



अंतर्राष्ट्रीय सैद्धांतिक विज्ञान केंद्र  
International Centre for Theoretical Sciences

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भारत सरकार के परमाणु ऊर्जा विभाग की एक स्वायत्त संस्थान एवं समविश्वविद्यालय

An Autonomous Institution of the Department of Atomic Energy of Government of India and a Deemed to be University

## ICTS Thesis Defense Seminar

**Title** : Hydrodynamic Equations Across Scales: Turbulence, Chaos, and Collective Dynamics

**Speaker** : Ritwik Mukherjee (ICTS-TIFR, Bengaluru)

**Date** : Tuesday, 14 July 2026

**Time** : 10:30 AM (IST)

**Abstract** : We explore how intermittency influences the statistical properties of the dissipation field by revisiting multifractality, which serves as a robust framework for interpreting intermittency. By comparing phenomenological predictions with numerical simulations, we find that, surprisingly, fluctuations follow a large-deviation principle in the Lagrangian perspective but not in the Eulerian one. We then examine how intermittency affects the chaotic properties of turbulent flows, showing that intermittent fluctuations of velocity gradients control the scaling of the Lyapunov exponent. Finally, we investigate geometric observables based on velocity increments in two- and three-dimensional turbulence, finding strong multiscaling and exponent saturation even where conventional velocity statistics exhibit weak intermittency, and show that this behaviour is largely explained by the bounded nature of the observables rather than turbulence-specific cascade dynamics. If time permits, we will discuss other hydrodynamic equations and the emergence of scaling solutions and collective dynamics.

**Venue** : Chern Lecture Hall

Zoom link: <https://icts-res-in.zoom.us/j/95949119408?pwd=h9B1JWv9kSLtUvGWc3rH6kPlntWNgl.1>

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