"Life in a Tight Spot: How Bacteria Move in Heterogeneous Media"

Virtual Seminar
Wednesday
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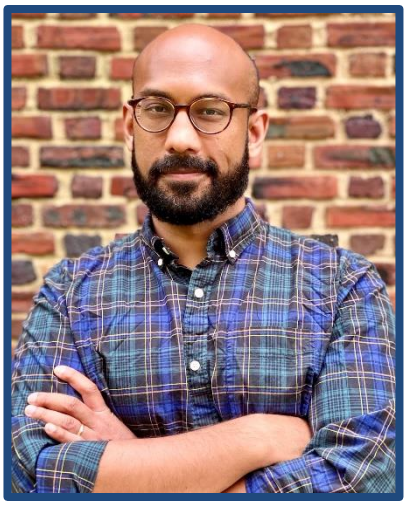
3:00 pm



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Abstract

Bacterial motility is central to processes in agriculture, the environment, and medicine. While motility is typically studied in homogeneous environments, many bacterial habitats—e.g., soils, sediments, and biological gels/tissues—are heterogeneous porous media. Here, we use studies of *E. coli* in transparent 3D porous media to demonstrate how confinement in a heterogenous medium fundamentally alters motility. In particular, we show how the paradigm of run-and-tumble motility is dramatically altered by pore-scale confinement, both for cells performing undirected motion and those performing chemotaxis, directed motion in response to a chemical stimulus. Our porous media also enable precisely structured multi-cellular communities to be 3D printed. Using this capability, we show how spatial variations in the ability of cells to perform chemotaxis enable populations to autonomously stabilize large-scale perturbations in their overall morphology. Together, our work thus reveals new principles to predict and control the behavior of bacteria, and active matter in general, in heterogeneous environments.

Bio

Sujit Datta is an Assistant Professor of Chemical and Biological Engineering at Princeton University. He earned a BA in Mathematics and Physics and an MS in Physics in 2008 from the University of Pennsylvania. He earned his PhD in Physics in 2013 from Harvard, where he studied fluid dynamics and instabilities in porous media and colloidal microcapsules with David Weitz. His postdoctoral training was in Chemical Engineering at Caltech, where he studied the biophysics of the gut with Rustem Ismagilov. He joined Princeton in 2017, where his lab studies soft and living materials in complex settings, motivated by challenges like water remediation, carbon sequestration, oil/gas recovery and targeted drug delivery. Prof. Datta is the recipient of the NSF CAREER Award, AIChE 35 Under 35 Award, ACS Unilever Award, APS Andreas Acrivos Award in Fluid Dynamics, APS LeRoy Apker Award, ACS Petroleum Research Fund New Investigator Award, and multiple Commendations for Outstanding Teaching.

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