

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Fluid-solid modeling of lymphatic valves ALEXANDER CAULK, MATTHEW BALLARD, ZHANNA NEPIYUSHCHIKH, BRANDON DIXON, ALEXANDER ALEXEEV, Georgia Institute of Technology — The lymphatic system performs important physiological functions such as the return of interstitial fluid to the bloodstream to maintain tissue fluid balance, as well as the transport of immune cells in the body. It utilizes contractile lymphatic vessels, which contain valves that open and close to allow flow in only one direction, to directionally pump lymph against a pressure gradient. We develop a fluid-solid model of geometrically representative lymphatic valves. Our model uses a hybrid lattice-Boltzmann lattice spring method to capture fluid-solid interactions with two-way coupling between a viscous fluid and lymphatic valves in a lymphatic vessel. We use this model to investigate the opening and closing of lymphatic valves, and its effect on lymphatic pumping. This helps to broaden our understanding of the fluid dynamics of the lymphatic system.

Matthew Ballard
Georgia Institute of Technology

Date submitted: 31 Jul 2015

Electronic form version 1.4