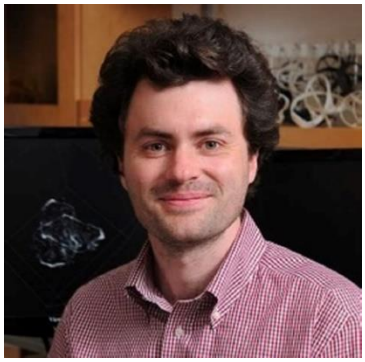
Weaving tangled vortex webs: vortex knots, conservation of helicity and turbulent blobs

Speaker: William Irvine (U. Chicago)

March 13, 2024, 6:00 to 7:00 PM (Refreshments 5:30 pm)

Room 4102, CUNY-Graduate Center, 365 5th Ave, NY, NY and Zoom

Vortices imbue flow with dynamism. Ever since Kelvin's 'vortex atom' hypothesis, tangled vortices and their topology have occupied a fundamental place in fluid mechanics. Knottiness - aka hydrodynamic or magnetic helicity has re-emerged as a conserved quantity in ideal fluids and plasmas, offering fundamental insights and radical new approaches to flow control. Turbulence and its eddies are fundamentally a complex vortex tangle representing the ultimate example of the central role of vorticity in flow. I will talk about experimental techniques to controllably weave vortex webs on demand, from isolated vortex knots and links to isolated blobs of turbulence. Observing their lively dynamics provides fundamental insights into how helicity can be surprisingly conserved in viscous flows and how turbulence can be assembled, controlled, and endowed with tunable cocktails of conserved quantities from `vortex Lego'.



William T. M. Irvine is a Professor at James Franck Institute, University of Chicago. His work sits at the crossroads of soft condensed matter physics, optics, and topological fluid mechanics, revealing the intricate geometric and topological mechanisms that underpin a broad spectrum of natural phenomena. Irvine's research endeavors to uncover the fundamental principles that govern these systems, from the complex flows of fluids to the self-assembly and fracturing processes in materials.

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