Center for Fluid Mechanics and Condensed Matter Physics Seminar

Thursday 4pm BH 190

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"Mixing and instability in complex and active fluids"

I will discuss two problems where flow instability drives a complex fluid -- or at least its mathematical model -- into intrinsic oscillations and unsteadiness. Both are in the Stokesian regiime where inertial effects are negligible. In the first, a visco-elastic fluid described by the Oldroyd-B model is driven by a background force that creates a local extensional flow. Beyond a critical Weissenberg number, stress accumulates rapidly there, and a symmetry breaking instability leads to coherent structures and multiple frequencies of oscillation. In the second, the complex fluid is a self-driven suspension of active swimmers. Analysis and simulation show the existence of long-wave instabilities that drive the system from isotropy to strongly mixing flows with system-size correlations.