1096-76-621 **Nathaniel Karst*** (nkarst@babson.edu), **Brian Storey** and **John Geddes**. *Spontaneous oscillations in simple fluid networks.*

Nonlinear phenomena including multiple equilibria and spontaneous oscillations are common in fluid networks containing either multiple phases or constituent flows. In many systems, such behavior might be attributed to the complicated geometry of the network, the complex rheology of the constituent fluids, or, in the case of microvascular blood flow, biological control. In this paper we investigate two examples of a simple three-node fluid network containing two miscible Newtonian fluids of differing viscosities, the first modeling microvascular blood flow and the second modeling stratified laminar flow. We use a combination of analytic and numerical techniques to identify and track saddle-node and Hopf bifurcations through the large parameter space. In both models, we document sustained spontaneous oscillations and, for an experimentally relevant example of parameter analysis, investigate the sensitivity of these oscillations to changes in the viscosity contrast between the constituent fluids and the inlet flow rates. For the case of stratified laminar flow, we detail a physically realizable set of network parameters that exhibit rich dynamics. The tools and results developed here are general and could be applied to other physical systems. (Received September 08, 2013)