UNIVERSITY OF DELAWARE
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DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

SEMINAR SERIES

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PRINCETON UNIVERSITY

Assistant Professor

Attend virtually: https://udel.zoom.us/j/99615073260

LIFE IN A TIGHT SPOT: HOW BACTERIA NAVIGATE CROWDED SPACES

Bacterial spreading through motility and growth plays a central role in agriculture, biotechnology, the environment, and medicine. These processes are typically studied in the lab in liquid cultures or on flat surfaces; however, many bacterial habitats—e.g., soils, sediments, and biological gels/tissues—are more complex and crowded 3D spaces. In this talk, I will describe my group's work unravelling how confinement in a crowded 3D space changes how bacteria behave. We have developed the ability to (i) directly visualize bacteria from the scale of a single cell to that of an entire population, and (ii) 3D-print precisely structured multi-cellular communities, in crowded 3D porous media more akin to their natural habitats. Our experiments using this platform have revealed previously unknown ways in which crowding fundamentally alters how bacteria move and grow, both at the single cell and population scales. Guided by these findings, we have developed theoretical models to more accurately predict the motion and growth of bacterial populations, and other forms of "active matter", in complex environments. Taken together, these findings help to reveal new principles to predict and control the organization of bacteria, and active matter in general, in complex and crowded environments. They could also potentially help provide quantitative guidelines for the control of these dynamics in processes ranging from bioremediation and agriculture to drug delivery.

ABOUT THE SPEAKER

Sujit Datta is an Assistant Professor and Director of Graduate Studies 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, and then a PhD in Physics in 2013 from Harvard, where he studied fluid dynamics and instabilities in soft and disordered media with Dave Weitz. His postdoctoral training was in Chemical Engineering at Caltech, where he studied the biophysics of the gut with Rustem Ismagilov. Datta joined Princeton in 2017, where his lab studies the fascinating behaviors manifested by soft ("squishy") and living systems in complex environments. Datta's work has been recognized by the NSF CAREER Award, Pew Biomedical Scholar Award, AIChE 35 Under 35 Award, ACS Unilever Award, Camille Dreyfus Teacher-Scholar Award, three awards from the APS (Early Career Award in Biological Physics, Andreas Acrivos Award in Fluid Dynamics, and the Apker Award), and multiple commendations for teaching.