



McGill

Mechanical Engineering Colloquium

February 23, 2016

Macdonald Engineering Building (MD) 267 from 2:30-3:30pm

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Multiphysics Modeling of Cardiac Flows: From Heart Murmurs to Ventricular Clot Formation

Abstract:

The heart is first and foremost a flow pump and the design of a healthy heart ensures the smooth and efficient pumping of blood through the cardiac chambers. Not surprisingly, fluid dynamics therefore figures prominently in almost all analyses of cardiac biomechanics. Cardiac pathologies on the other hand, almost always bring to fore the coupling of blood flow with other physical phenomena such as structural dynamics, electromechanics, biochemistry and acoustics. In my talk I will describe two ongoing research projects that are focused on such multiphysics aspects of cardiac flows: the first is on the modeling and clinical translation of coupled flow-biochemistry models of ventricular thrombogenesis (clot formation) in infarcted ventricles, and the second, on the experimental analysis as well as computational modeling of heart murmurs.

Biography:

Rajat Mittal is Professor of Mechanical Engineering at the Johns Hopkins University (JHU). He received the B. Tech. degree in aeronautical engineering from the Indian Institute of Technology at Kanpur in 1989, the M.S. degree in aerospace engineering from the University of Florida, Gainesville in 1991 and the Ph.D. degree in applied mechanics from The University of Illinois at Urbana-Champaign, in 1995. Before coming to JHU he taught at the George Washington University and the University of Florida. His research interests include computational fluid dynamics, vortex dominated flows, biofluid mechanics, and flow control, and he has published over a 100 archival papers on these topics. He is recipient of the 1996 Francois Frenkiel Award from the Division of Fluid Dynamics of the American Physical Society (APS) and the 2006 Lewis Moody Award from the American Society of Mechanical Engineers (ASME). He is a Fellow of ASME as well as APS, and an Associate Fellow of the AIAA. He is associate editor of the Journal of Computational Physics and Frontiers of Computational Physiology and Medicine, and is a member of the editorial board of the Journal of Experimental Biology.