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Hydrodynamic and chemotactic influences in bacterial foraging NIKHIL DESAI, VASEEM SHAIK, AREZOO ARDEKANI, Purdue University — The discovery that marine bacteria can break down the hydrocarbons in oil for nutrition has motivated a fundamental understanding of the mechanisms underpinning oil-microbe interactions, e.g., the effect of oil-water interfaces on the hydrodynamics of swimming microbes. Hydrodynamic interactions enable the passive capture of microswimmers around rigid/fluid spherical obstacles, which has important consequences on a bacterium's ability to populate nutrient sources like marine snow, oil drops etc. In this talk, we first demonstrate theoretically, that surfactant-laden drops act as more effective hydrodynamic traps for bacteria than clean drops. Next, we explain the important differences between hydrodynamic trapping around stationary versus translating obstacles. Finally, we show how hydrodynamic interactions are complemented by chemotaxis to non-trivially alter the distribution of marine bacteria around both stationary oil drops and sinking marine snow particles effusing hydrocarbon/nutrient plumes. We thus delineate the effects of various physicochemical influences–like nutrient distribution, fluid-flow and proximity to interfaces–on microbial behavior in natural environments.

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