1126-35-368 **Gary A. Moon*** (garymoon@live.unc.edu) and **Sarah G. Raynor** (raynorsg@wfu.edu).

Neumann Solutions to a Two-Phase Elliptic Free Boundary Problem in Two Dimensions.

We discuss a two-phase elliptic free boundary problem with mixed boundary conditions. We focus on solutions minimizing the functional

$$J(v) = \int_{\Omega \cap B_r} |\nabla v|^2 + q^2(x)\lambda^2(v)dx$$

over a suitable class of functions where $q(x) \neq 0$, $\lambda^2(v) = \lambda_1^2$ for $v \leq 0$, $\lambda^2(v) = \lambda_2^2$ for $v > 0$ and Ω is a bounded, convex subset of two-dimensional Euclidean space. We are concerned with the behavior of solutions as well as the free boundary near the Neumann part of the fixed boundary. We will establish the Lipschitz continuity of solutions near the Neumann fixed boundary via the use of a monotonicity formula. Additionally, we will discuss the behavior of the free boundary using numerical experiments, specifically focusing on how the free boundary intersects the Neumann fixed boundary. (Received January 17, 2017)