Meeting: 1000, Albuquerque, New Mexico, SS 11A, Special Session on Nonlinear Partial Differential Equations Applied to Materials Science

1000-35-210 **Stan Alama** (alama@mcmaster.ca), Dept. of Math. & Stats, McMaster University, Hamilton, Ontario L8S 4K1, Canada, and **Lia Bronsard*** (bronsard@mcmaster.ca), Dept. of Math. & Stats., McMaster University, Hamilton, Ontario L8S 4K1, Canada. *Vortices and pinning effects for the Ginzburg–Landau model in multiply connected domains.*

We consider the two-dimensional Ginzburg–Landau model with magnetic field, for a superconductor with multiply connected cross-section. We study energy minimizers in the London limit as the Ginzburg–Landau parameter $\kappa = 1/\epsilon \to \infty$, to determine the number and asymptotic location of vortices. We show that the holes act as pinning sites, acquiring nonzero winding for bounded fields and attracting all vortices away from the interior for fields up to a critical value $h_{ex} = O(|\ln \epsilon|)$. At the critical level the pinning effect breaks down, and vortices appear in the interior of the superconductor at locations which we identify explicitly, in terms of the solutions of an elliptic boundary value problem. The method involves sharp upper and lower energy estimates, and a careful analysis of the limiting problem which captures the interaction between the vortices and the holes. (Received August 24, 2004)