Statistical Physics 2 : Disordered Systems and Interdisciplinary Applications

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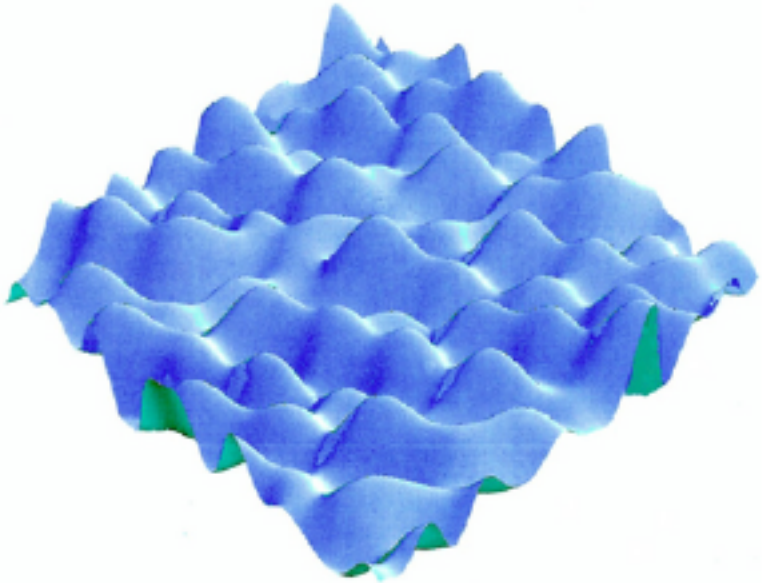
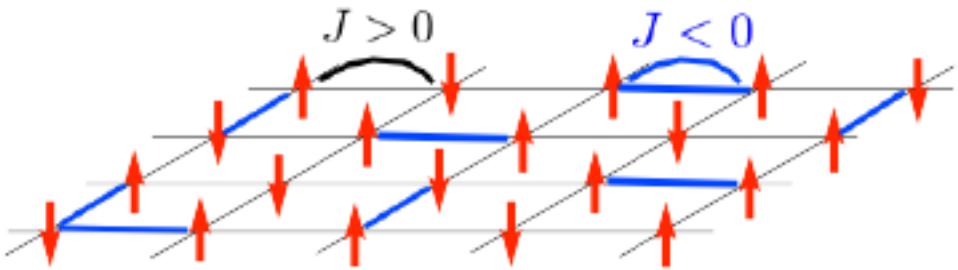
Disordered systems

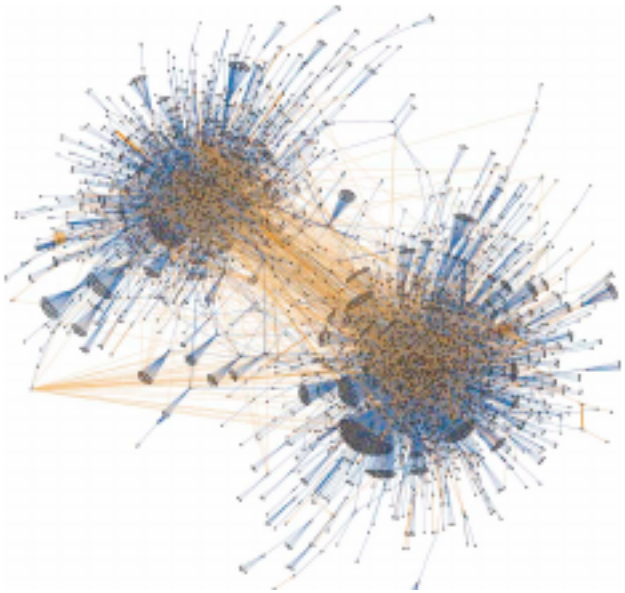
Random Landscapes



Random Systems

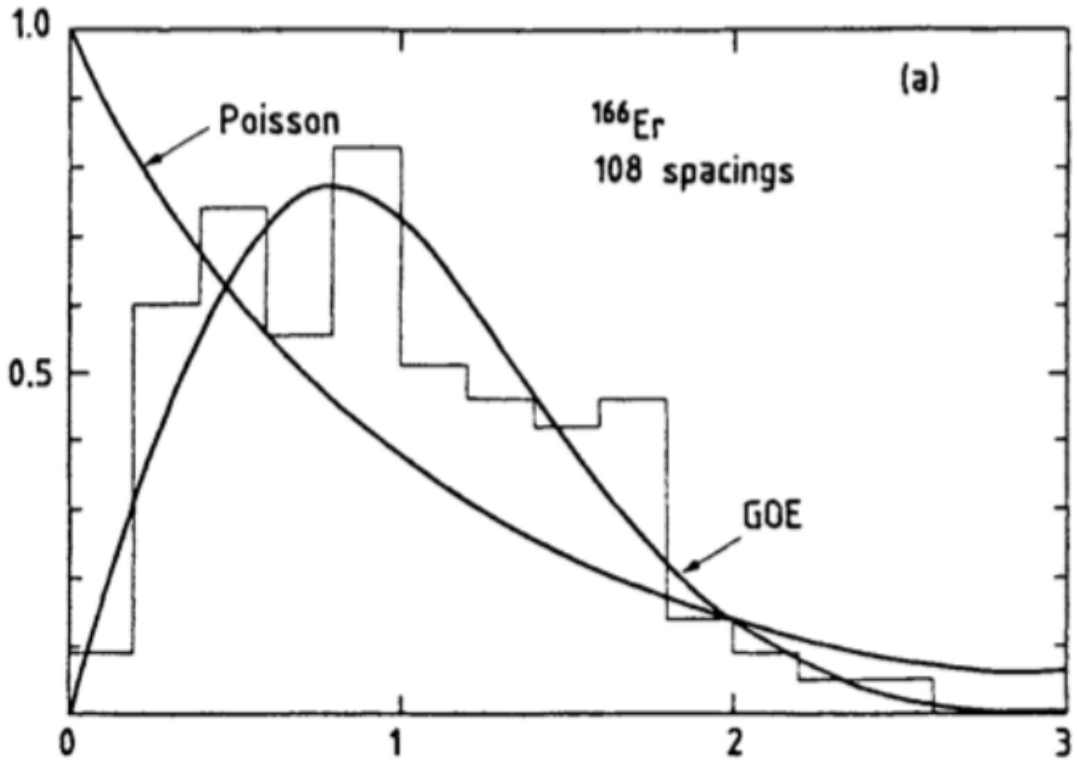


Random Networks



Slide by G. Biroli

Universality



Spacing distribution of :

- Eigenvalues of random matrices
- Energy levels of condensed matter and nuclear systems
- Zeroes of Riemann zeta function

Objects of study

- (Spin-)Glasses
- Localization transition
- Random graphs
- Applications to
  - computer science (coloring problem)
  - information theory (error-correcting codes)

Tools

- Probability
- Random matrices
- Replica method

Practical informations

- Monday morning, salle Borel (29 Rue d'Ulm)
  Course: 8:30 - 10:15
  Exercises: 10:30 - 12:30, working autonomously or in small groups, with frequent exchanges with the instructor
- Facultative "homeworks" to prepare the next course and exercise session
- References, Exercises + some solutions will be on

`http://www.phys.ens.fr/~zamponi/teaching/M2disorder/disorder.html`

Outline

1. Reminder on probability, sums and maxima of random variables
2. Introduction to disordered systems
3. Spin-glasses, replica method
4. Random graphs
5. Applications to computer science and information theory
6. Effect of disorder on phase transitions
7. Random matrices
8. Localization problems
9. Out of equilibrium dynamics