

# Nonequilibrium Physics

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'natural processes occur in nonequilibrium'

## Giorgio Parisi Facts



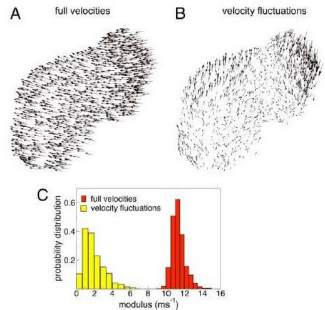
Giorgio Parisi  
The Nobel Prize in Physics 2021

Born: 4 August 1948, Rome, Italy

Affiliation at the time of the award: Sapienza University of Rome, Rome, Italy

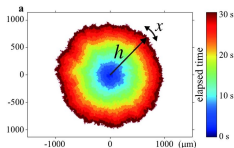
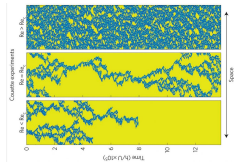
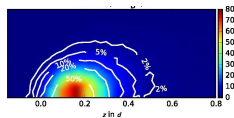
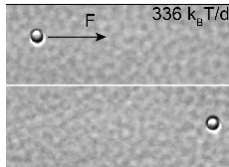
Prize motivation: "for the discovery of the interplay of disorder and fluctuations in physical systems from atomic to planetary scales."

Prize share: 1/2



'Scale-free correlations in starling flocks',  
Cavagna et al., PNAS **107** 11865 (2010)

**Topics:** Advanced Statistical Mechanics concepts for many particle systems in evolution



N. Senbil, A. Puestas, et al  
driven colloids (2019)

B. Hof, (2016) turbulence  
via directed percolation

Takeuchi, et al. (2011),  
Kardar Parisi Zhang eqn.

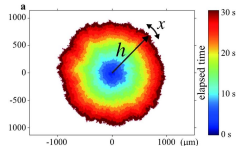
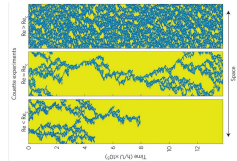
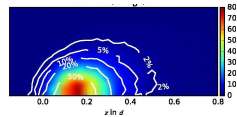
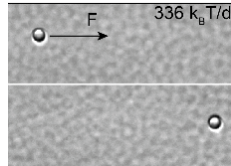
**Contents:**

- ▶ Time-dependent response theory
- ▶ Stochastic processes
- ▶ Functional integrals
- ▶ Large deviation formalism
- ▶ Entropy variational principles

**Applications:**

- ▶ phase transformation kinetics
- ▶ pattern formation
- ▶ examples from biophysics
- ▶ examples from information processing

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**Literature:**

- ▶ R. Livi & P. Politi , *Nonequilibrium Statistical Physics* (CUP, 2017)
- ▶ A. Kamenev, *Field Theory of Non-Equilibrium Systems* (CUP, 2011)
- ▶ D. Evans & G. Morriss, *Nonequilibrium Liquids* (Cambridge UP, 2008)

**Prerequisites:** IK & Statistical Physics

**Times:** Lecture: Mo 15:15—16:45 & Fr 08:45—09:45, (prelim.)

Tutorials: to be decided,

exercises & journal presentations

registration: Zeus (until semester)

**Examination:**

MS Phys (10 Cr; 4+2 SWS): admission: [tutorials](#); mark: [oral exam](#)

**Language:**

choice: German or English

**Materials:**

<https://ilias.uni-konstanz.de/ilias> to be done