Effects of hydrodynamic interactions in bacterial swimming.¹
SUDDHASHIL CHATTOPADHYAY, XIAO LUN WU, University of Pittsburgh
— The lack of precise experimental data has prevented the investigation of the
effects of long range hydrodynamic interactions in bacterial swimming. We per-
form measurements on various strains of bacteria with the aid of optical tweezers
to shed light on this aspect of bacterial motility. Geometrical parameters recorded
by fluorescence microscopy are used with theories which model flagella propulsion
(Resistive force theory & Lighthill’s formulation which includes long range inter-
actions). Comparison of the predictions of these theories with experimental data,
observed directly from swimming bacterium, led to the conclusion that while long
range interactions were important for single polar flagellated strains (Vibrio Algi-
nolyticus & Caulobacter Crescentus), local force theory was adequate to describe
the swimming of multi-flagellated Escherichia Coli. We performed additional mea-
surements on E. Coli minicells (miniature cells with single polar flagellum) to try
and determine the cause of this apparent effect of shielding of long range interactions
in multiple flagellated bacteria.

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