Department of Physics
Condensed Matter Physics
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UNIVERSITY OF OXFORD

CONDENSED MATTER SEMINAR

Thursday 2 November at 14:30
Simpkins Lee room

"Boosting Biomolecular Switch Efficiency With Quantum Coherence"

Mattheus Burkhard
ENS Paris

The resource theory of quantum thermodynamics has emerged as a powerful tool for exploring the out-of-equilibrium dynamics of microscopic and highly correlated systems. Recently, it has been employed in photoisomerization, a mechanism facilitating vision through the isomerism of the photo receptor protein rhodopsin, to elucidate the fundamental limits of efficiency inherent in this physical process. Limited attention has been given to the impact of energetic quantum coherences in this process, as these coherences do not influence the energy level populations within an individual molecule subjected to thermal operations. However, a specific type of energetic quantum coherences can impact the energy level populations in the scenario involving two or more molecules. In this study, we examine the case of two molecules undergoing photoisomerization to show that energetic quantum coherence can function as a resource that amplifies the efficiency of photoisomerization. These insights offer evidence for the role of energetic quantum coherence as a key resource in the realm of quantum thermodynamics at mesoscopic scales.

Host: Tristan Farrow