

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

## Mechanical Engineering Seminar

**Dr. Yong Chen**  
**Professor**

Epstein Department of Industrial and Systems Engineering  
Department of Aerospace and Mechanical Engineering (courtesy)  
**University of Southern California**



**Lecture Title: Additive Manufacturing of Bio-inspired Structures  
via Nanocomposite 3D Printing**

Thursday, September 26, 2019 at 1:30 PM, Room 173 Light Engineering Building

### Abstract

Many natural structures out-perform conventional synthetic counterparts due to the specially evolved multi-scale and multi-material architectures. However, the majority of current 3D printing systems are designed to fabricate parts using a single material in a single scale mainly for structural purpose. Such complex yet beautiful designs existing in natural structures are far beyond the fabrication capability of current 3D printing systems. This talk will report our recent work on developing new multi-scale and multi-material additive manufacturing processes to fabricate bio-inspired structures including (1) the Bouligand structure in natural creatures to create highly impact-resistant architectures, and (2) the eggbeater structure of the *Salvinia Molesta* leaves to create superhydrophobic structures. After a brief overview of current 3D printing technology, an electrically assisted additive manufacturing (AM) approach to fabricate complex reinforcement architectures will be presented. The fabricated structures show three times enhanced impact resistance with Bouligand-type orientation compared with random orientation. Another additive manufacturing process named Immersed Surface Accumulation to fabricate complex micro-scale structures on an object surface will be presented. Such AM process enables one to reproduce biomimetic functional surfaces to achieve interesting properties such as hydrophobicity and petal effect. Some promising applications enabled by the 3D-printed structures will also be demonstrated and discussed. The talk will conclude with remarks and thoughts on future 3D printing developments and potential opportunities for product designers and manufacturing engineers.

### Biography

Dr. Yong Chen is a professor of Industrial and Systems Engineering and Aerospace and Mechanical Engineering and the Director of Daniel J. Epstein Institute at the *University of Southern California* (USC). He received his Ph.D. degree in Mechanical Engineering from *Georgia Institute of Technology* in 2001. Before joining USC in 2006, he was a Senior Research and Development engineer in *3D Systems Inc.*, the pioneer in the 3D printing industry. Dr. Chen's research focuses on additive manufacturing (3D printing) in micro- and meso- scales. He received over ten *Best/Outstanding Paper Awards* in major design and manufacturing journals and conferences. Other major awards he received include the National Science Foundation *Faculty Early Career Development (CAREER) Award*, the *Outstanding Young Manufacturing Engineer Award* from the Society of Manufacturing Engineers (SME), and the invitations to the National Academy of Engineering (NAE) *Frontiers of Engineering Symposiums*. Dr. Chen is a Fellow of the American Society of Mechanical Engineers (ASME). He has served as conference/program chairs as well as keynote speakers in several international conferences, including the Conference Chair of the 2017 International Manufacturing Research Conference (NAMRC/MSEC/ICM&P) and the program co-chair of the 2019 International Design Engineering Technical Conferences (IDETC). He also serves on the editorial boards of several design and manufacturing journals.

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Check <http://me.eng.sunysb.edu> for any changes to location or time.



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