Soft Living Active and Adaptive Matter

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Growing in flows: from evolutionary dynamics to microbial jets

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Abstract:

Biological systems can self-organize in complex structures, able to evolve and adapt to widely varying environmental conditions. Despite the importance of fluid flow for transporting and organizing populations, few laboratory systems exist to systematically investigate the impact of advection on their spatial evolutionary dynamics. In this talk, I will discuss how we can address this problem by studying the morphology and genetic spatial structure of microbial colonies growing on the surface of a viscous substrate. When grown on a liquid, I will show that S. cerevisiae (baker's yeast) can behave like "active matter" and collectively generate a fluid flow many times larger than the unperturbed colony expansion speed, which in turn produces mechanical stresses and fragmentation of the initial colony. Combining laboratory experiments with numerical modeling, I will demonstrate that the coupling between metabolic activity and hydrodynamic flows can produce positive feedbacks and drive preferential growth phenomena leading to the formation of microbial jets. Our work provides rich opportunities to explore the interplay between hydrodynamics, growth and competition within a versatile system.

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

About the speaker:

Dr. Severine Atis is a postdoctoral fellow at the University of Chicago working with Prof. William Irvine's group. Her research focuses on self-organization in out-of-equilibrium systems and active fluids.

She received her PhD from Sorbonne University in Physics where she worked with reaction wave propagation in disordered flows. She joined Prof. David Nelson's group at Harvard University as a postdoctoral scholar where she investigated evolutionary dynamics coupled with hydrodynamic flows in collaboration with Prof. Andrew Murray in the Molecular and Cellular Biology department.

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