Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

Bacterial Motility Near a Smooth Surface: Experiments and Analysis[1] KEATON HOLT, Trinity University Physics, QUAN HOANG, NAM-DUNG HOANG, Vietnam National University Mathematics, FRANK HEALY, Trinity University Biology, HOA NGUYEN, Trinity University Mathematics, ORRIN SHINDELL, Trinity University Physics — Motile bacteria play a pivotal role among forms of life on Earth and studying them has many real world applications. In particular, studying how motile bacteria interact with a smooth surface provides understanding about their transition from living as free-swimmers in the fluid to being a part of a surface aggregated community. Such knowledge can be useful in the resolution of medical problems like infections in the lungs of cystic fibrosis patients. In this work, we report the reconstructed motion of the motile bacterium Escherichia coli (E. coli) from 2D images generated by Total Internal Reflection Fluorescence (TIRF) microscopy. The Trackpy package for Python allows us to follow a bacterium along its trajectory while acquiring an initial estimate of its position in 2D space at each step. Then, from the collection of brightly lit pixels that make up an instance of a bacterium, we use our in-house Ellipsoid Fitting Algorithm to determine its 3D position and orientation relative to the surface. From these parameters, we further extract the velocity, the localized radii of curvature of the trajectory, and the orientation relative to the local axes defined by the trajectory.

[1]National Science Foundation grant DMS-1720323 and Trinity University

Keaton Holt
Trinity University

Date submitted: 30 Sep 2019 Electronic form version 1.4