# Self-organized lane formation in bidirectional transport of molecular motors

Robin Jose and Ludger Santen

*Department of Theoretical Physics & Center for Biophysics, Saarland University, 66123 Saarbrücken, Germany*

Within cells, vesicles and proteins are actively transported several micrometers along the cytoskeletal filaments. The transport along microtubules is propelled by dynein and kinesin motors, which carry the cargo in opposite directions. Bidirectional intracellular transport is performed with great efficiency, even under strong confinement, as for example in the axon, where bidirectional motor-driven transport is carried out on a bundle of parallel microtubules which are embedded in a long, narrow, and crowded channel. For this kind of transport system one would expect generically cluster formation.
In this work we discuss the effect of the recently observed self-enhanced binding affinity along the kinesin trajectories on the MT [1]. We introduce a stochastic lattice gas model, where the enhanced binding affinity is realized via a floor-field. Our model results show that this mechanism can lead to symmetry breaking and lane formation which indeed leads to efficient bidirectional transport in narrow environments.

[1] Shima et al., J Cell Biol, 217, 4164, (2018).