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**Viscoelastic Fluid-Structure Interactions** ANITA DEY, JONATHAN ROTHSTEIN, YAHYA MODARRES-SADEGHI, University of Masachusetts Amherst — When a flexible object such as an elastic sheet is placed perpendicular to the flow of a Newtonian fluid, the structure can oscillate due to the shedding of separated vortices at high Reynolds numbers. If the same flexible object is placed in non-Newtonian flows, however, the structure's response is still unknown. Unlike Newtonian fluids, the flow of viscoelastic fluids can become unstable at infinitesimal Reynolds numbers due to a purely elastic flow instability. In this talk, we will discuss the fluid-structure interaction between a wormlike micelle solution at high Weissenberg number and a flexible elastic sheet in cross flow. Elastic flow instabilities have been observed for wormlike micelle solutions in a number of flows. Here we will study what happens when elastic flow instabilities occur in the vicinity of a thin flexible polymer sheet. We will show that the time varying fluid forces exerted on the structure can grow large enough to cause a structural motion which can in turn feed back into the flow to modify the flow instability. The static and dynamic responses of the flexible sheet will be presented for a series of flexible sheets oriented at different angles to the flow direction, for varying fluid flow rates, and for varying fluid compositions and properties. In addition, measurements of velocity profiles and flow-induced birefringence will be presented in order to quantify the time variation of the flow field and the state of stress in the fluid.

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