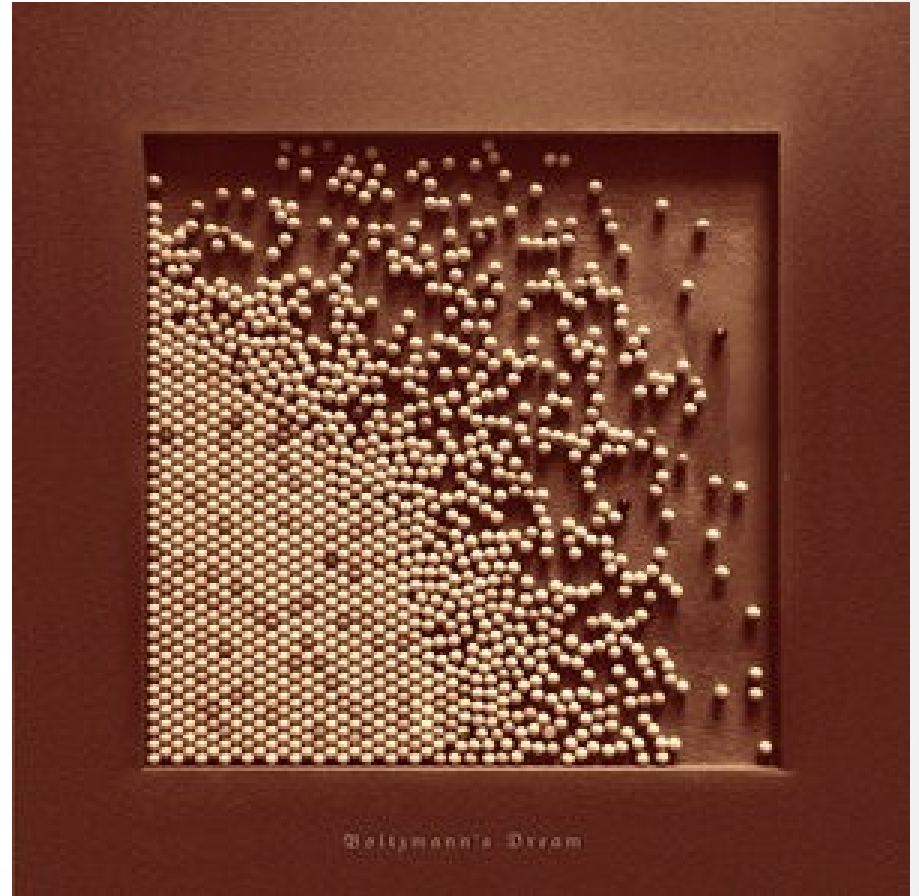# Meccanica Statistica

- Contenuto del corso

- Qualche commento

pic by Riccardo Tiddi

An historical excursion

- We start from the second law, first enunciated by R. Clausius in 1854.

- It states that heat cannot pass from a colder to an warmer body if no other process takes place, e.g., a refrigerator spends energy to cool down the cold body further

- Maxwell, *The Theory of Heat*, 1872

- the second law "is undoubtedly true as long as we can deal with bodies only in mass, and have no power of perceiving or handling the separate molecules of which they are made up."

An historical excursion

- The physics of *small out-of-equilibrium systems*

- Nowadays we are able to manipulate micro- or nano-systems, e.g. single atoms, ions, biomolecules.

- Was Maxwell's intuition true?

