



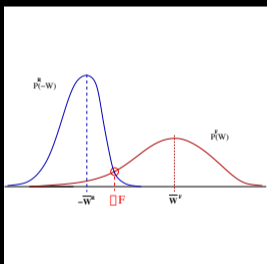
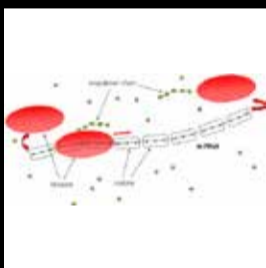
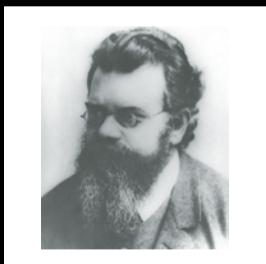
School of Physics and Astronomy
The Raymond and Beverly Sackler
Faculty of Exact Sciences
Tel Aviv University

Lecture Series on:

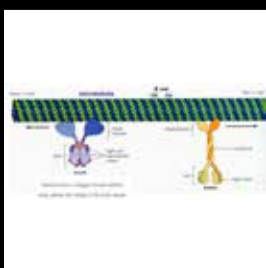
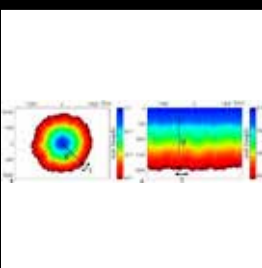
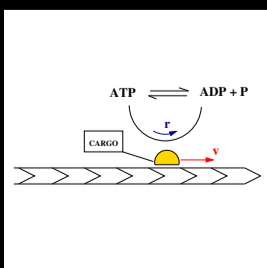
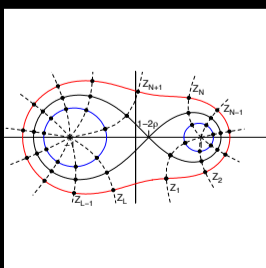
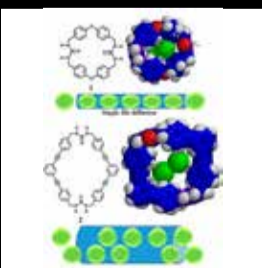
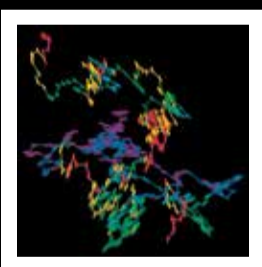
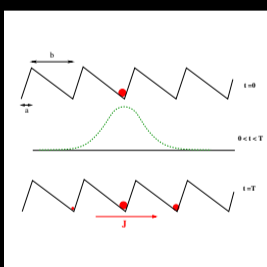
Recent Developments in Non-Equilibrium Statistical Physics

Kirone Mallick, CEA-Saclay, France

Many natural systems keep on exchanging matter, energy or information with their surroundings. These exchanges induce currents that break time-reversal invariance. Such processes lie beyond the realm of traditional thermodynamics and the principles of equilibrium statistical mechanics do not apply to them. One may wonder if a microscopic theory of non-equilibrium behavior will ever be constructed. At present, no general framework exists.



In the last two decades, however, important advances in our understanding of non-equilibrium processes have been made. Fluctuations far from equilibrium have been shown to satisfy some universal properties – that result from fundamental microscopic symmetries – such as the Fluctuation Theorem and the Work Identities (Jarzynski, Crooks). Besides, large deviations, that quantify rare events, appear to play a role akin to that of thermodynamic potentials. Finally, a variational principle, known as the Macroscopic Fluctuation Theory, represents a first step towards a unified approach to non-equilibrium behavior.



Our aim, in these lectures, is to present some remarkable results that have been obtained in the last decades in statistical physics for systems far from thermodynamic equilibrium. These results led to a unified description of rare events, fluctuations and (ir)reversibility in many physical systems. General concepts will be illustrated using examples from condensed matter physics.

Physics Colloquium

Sunday, November 25, 2018, 2pm. Melamed Hall, Shenkar Physics Building.

Rare Events and Fluctuation Relations: Understanding Systems far from Thermodynamic Equilibrium

Lecture I

Tuesday, November 27, 2018, 10am-noon. Porter Building, room 101.

(Ir)Reversibility and its Consequences

Reversibility at equilibrium, detailed balance and Onsager-Machlup Theory. Far from equilibrium, breaking time reversal invariance and the Gallavotti-Cohen Fluctuation theorem.

Lecture II

Thursday, November 29, 2018, 2pm-4pm. Porter Building, room 101.

The Jarzynski Formula and Work Identities

Proofs and consequences; applications to molecular motors, Langevin dynamics and interacting particle processes.

Lecture III

Tuesday, December 4, 2018, 10am-noon. Porter Building, room 101.

Exactly Solvable Models Out-of-Equilibrium

Universality classes of the Kardar-Parisi-Zhang equation.

Lecture IV

Thursday, December 6, 2018, 2pm-4pm. Porter Building, room 101.

The Macroscopic Fluctuation Theory

A variational principle for non-equilibrium; dynamical phase transitions, concrete examples and open problems.