

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Elastocapillary

imbibition

CAMILLE DUPRAT, JEFFREY ARISTOFF, HOWARD STONE, Department of Mechanical and Aerospace Engineering, Princeton University, PRINCETON UNIVERSITY TEAM — The deformation of elastic structures under capillary forces (elastocapillarity), and their interaction with fluid flow (elastohydrodynamics), are relevant to many biological, geophysical and engineering processes. Here, we present the dynamics of surface-tension-driven flow into a gap between flexible boundaries (i.e. elastocapillary imbibition). We examine two model systems of elastocapillary imbibition, with and without gravitational effects, using a combination of experiment, theory, and numerical simulation. We identify the characteristic length and time scales, and demonstrate how the presence of flexible boundaries leads to a departure from classical imbibition. The time to reach equilibrium (if one exists) is determined, and a criterion for the coalescence of the boundaries is established. Good agreement between experiment and theory is obtained.

Camille Duprat
Dept of Mechanical and Aerospace Engineering, Princeton University

Date submitted: 28 Nov 2010

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