Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Active oil-water interfaces: buckling and deformation of oil drops by bacteria GABRIEL JUAREZ, ROMAN STOCKER, MIT — Bacteria are unicellular organisms that seek nutrients and energy for growth, division, and self-propulsion. Bacteria are also natural colloidal particles that attach and self-assemble at liquid-liquid interfaces. Here, we present experimental results on active oil-water interfaces that spontaneously form when bacteria accumulate or grow on the interface. Using phase-contrast and fluorescence microscopy, we simultaneously observed the dynamics of adsorbed Alcanivorax bacteria and the oil-water interface within microfluidic devices. We find that, by growing and dividing, adsorbed bacteria form a jammed monolayer of cells that encapsulates the entire oil drop. As bacteria continue to grow at the interface, the drop buckles and the interface undergoes strong deformations. The bacteria act to stabilize non-equilibrium shapes of the oil-phase such wrinkling and tubulation. In addition to presenting a natural example of a living interface, these findings shape our understanding of microbial degradation of oil and may have important repercussions on engineering interventions for oil bioremediation.

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Date submitted: 01 Aug 2014 Electronic form version 1.4