ID de Contribution: **9** Type: **Lecture / lecture series**

Random critical points: Anderson transitions, multifractality, and conformal symmetry

lundi 10 mai 2021 15:00 (1 heure)

I will start with a brief overview of the basic issues related to disordered systems (ensembles, distributions, disorder averages), and introduce examples of disordered systems (random magnets, disordered electronic systems), and basic techniques to get to a field theory description (replicas and SUSY).

Then I will focus (perhaps exclusively, depending on the available time) on Anderson transitions and multifractality (MF) of wave functions. I will talk about MF spectra and their properties, and how to compute them in some simple models (Dirac fermion in a random gauge potential). I will also talk about sigma model and how the symmetry of the target space implies symmetries of the MF spectra.

Finally, I plan to discuss Suslov's proposal for parabolicity of MF spectra, how it fails in general, and how it can be demonstrated for the IQH transition using CFT (based on an article by Bondesan, Wieczorek and Zirnbauer).

If time allows, I plan to discuss mappings of network models to stat-mech models for classes C and A, and relate to geometric disorder, SLE, etc.

- Lecture 1. Introduction. General remarks about disorder. Random Hamiltonians, random observables. Statistical treatment, quenched averages. First example: classical spin systems. Replica method. Harris criterion. Two dimensions: c=0 and logarithmic CFTs.
- Lecture 2. Second example: quantum spin systems and SYK models. Third example: geometric critical phenomena. Percolation, random cluster, and random loop models. Stochastic geometry. Two dimensions: stochastic conformal geometry, SLE and conformal restriction.
- Lecture 3. Fourth example: disordered electronic systems, Anderson localization, Anderson transitions. Supersymmetry method and non-linear sigma models. Altland-Zirnbauer classification. Multifractality of critical wave functions: basic properties and formalism. Multifractal dimensions and field theory.
- Lecture 4. Symmetries of multifractal spectra. Generalized multifractal observables. Two dimensions: application of 2D CFT to multifractality. Exact parabolicity of multifractal spectra.

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Classification de thématique: 2. Statistical physics targets