1155-76-423 **H. Reed Ogrosky*** (hrogrosky@vcu.edu). *Linear stability, nonlinear dynamics, and predicting plug formation for film flows inside a tube in the presence of surfactant.*

Viscous film flows inside a tube arise in numerous scientific applications. If such films are thick enough, they may pinch off and form liquid bridges, or plugs. The presence of an insoluble surfactant at the film's free surface has been previously shown to delay plug formation and in this talk we explore this phenomenon using a long-wave model. Linear stability analysis identifies two modes; in the absence of base flow, the 'interface' mode is the only unstable mode. The growth rates of this mode serve as an accurate predictor of how surfactant concentration increases plug formation time, and the effects of film thickness on this increase are quantified. In the presence of base flow, both the interface mode and 'surfactant' mode may be unstable. In the absence of surfactant, turning points in traveling wave solution families have previously been shown to be a good indicator of h_c, the critical thickness past which plugs may form. Here, in the presence of surfactant, turning points in solution families that arise from an unstable surfactant mode give an estimate of h_c, if the interface mode is linearly stable. When both modes are unstable, interpretation of these turning points as they relate to plug formation is more complicated. (Received January 20, 2020)