Program

June 5^{th}

Amphithéâtre Buffon - Université Paris Cité : Bât. Buffon, 15 rue Hélène Brion 75013 Paris

9:00-9:30	*Welcome reception*
9:30-10:20	Gérard Ben Arous
10:20-11:10	Alain-Sol Sznitman
11:10-11:40	*Coffee break*
11:40-12:20	Nina Gantert
12:20-14:00	*Lunch break*
14:00-15:30	*Tribute to Francis*
15:30-16:00	*Coffee break*
16:00-17:00	*Public Lecture:* Josselin Garnier
17:00-18:30	*Cocktail*

June 6^{th} and 7^{th}

Collège de France 11, place Marcelin Berthelot 75005 Paris

June 6^{th}		June 7^{th}	
9:30-10:20	Amir Dembo	9:30-10:20	Erwin Bolthausen
10:20-11:10	Justin Salez	10:20-11:10	Marie Théret
11:10-11:40	*Coffee break*	11:10-11:40	*Coffee break*
11:40-12:20	Catherine Matias	11:40-12:20	Hubert Lacoin
12:20-14:00	*Lunch break*	12:20-14:00	*Lunch break*
14:00-14:50	Alejandro Ramirez	14:00-14:50	Nikolaos Zygouras
14:50-15:40	Zhan Shi	14:50-15:40	Clément Cosco
15:40-16:10	*Coffee break*	15:40-16:10	*Coffee break*
16:10-17:00	Alessandra Faggionato	16:10-17:00	Ofer Zeitouni
17:00-17:50	Seguei Popov		

Public Lecture - Séminaire Grand Public

Josselin Garnier

Ecole Polytechnique, Paris

Une promenade dans les marches aléatoires

Lors de cet exposé nous explorerons certains des domaines de recherche de Francis Comets. Nous présenterons des questions et des applications liées aux marches aléatoires. Nous examinerons quelques propriétés de ces marches et nous regarderons des applications allant des algorithmes de classification des pages web aux modèles génératifs utilisés en apprentissage automatique. Cette promenade nous montrera combien les relations entre l'ordre et le désordre peuvent être complexes et riches.

Wandering amongst random walks

In this talk we will explore some of Francis Comets' areas of research. We will present questions and applications related to random walks. We will examine some properties of these walks and look at applications ranging from web page classification algorithms to generative models used in machine learning. This walk will show us how complex and rich the relationship between order and disorder can be.

Cet exposé sera en français. This talk will be given in French.

Abstracts of talks

Gérard Ben Arous

New York University, USA

The not-so-simple high temperature phase of Spin Glasses, since Comets-Neveu

In 1995 Francis Comets introduced (with Jacques Neveu) an elegant and natural method to understand the fluctuations of the free energy of mean-field Spin Glasses in the high-temperature phase, after the initial works in 1987 by Aizenman-Lebowitz-Ruelle and Frohlich-Zegarlinsky. I will survey questions open to this day about the supposedly simple high temperature phase of spin glasses. I will first recall the known results for the Random Energy Model and then switch to the context of spherical spin-glasses both from the static and dynamic point of views. In particular I will talk about the topological structure of the so-called shattering phase, the dynamical transition, and the Barrat-Burioni-Mézard metastability transition. I will rely in particular on recent work with Aukosh Jagannath.

Erwin Bolthausen

University of Zürich, Switzerland

Large deviations for the capacity of the Wiener sausage

The capacity C_t of the standard Wiener sausage of time length t in dimensions $d \geq 5$ is typically of order $c_d t$ where c_d is a not explicitely given constant. In dimension 4, there is a logarithmic correction. We derive a variational formula for the probability that $C_t \leq bt$ where $b < c_d$ in dimension 5 and above. This is joint work with Michiel van den Berg (Bristol), and Frank den Hollander (Leiden).

Clément Cosco

Université Paris Dauphine, Paris

High moments of the 2D polymer partition function

The model of directed polymers describes the behavior of a long chain of monomers that spreads among an inhomogeneous environment along a given direction. In dimension 1+ 2, there exists a (rescaled) high temperature region where the partition function of the model is bounded in L2. In this regime, it is known that the partition function converges towards a log-correlated Gaussian field, and it is natural to wonder what this implies in terms of extreme values of the partition function field. In the polymer language, this brings us to the study of favorite paths. I will present two preliminary results in this direction, namely an upper bound on the moments of the partition function and a lower bound that we have obtained recently. This is joint work with Ofer Zeitouni.

Amir Dembo

Stanford University, USA

Asymptotic for the capacity of the range of simple random walk

In a joint work with Izumi Okada, we study the capacity of the range of a simple random walk in three and higher dimensions. It is known that the order of the capacity of the random walk range in n dimensions has a similar asymptotic to that of the volume of the random walk range in $n-2$ dimensions. Proving the law of the iterated logarithm for the capacity of the range, we find that this correspondence breaks down for $n = 3$, leading to an unexpected host of challenging open problems.

Alessandra Faggionato

Sapienza, Università di Roma, Italy

Symmetric simple exclusion processes on random graphs in $\mathbb{R}^d$ with random conductances: construction, hydrodynamics and equilibrium fluctuations

Interacting particle systems on random geometric structures have been the object of intensive research in the last years. We focus here on the symmetric simple exclusion process (SSEP) on a generic random graph in $\mathbb{R}^d$ with random weights (conductances). The graph is assumed to be microscopically disordered but macroscopically homogeneous from a statistical viewpoint. As examples we mention the supercritical percolation cluster on $\mathbb{Z}^d$ or other lattices, the Delaunay triangulation and the complete graph of a point process, the Boolean model, the random connection model (all with random conductances). We discuss the graphical construction of the SSEP, properties of its Markov semigroup and the quenched hydrodynamic limit in path space. For some special random graphs we present results on the equilibrium fluctuations.