- Yes: but you have to wait until the second part of the course.
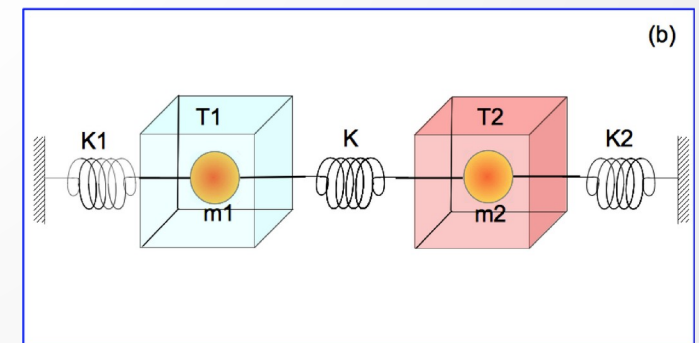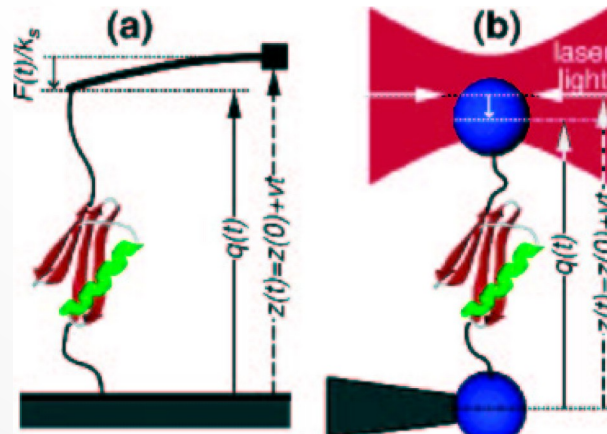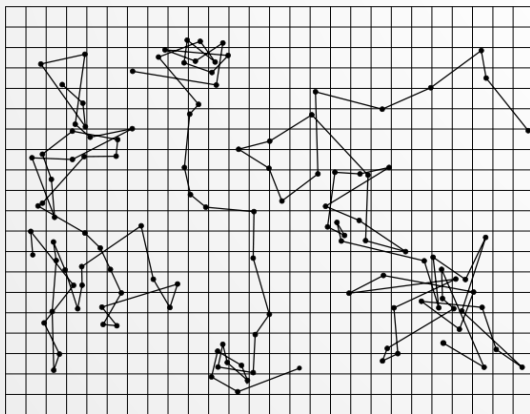
Course content

- Short review of thermodynamics and basic concepts in Stat. Phys.

- Systems with interaction: Ising model (and variations)

  - Mean field and Landau Theory

  - Critical behaviour of mean field

  - Exact solution of systems of interest (?)

Course content

- Dynamics: Master Equation, Brownian motion, Langevin Equation, Fokker-Planck equation

- Statistical mechanics of non-equilibrium systems:

  - Systems close to equilibrium

  - Systems far from equilibrium

  - the concepts of work and heat revisited

  - the fluctuation theorems

Termodinamica dell'informazione

- Termodinamica dei "diavoletti di Maxwell"
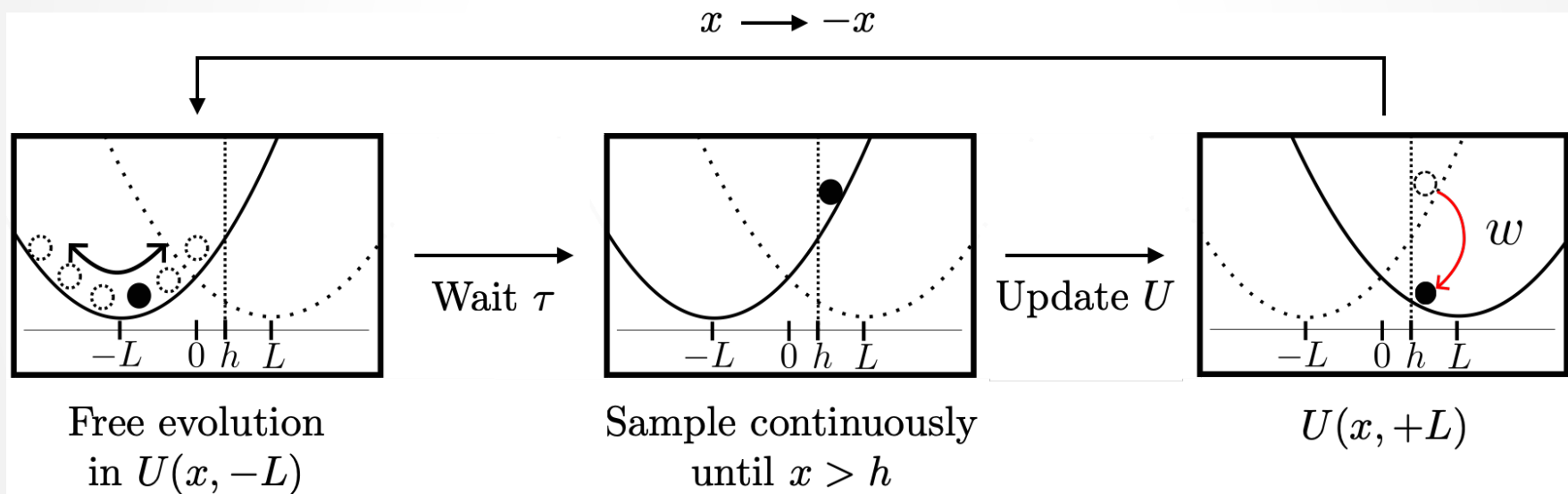
Esercizi

- Verranno assegnati degli esercizi da svolgere a casa

- Importante provare a risolverli

- All'esame orale saranno parte della discussione