Soft Living Active and Adaptive Matter

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Theory of activity-powered interface

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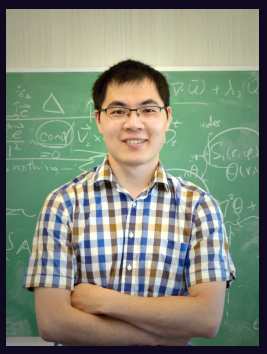
Abstract:

Interfaces and membranes are ubiquitous in cellular systems across various scales. From lipid membranes to the interfaces of biomolecular condensates inside the cell, these borders not only protect and segregate the inner components from the outside world, but also are actively participating in mechanical regulation and biochemical reaction of the cell. Being part of a living system, these interfaces (membranes) are usually active and away from equilibrium. Yet, it's still not clear how activity can tweak their equilibrium dynamics. Here, I will introduce a model system to tackle this problem. We put together a passive fluid and an active nematics, and study the behavior of this liquid-liquid interface. Whereas thermal fluctuation of such an interface is too weak to be observed, active stress can easily force the interface to fluctuate, overhang, and even break up. In the presence of a wall, the active phase exhibits superfluid-like behavior: it can climb up walls -- a phenomenon we call activity-induced wetting. I will show how to formulate theories to capture these phenomena, highlighting the nontrivial effects of active stress. Our work not only demonstrates that activity can introduce interesting features to an interface, but also sheds light on controlling interfacial properties using activity.

Date:
8/30/2021

Time:
9:00 AM-10:15 AM (PT)

About the speaker:



Dr. Zhihong You is a Postdoc Scholar working with Prof. M. Cristina Marchetti at University of California Santa Barbara. His research focuses on the (statistical) mechanics of active matter. He is currently engaged in multi-component active systems, with emphasis on the pattern formation and interfacial properties.

Dr. You received his Ph.D. in theoretical physics from Leiden University, where he studied growth-induced self-organization in bacterial colonies.

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