“Shake It Off: Dynamics of Bacterial Adhesions at Interfaces”

Wednesday
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3:30 pm
Wu and Chen Auditorium
Levine Hall

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Abstract

Control over adhesion of bacteria on solid and liquid interfaces underlies a spectrum of practical applications, ranging from preventing the formation of destructive biofilms on medical devices and on resource pipelines to removing pollutants from water. Because microscale bacteria are similar in size to colloidal particles, bacterial adhesion has long been studied using models for colloidal deposition. Many bacteria, however, are active and can move, swim, tumble, and rotate near interfaces. This activity, not captured in models for deposition of passive colloids, must affect how bacteria deposit onto surfaces. Here, I will describe work exploring effects of motility on adhesion to solid substrates and to liquid-liquid interfaces. On solid surfaces, we relate near-surface mobility and adhesion to surface properties using imaging; engineer bacteria to identify surface adhesions that control transient mobility; and apply insights from these studies to design responsive polymer brush surfaces that detach adherent bacteria. On liquid-liquid interfaces, we test the applicability of thermodynamic pictures for adhesion of non-motile bacteria on oil droplets; identify how bacterial swimming alters this adhesion; and show that motile adhered bacteria can drive droplet rotation.

Bio

Jacinta C. Conrad is a physical scientist studying transport and dynamics within soft, complex materials and matrices. Using a broad range of microscopy, rheology, scattering, and computational methods, her group seeks to understand how microscale particles, including colloids, nanoparticles, bacteria, viruses, and proteins, explore and/or transport through confined and crowded environments containing polymers, macromolecules, or other dispersed species. Insights gained from fundamental studies of these non-equilibrium processes inform the design of new materials for preventing fouling and corrosion, for remediating environmental damage, and for sensitively diagnosing disease. She earned her BS in Mathematics from the University of Chicago, and MA and PhD degrees in Physics from Harvard. She worked as a postdoctoral associate in MatSE at Illinois before starting her faculty position at the University of Houston (UH). Currently, she is the Frank M. Tiller Professor of Chemical Engineering at UH, the Chair-Elect of the American Physical Society Division of Soft Matter (DSOFT), and an Associate Editor for ACS Applied Nano Materials, and was named a Fellow of the Society of Rheology in 2021.