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Geometry and Hydrodynamics of Flagellar Bundles[1] MARIA TATULEA-CODREAN, ERIC LAUGA, DAMTP, University of Cambridge — Most motile bacteria exploit chirality in order to break the symmetry of low Reynolds number flows and generate propulsion. Spirochaetes have developed corkscrew-shaped bodies, while bacteria with simpler bodies can assemble and actuate helical flagellar filaments. In the case of multi-flagellated species, the bacterium can bundle and unbundle its flagellar filaments in order to swim in a straight line or change direction, respectively. This process is central to their run-and-tumble mobility. The hydrodynamic benefit of having multiple filaments, however, is associated with an increasing risk of tangling within the bundle. At one extreme, we know that straight flagellar filaments could not intertwine, but neither could they propel the cell forward in a viscous fluid. Similarly, one filament could never tangle on its own, but neither could it generate a propulsive force as large as a bundle of flagellar filaments. In this talk, we will present some recent theoretical results about the role that flagellar geometry and number play in the robustness of forming a tangle-free bundle and the hydrodynamic efficiency thereof.

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