1014-76-403 **Lael S Fisher*** (lael@northwestern.edu), Northwestern University, Department of Applied Mathematics, 2145 Sheridan Road, Evanston, IL 60208, and **Alexander A Golovin** (a-golovin@northwestern.edu), Northwestern University, Department of Applied Mathematics, 2145 Sheridan Road, Evanston, IL 60208. *Nonlinear Analysis and Numerical Simulations of a Two-Layer Thin Liquid Film.*

The nonlinear analysis of a two-layer thin liquid film on a solid substrate is performed. Weakly nonlinear stability analysis of a system of two nonlinear coupled PDE's describing evolution of the two interfaces reveals that coupling of van der Waals interactions in the layers can lead to an autophobic behavior of the film, similar to spinodal decomposition. Numerical simulations of the strongly nonlinear evolution equations by means of a conservative finite-difference scheme confirm this conclusion. The effect of both soluble and insoluble surfactants on the film stability is also studied. This case is described by a system of three coupled nonlinear PDE's. Linear stability analysis and numerical simulations show that the presence of surfactants can lead to an osillatory instability of a two-layer film that manifests itself as dewetting waves. (Received September 14, 2005)