

Anestis S. Veletsos (1927-2018)

Professor Anestis (“Andy”) Veletsos, a towering figure in the fields of Structural Dynamics and Earthquake Engineering, died peacefully in Houston, Texas, on October 25, 2018 surrounded by his family. He was 91 years old and lived an extraordinary life.

He was born on April 28 1927 to Greek parents in Istanbul, Turkey, where he completed his secondary education. He attended Robert College in Istanbul (the oldest American Academic Institution outside the U.S., where Karl Terzaghi taught in the 1920’s), and received his bachelor's degree in 1948 with highest honours.

He continued his studies at the University of Illinois at Urbana-Champaign under the supervision of earthquake-engineering legend Nathan M. Newmark, and graduated with a PhD degree in 1953. His classmates at Illinois included Frank Richart Jr. (1919-1994), Emilio Rosenblueth (1926-1994), Mete Sozen (1930-2018), all pioneers of earthquake engineering. After his graduation he became academic staff at Illinois and reached the rank of Professor of Civil Engineering. In the era of Newmark and Veletsos, the department of Civil Engineering at Illinois became the leading center in earthquake engineering research, worldwide.

In 1964 he moved to Houston, Texas, to become the Brown & Root Professor in the Department of Civil Engineering at Rice University, a position he kept for 45 years. He also held visiting appointments at the University of California, Berkeley as well as in several other academic institutions around the world. In the mid 1980's he collaborated with researchers from the State University of New York at Buffalo towards the foundation of the National Center for Earthquake Engineering Research (NCEER). After his retirement from Rice, he served as Distinguished Adjunct Professor at the University of Houston from 2010-2013, until his final retirement at the age of 86.

Andy Veletsos’ research covered a variety of subjects in Structural Dynamics and Earthquake Engineering. As he was known to say, he was lucky to be working in this area at the time it was taking shape. And indeed his contributions to understanding

the earthquake response of structures and their interaction with the foundation soil have shaped this field. In the 1960's, along with Newmark, Veletsos carried out his pioneering studies on dynamic response of yielding systems, the results of which provided the basis of modern seismic codes. After moving to Rice University, he started working at the interface between Structural Dynamics and Soil Dynamics. His work on foundation vibrations, soil-wall systems and storage tanks led to the development of simple analysis methods which have been adopted by seismic codes and engineering provisions, worldwide. His research focused on the development of simple solutions, based on a unique combination of rigorous mathematics and physically-motivated simplifications. Apart from a handful of recorded earthquake motions (notably the 1940 El-Centro record), he rarely used experimental data. No other person in the history of earthquake engineering achieved a similar level of success through purely theoretical research.

During his long career, Veletsos authored 140 publications, focusing almost exclusively on Structural Dynamics and Earthquake Engineering. He was awarded prestigious awards, including the Norman Medal (twice), the Reese Research Prize and the Theodore von Karman Medal of the American Society of Civil Engineers (ASCE), the Huber Research Prize, the Newmark Medal, the Howard Award and the George W. Housner Medal of the Earthquake Engineering Research Institute (EERI). He was elected to the National Academy of Engineering (1979), to an Honorary Membership of ASCE and to the Academy of Medicine, Engineering and Science of Texas. He was also awarded an Honorary Doctorate from the University of Patras, Greece.

Following on Newmark's footsteps, he was an active consultant on projects related to dynamic response of structures and foundation systems. He served on a multitude of advisory panels and boards for public and private firms applying his knowledge, but at the same time getting stimulus for new research. He was known as a perfectionist, often treating simple consulting reports as scientific papers.

Professor Veletsos was a distinguished educator who emphasized the importance of mastering the fundamentals of a subject and developing physical insights. His lectures were exciting, conveying his passion for science and research to his

audience. He focused extensively on simple concepts like dynamic amplification factors for various types of pulses, transmissibility functions, and energy solutions based on Rayleigh's method and its derivatives. He insisted in teaching simple iterative methods, like the moment distribution approach of Hardy Cross, and in relating the behaviour of complex systems to that of simpler ones. In the footsteps of Newmark, he believed that engineers should know by heart a number of simple solutions that could serve as predictors (often providing upper and lower bounds) of the behaviour of more complex problems; he highlighted these relationships by showing that the end result was often a dimensionless factor times the solution of a simpler problem. In the classroom he demanded undivided attention and encouraged student participation by asking questions on a one-to-one basis. Out of this Socratic method, the class would gradually come up with the right answers and advance to a higher level of knowledge. He was gentle but demanding and he ensured that the whole class was advancing - not just a few strong students. He was always providing visualisations of the concepts of dynamics by using his ruler which he vibrated expertly as if an extension of his hands. He was always giving closed-book exams, which included some simple yet tricky questions through which he was judging his students' intuition. In his own words: "*If you understand the physics of a problem, you can reduce it to a suite of simpler questions that will help you find the answer*". It is a pity that his book on Structural Dynamics, on which he spent a great amount of time, was left unfinished.

His papers are masterpieces of scientific writing, due to the clarity of expression and excellent graphical content. Compared to Newmark, he had a relatively small research group and produced only a handful of academic heirs. However, he had a great impact on the scientific community, mainly through his papers and lectures.

For the people who worked with him, Andy combined intelligence with kindness, humility and integrity. He was always calm, speaking slowly with well chosen words that were conveying his thoughts maintaining the same level of clarity in his verbal communication as he had in his writings. To his students and colleagues, he has been always a very warm and cordial host. He was highly respected and very popular among his colleagues and helped many young scientists, including the signatories, to advance their careers.

“A good equilibrium between personal and professional life is the secret of a long-lasting, successful career”, he always said. He lived happily with his wife, Katherine and his two daughters, Ann-Marie and Melinda, who survived him. From Melinda's marriage with Jaime Vieser, he has four grandchildren, Katherine, Alexandra, Bella and Will.

Andy Veletsos was the last of the pioneers that shaped earthquake engineering and his impact will be lasting. He will be greatly missed.

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