CNLD Seminar, Monday, October 5, 1:00 p.m. PMA 11.204

Dynamics of bubbles in a fluid flow between closely spaced plates

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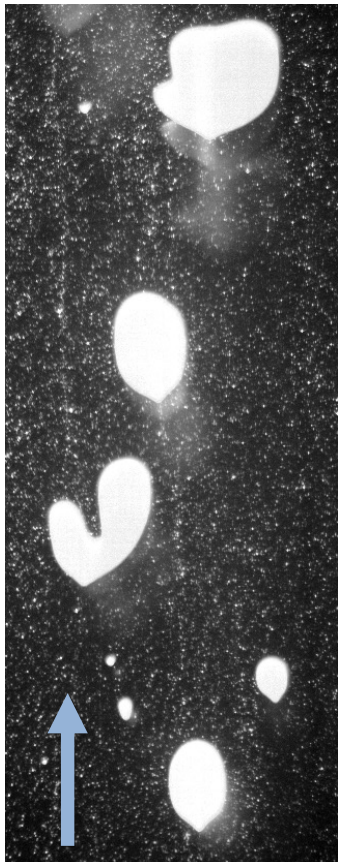

We examine "Laplacian growth," a prototype for many processes such as bacterial colony growth, combustion fronts, and dendritic solidification. Laplacian growth is a universal process that includes all major features of unstable interface dynamics: nonlinearities, instabilities, universal patterns, and applications ranging from malignant growth to oil/gas recovery. Interest in Laplacian growth is also driven by recent discoveries of connections to quantum gravity and the quantum Hall effect. In addition, Laplacian growth has close connections with classical mathematics (e.g., Riemann surfaces and the inverse potential problem) and to modern developments such as solitons and random matrices. We consider the dynamics of an interface of a moving fluid interface between two parallel plates separated by an infinitesimally small gap, which is called Hele-Shaw flow. In 1958 Saffman and Taylor posed the question: what selects the shape of the interface from a continuum of possible solutions in a Hele-Shaw flow? In this talk we will discuss how consideration of "well-posedness" can lead to a solution for the interface for fluids, both with surface tension and without surface tension. We hope that experiments will be designed to test our theoretical predictions. The combination of theory and experiment should lead to an improved fundamental understanding of growth patterns.