## **Physics of Microbial Motility**



Contribution ID: 42

Type: Poster

## Geometry and Motility: Ratcheting, Autonomous Pumping, Guidance and Filtering

The interplay of motility and geometry can lead to a variety of striking effects such as rectification of motion of motile particles and autonomous pumping of passive particles in a ratchet channel [1], trapping and release of motile and immotile particles assisted by motile species [2], guidance and transient rectification of motion of motile particles due to the directional locking in presence of immotile species [3], and guidance of motion of motile particles by soft "boundaries" on a topographically flat surface of distinct chemical patterns allowing reflection, crossing and filtering of motile particles [4].

The mechanism of rectification of motion of motile particles in an asymmetric channel is different from that for the Brownian motion. It essentially involves the memory effect related to motility and the finite persistence length [1]. The direction locking leads to the increase of the persistence length and occurs due to the transient "embedding" of motile particles in clusters of immotile species [3]. An electrokinetic motile Janus particle can sense boundaries between distinct chemical patterns with different Zeta-potentials, via the feedback modification of the electroosmotic flows generated by the motile particle by these soft boundaries, resulting in gentle guidance of motile particles on topographically flat surfaces [4].

## References

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