Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Physical Mechanisms of Patterning Instabilities in the Formation of Vascular Network ABBAS SHIRINIFARD, JAMES GLAZIER, The Biocomplexity Institute, Department of Physics, Indiana University, SHANTIA YARAHMADIAN, Mathematics Department, Indiana University — Endothelial cells, which line the inner walls of blood vessels, self-organize into network structures in vitro and in vivo. The physical mechanisms of network formation are a current subject of debate may be important during development, wound heeling, and tumor growth. Using Glazier and Graner's Cellular Potts Model (CPM) to model chemotactically migrating cells, we studied the patterning instabilities and scaling properties of the network in two and three-dimensions. We ran our simulations in Compucell3D, an open-source software environment based on CPM (http://simtk.org/home/compucell3d). The average characteristics of the network structure are independent of the initial configuration of cells and scale with the diffusion parameters of the chemoattractant. We have also developed an analytical PDE model to study nature of patterning instabilities.

Abbas Shirinifard
The Biocomplexity Institute, Department of Physics, Indiana University

Date submitted: 20 Nov 2006 Electronic form version 1.4