

Thursday January 23, 2025

Refreshments at 3:15PM outside PSF 101

Colloquium from 3:30PM – 4:30PM in PSF 101

Boundaries, Inclusions, and Disorder in Active Matter

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Abstract:

Active systems are driven out of equilibrium by exchanging energy and momentum with their environment. This endows them with anomalous mechanical properties which leads to rich phenomena when active fluids are in contact with boundaries, inclusions, or disordered potentials. Indeed, studies of the mechanical pressure of active fluids and of the dynamics of passive tracers have shown that active systems impact their environment in non-trivial ways, for example, by propelling and rotating anisotropic inclusions. Conversely, the long-ranged density and current modulations induced by localized obstacles show how the environment can have a far-reaching impact on active fluids. This is best exemplified by the propensity of bulk and boundary disorder to destroy bulk phase separation in active matter, showing active systems to be much more sensitive to their surroundings than passive ones.

Biography:

Mehran Kardar is the Francis Friedman Professor of Physics at MIT. Born and educated through high school in Tehran (Iran), he obtained a BA degree from Cambridge University (UK) in 1979, and a PhD in Physics from MIT in 1983. He was a Junior Fellow of the Harvard Society of Fellows for three years, before joining MIT faculty in 1986. His specialty is Statistical Physics, having authored two textbooks in this field, and conducted research on a variety of topics spanning soft-matter, biophysics, and fluctuation-induced phenomena. Prof. Kardar is the recipient of a number of awards including the A.P. Sloan Fellowship, Presidential Young Investigator Award, Guggenheim Fellowship, and the Alexander von Humboldt Foundation Research Award. He is a fellow of the American Physical Society, the American Academy of Arts and Sciences, and the National Academy of Sciences.