Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Critical forces for actin filament buckling and force transmission influence transport in actomyosin networks SAMANTHA STAM, Univ of Chicago, MARGARET GARDEL, Dept. of Physics, Univ of Chicago — Viscoelastic networks of biopolymers coordinate the motion of intracellular objects during transport. These networks have nonlinear mechanical properties due to events such as filament buckling or breaking of cross-links. The influence of such nonlinear properties on the time and length scales of transport is not understood. Here, we use in vitro networks of actin and the motor protein myosin II to clarify how intracellular forces regulate active diffusion. We observe two transitions in the mean-squared displacement of cross-linked actin with increasing motor concentration. The first is a sharp transition from initially subdiffusive to diffusive-like motion that requires filament buckling but does not cause net contraction of the network. Further increase of the motor density produces a second transition to network rupture and ballistic actin transport. This corresponds with an increase in the correlation of motion and thus may be caused when forces propagate far enough for global motion. We conclude that filament buckling and overall network contraction require different amounts of force and produce distinct transport properties. These nonlinear transitions may act as mechanical switches that can be turned on to produce observed motion within cells.

Samantha Stam
Biophysical Sciences Graduate Program, Univ of Chicago

Date submitted: 06 Nov 2015 Electronic form version 1.4