Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

F-actin Severing Facilitates Distinct Mechanisms of Stress Relaxation in the Actin Cytoskeleton[1] TAEYOON KIM, Weldon School of Biomedical Engineering, Purdue University, WONYEONG JUNG, School of Mechanical Engineering, Purdue University, MICHAEL MURRELL, Systems Biology Institute and Department of Biomedical Engineering — Rheological behaviors of actin cytoskeleton play an important role in physiological processes including cell migration and division. The actin cytoskeleton shows a wide variety of viscoelastic responses to external mechanical cues, such as strain-stiffening and stress relaxation. It has been hypothesized that the stress relaxation originates mainly from transient nature of cross-linkers that connect pairs of F-actins. By contrast, potential impacts of rich F-actin dynamics to the stress relaxation have been neglected in most previous studies. Here, using a computational model, we demonstrated that severing of F-actins induced by buckling during strain-stiffening can facilitate a very distinct mode of stress relaxation in the actin cytoskeleton from that induced by the transient cross-linkers. We also explored conditions where the severing-induced stress relaxation becomes prominent. This finding provides a more complete understanding of rheological behaviors of the actin cytoskeleton.

[1]We gratefully acknowledge the support of the National Science Foundation (1434013-CMMI and 1434095-CMMI).

Taeyoon Kim
Purdue Univ

Date submitted: 02 Nov 2015 Electronic form version 1.4