Albert Einstein, Thomas Edison, and Marie and Pierre Curie, for developing novel methods to model complex engineering systems in structural dynamics, acoustics, fluid mechanics, and electromechanical systems.

Professor Nayfeh was a Fellow of ASME, AIAA, the American Academy of Mechanics, and the American Physical Society. In addition, he earned three honorary doctorates from the Politechnika Szczecinska of Poland, the Technical University of Munich, Germany, and the Marine Technical University of St. Petersburg, Russia.

Professor Ali Hasan Nayfeh was a remarkable individual who leaves behind a remarkable legacy of scholarship and impact. He has without a doubt been one of the most influential scholars in the nonlinear mechanics community. His exceptional contributions have touched many generations of scientists, engineers, and applied mathematicians who have worked and continue to work in this field. His amazing journey of life will continue to inspire many generations to come. He was a brilliant scientist, a distinguished teacher, an inspiring motivator, a great community leader, and an amazing and wonderful human being. He will be truly and deeply missed.

**Balakumar Balachandran**  
Department of Mechanical Engineering,  
University of Maryland,  
College Park, MD 20742

**Mohammad Younis**  
Department of Physical Science and Engineering,  
King Abdullah University of Science and Technology,  
Thuwal 23955, Saudi Arabia

**I. Y. (Steve) Shen**  
Department of Mechanical Engineering,  
University of Washington,  
Seattle, WA 98195