WINTER SEMESTER 2024 / 2025

RTG 2756 CYTAC SEMINAR SERIES

TUESDAY, NOVEMBER 5
17:00 IN HS5

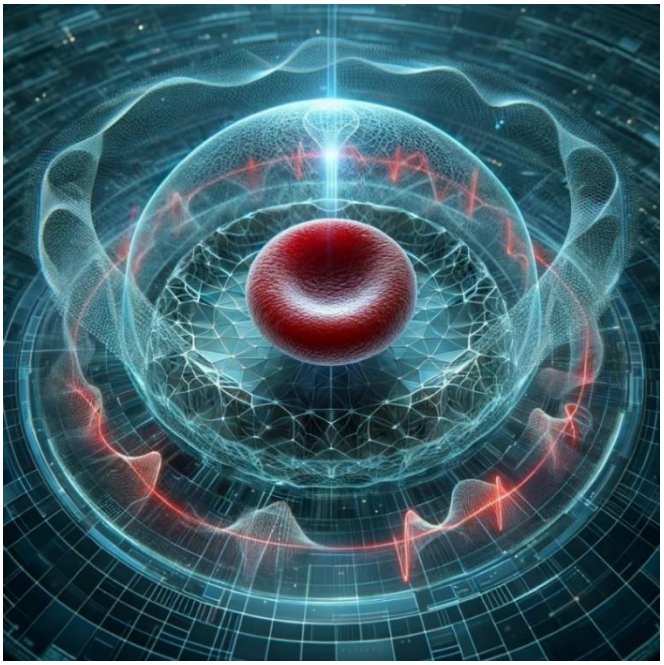
CYTAC

RTG 2756

PROF. DR. FELIX RITORT

University of Barcelona

VARIANCE SUM RULE FOR ENTROPY PRODUCTION



Nonequilibrium pervades nature, from the expanding universe to climate dynamics, living cells and molecular machines. Key to nonequilibrium states is the entropy production rate σ at which energy is dissipated to the environment. Despite its importance, σ remains challenging to measure, especially in nanoscale systems with limited access to microscopic variables. Here I present a recently introduced variance sum rule for displacement and force variances that permits to measure σ by constraining energetics through modelling. We apply it to measure the first heat map of human red blood cells in experiments with laser optical tweezers and ultrafast life-imaging microscopy. We find a spatially heterogeneous σ with finite-correlation length of half a micron ξ~0.5μm and global σ~106 kBT/s per single cell, in agreement with calorimetry estimates. The variance sum rule sets a new resource for nonequilibrium systems, from measuring entropy production rates in active and living matter to machine learning.