

Swimming navigation in micro

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Interactions of microorganisms with solid boundaries and external flows play an important role in biological processes, such as egg fertilization, biofilm formation, and soil colonization, where microswimmers move within the flow and a structured environment. Despite recent efforts to understand their origin, it is not clear whether these interactions can be understood as being fundamentally of hydrodynamic origin, relying on the swimmer's direct contact with the obstacle or depending on biological mechano-sensing. Using microfluidic devices, one can investigate systematically the behavior swimming cells over a wide range of relevant parameters influencing their motion, including variable surface topography, external flows and viscosities. Here I will discuss recent studies on flagellated swimmers, such as sperm cells, green algae and bacteria, the interaction mechanisms with the surfaces and shear flow, and the resulting directed transport and sorting of the cells.