

**ICTS**

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TATA INSTITUTE OF FUNDAMENTAL RESEARCH

### **ICTS Colloquium**

**Title** : Ecology and evolution in high dimensions

**Speaker** : Akshit Goyal (ICTS-TIFR, Bengaluru)

**Date** : Thursday, 22 January 2026

**Time** : 2:00 PM (IST)

**Abstract** : Organisms in nature evolve within complex, species-rich communities shaped by ongoing ecological interactions. Yet theoretical frameworks remain fragmented—ecology often ignores evolution, while evolutionary theory neglects ecological effects. I will present our efforts to bridge this gap by developing a unified theory of eco-evolutionary dynamics in highly diverse communities. I will show how techniques from the physics of disordered systems help integrate ecology into classical models of evolution. Using it, I will show that ecological interactions between parents and mutants can be characterized by a single emergent parameter that measures the strength of ecological feedbacks. I will derive explicit analytic expressions for the fixation probability that generalizes Kimura's famous results in population genetics and analyze it in various ecological and evolutionary limits. We find that ecological interactions suppress fixation probabilities for moderately beneficial mutants when compared to Kimura's predictions. Our theory also gives rise to prolonged parent-mutant coexistence in complex communities, a phenomenon absent in classical population genetics. Our study establishes a framework for integrating ecological interactions into models of evolution and helps provide a path to a general theory of eco-evolutionary dynamics.

**Venue** : Emmy Noether Seminar Room

Zoom Link: <https://icts-res-in.zoom.us/j/91032007113?pwd=aRE3p4YaxU4HgF92W8eK3IQd6ZrCVH.1>

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