MAR15-2014-020482

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

**Bacterial transport: From flagellar mechanics to unmixing**

JEFFREY GUASTO, Tufts University

Swimming bacteria play integral roles in processes ranging from infections in the human body to bioremediation in the environment. Understanding the physical mechanisms underlying bacterial transport is key to controlling these important process. Using high-speed video microscopy and microfluidic devices, we uncover surprising mechanics at the level of individual cells that lead to complex motility patterns. We describe a novel mechanism enabling bacteria with a single flagellum to reorient, whereby their propulsive thrust induces a buckling instability in their flagellum. We also show that hydrodynamic shear produces striking spatial heterogeneity in suspensions of otherwise randomly-swimming bacteria. This shear-induced 'unmixing' phenomenon directly impacts bacterial survival strategies, by suppressing chemotaxis and enhancing surface attachment.