Non-equilibrium statistical mechanics
Mécanique statistique hors d'équilibre

(Org: **Tomohiro Sasamoto** (Tokyo Institute of Technology) and/et **Cristina Toninelli** (Université Paris Diderot))

RIDDHIPRATIM BASU, International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, India
Coalescing Polymers and the Slow Bond Problem

Last passage percolation on $\mathbb{Z}^2$ with independent exponentially distributed passage times with a common mean is one of the paradigm examples of exactly solvable models in the KPZ universality class. One can study the geometry of polymers in this model by combining the moderate deviation estimates for polymer weights that are available from the integrable probability literature together with techniques of percolation. I shall discuss some recent results in this vein.

We shall consider two polymers to (n,n) from (say) $(k,-k)$ and $(-k,k)$ (with $n \gg k$) and show that they typically coalesce within distance $O(k^{3/2})$ of the origin. As an application beyond the exactly solvable regime, we shall discuss how this result, together with the well-known mapping between exponential last passage percolation and Totally Asymmetric Simple Exclusion Process (TASEP) on $\mathbb{Z}$, can be used to obtain a characterization of the invariant measures of TASEP on the line with a slow bond at the origin, verifying conjectures by Janowsky and Lebowitz and also of Liggett.

This is based on joint works with Sourav Sarkar, Vladas Sidoravicius and Allan Sly.

BENJAMIN DOYON, King's College London
Hydrodynamics for integrable systems out of equilibrium

Hydrodynamics is a powerful framework for describing the large-scale behaviours of many-body systems in inhomogeneous, non-stationary states. Until recently, however, it was restricted to non-integrable models, as the assumption of local thermodynamic equilibrium is broken by the large amount of conserved charges afforded by integrability. I will describe how to generalize hydrodynamics to integrable systems. The resulting Euler-scale theory has a rich structure. It allows us to solve experimentally relevant setups such as the famous "quantum Newton's cradle" in cold atomic gases, and to evaluate exact non-equilibrium currents, correlations, Drude weights and scaled cumulants of non-equilibrium transport. It applies to large families of quantum and classical field theories, chains and gases. I will introduce generalized hydrodynamics and state its main results.

NICOLAS PERKOWSKI, Max Planck Institute for Mathematics in the Sciences Leipzig
Mass asymptotics for the 2d parabolic Anderson model

I will discuss the long time asymptotics of the total mass of the two-dimensional parabolic Anderson model with (space) white noise potential. The proof is based on a new method of stochastic characteristics for singular stochastic PDEs and heat kernel estimates for singular diffusions, in combination with recent results by Chouk and van Zuijlen on the asymptotics of the spectrum of the Anderson Hamiltonian with white noise potential. Joint work with Wolfgang König and Willem van Zuijlen.

JEREMY QUASTEL, University of Toronto
The KPZ fixed point

We describe the scaling invariant Markov process governing large distance long time fluctuations in the KPZ universality class and how it arises from the exact solution of the discrete model TASEP.

MAKIKO SASADA, The University of Tokyo
Dynamics of the box-ball system with random initial conditions via Pitman's transformation

The box-ball system (BBS), introduced by Takahashi and Satsuma in 1990, is a cellular automaton that exhibits solitonic behaviour. In this talk, we study the BBS when started from a random two-sided infinite particle configuration. For such a model, Ferrari et al. recently showed the invariance in distribution of Bernoulli product measures with density strictly less than $\frac{1}{2}$, and gave a soliton decomposition for invariant measures more generally. We study the BBS dynamics using the transformation of a nearest neighbour path encoding of the particle configuration given by 'reflection in the past maximum', which was famously shown by Pitman to connect Brownian motion and a three-dimensional Bessel process. We use this to characterise the set of configurations for which the dynamics are well-defined and reversible for all times. We give simple sufficient conditions for random initial conditions to be invariant in distribution under the BBS dynamics, which we check in several natural examples, and also investigate the ergodicity of the relevant transformation. Furthermore, we analyse various probabilistic properties of the BBS that are commonly studied for interacting particle systems, such as the asymptotic behavior of the integrated current of particles and of a tagged particle. The talk is based on a joint work with David Croydon, Tsuyoshi Kato and Satoshi Tsujimoto.

SERGIO SIMONELLA, CNRS - École Normale Supérieure de Lyon
Dynamical connectivity and propagation of chaos

I will discuss a strategy to obtain detailed estimates of correlations in large particle systems, covering simultaneously several types of kinetic models, by means of a common hierarchy of equations. I will then explain how to use the same hierarchical structure to describe a dynamical phase transition for the number of particles connected by a sequence of binary interactions.