Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Spontaneous rupture of thinning liquid films with Plateau borders[1] ANTHONY ANDERSON, Northwestern University, LUCIEN BRUSH, University of Washington, STEPHEN DAVIS, Northwestern University — Spontaneous film rupture from van der Waals instability is investigated in 2D. A thin liquid film between adjacent bubbles in a foam has finite length, curved boundaries (Plateau borders), and a drainage flow from capillary suction that causes thinning. A full linear stability analysis of this thinning film shows that rupture occurs once the film has thinned to *tens* of nanometers. Whereas, in an unbounded, quiescent, flat free film, rupture occurs when the thickness is *hundreds* of nanometers. Finite length, Plateau borders and flow are all found to contribute to the stabilization. The drainage flow leads to several distinct qualitative features as well. In particular, unstable disturbances are advected by the flow to the edges of the thin film. As a result, the edges of the film close to the Plateau borders are more susceptible to rupture that the center of the film.

[1]National Science Foundation, Grant Nos. CMMI-0827101 (LNB) and DMS-0636574 (AMA).

Anthony Anderson
Northwestern University

Date submitted: 03 Aug 2009 Electronic form version 1.4