

Institut de Physique Théorique

Theoretical physics courses



Statistical Physics of Ecosystems

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Fridays 22, 29 May and 5, 12, 19, June 2026. In person at IPhT and live online.

There is an intriguing robustness in certain statistical patterns describing the dynamics and organization of seemingly very different ecosystems, spanning scales from trees in a rainforest to bacteria in the human gut.

These patterns motivate several common questions: How can so many ecologically similar species coexist locally? Why does only a small fraction of these coexisting species typically account for most of the total biomass? What drives changes in the identity of these dominant species across space and time?

In this lecture, I will give an account of recent work at the intersection of statistical physics and theoretical ecology that aims to address these questions. Emphasis will be placed on disordered-systems approaches, which provide a natural theoretical framework without committing to any specific ecosystem.

Topics covered include:

- Common patterns in the organization and dynamics of species-rich ecosystems
- Disordered Lotka-Volterra-like models and Dynamical Mean-Field Theory
- Models for the coexistence of spatially extended populations
- Inverse stability-complexity relationship in the presence of environmental disorder

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