Nina Gantert

Technical University of Munich, Germany

Branching random walks with annihilation

We study a branching annihilating random walk in which particles move on the d-dimensional lattice and evolve in discrete generations. Each particle produces a Poissonian number of offspring with mean μ which independently move to a uniformly chosen site within a fixed distance R from their parent's position. Whenever a site is occupied by at least two particles, all the particles at that site are annihilated. We prove that for any $\mu > 1$ the process survives when R is sufficiently large. For fixed R we show that the process dies out if μ is too small or too large. Furthermore, for fixed (but large) R and $1 < \mu < e^2$ we exhibit an interval of μ-values for which the process survives. For such μ's we can also show that the process has a unique non-trivial ergodic equilibrium and prove complete convergence starting from arbitrary initial conditions. The main techniques involve comparison with oriented percolation and coupling arguments.

Based on joint work with Alice Callegaro, Matthias Birkner, Jiří Černý and Pascal Oswald

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Hubert Lacoin

IMPA, Rio de Janeiro, Brasil

The phase diagram of complex Gaussian Multiplicative Chaos

The complex Gaussian Multiplicative Chaos (or complex GMC) is informally defined as a random distribution $e^{\gamma X}\mathrm{d}x$ where X is a log-correlated Gaussian field on $\mathbb{R}^d$ and $\gamma = \alpha + i\beta$ is a complex parameter. The correlation function of X is of the form

$$K(x,y) = \log \frac{1}{|x-y|} + L(x,y),$$

where L is a continuous function. The study of such an object is motivated by various applications, in theoretical Physics: including the mathematical construction of 2D Liouville Quantum Gravity, study of the two dimensional-Coulomb Gas, etc... Since $K(x,x)$, the field X cannot be defined pointwise but only via integration against test functions. For this reason, the construction of a mathematical object corresponding to this formal definition is a non-trivial task. The procedure which is usually used to define a GMC is to replace X by an approximation (obtained e.g. by mollifying the field X) and then consider a limit with an appropriate normalization. The nature of the obtained limit and the required normalization both depend on the value of γ. The study of the case $\gamma \in \mathbb{R}$, dates back to Kahane and is now fully understood. The investigation of the convergence for complex values of γ much more recent. In this talk we describe the phase diagram in γ of the complex GMC.

Catherine Matias

CNRS, Paris

Statistical success of MAMAs: a guided tour through Francis' contributions

MAMAs (marche aléatoire en milieu aléatoire) is the French acronym for random walks in random environment. Francis has been a forerunner and a driving force in this area for more than 20 years in probability. Very quickly he became convinced that the development of statistical results for MAMAs was also an important line of research and he actively contributed to the emergence of a group of people interested in those aspects. I will review some statistical contributions and remaining challenges around MAMAs.

Two-dimensional (Brownian) random interlacements

University of Porto, Portugal

Serguei Popov

In this talk, we will define and discuss two dimensional random interlacements, both in discrete and continuous setups. We also discuss some (surprising) properties of their "noodles", which are (two-dimensional) simple random walks conditioned on never hitting the origin in the discrete case and Brownian motions conditioned on never hitting the unit disk in the continuous case.

Alejandro Ramirez

NYU Shanghai, China

KPZ fluctuations in the planar stochastic heat equation

We consider Wick ordered solutions to the planar stochastic heat equation, corresponding to a Skorokhod interpretation in the Duhamel integral representation of the equation. We prove that the fluctuations far from the center are given by the stochastic heat equation. This talk is based on a joint work with Jeremy Quastel and Balint Virag.

Justin Salez

Université Paris Dauphine, Paris

Do there exist expanders with non-negative curvature?

In this talk I will briefly recall the framework of local weak limits of finite graphs introduced by I. Benjamini and O. Schramm, and then explain how this probabilistic viewpoint recently allowed me to answer an open question in discrete geometry, raised by E. Milman and A. Naor and publicized by Y. Ollivier.

Zhan Shi

Chinese Academy of Sciences, Beijing, China

The random series-parallel graph

I am going to make some elementary discussions on the distance on the random series-parallel graph. Joint work with Xinxing Chen, Bernard Derrida and Thomas Duquesne.

Alain-Sol Sznitman

ETH Zürich, Switzerland

On the cost of disconnection

In this talk we discuss some questions and results involving asymptotics of a large deviation character and their related cost for certain problems pertaining to disconnection by random walks, random interlacements, and level-sets of the Gaussian free field.

Marie Théret

Université Paris Nanterre, Paris

First order behaviour of the time constant in Bernoulli First Passage Percolation

In the classical model of First Passage Percolation on $\mathbb{Z}^d$, a family of i.i.d. non negative random variables is associated to the edges of the graph. These variables are interpreted as the random time needed to cross each edge. This defines a toy model to study propagation phenomena. The asymptotic average speed of propagation in a given direction v is given by $\mu(v)^{-1}$, where $\mu(v)$ is a constant (depending on the direction v, the dimension d and the distribution of the passage times) called the time constant. The ergodic sub-additive theorem state the existence of such a constant, but gives us no information on its value, and very few is known in a general setting. In this talk, we consider a very simple family of passage time distributions, namely Bernoulli distributions with parameter $1-\epsilon$. For $\epsilon = 0$, $\mu_\epsilon(v) = \|v\|_1$. We investigate the first order behaviour of $\epsilon \mapsto \mu_\epsilon(v)$ when ϵ goes to 0. This is a joint work with Anne-Laure Basdevant and Jean-Baptiste Gouéré.
