MAR10-2009-020242

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

Shaping Cells by Force and Rigidity through Protein Stretching

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Control of cell morphology involves the integration of mechanical sensing and different types of cell motility to produce the desired shape of the organism. Nanometer level analyses of cell behavior have revealed only a limited number of types of motility involving complex mechanochemical steps (Döbereiner, et al., 2004. *Phys Rev Letters* **93**, 108105). For example, cell spreading on matrix-coated surfaces have revealed three different types of motility, an initial blebbing, continuous spreading, and periodic contraction motility dependent upon myosin II. Matrix forces are sensed by protein stretching through two different cytoplasmic mechanisms. One example is the activation of protein phosphorylation by stretching (Sawada et al., 2006. Cell 127, 1015). Secondly, the stretching of proteins can unveil binding sites such as the stretching of talin causing the increased binding of vinculin (del Rio et al., 2009. Science 323, 638). Stretching controls different motility types and it is important to understand each type of motility at the nanometer level.