Statistical physix in Lugdunum

June 24–28, 2013 — UMPA, ENS-Lyon

Mini summer-school sponzored by the ANR MAC 2
Organization: V. Beffara and C. Garban

- 4 mini-courses (3*90 minutes) by:

Omer Angel (UBC, Vancouver)
Planar maps, Random Walks and circle packings

Steffen Rohde (UW, Seattle)
Discrete conformal maps

Allan Sly (UCB, Berkeley)
Lipschitz embedings of Random Sequences

Fabio Toninelli (CNRS, Université Lyon 1)
Stochastic dynamics of random interfaces

- Tentative schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10:30	S. Rohde 1	A. Sly 1	O. Angel 2	O. Angel 3	S. Rohde 3
11-12:30	F. Toninelli 1	F. Toninelli 2	A. Sly 2	S. Rohde 2	Talk 4 Fribergh

12:30-14	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
14-15:30	O. Angel 1	F. Toninelli 3		A. Sly 3	
16-17	Talk 1 Curien	Talk 2 Viklund		Talk 3 Manolescu	
Evening				DINNER	

- Abstracts

Steffen Rohde: *Discrete conformal maps*

It is often desirable to represent a planar graph in a "conformally natural" way. In this mini-course, we will discuss two such representations, namely circle packings, and the Riemann surface obtained by glueing euclidean polyhedra. We will begin with a thorough discussion of existence and uniqueness of circle packings (following Koebe and Schramm) and the Rodin-Sullivan theorem of convergence to the conformal map. We will then discuss the Riemann surface approach, compare the two, and see that Brownian motion on the Riemann surface associated with the uniform infinite planar triangulation is recurrent. We will also discuss conformally natural representations of trees (via Shabat polynomials), and of carpets (such as CLE). Some of this is joint work with Jim Gill, with Don Marshall, and with Brent Werness.

Allan Sly: *Lipschtiz Embeddings of Random Sequences and Objects*

A range of problems popularized by Winkler involve embedding one random sequence into another. These include his compatible sequence and clairyoiant demon problem and the question of finding a Lipschitz
embedding from one i.i.d. Bernoulli sequence into another. A fourth is
the question of whether two Poisson processes on the real line are roughly isometric. These can all be viewed as problems in co-ordinate
percolation.

I will discuss new multi-scale methods which give a unified framework for tackling these problems. I will then describe the extension of these
models to higher dimensions. Working in higher dimension involves a
number of additional challenges and the base case on the induction requires new results in analysis finding smooth ways of stretching measureable sets. Finally I will conclude by discussing open problems in
extending these problems to more complex random objects such as trees,
random graphs and percolation clusters.

Based on joint work with Riddhipratim Basu and Vladas Sidoravicius

Fabio Toninelli: *Stochastic dynamics of random interfaces*

In this mini-course we will consider random discrete interfaces: these model for instance the boundary between the + phase and the - phase of the Ising model, at low temperature. Our goal is to understand the stochastic evolution of such interfaces under some natural Markov (Glauber) dynamics. In many situations one expects that the relevant timescale T_L of interface evolution grows like the square of the interface diameter L (diffusive scaling), but this is in general very hard

to prove.

More specifically, we will concentrate on the case of the 3d Ising model at zero temperature: in this case, interfaces can be locally seen as lozenge tilings of the plane. We will see that the knowledge of the (Gaussian-Free-Field-like) fluctuations of random tilings, together with geometric ideas of mean-curvature-motion type, allow in some cases to prove the conjectured scaling T_L\approx L^2.

Based on joint works with P. Caputo, B. Laslier, F. Martinelli, F. Simenhaus.

Fredrik Viklund: *On the continuity of SLE(\kappa) in \kappa and related results*

SLE(\kappa) is a family of random curves constructed by solving the Loewner equation with a standard Brownian motion times the square-root of \kappa as driving term. A natural question that has been asked is whether almost surely the SLE(\kappa) curves simultaneously exist and change continuously if the Brownian motion sample is kept fixed but the parameter \kappa is varied in an interval; there exist examples of deterministic Loewner chains with driving terms more regular than Brownian motion for which the corresponding statement is false. We will discuss a result giving a positive answer to this question and also indicate how related ideas can be used to obtain power-law convergence rate results for, e.g., the LERW path, when a rate for the driving term is known.
The talk is in part based on joint work with Rohde and Wong.

- Participants (under construction)

Omer Angel (UBC Vancouver)
Juhan Aru (ENS Lyon)
Vincent Beffara (ENS Lyon)
Stephane Benoist (Columbia University)
Nathanael Berestycki (Cambridge)
Cédric Bernardin (ENS Lyon)
Oriane Blondel (Paris 7)
Anne Briquet (Université de Lorraine)
Loren Coquille (Unité de mathématiques, Genève)
Nicolas Curien (Paris 6)
Daphné Dieuleveut (ENS Paris)
Leif Doering (ETH Zurich)
Clément Erignoux (ENS Paris)
Max Fathi (Paris 6)
Alexander Fribergh (Université de Toulouse)
Christophe Garban (ENS LYON)
Maxime Gagnebin (Unité de mathématiques, Genève)
Thierry Gobron (Université de Cergy-Pontoise)
Henry Jackson (cambrdige)
Emmanuel Jacob (ENS Lyon)
Benoit Laslier (Université Lyon 1)
Jhih-Huang Li (Université d'Orsay)

Sébastien Martineau (ENS Lyon)
Ioan Manolescu (Unité de mathématiques, Genève)
Grégory Miermont (ENS Lyon)
Pierre Nolin (ETH, Zurich)
Loic Richier (ENS Lyon)
Steffen Rohde (UW, Seattle)
Mikael de la Salle (Université de Franche-Comté)
Bati Sengul (Cambridge)
Marielle Simon (ENS Lyon)
Allan Sly (UCN, Berkeley)
Robin Stephenson (Dauphine)
Vincent Tassion (ENS Lyon)
Béatrice de Tilière (Paris 6)
Michele Triestino (ENS Lyon)
Fabio Toninelli (Université Lyon 1)
Niccolo Torri (Université Lyon 1)
Fredrik Viklund (Columbia university)
Xiaolin Zeng (Université Lyon 1)
