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Bacterial Swimming at Air/Water and Oil/Water Interfaces MICHAEL MORSE, ATHENA HUANG, GUANGLAI LI, JAY TANG, Brown University, JAY TANG'S BIOPHYICS GROUP TEAM — The microbes inhabiting the planet over billions of years have adapted to diverse physical environments of water, soil, and interfaces between water and either solid or air. Following recent studies on bacterial swimming and accumulation near solid surfaces, we turn our attention to the behavior of Caulobacter crescentus, a singly flagellated bacterium, at water/air and water/oil interfaces. The latter is motivated by relevance to microbial degradation of crude oil in light of the recent oil spill in the Gulf of Mexico. Our ongoing study suggests that Caulobacter swarmer cells tend to get physically trapped at both water/air and water/oil interfaces, accumulating at the surface to a greater degree than boundary confinement properties like that of solid surfaces would predict. At the water/air interface, swimmers move in tight circles at half the speed of swimmers in the bulk fluid. At the water/oil interface, swimming circles are even tighter with further reduced swimming speed. We report experimental data and present preliminary analysis of the findings based on low Reynolds number hydrodynamics, the known surface tension, and surface viscosity at the interface. The analysis will help determine properties of the bacterium such as their surface charge and hydrophobicity.

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