Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Phase Separation and Membrane Protrusions Driven by Actin Polymerization and Adhesion ALEX VEKSLER, NIR S. GOV, Weizmann Institute of Science, Israel — Formation of protrusions and protein segregation on the membrane is of a great importance for the functioning of the living cell. This is most evident in recent experiments that show the effects of the mechanical properties of the surrounding substrate on cell morphology. We model the cell membrane as having a mobile but constant population of protein with a convex spontaneous curvature. Our basic assumption is that these membrane proteins represent small clusters that may include both adhesion proteins (integrins) and proteins that activate actin polymerization (WASP). We propose a continuum model based on the Helfrich's Hamiltonian for the membrane elastic energy, including the adhesion, with the protrusive actin force added to the equations of motion. Linear stability analysis shows that sufficiently strong adhesion energy and actin polymerization force, can bring about phase separation of the membrane protein and the appearance of protrusions. Specifically this occurs when the spontaneous curvature alone does not. Different instability characteristics are calculated for the various regimes, and are compared to various types of observed protrusions.

Alex Veksler
Weizmann Institute of Science, Israel

Date submitted: 19 Nov 2006 Electronic form version 1.4