1038-92-127 **James A. Glazier*** (glazier@indiana.edu), Indiana University, Dept. of Physics and Biocomplexity Institute, 727 East 3rd Street, Swain Hall West 159, Bloomington, IN 47405-7105, and **Abbas Shirinifard** (ashirini@indiana.edu), Indiana University, Dept. of Physics and Biocomplexity Institute, 727 East 3rd Street, Swain Hall West 024, Bloomington, IN 47405-7105.
Instability Mechanisms and Wavelength Selection during Vasculogenesis and Angiogenesis.

The initial organization of randomly-distributed capillary endothelial cells to form a primary vascular network (or plexus) is a striking and counterintuitive process during early vertebrate development. The network rapidly reorganizes into a pattern of quasi-polygonal domains whose length-scale increases in time due to domain disappearance. This organization presents several fundamental biological and mathematical problems. Biologically, by what mechanisms do the endothelial cells signal to each other to form the network: mechanically or by secretion of diffusible chemicals? If the latter, what chemicals? Do the same mechanisms also direct sprouting angiogenesis (which is important in wound healing and cancer in adults)? Mathematically, what determines the thickness of the vascular cords and the much longer scale of the quasi-polygonal network? I will present a number of results on the mathematics and simulation of chemotaxis-driven vasculogenesis and angiogenesis, including a discussion of a novel instability mechanism which leads to the wavelength selection which determines the cord width. I will also show that the resemblance between a two-dimensional soap froth and the primary vascular plexus results from a surprising mathematical equivalence of their governing equations. (Received February 04, 2008)