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Collective migration in myxobacteria driven by adventurous motility and elongated cell shape

Myxococcus xanthus is a soil living bacterium that is capable of forming multicellular fruiting bodies. Thus, M. xanthus may serve as an attractive model system for studying organizational principles that allow individual cells to organize into and behave like a multicellular organism.

I will present our latest experimental insights on the cluster formation of adventurous myxobacteria with the main focus on statistical analysis [3]. Interestingly, initially unstructured colonies restructure into collectively migrating clusters and finally converge into a characteristic distribution of cluster sizes.

We envisage a simple mechanism for clustering based on the characteristic rod cell shape and cell motility. We made use of three modelling approaches, including a cellular Potts model, to elucidate their implications on multicellular organization [1,2]. Recently we have shown that self-propelled rods interacting just by volume exclusion exhibit a non-equilibrium transition to clustering [1]. Using both, statistical analysis and a mean field approach, we show that the models resemble the characteristics of the experimental cluster size distributions, including a clustering transition at a critical cell density.

References

[1] Peruani, F., Deutsch, A., & Bär, M. (2006) *Non-equilibrium clustering of self-propelled rods.* Phys. Rev. E, **74**(3), 030904.
[2] Starruß, Jörn, Bley, Thomas, Søgaard-Andersen, Lotte and Deutsch, Andreas (2007) *A new mechanism for collective migration in M. xanthus*, in: J. Stat. Phys., **128**, pp 269-286
[3] Manuscript in preparation