

The Department of Mechanical Engineering/College of Engineering and Applied Sciences, State University of New York at Stony Brook presents:
The Mechanical Engineering Distinguished Lecture Series



Dr. Sheldon Weinbaum, Distinguished Professor, Department of Biomedical Engineering, School of Engineering, City College of City University of New York

Lecture Title: Skiing, tip toeing and feeling your way across the endothelial glycocalyx: A miracle structure for the regulation of transport and red and white cell interaction with vascular endothelium.

2PM, Friday, May 9, 2003 in room 301 of the Engineering Building

Professor Weinbaum has published more than 185 full length papers plus numerous shorter communications and conference papers. His research has involved important collaborations with other investigators and institutions. His joint studies with the UC San Diego have investigated the cellular origins of the permeability of arterial endothelium to low density lipoproteins, transport models for the arterial intima and the formation of subendothelial liposomes. His studies in bioheat transfer have examined the development of a fundamental bioheat equation to describe microvascular blood-tissue heat transfer (Weinbaum-Jiji equation) and the application of bioheat models to describe heat transfer in muscle tissue, limbs, rat tail and finger. His joint studies with the UC Davis have attempted to elucidate the structural pathways through the interendothelial cleft that determine capillary permeability and osmotic forces. His joint studies with S. C. Cowin have explored the cellular transduction mechanism by which bone cells detect mechanically induced strains and communicate these strains to the bone forming cells. His studies with Weill-Cornell Medical School have led to a new hypothesis for the mechanosensory mechanism that leads to the glomerulotubular balance in the kidney. He has also examined a wide variety of basic fluid mechanics problems that have arisen in biologically motivated applications. More than 30 of these papers have been published in the Journal of Fluid Mechanics.

Abstract

While the existence of an endothelial surface layer has been known for four decades, it is only since (1996) that it has been observed *in vivo* and only since then that its multi-varied functions have been appreciated. This has led to a new understanding at the cellular level of the Starling forces for the movement of water across our micro-vessel walls, and a new view as to how red and white cells move through our microcirculation. We shall show that red cells are extraordinarily efficient skiers and that white cells are like Jesus Christ lizards that can run across water. Most recently, we have proposed a new theory describing how fluid shear stresses are transmitted across this surface layer by bush-like core protein structures that are linked to the intracellular cortical actin cytoskeleton of the cell. This new model could lead to fundamental new insights into the relationship between hydrodynamic forces and intracellular signaling.

Previous Distinguished Lectures: The Taguchi Method and Quality Engineering by Genichi Taguchi, October 11, 2002, Mechanics of Materials at Nanosecond Time Scales, by Rodney Clifton, February 21, 2003

By Car: From New York City, take the Long Island Expressway (LIE I-495) eastbound from the Queens Midtown Tunnel in Manhattan or the Throgs Neck Bridge or Whitestone Bridge in Queens To exit 62 and follow Nicolls Road (Route 97) north for 9 miles. The main entrance to the University is on the left. For more information, call Ann at 632 8300

