Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Modelling flow driven by travelling wave motion in the glymphatic system LOGAN BASHFORD, NOAH ANDERSON, AMY BURKE, JEFFREY TITHOF, DOUGLAS H. KELLEY, University of Rochester — The glymphatic system is a waste removal mechanism of the brain. The glymphatic pathway includes perivascular spaces (PVS), which are annular channels surrounding blood vessels in the brain. These channels are filled with cerebrospinal fluid (CSF). There is substantial experimental evidence that the pulsation of these blood vessels drives CSF flow through the PVS. Irregular or weak arterial pulsations may cause suboptimal flow and poor waste removal. A build-up of these wastes (e.g., amyloid-beta) is linked to the development of neurodegenerative disorders such as Alzheimer's disease. This research introduces a laboratory model of an artery and surrounding PVS. A viscous fluid fills the annular space between a small flexible tube and a rigid transparent cylinder. A travelling wave is generated by moving spherical beads through the flexible tube. The speed of the travelling wave is varied, and flow between the cylinders is quantified with a Lagrangian particle tracking algorithm. It was observed that increasing the speed of the travelling wave increased flow speed in a linear manner. This work provides an experimental foundation to investigate the effect of other parameters, such as frequency, amplitude, and wave shape.

Logan Bashford
University of Rochester

Date submitted: 30 Jul 2019 Electronic form version 1.4