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Abstract Title: **Combining Magnetic and Optical Trapping to Quantify Position Dependent Variations in Cellular Rheology**

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The capability of using optical tweezers to precisely arrange magnetic beads in a predetermined pattern on a surface was demonstrated. We have used optical tweezers to position magnetic beads on specific locations of tear drop shaped micropatterned cells to determine the rheological differences between the leading and trailing edge of migrating cells. Microcontact printing of self-assembled monolayers (SAMs) of alkanethiolates on gold was used to generate a substrate consisting of an array of asymmetric teardrop patterns surrounded by non-adhesive regions. Cells plated on such substrates spread to take on the shape of the underlying pattern. Fibronectin coated magnetic beads were optically trapped and brought into contact with the cell at a specific location for a minute after which the trap was turned off and the bead left to naturally adhere. The location of each cell was marked by burning a box around the cell in the gold substrate. Magnetic trap experiments were performed 12 hours after the beads were positioned to allow endocytosis of the beads to occur. Our preliminary results indicate that the leading edge has a significantly higher shear modulus than the trailing edge and that this increase in shear modulus correlates with a greater density of filamentous actin as measured by phalloidin staining. We thank NIH (P01HL6485, and Biotechnology Training Program Fellowship to R.B.), the NSF (graduate research fellowship to T.J.S.). and the Lemelson Foundation (graduate fellowship to R.B.) for financial support.

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