1071-65-1 **Hector D Ceniceros*** (hdc@math.ucsb.edu), Department of Mathematics, University of California Santa Barbara, Santa Barbara, CA 93110. *Immersed boundaries in complex fluids.*

The interaction of flexible free-to-move boundaries with non-Newtonian (complex) fluids is receiving increased attention. Accurately capturing the coupled dynamics of this intricate flow-structure interaction is a challenging computational problem. The Immersed Boundary (IB) Method provides a versatile tool for this type of systems. However, even in the Newtonian fluid case, strong tangential forces on the immersed structures induce a well-known, severe time-step restriction for explicit discretizations. Moreover, as the number of immersed elements increases, the direct evaluation of the flow-structure interaction becomes computationally expensive. We will present a new approach that overcomes these two difficulties and yields a fast and non-stiff IB Method both in 2D and 3D. We will then discuss our progress in the investigation of peristaltic pumping in a simple model of a viscoelastic fluid in 3D. (Received March 07, 2011)