## The underlying non-equilibrium features of trapped active swimmers

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We consider the analysis of out-of-equilibrium phenomena, specifically, the analysis of the patterns of motion of trapped *active swimmers*, which absorb energy from the environment and transform it into self-locomotion, generally, through very complex mechanisms. Though the out-of-equilibrium nature of the motion of these systems is well recognized, is generally difficult to determine with precision, how far from equilibrium these systems are [1]. In some simple situations, the motion of active particles –at large length- or time-scales– can be understood as the diffusive motion of *pasive* Brownian particles in a uniform medium at an effective temperature determined, on the one hand, by the parameters of active motion, namely, the swimming velocity $v$ and the persistence time $\tau$, and on the other, by the coupling of the particle motion with the medium taken into account by the mobility $\mu$ [2,3].

In this work we elucidate the out-of-equilibrium features of diluted systems of trapped active particles, with constant $v$ and $\tau$, whose pattern of motion are described by one dimensional run-and-tumble and one-dimensional active Brownian dynamics. The former, describes the overdamped motion of organisms in a fluid, such as bacteria E. Coli, that moves in almost straight lines during random periods of time and, for very short periods, it randomly changes its direction of motion. Active Brownian motion on the other hand, has been realized through different phoretic mechanisms that furnish the Brownian particles with a self-propelling force, such as in the well known demixing of a binary fluid mixture by the laser-heating of gold half-coated Janus active particles.

We show that the stationary distributions for the positions of run-and-tumble and active Brownian particles, moving under the effects of an external trapping potential, are equivalent to the stationary distribution of non-interacting, passive Brownian particles, moving in the same trapping potential but in an inhomogeneous source of heat (or effective local temperatures). The resulting thermophoretic forces are elucidated for standard trapping potentials analyzed in the literature, namely the sedimentation process (linear potential with impenetrable boundary condition at one end), the harmonic potential and the symmetric double well potential. The interest in this topic has recently regrown due to the experimental possibility to design man-made active particles that emulate the ones that exist in the biological realm.

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