LadHyX/LMS Seminar – May 12, 11:00, – LadHyX Library

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Shake your hips: an active particle with a fluctuating propulsion force

The active Brownian particle (ABP) model describes a microswimmer, synthetic or living, whose direction of swimming is a Brownian motion. The swimming is due to a propulsion force, and the fluctuations are often assumed thermal in origin. We present a 2D model where the fluctuations arise from nonthermal noise in a propelling force acting at a single point, such as that due to a flagellum. We carefully take the overdamped limit and find several modifications to the traditional ABP model. Since the fluctuating force causes a fluctuating torque, the diffusion tensor describing the process has a coupling between translational and rotational degrees of freedom. An anisotropic particle also exhibits a noise-induced drift. We show that these effects have measurable consequences for the long-time diffusivity of active particles, in particular adding a contribution that is independent of where the force acts. This is joint work with Jiajia Guo.