Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Characterizing Cell Mechanics with AFM and Microfluidics N. WALTER, Max-Planck Institute for Metals Research and University of Heidelberg, Germany; Massachusetts Institute of Technology, USA, A. MICOULET, S. SURESH, MIT, J.P. SPATZ, Max-Planck Inst. for Metals Research and Univ. of Heidelberg — Cell mechanical properties and functionality are mainly determined by the cytoskeleton, besides the cell membrane, the nucleus and the cytosol, and depend on various parameters e.g. surface chemistry and rigidity, surface area and time available for cell spreading, nutrients and drugs provided in the culture medium. Human epithelial pancreatic and mammary cancer cells and their keratin intermediate filaments are the main focus of our work. We use Atomic Force Microscopy (AFM) to study cells adhering to substrates and Microfluidic Channels to probe cells in suspension, respectively. Local and global properties are extracted by varying AFM probe tip size and the available adhesion area for cells. Depth-sensing, instrumented indentation tests with AFM show a clear difference in contact stiffness for cells that are spread of controlled substrates and those that are loosely attached. Microfluidic Channels are utilized in parallel to evaluate cell deformation and "flow resistance", which are dependent on channel cross section, flow rate, cell nucleus size and the mechanical properties of cytoskeleton and membrane. The results from the study are used to provide some broad and quantitative assessments of the connections between cellular/subcellular mechanics and biochemical origins of disease states.

N. Walter
Max-Planck Institute for Metals Research and
University of Heidelberg, Germany; Massachusetts Institute of Technology, USA

Date submitted: 15 Nov 2006 Electronic form version 1.4