1072-76-123 **Pam Cook*** (cook@math.udel.edu), Department of Math Sciences, University of Delaware, Newark, DE 19716, and **Lin Zhou**, **Michael Cromer** and **Gareth McKinley**. *Models and flows of complex (wormlike micellar) fluids.*

Highly entangled microstructural systems such as wormlike micellar (surfactant) fluids can exhibit spatially inhomogeneous shear-banding structures under simple deformations. Rheological equations of state capable of describing these fluids include the VCM model, a model which specifically incorporates the rate-dependent breakage and reforming of these wormy micelles. The resulting coupled system of nonlinear partial differential equations, constitutive equations together with conservation of mass and momentum, describes the number density and stresses of each of the micellar species in addition to other stress-relaxation mechanisms. In shear flow the model predicts the localized shear-bands where the macroscopic field varies rapidly and the fluid microstructure is highly aligned. The use of numerics and asymptotics to interrogate these models in transient and oscillatory shear, and pressure-driven flow in microfuidic devices will be described. Of particular emphasis will be the predictions of the model including boundary layers, shear layers, and with and without inertial effects. (Received June 24, 2011)