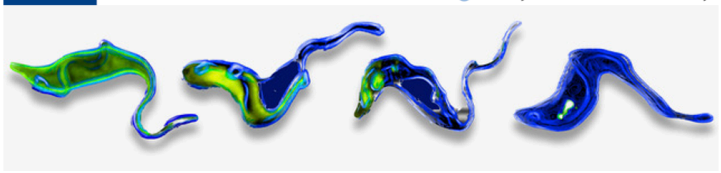

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Optimal run-and-tumble in confinement

Run-and-tumble is a basic model of persistent motion and a widespread moving strategy in micro-organisms and individuals cells. In many natural settings, motion occurs in the presence of surfaces and confinement~[1]. While accumulation at the wall has been extensively studied~[2,3], the transport along the surfaces has received less attention. We consider a run-and-tumble particle confined in a slit, and which may move, or not, at the wall. We first propose a four-direction model that is fully tractable and obtain analytically the long-time diffusion coefficient along the slit. Second, we show using numerical simulations of more realistic motions that our prediction is to a large extent valid more generally. Third, we find that lateral transport might be maximized by an optimal mean run time and identify the conditions for the existence of an optimum. Our results should help to assess the advantages of micro-organisms moving strategies in confined environments.

Primary authors: COTTIN-BIZONNE, Cecile (University Claude Bernard Lyon 1); Mr YBERT, Christophe (Université Claude Bernard Lyon 1); DETCHEVERRY, Francois (Université Claude Bernard Lyon 1); Mr PIETRANGELI, Tommaso (Université Claude Bernard Lyon 1)

Presenter: DETCHEVERRY, Francois (Université Claude Bernard Lyon 1)