Theoretical modeling of kinesin and dynein gliding assays

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Inside the cell, cargo needs to be transported in a controlled, well targeted manner over long distances. The intracellular transport is performed by molecular motors walking on cytoskeletal filaments. Here we focus on microtubule-based long-range transport carried out by anterogradely directed kinesin and retrogradely directed dynein motors.
In close collaboration with the experiment we use theoretical modeling to investigate kinesin and dynein gliding assays with the objective of understanding their collective behavior inside the cell.
Our experimental results point out that contrary to kinesin motors, dynein motors need the collective to walk processively.
On the base of earlier studies of motor driven transport [1], we introduce a model where single dynein motors perform unbiased motion until they activate each other by tension.

[1] Sarah Klein, Cécile Appert-Rolland, and Ludger Santen. EPL (Europhysics Letters), 107(1):18004 (2014).