

The Department of Mechanical Engineering/College of Engineering and Applied Sciences  
Stony Brook University

## Mechanical Engineering Distinguished Lecture



**Dr. Tsu-Wei Chou**  
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**Lecture Title: Electro-Mechanical Behavior of  
Carbon Nanotubes and their Composites**

Friday, April 4, 2008, 11:00AM, Room 301 Engineering Building

### Abstract

Progressively more material systems are being tailored for multifunctionality where sensory and adaptive capabilities may be incorporated. Carbon nanotubes with their unique mechanical, electrical and thermal properties are inherently multifunctional. Thus, the possibility exists to tailor the structural and functional properties of existing ceramic- and polymer-based composite systems using carbon nanotubes for applications in sensing and actuation. Toward this goal, we have studied the electro-mechanical behavior of carbon nanotubes and their composites from atomistic to the macro-scales. This presentation first reports a theoretical study of the electrical charge-induced deformation and failure based on the molecular structural mechanics method. Second, we demonstrate that conducting carbon nanotube networks formed in a polymer matrix can be utilized as highly-sensitive sensors for detecting the onset, nature and evolution of damage in advanced polymer-based fiber composites. The electrical percolation behavior as influenced by nanotube waviness and contact resistance has been investigated. Lastly, the potential of carbon nanotubes for *in situ* monitoring of damage accumulation in fiber composite structures will be discussed.

### Biography

Dr. Tsu-Wei Chou is the Pierre S. du Pont Chair of Engineering at the University of Delaware. He received the B.S. degree in civil engineering from the National Taiwan University (1963), the M.S. and Ph.D. degrees in materials science from Northwestern University (1966) and Stanford University (1969), respectively. Dr. Chou's research interests are in materials science, applied mechanics, fiber composite materials, piezoelectric materials, and nanocomposites. He has authored nearly 300 archival journal papers and book chapters in these areas. Dr. Chou is the author of the book, *Microstructural Design of Fiber Composites*, Cambridge University Press, England (1992), the co-author of the book, *Composites Materials and Their Use in Structures*, Elsevier Applied Science, London (1975), and the editor of several books. Dr. Chou is a Fellow of ASME, ASM International, ASC, American Ceramic Society, AIAA and TMS, and a recipient of the Charles Russ Richards Memorial Award and the Worcester Reed Warner Medal of ASME, the Distinguished Research Award of American Society for Composites, and the Francis Alison Medal of the University of Delaware. Dr. Chou is the Editor-in-Chief of the international journal *Composites Science and Technology*. He has been recognized by ISI as one of the "Highly Cited Researchers" in materials science.

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