Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Surface manipulation of protein filaments[1] LAURENT KREPLAK, DOUGLAS STAPLE, Dalhousie University, MARKO LOPARIC, Biozentrum, University of Basel, HANS-JUERGEN KREUZER, Dalhousie University — Within mammalian tissues, cells move by actively remodeling a dense network of collagen fibrils. In order to study this situation, we analyze the force response of two types of filamentous protein structures, desmin intermediate filaments 12 nm in diameter and collagen fibrils 80 nm in diameter. Both types of filaments were adsorbed at a solid-liquid interface and locally moved with an AFM tip at constant velocity against surface friction in the interfacial plane. In the case of collagen fibrils, that have an extensibility below 30% extension, we observed that microns long fibrils could be moved by the tip and deformed into shapes that could not be explain by the linear elastic theory for a stiff rod. In the case of desmin filaments that can be stretched up to 3.5 times there length, we observed local stretching of the filaments and discreet steps in the torsional force measured with the cantilever. In order to describe both types of filaments' behaviors, we described the protein filaments as a chain of beads of mass m linked together by a mass-less polymer linker. By solving the Newtonian equations of motions for the coupled beads in the presence of a point load and a viscous drag due to the surface-filament interactions we were able to reproduced our experimental data and extract information on friction.

[1]This work was supported by grants from NSERC.

Laurent Kreplak
Dalhousie University

Date submitted: 25 Nov 2008 Electronic form version 1.4