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Shuwang Li* (sli15@iit.edu), Rettaliata Engineering Center, 10 W. 32nd St., Room 208,
Chicago, IL 60616. *Curvature driven interface problems: modeling and computation.*

The Hele-Shaw problem is a classical example for studying interface dynamics or systems driven out of equilibrium. When a less viscous fluid is injected into a Hele-Shaw cell to displace an existing viscous fluid, the interface separating the two fluids develops fingering patterns due to the well-known Saffman-Taylor instability. Repeated finger tip-splitting events lead to dense branching morphologies.

In this talk, I will present a curvature weakening model, which is concerned with a newly-produced gel-like phase that stiffens the interface, thus the interface is modeled as an elastic membrane with curvature dependent rigidity that reflects geometrically induced breaking of intermolecular bonds. We perform simulations using a spectrally accurate boundary integral method, together with a rescaling scheme to dramatically speed up the intrinsically slow evolution of the interface. We find curvature weakening may inhibit tip-splitting and promotes side-branching morphology. (Received January 25, 2019)