JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Friday, October 11, 2019
3:00 PM, 132 Gilman Hall

"Fluctuations, Dissipation and Transitional Phenomena in Turbulent Pipe Flow"

Presented by Prof. Nigel Goldenfeld
University of Illinois at Urbana-Champaign
Department of Physics
Hosted by Gregory Eyink (JHU - AMS)

In this seminar, I propose that turbulence is most fruitfully regarded as a problem in non-equilibrium statistical mechanics, and will show that this perspective explains turbulent drag behavior measured over 80 years, and makes predictions that have been experimentally tested in 2D turbulent soap films. I will also explain how this perspective is useful in understanding the laminar-turbulence transition, establishing it as a non-equilibrium phase transition whose critical behavior has been predicted and tested experimentally. This work connects transitional turbulence with statistical mechanics and renormalization group theory, high energy hadron scattering, the statistics of extreme events, and even population biology.

Bio

Nigel Goldenfeld holds a Swanlund Endowed Chair and is a Center for Advanced Study Professor in Physics at the University of Illinois at Urbana-Champaign (UIUC). He is the Director of the NASA Astrobiology Institute for Universal Biology at UIUC, and leads the Biocomplexity Group at the University's Institute for Genomic Biology. Nigel received his Ph.D. from the University of Cambridge (U.K.) in 1982, and for the years 1982-1985 was a postdoctoral fellow at the Institute for Theoretical Physics, University of California at Santa Barbara. Nigel's research explores how patterns evolve in time; examples include the growth of snowflakes, the microstructures of materials, the flow of turbulent fluids, the dynamics of geological formations, and even the spatial structure of ecosystems. His interests in emergent and collective phenomena extend from condensed matter physics, where he has contributed to the modern understanding of high temperature superconductors, to biology, where his current work focuses on evolution, microbial ecology and astrobiology.