FEATURED SPEAKER

CHARLES F. BABBS, MD, PHD

Founding Member of Purdue's Biomedical Engineering Center and Senior Lecturer, Weldon School of Biomedical Engineering, Purdue University

Dr. Babbs holds the M.D. from Baylor College of Medicine, and the Ph.D. in pharmacology from Purdue University, and the B.S. in experimental psychology from Yale University. He has written over 200 refereed articles and 10 chapters in scholarly journals and textbooks. His works have been cited over 14,000 times according to Google Scholar. His research is in the areas of biomedical engineering, cardiopulmonary resuscitation, the biochemistry of cellular damage after cardiac arrest, and the biomechanics of closed head injury. He has played a role in the development of several new medical devices, including, an automatic implantable defibrillator, an inspiration triggered system for ambulatory oxygen therapy. He is a former member of the subcommittee on Advanced Cardiac Life Support for the American Heart Association. He continues an active research mission, focusing on mathematical and computer modeling in medicine and physiology.

As an award-winning faculty member at Purdue University from 1975 to the present day and Indiana University School of Medicine, Lafayette from 1978 to 2013 he taught a wide variety of classes including anatomy and physiology, biomedical instrumentation, physical diagnosis, biostatistics, histology, gross anatomy, and microbiology.

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SEMINAR FOR NEUROTRAUMA AND DISEASES

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PRESENTS

THE BRAIN'S WASTE DISPOSAL SYSTEM: HOW GLYMPHATIC FLOW HAPPENS

Date: September 6, 2023 **Time:** 4:00 p.m. - 5:00 p.m. EST

Location: DLR 131 **Zoom Link**: https://bit.ly/441DIlq

Meeting ID: 998 3163 3744 **Passcode:** CPR

ABSTRACT

It has been revealing to explore the biophysics of interstitial tissue fluid flow in the brain, based upon the anatomy and mechanics of the perivascular spaces, in order to better understand how glymphatic flow happens. The dynamics of perivascular and interstitial fluid flow at cardiac frequencies can be investigated in rapidly computable, branched, geometric models of brain tissue at multiple scales. The models include pulsatile changes in intracranial pressure, resulting elastic expansion of brain tissue, and nonlinear changes in resistance to flow of cerebrospinal fluid along the axis of the Virchow-Robin space. Resulting changes in periarterial and perivenous pressures and the resulting bulk flow of interstitial fluid from arteriolar to venular perivascular spaces are calculated on a laptop computer. Under typical physiological conditions a time averaged positive pressure of ~ 0.5 mmHg develops between the smaller, distal periarteriolar and perivenous branches. Based on tissue geometry and hydraulic resistance, the resulting flow is sufficient to refresh the interstitial fluid once every 1 to 10 hours. The calculated average glymphatic flow through the whole brain is similar to the measured production of new cerebrospinal fluid by the arachnoid villi. When the biophysics of cerebrospinal fluid flow in perivascular spaces are properly considered, these spaces have surprising emergent properties. Biologically meaningful amounts of advective interstitial fluid flow can happen between periarteriolar and perivenous spaces, explaining how the brain's "glymphatic" waste disposal system works.

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