

MECHANICAL ENGINEERING DEPARTMENT
ME/IE 8773-8774

**Recent Advancements in Computational Biofluids Research: From Aquatic Locomotion
to Cardiovascular Hemodynamics**

by

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Wednesday, September 20, 2006
3:30-4:30 p.m.
Room 1130 ME

Coffee and cookies will be available at 3:15 p.m. in Room 1130 ME before the seminar

ABSTRACT — The term biofluids in its broadest sense denotes the study of fluid flows in and around living organisms in order to elucidate and quantify presumed links between fluid mechanics and particular biological responses and biochemical processes or specific behavioral and/or evolutionary patterns. Examples highlighting the diversity of this broad, cross-disciplinary area range from the interaction of the aquatic habitat with turbulence in natural and engineered environments to the role that blood-vessel scale hemodynamics play in stimulating disease-inducing biochemical processes at the cellular level in the cardiovascular system. The study of such problems is obviously important from a fundamental scientific standpoint but could also lead to exciting technological and/or ecological innovations. These include among others: virtual surgery; novel biomedical devices and artificial organs; bio-mimetically inspired robots; and the effective restoration of natural rivers.

In this talk I will highlight the role of Computational Fluid Dynamics (CFD) as a powerful biofluids research tool and review our progress towards the development of advanced CFD algorithms for tackling a broad range of biologically important problems. I will present results from the application of these algorithms to simulate fish and plankton swimming as well as the hemodynamics of prosthetic heart valves and complex, surgically created, blood-vessel anatomies.

BIO — **Prof. F. Sotiropoulos** is the director of the Saint Anthony Falls Laboratory (SAFL) and Professor of Civil Engineering at the University of Minnesota. He received a BS in Mechanical Engineering from the National Technical University of Athens (Athens, Greece) in 1986, a MS in Aerospace Engineering from The Penn State University (State College, PA) in 1989, and a PhD in Aerospace Engineering from the University of Cincinnati (Cincinnati, OH) in 1991. He started his academic career at the Georgia Institute of Technology in 1995 as an assistant professor of Civil and Environmental Engineering. He was promoted to the rank of professor in 2005 and shortly thereafter he moved to the University of Minnesota to assume the directorship of SAFL. His research interests span a broad range of topics in computational fluid dynamics with emphasis on applications in biofluids, environmental fluid dynamics, renewable energy systems, and chaotically advected flows. He is serving as an associate editor for the ASCE Journal of Hydraulic Engineering and on the editorial board of the International Journal for Heat and Fluid Flow. He has authored and co-authored over 80 journal papers, book chapters, and conference proceedings. He is a recipient of a NSF Career award and was invited twice by the National Academy of Engineering to participate in Frontiers of Engineering symposia.

Informal Faculty Luncheon: Wednesday, September 20, 2006, 12:00 noon. Meet in 1100 ME and walk to lunch with other faculty. Prof. Fotis Sotiropoulos will be able to attend.