School of Nano Science

IPM Condensed Matter and Statistical Physics Group

Weekly Seminar

Active micro-swimmers under imposed shear flow

Speaker:

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IPM

Abstract:

Active biological matter is responsible for a wide array of functions inside the human body. An important example is the vast majority of bacteria that are self-propelled, i.e. do not require an external force to move. Self-propelled particles are also finding increased usefulness for (bio)technological applications, e.g. the transport of cargo to a designated place within a microfluidic network, or indeed the human body, the latter contributing towards nano drug delivery. Whether natural or synthetic, active micro-swimmers typically reside in environments where external flow is present. It is therefore important to understand the behavior of swimmers when subjected to flow shear. In this talk, a summary of our research into the effect of shear will be presented and discussed. Towards this purpose, we chose a flow of constant shear rate and linear shear, known as Couette flow, to be imposed on a confined suspension of active micro-swimmers. Using a continuum model that is based on a single equation governing the swimmer probability distribution function, we have shown that the shear induces upstream (i.e. against flow) swimming, and that the tendency of swimmers to move toward confining boundaries gives rise to a continuous conversion of upstream to downstream swimmers in a phenomenon we refer to as “population splitting”.

Wednesday, 22 Ordibehesht 95 (11 May, 2016), 2-3 pm

Farmaniyeh seminar room