

Variations on familiar flows:

- (i) Marangoni flows with soluble surfactants and*
- (ii) Trapping of bubbles in stagnation point flows*

Howard Stone

Princeton University

In this talk we describe two distinct problems that we have studied where seemingly modest variations in the flow produce new effects. First, we describe an experiment where the degree of miscibility of an amphiphile controls the area over which a surface-tension-driven flow is observed at the interface of water and air. We report universal features of the surface velocity distribution and identify a scaling law for the area over which the flow is observed. An analytical description is offered for some of these observations. Second we consider flow in a T-junction, which is perhaps the most common element in many piping systems. The flows are laminar but have high Reynolds numbers, typically $Re=100-1000$. It seems obvious that any particles in the fluid that enter the T-junction will leave following the one of the two main flow channels. Nevertheless, we report experiments that document that bubbles and other low density objects can be trapped at the bifurcation. The trapping leads to the steady accumulation of bubbles that can form stable chain-like aggregates in the presence, for example, of surfactants, or give rise to a growth due to coalescence. Our three-dimensional numerical simulations rationalize the mechanism behind this phenomenon.