

Hydra axis formation: The first steps towards spontaneous, collective symmetry breaking - nearest-neighbour communication and the importance of fluctuations

Heike Dobicki

Biologische Experimentalphysik, Universität des Saarlandes, Saarbrücken, Germany

Symmetry breaking in early embryonic development and in the early evolution of multicellular organisms is based on the polarization of cells and tissue. The underlying biological mechanisms are not yet understood. Prior work from our group presented a nearest-neighbour interaction based model that explains, based on a simple idea, experimentally observed temperature dependent axis orientation as well as *ks1* mRNA expression fluctuations [1]. Here we show the importance of shape fluctuations and mechanotransduction in the early stages of symmetry breaking. We observe self organized polarization in regenerating hydra spheroids. This process is driven by biomechanical oscillations and mediated by the microtubule cytoskeleton.

[1] Gamba, A.; Nicodemi, M.; Soriano, J. & Ott, A. Critical behavior and axis defining symmetry breaking in Hydra embryonic development *Physical Review Letters*, APS, 2012, 108, 158103