Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

FRAP in thin film flows JASON WEXLER, IAN JACOBI, HOWARD STONE, Princeton University — A new technique is proposed for measuring the velocity field within thin liquid films, which combines Fluorescence Recovery After Photobleaching (FRAP) measurements with two-dimensional Taylor dispersion analysis. FRAP is a technique used largely by biologists to measure the diffusion coefficient of compounds in living cells. A small spot of fluorescent dye is bleached and then monitored for subsequent fluorescence recovery. The rate of recovery can be related to the coefficient of molecular diffusion. In our experiments we apply FRAP to a flowing liquid film, where advection, in addition to molecular diffusion, contributes to the evolution of the bleached spot. By employing simple optical measurements of the rate of advection and diffusion, combined with an analysis of dispersion, we can uniquely determine the velocity profile within a thin film. As a proof of concept we apply this technique to shear-driven flow over a liquid film within a micro-patterned surface.

Jason Wexler
Princeton University

Date submitted: 01 Aug 2013 Electronic form version 1.4