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Investigating bacteria-surface interactions with microfluidics and Digital Holographic Microscopy HARSH AGARWAL, University of Minnesota, MICHAEL BARRY, ROMAN STOCKER, Massachusetts Institute of Technology, JIAN SHENG, University of Minnesota — Quantitative data of swimming characteristics of bacteria in the shear flow adjacent to a surface are crucial for understanding cell attachment and detachment, and thus biofilm formation. We combined microfluidics and holography to expose *Escherichia coli* AW405 to a carefully controlled flow environment and visualize their movement in three dimensions. We investigated wall shear rates up to 200 (1/s) and recorded holograms at 40X magnification and 15fps for several minutes. Three-dimensional locations and orientations of bacteria were extracted from numerically reconstructed images. We obtained thousands of 3D trajectories over a sample volume of $380\times380\times200$ μm, with a resolution of 0.2 μm in the two in-plane directions and 1 μm in the out-of-plane direction. Preliminary results revealed a range of behaviors, including circular trajectories near surfaces and migration normal to the wall. We expect that ongoing analysis will provide robust statistics of wall effects on bacterial motility. Sponsored by NIH (1-R21-EB008844-01) and NSF (CBET-0844647, DBI-0852875)

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