“Statistical Mechanics, Integrability and Combinatorics”
Schedule for Week 6, June 15-19

Monday June 15, Room B, 14.30

Plane partitions with two-periodic weights
Sevak Mkrtchyan *(University of Rochester)*

We will discuss scaling limits of skew plane partitions with two-periodic weights under several boundary conditions. We will discuss the frozen boundary and the correlation kernel of the limiting point processes. Of particular interest is the process at the turning points. The turning points that appear in the homogeneous case split in the two-periodic case into pairs of turning points macroscopically separated by a “semi-frozen” region. As a result the point process at a turning point is not the GUE minor process, but rather a pair of GUE minor processes, non-trivially correlated. We will also discuss an intermediate regime when the weights are periodic but all converge to 1. In this regime the limit shape and correlations in the bulk are the same as in the case of homogeneous weights and periodicity is not visible in the bulk. However, the process at turning points is still not the GUE minor process.

Monday June 15, Cloister, 17.30

Wine and Cheese “garden party”
Accompanying persons are welcome

Tuesday June 16, Room B, 11.30

Topological vertices and integrable models
Omar Foda *(The University of Melbourne)*

A topological vertex is a combinatorial object that one associates to a plane partition. It is also a building block of instanton partition functions which, via the AGT correspondence, are expectation values of vertex operators in integrable models.
I wish to explain, with emphasis on computational details, how one can start from a set of topological vertices, glue them to construct a topological partition function, and choose the parameters of the latter to obtain conformal blocks of Virasoro minimal models.

Wednesday June 17, Room B, 11.30

Generalized Smoluchowski Equations and Scalar Conservation Laws
Fraydoun Rezakhanlou *(University of California, Berkeley)*

By a classical result of Bertoin, if initially a solution to Burgers' equation is a Levy process without positive jumps, then this property persists at later times. According to a theorem of Groeneboom, a

white noise initial data also leads to a Levy process at positive times. Menon and Srinivasan observed that in the both aforementioned results the evolving Levy measure satisfies a Smoluchowski–type equation. They also conjectured that a similar phenomenon would occur if instead of Burgers' equation, we solve a general scalar conservation law with a convex flux function. Though a Levy process may evolve to a Markov process that in most cases is not Levy. The corresponding jump kernel would satisfy a generalized Smoluchowski equation. Along with Dave Kaspar, we show that of this conjecture is true for monotone solutions to scalar conservation laws. I also formulate some open questions concerning the analogous questions for Hamilton-Jacobi PDEs in higher dimensions.

Thursday June 18, Room B

11.00-11.45
Dimers on rail yard graphs
Sanjay Ramassamy *(Brown University, Providence)*

The dimer model is a statistical mechanics model corresponding to perfect matchings on graphs. We introduce a general model of dimer coverings of certain planar bipartite graphs, which we call rail yard graphs (RYG). Using transfer matrices and dimer-localizing operators, we give explicit expressions for the partition function and for the inverse Kasteleyn matrix, which yields all dimer correlation functions. Plane partitions, domino tilings of the Aztec diamond and pyramid partitions arise as particular cases of the RYG dimer model.
This is joint work with Cédric Boutillier, Jérémie Bouttier, Guillaume Chapuy and Sylvie Corteel.

11.45-12.30
Integrability of limit shape phenomenon in the six-vertex Model
Aneth Sridhar *(University of California, Berkeley)*

The six vertex model on a planar region can be reformulated as a theory random stepped surfaces called height functions. In certain circumstances, the six vertex model exhibits the limit shape phenomenon: in the thermodynamic limit, the average height function is deterministic and conjecturally can be found by solving a certain variational problem. In this talk, we discuss the implications of the discrete integrability of the six vertex model (in the sense of commuting transfer matrices) on the integrability of the limit shape phenomenon (in the sense of commuting Hamiltonians for the PDE arising from the variational problem).

Friday June 19, Room B, 11.30

Appearance of determinants for stochastic growth models
Tomohiro Sasamoto *(Tokyo Institute of Technology)*

For the Kardar-Parisi-Zhang (KPZ) equation and related discrete growth models, certain quantities can be written as Fredholm determinants. From this follows for example that the fluctuations of the models in the large time limit is described by the Tracy-Widom distributions from random matrix theory. An interesting point here is that many models in question are apparently not free-fermionic (not determinantal) but still admit the Fredholm determinant formulas for certain quantities. In this talk I will present and explain about a few such examples (TASEP, KPZ equation, O'Connell-Yor polymer etc).