

Speaker: Sara LOOS (ICTP, Italy)

Title: Irreversibility, heat and information flows induced by non-reciprocal interactions

Abstract

In complex systems far from equilibrium, such as active matter, Newton's third law does not always hold, giving rise to non-reciprocal interactions. Here, we study the thermodynamic properties induced by non-reciprocal interactions between stochastic degrees of freedom. We show that non-reciprocal coupling alone implies a steady energy flow through the system, as well as a nontrivial information flow. Remarkably, non-reciprocal coupling can induce a reversed heat flow from cold to hot. We also discuss the dynamics and thermodynamics seen by a marginal observer, who only sees one of the non-reciprocally coupled systems. Due to the nonreciprocity, the non-Markovian dynamics seen by the marginal observer involves complex types of memory, and the marginal entropy production obeys a generalized second law involving the continuous information flow (aka learning rate).

Loos & Klapp, Entropy 23, 696 (2021).

Loos & Klapp, NJP 22, 123051 (2020).