

# PHYSICAL MATHEMATICS SEMINAR

## Nonlinear interfacial phenomena in multilayer shear flows

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### ABSTRACT:

Viscous multilayer flows can become unstable at small Reynolds numbers due to the presence of interfaces and resulting interfacial deflections. This talk will provide an overview of nonlinear interfacial instabilities in microscale flows where inertia may be absent or moderate. Several problems involving single-, two- and three-fluid multilayer flows will be discussed and the nonlinear coherent structures that can emerge will be described. The models derived (nonlocal with multi scale coupling between the phases) are shown to perform well in comparisons with DNS and experiments. The models also predict experimental phenomena that have not been described theoretically to-date. The effect of surfactants will also be discussed and in particular for three-dimensional flows (two-dimensional interfaces) and some rigorous results will be given and open problems noted. Finally, some recent results will be described on multilayer flows when there is Navier slip at fluid-fluid interfaces, a kind of viscous analogue of the Kelvin-Helmholtz instability. We find that slip can destabilize otherwise stable flows.

**TUESDAY, NOVEMBER 30, 2021**

**2:30 PM – 3:30 PM**

<https://math.mit.edu/sites/pms/>

<https://mit.zoom.us/j/95597721876>

**Meeting ID: 95597721876**