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The Enigma of Turbulence

In physics, the concept of turbulence — the pervasive yet haphazard motion caused by eddies within a moving fluid — remains one of the last great, unsolved problems.

Turbulence governs the air drag of an automobile and the speed at which rivers flow. It has the power to kill by causing arteries and aneurisms to burst; yet it also makes stars twinkle.

Despite a century of investigation, scientific understanding of turbulence is primarily based on a mere handful of early seminal insights.

Condensed matter physicist Nigel Goldenfeld, a professor at the Center for Advanced Study at the University of Illinois Urbana-Champaign (UIUC), will address the continuing enigma of turbulence in the 65th Kavli Institute for Theoretical Physics (KITP) Public Lecture Wednesday, Feb. 1, at 8 p.m. in Kohn Hall.

“I’ll try to explain why understanding turbulence is so difficult — much harder than chaos — and what solving it would mean,” said Goldenfeld, who leads the Biocomplexity Group at UIUC and is the director of the campus’s NASA Astrobiology Institute for Universal Biology. “I’ll also discuss recent dramatic advances in both experiment and theory that account for the way in which fluids start to become turbulent as their flow speed increases.”

Goldenfeld received his doctorate in 1982 from the University of Cambridge, where he studied with the late Sir Sam Edwards, the British condensed matter physicist. From 1982 to 1985, Goldenfeld was a postdoctoral fellow at UC Santa Barbara at

what was then called the Institute for Theoretical Physics (now KITP). He is a member of the U.S. National Academy of Sciences and a fellow of the American Physical Society.

In addition to turbulence, Goldenfeld’s extraordinarily broad research addresses pattern formation in physics and biology, high-temperature superconductivity and phase transitions in condensed matter physics, the evolution of the genetic code and the quantitative study of financial markets.

Questions about Goldenfeld's talk can be directed to (805) 893-6324.

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