Diffusion in models of active Brownian particles of relevance in biological self-propelled motion

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Self-propelled motion is one of the most fascinating aspects of biological systems. This motion can appear in many different biological contexts either inside cells[1] (*e.g.* molecular motor proteins[2]) or on the multi-cellular level[1]. Simple phenomenological models can help to understand the dynamics of self-propelled entities and their statistics (including their transport properties).

One class of models successfully studied during the last 15 years are active Brownian particles[3] (ABP). Here we study, both theoretically and numerically, the effective diffusion coefficient of one-dimensional ABP models. We show that, depending on the choice of the friction function, the diffusion coefficient does or does not attain a minimum as a function of noise intensity. We furthermore discuss the case of an additional bias breaking the left-right symmetry of the system. We show that this bias induces a drift and that it generally reduces the diffusion coefficient. For a finite range of values of the bias, the models can exhibit a maximum in the diffusion coefficient vs. noise intensity[4].

Finally, we establish a connection between our results for simple one-dimensional ABP models with detailed models of molecular motors[2]. This link allows us to make experimentally testable predictions about transport properties of molecular motors.

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