Abstract Submitted
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Carbon nanotubes as mechanical probes of equilibrium and non-equilibrium cytoskeletal networks NIKTA FAKHRI, Third Institute of Physics - Biophysics, Georg-August-Universitaet, Goettingen, Germany, MATTEO PASQUALI, Department of Chemical and Biomolecular Engineering, Rice University, Houston, TX, USA, FREDERICK C. MACKINTOSH, Department of Physics and Astronomy, Vrije Universiteit, Amsterdam, The Netherlands, CHRISTOPH F. SCHMIDT, Third Institute of Physics - Biophysics, Georg-August-Universitaet, Goettingen, Germany — Networks of filamentous proteins underlie the mechanics of cells. The activity of motor proteins typically creates strong fluctuations that drive the system out of equilibrium. Understanding the behavior of such networks requires probes that ideally span the characteristic length-scales, from nanometers to micrometers. Single-walled carbon nanotubes (SWNTs) are nanometer-diameter filaments with micrometer length and tunable bending stiffness. On a Brownian energy scale they have persistence lengths of about 20-100 micrometers and show significant thermal fluctuations on the cellular scale of a few microns. Diffusive motion and local bending dynamics of SWNTs embedded in an active polymeric network reflect forces and fluctuations of the embedding medium. We study the motion of individual SWNTs in equilibrium and non-equilibrium networks by near infrared fluorescence microscopy. We show that SWNTs reptate in the network. We will discuss the possibility of using SWNTs as multi-scale probes relating their local dynamic behavior to the viscoelastic properties of the surrounding network.

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