

Colloquium

Thursday, October 1, 2026 at 4 p.m.
Physics & Astronomy Building (PAB) 1-434

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Quiet within, chaos without: putting turbulence to work

Turbulence is synonymous with chaos, yet its fluctuations are far from featureless: energy injected at large scales cascades through a hierarchy of eddies down to the viscous cutoff, forming a structured non-equilibrium state. Unlike the thermal fluctuations of a molecular gas, this cascade is not bound by the equilibrium theorems that forbid extracting work from fluctuations. Can turbulence be put to work? I will describe experiments in which we do so. The common ingredient is geometry: passive structures that partition turbulent fluctuations, sustaining sharp gradients in turbulent intensity within a single flow. Against these gradients, fluctuations are rectified into motion and transport, from the centimeter to the micrometer scale, even as the dominant physics changes with scale. Beyond applications in filtration, delivery, and energy harvesting, these systems provide a new probe of transport and irreversibility in turbulence, and recast it not as disorder in which energy is dissipated but as a resource to be exploited.