MITMECHE

Ogilvie Lecture

TF Ogilvie Young Investigator Lecture in Ocean Sciences and Engineering

Re-powering Infrastructure via Monitoring & Simulation

Eleni Chatzi

Institut für Baustatik und Konstruktion/ Institute of Structural Engineering, Zurich

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Technical infrastructure forms a main pilar of the modern world, hosting our built environment, serving transportation and communication needs, as well as enabling the generation and transfer of energy. Within this context, engineers and owners need to warrant safe and robust operation of these systems for ensuring a smooth societal flow and resilience against short- (extreme events) and long-term threats (deterioration and fatigue processes). In tackling this challenge, civil engineers are becoming increasingly aware of the benefits stemming from Structural Health Monitoring, i.e., the process of gathering feedback from infrastructure components via use of appropriate sensory systems. Developments in low-cost and easily deployed sensors allow for instrumentation of large scale civil structures, such as bridges, buildings, dams or wind turbines, generating a Big Data stream of diverse information, such as acting loads, strains, cracking and dynamic response.

When adequately interpreted through fusion with appropriate models, this data may then be transformed into effective knowledge on structural performance thereby facilitating the operation and maintenance of infrastructure. This talk will discuss developments introduced by the Chair of Structural Mechanics for tackling the multiplicity of challenges in this non-trivial task. Among others, we will discuss the monitoring, simulation and protection of structures that are of uncertain nature, either due to modeling imprecision or due to influence of continually varying and little known environments; the challenges of non-linearity and high-dimensionality; data compression schemes for smart sensing; the extraction of salient features and robust performance indicators able to warn of damage and deterioration, as well as policy-planning for getting more out of structural components, systems and networks. An objective of the talk is to bring together the puzzle pieces toward the broader vision of a data-driven, benefit-oriented framework for engineering infrastructure efficiency.

This lecture was named for Professor TF. Ogilvie, who was born and reared in Atlantic City, where he early developed an aversion to boats, water, and sand. He went to Cornell University at age 16, where he was appointed to the position of campanologist while earning a Bachelor of Arts degree with a major in physics. He subsequently discovered that he could study boats and water without getting wet, and so he accepted a position as a physicist at the David Taylor Model Basin (DTMB) of the US Navy.

Professor Ogilvie came to MIT with appointments as Professor of Ocean Engineering and Head of the Department of Ocean Engineering. He held the latter position for over 12 years. During that period, the department completely redirected its undergraduate program, developed several new laboratories, and effectively integrated its unique Naval Construction and Engineering Course into the MIT engineering mainstream. Professor Ogilvie has held positions as Visiting Professor of Naval Architecture in Osaka University (Japan) and Honorary Professor of Mathematics in Manchester University (UK). He was the first recipient of the William H Webb Medal, awarded by the Society of Naval Architects and Marine Engineers for outstanding contributions to education. He has received the Meritorious Public Service Award, US Department of the Navy (1955), and the Meritorious Public Service Award, US Department of Transportation (1982). In 1996, he received an honorary doctorate from the National Technical University of Athens (Greece) in recognition of his research accomplishments in ship hydrodynamics. He and his wife Joan now reside in Ann Arbor, Michigan.