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Hydrodynamic essentials of flagellar bundling ALEXANDER CHAMOLLY, ERIC LAUGA, University of Cambridge — A lot of recent research activity has addressed the swimming dynamics of prokaryotic cells, in particular the formation of bundles of helical flagella in bacteria such as *E. coli*. The exact dynamics of this process are complex, and most hitherto proposed computational models aiming for a detailed description have involved an interplay between a number of physical effects including long-range hydrodynamic interactions, elastic restoring forces and short-range steric interactions while respecting the overall force and torque balance between flagella and the cell body. In this study we aim to understand what fundamental physical mechanism triggers bundle formation in the first place. We distinguish between active bundling, induced by hydrodynamic interaction of the flexible flagella with each other, and passive bundling, triggered by advection of fluid around a moving cell body. We propose a minimal analytical model that involves only the essential hydrodynamics of flagellar propulsion and show that it is able to predict the dynamics of bundling, as well as the relative strength of both hydrodynamic effects.

Alexander Chamolly
University of Cambridge

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