Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

**Dynamics and structure of simple suspensions of active dipoles** TONG GAO, Courant Institute of Mathematical Sciences, MEREDITH BETTERTON, University of Colorado at Boulder, AN-SHENG JHANG, MICHAEL SHELLEY, Courant Institute of Mathematical Sciences — We analyze what is perhaps the simplest active fluid with complex dynamics: a suspension of non-motile, but mobile, "extensor" or "contractor" rods that exert active dipolar stresses on a fluid in which they are immersed. This is relevant to several experimental systems, including growing filaments in isotropic to smectic phase transitions, bundles of cytoskeletal filaments driven by motor proteins, and trimetallic gold-platinum rods immersed in hydrogen peroxide solutions. We first describe the system through a kinetic theory based on microscopic modeling. The stresses produced by particle activity produces long-ranged hydrodynamic coupling, and for extensors can lead to complex time-dependent flows and, depending upon flow geometry, to a form of singularity dynamics through disclination defects production, propagation, and annihilation. We then study useful closures of the kinetic theory, particularly the "Q-tensor" Bingham closure that has been used to study suspensions of passive micrscopic rods.

Tong Gao
Courant Institute of Mathematical Sciences

Date submitted: 26 Jul 2015 Electronic form version 1.4