SMU Department of Mechanical Engineering

SEMINAR

"Geometric Mechanics and Biomorphic Aquatic Locomotion"

DR. SCOTT DAVID KELLY

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Friday, February 5, 2010
3:00 – 4:00 p.m.
Huitt-Zollars Pavilion

Abstract: Biologically inspired designs for underwater vehicles promise advantages over more conventional designs in agility, energy efficiency, and stealth. The superior swimming performance of marine animals, however, hinges on their ability to exploit subtle and complex hydrodynamic phenomena. The realization of mathematical models for aquatic locomotion which are rich enough to accommodate such phenomena, yet tractable enough to be used in model-based control design, requires a novel perspective. This talk will frame idealized aquatic locomotion in the setting of Lagrangian and Hamiltonian mechanics, beginning with a treatment of driftless swimming at the extremes of Reynolds number in terms of connections on principal bundles and graduating to the computational exploration of a model for the planar locomotion of a free deformable hydrofoil shedding discrete vorticity in an inviscid fluid. Issues of energy efficiency and control will be discussed both for solitary vehicles and for schools of vehicles able to cooperate through hydrodynamic coupling.

Bio: Scott David Kelly received a BS in Mechanical and Aerospace Engineering from Cornell University in 1991 and an MS and PhD in Mechanical Engineering from the California Institute of Technology in 1992 and 1998, respectively. He worked as a research engineer in Biological Systems Modeling at Entelos, Inc. and as an assistant professor of Mechanical Science and Engineering at the University of Illinois at Urbana-Champaign before joining the faculty at UNC Charlotte in 2007, where he is presently an associate professor and the Director of Graduate Studies in Mechanical Engineering and Engineering Science. Professor Kelly received a National Science Foundation CAREER Award in 2005 and a Presidential Early Career Award for Scientists and Engineers (PECASE) in 2006.