1097-35-71 **Michael Shearer*** (shearer@ncsu.edu), Department of Mathematics, North Carolina State University, Raleigh, NC 27695, and **Melissa Strait**, Department of Mathematics, North Carolina State University, Raleigh, NC 27695. *Two fluid flow in a capillary tube.* Preliminary report.

A phase field model for two-phase flow in a capillary tube, developed by Cueto-Felgueroso and Juanes, results in a PDE with higher-order terms. We find traveling wave solutions of the PDE and determine a bound on parameters to obtain physically relevant solutions. We observe that the traveling wave height decreases monotonically with capillary number. Finite difference simulations of the injection of a gas finger into water show a traveling wave advancing ahead of a rarefaction, leaving a plateau region of fluid adjacent to the tube wall. The residual thickness of this region was measured in experiments by G.I. Taylor in his famous 1961 paper. We find agreement between the traveling wave heights and the plateaus seen in the PDE simulations, and the results also compare favorably with the residual fluid thickness observed in the experiments. (Received January 10, 2014)