

## Propulsion mechanisms of catalytic microswimmers

There has been a great deal of recent interest in the topic of self-propelled colloidal particles, from microorganisms such as bacteria and algae to a wide range of synthetic microswimmers. Much work has focused on using these microswimmers as model systems to study emergent, collective behaviours such as phase separation and swarming. However, the very varied and complex propulsion mechanisms of the synthetic microswimmers means that even study at the single-particle level can be rewarding.

In this talk, I will look in detail at one particular microswimmer propulsion mechanism, so-called self-electrophoresis. In self-electrophoresis, a charged swimmer is propelled along a local electrostatic gradient, which the swimmer itself generates, typically by a chemical reaction on its surface. This is the accepted propulsion mechanism for swimmers made of two different metals in hydrogen peroxide solution [1] (this is effectively a battery), but we recently showed [2] that it could apply even when one of the metals is replaced by a dielectric [3].

I will present recent theoretical work on self-electrophoresis, in which we look at the influence of allowing bulk reactions between the chemical species which generate the electrostatic gradient. I will also touch on the implications of these results for swimmer-swimmer and swimmer-surface interactions.

[1] Paxton et al., *J. Am. Chem. Soc.* **126**, 13424 (2004)

[2] Brown and Poon *Soft Matter* **10**, 4016 (2014)

[3] Howse et al. *PRL* **99**, 048102 (2007)