Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamic contact guidance of migrating cells WOLFGANG LOSERT, XIAOYU SUN, CAN GUVEN, MEGHAN DRISCOLL, JOHN FOURKAS, University of Maryland College Park — We investigate the effects of nanotopographical surfaces on the cell migration and cell shape dynamics of the amoeba Dictyostelium discoideum. Amoeboid motion exhibits significant contact guidance along surfaces with nanoscale ridges or grooves. We show quantitatively that nanoridges spaced 1.5 μm apart exhibit the greatest contact guidance efficiency. Using principal component analysis, we characterize the dynamics of the cell shape modulated by the coupling between the cell membrane and ridges. We show that motion parallel to the ridges is enhanced, while the turning, at the largest spatial scales, is suppressed. Since protrusion dynamics are principally governed by actin dynamics, we imaged the actin polymerization of cells on ridges. We found that actin polymerization occurs preferentially along nanoridges in a "monorail" like fashion. The ridges then provide us with a tool to study actin dynamics in an effectively reduced dimensional system.

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Date submitted: 15 Nov 2013 Electronic form version 1.4