Weekly CEAFM Seminar: Spring 2016

JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Date:	**Friday, February 19, 2016**
Time:	11:00 AM
Location:	Gilman Hall 50 (Marjorie M. Fisher Hall)
Speaker:	**Prof. Keefe Manning** (Pennsylvania State University)
Title:	***"Toward a Computational Model for Macroscopic Predictions of Device-Induced Thrombosis"***

Abstract

Thrombosis remains an obstacle in current blood-contacting devices, primarily due to regions of disturbed flow. Specifically, regions of high shear stress activate platelets and regions of low wall shear rate allow for platelet adhesion and thrombus growth. Both of these phenomena occur in regions of flow separation. A computational model capable of predicting device-induced thrombosis on a macroscopic scale and relatively quickly, compared to existing models, would be useful in the device development process. A single-scale thrombosis model was modified to predict device-induced thrombosis. Bulk concentrations of platelets (non-activated and activated) and a chemical activator are considered. A power law model is used to predict platelet activation based on the local shear stress, and a non-linear weighting function is used to quantify thrombus deposition based on the local wall shear rate. A modified Brinkman term is added to the Navier-Stokes equations to account for a growing thrombus by modeling it as a porous material. In summary, a model that predicts macroscopic thrombus is presented to achieve the goal of expediting the cardiovascular device design process.

Bio

Keefe B. Manning, Ph.D. Associate Professor of Biomedical Engineering and Surgery, Ph.D., Biomedical Engineering, Virginia Commonwealth University, 2001 M.S., Bioengineering, Texas A&M University 1997 B.S., Bioengineering, Texas A&M University, 1995 Dr. Manning's research focuses primarily on 1) understanding the cardiovascular fluid dynamics associated with devices, 2) studying pediatric hemorheology, and 3) developing computational models for thrombosis. To accomplish these goals, in vitro experiments and computational fluid dynamic simulations are conducted to investigate and improve cardiovascular prosthetic devices such as: ventricular assist devices, inferior vena cava filters, and prosthetic heart valves including efforts to minimize the impact of these devices to the cardiovascular system and how thrombi form with these technologies. His work has been supported by NIH, FDA, industry, and private foundations. Currently, he serves as the Chair for the Biofluids Technical Committee of the ASME Bioengineering Division.