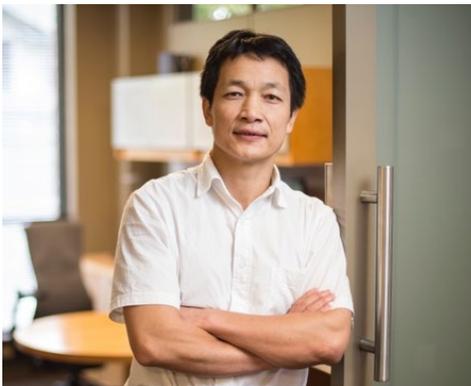




ME Special Seminar

Computational fluid-structure interaction for biological and biomedical applications



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Friday, October 19, 2018

10:00 – 11:00 am

1680 IOE

Abstract:

Fluid–structure interaction (FSI) can be found in many biological tissues and organs. Among the examples are insect wings, fish fins, heart valves, blood vessels, and vocal folds. Although their anatomies, structural components, and mechanical behaviors are quite different from one another, these flexible solid bodies share the kinematic features of large deformation in the three-dimensional (3D) space, and the time-varying deformations are critical for the bodies to perform their physiological functions. Because of the large deformation and also the intrinsic complexity of the accompanying flow, computational modeling of the 3D FSI for this type of problems is still highly challenging and thus has not been extensively explored. In this talk, I will describe an immersed-boundary approach to solve the governing Navier-Stokes equation and its coupling with a finite-element approach for solving the nonlinear tissue mechanics. I will discuss several applications currently pursued in our group including animal flight (e.g., hummingbirds and insects), fish swimming, vocal cord vibration, and heart valves, and will present the progress we made on these topics.

Bio:

Dr. Haoxiang Luo is an Associate Professor in the Department of Mechanical Engineering at Vanderbilt University, Nashville, Tennessee, where he is also the Associate Department Chair. He has a secondary appointment in the Department of Otolaryngology within the School of Medicine. He obtained his Bachelor's and Master's degrees from Tsinghua University in China, and Ph.D. from University of California, San Diego (UCSD), all degrees in mechanical engineering. He had postdoctoral training at UCSD and George Washington University before he joined Vanderbilt University in 2007. Dr. Luo received the Doctoral New Investigator award from the American Chemical Society, Petroleum Research Fund in 2008, the National Science Foundation (NSF) Faculty Early Career Development (CAREER) award in 2010, and General H.H. Arnold award from the AIAA Tennessee Section in 2013. He is a member of APS, AIAA (Associate Fellow), and ASME. He is currently serving on the AIAA Fluid Dynamics Technical Committee.