Meeting: 999, Nashville, Tennessee, SS 11A, Special Session on Nonlinear Partial Differential Equations and Applications

999-35-124 **Thomas C. Hagen*** (thagen@memphis.edu), Department of Mathematical Sciences, 373 Dunn Hall, The University of Memphis, Memphis, TN 38152-3240. *Mechanics of Forced Elongation.* Preliminary report.

As a response to recent successes in material design and processing techniques, the last few years have seen a rapid growth of hydrodynamical and analytical studies of nonstandard flow regimes. In particular, the formation and evolution of free fluid fibers and films has been the focal point of intensive research.

In this note we present analytical and numerical advances in the understanding of the forced elongation of highly viscous fluid filaments. Flows of this kind can be found in nature (spinning of spider silk) and industry (fiber spinning, glass drawing). The equations governing forced elongation are essentially due to Matovich and Pearson. They consist of a nonlinear mass transport equation coupled to a nonlinear momentum balance in one spatial dimension. In the talk we will show that the solutions of the Matovich-Pearson equations exhibit filament break-up at no point in time and that the onset of instabilities (draw resonance) is inhibited by cooling and inertia.

Part of the presentation is based on joint work with Michael Renardy. (Received August 18, 2004)