PHYSICS COLLOQUIUM:
Shape, wobble, and roll: manipulation of microscale transport through geometries and symmetries

Dr. Bin Liu
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Date:
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Time:
10:30 AM – 11:50 AM

Location:
GRANITE PASS 135

About The Speaker:

Dr. Bin Liu is an Associate Professor of Physics at the University of California, Merced. He received his Ph.D. in physics, followed by a postdoctoral stay at the Courant Institute of Applied Mathematics at New York University. Before joining UC Merced, he conducted his postdoctoral research at Brown and Cornell University, studying a variety of biology-inspired physics problems. His research interests focus on the underlying geometric, topological, and symmetry-based principles in complex mechanics, especially those involved in bacterial transport and cell-environment interactions. Bin is a recipient of the National Science Foundation Career Award in 2020.

Abstract:

Microorganisms' responses to mechanical environments typically involve a myriad of complex interactions, resulting in empirical understandings and limited guidance for practical applications. We manipulate these microorganism-environment interactions using geometry- and symmetry-based rules, requiring no detailed knowledge of force types. Our research demonstrates that these geometries and symmetries yield surprising yet robust principles in the movement of microorganisms and microfluidic flows, independent of specific media properties and force types. In addition to providing a fundamental understanding of microscale transport, these principles open up novel applications in micromanipulations, including 3D perturbation-free manipulation of microorganisms.

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