

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Spontaneous Oscillations in Nonlinear Active Solids**<sup>1</sup> SHILADITYA BANERJEE, Syracuse University, TANNIEMOLA B. LIVERPOOL, University of Bristol, M. CRISTINA MARCHETTI, Syracuse University — We present a generic continuum model of a nonlinear active gel with both passive and active crosslinks. The model is relevant for actin gels with passive elasticity provided by ABPs such as filamin-A or  $\alpha$ -actinin and dynamic active crosslinkers such as myosin-II. We consider an one dimensional continuum active solid where compressional deformations are coupled to molecular motor dynamics. Three kinds of nonlinearities are incorporated : (a) nonlinear load dependence of unbinding rate of molecular motors, (b) pressure nonlinearities stemming from excluded volume interactions, and (c) nonlinearity due to convection of bound motors along the gel. Unbinding rate nonlinearity stabilizes the oscillatory instabilities predicted by the linear theory and lead to sustained oscillations at intermediate concentrations of ATP. Pressure nonlinearity due to excluded volume interactions stabilizes the contractile instability and leads to a contracted ground state. Our work provides a generic framework for the description of the large scale properties of nonlinear isotropic active solids.

<sup>1</sup>This work is supported by the NSF on grants DMR-MWN-0806511 and DMR-100478.

Shiladitya Banerjee  
Syracuse University

Date submitted: 19 Nov 2010

Electronic form version 1.4