Abstract Submitted
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A simple mapping between cell swimming behavior and single-motor state in multi-flagellated *E. coli*[1] PATRICK MEARS, SANTOSH KOIRALA, CHRISTOPHER RAO, University of Illinois at Urbana-Champaign, IDO GOLDING, Baylor College of Medicine, YANN CHEMLA, University of Illinois at Urbana-Champaign — We present new data that resolve a long-standing question on bacterial motility: How does the cell's swimming behavior depend on the number and state of the flagella that propel it? Addressing this question brings us closer to a full understanding of bacterial chemotaxis, arguably still our best paradigm for the way cells modulate their behavior based on signals from the environment. This new is enabled by technical innovation: we combine optical traps, fluorescence microscopy, and microfluidics to simultaneously track the swimming behavior and flagellar rotation state of individual, immobilized *E. coli* cells. We reveal a simple mathematical relationship between the number of flagella on the cell, their rotational bias, and the resulting probability of tumbling. Importantly, inter-flagella correlations result in *E. coli* behaving as if they possess a smaller number of effectively independent flagella than the actual number of flagella. Data from a chemotaxis mutant and stochastic modeling of the network suggest that temporal fluctuations of the key regulator CheY-P are the source of the observed flagellar correlations. A consequence of inter-flagellar correlations is that a cell's run/tumble behavior is only weakly dependent on number of flagella.

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