PHYSICAL MATHEMATICS SEMINAR

TOPIC: DIMPLING AND BUCKLING OF VISCOELASTIC FREE SURFACES

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ABSTRACT:

Among the instabilities which distinguish viscoelastic fluids from Newtonian (Navier-Stokes) fluids, those involving free surfaces are often the most striking. For instance, an air bubble rising in a viscoelastic fluid can have a steady cusp-like tail. I will describe two experiments initially inspired by such cusped bubbles. The first concerns the steady state shape of a polymer fluid drop falling through a viscous medium. At large volumes we observe a dimpled shape, which becomes unstable to an internal tip-streaming; at even larger volumes the drop has a stable, toroidal shape. The second experiment focuses on the stretched funnel-shaped surface formed by the dynamic wetting of a solid sphere sinking slowly into a viscoelastic fluid. As the sphere sinks, we observe a buckling instability which leads to long-lived surface folds. Mathematical models for these observations will also be presented.

DATE: Tuesday, March 30, 2004

TIME: 2:30 PM

LOCATION: Building 2, Room 338

Refreshments at 3:30 PM in Building 2, Room 349.

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