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Vasculogenesis and collective movement of endothelial cells

The early vascular network is one of the simplest functioning organs in the embryo. Its formation involves only one cell type and it can be readily observed and manipulated in avian embryos or in vitro explants. The early vascular network of warm-blooded vertebrates self-organizes by the collective motility of cell streams, or multicellular "sprouts". The elongation of these future vascular network segments depends on a continuous supply of cells, moving along the sprout towards its tip. To understand the observed self-organization process, we investigate computational models containing interactions between adherent, polarized and self-propelled cells. By comparing the simulations with data from in vivo or simplistic in vitro experiments, we explore the role of active migration, tip cells, invasion of the ECM, and cell guidance by micromechanical properties of adjacent cell surfaces.