Seminar/Talk

The monomer-dimer model and the Neumann Gaussian Free field

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Host: M. Beiglböck, N. Berestycki, L. Erdös, J. Maas, F. Toninelli

The classical dimer model is a uniform probability measure on the space of perfect matchings of a graph, i.e., sets of edges such that each vertex is incident on exactly one edge. In two dimensions, one can define an associated height function which naturally models a ''uniform'' random surface (with specified boundary conditions). Moreover the model can be solved exactly which in particular means that its correlations are given by the entries of the inverse Kasteleyn matrix. This exact solvability was the starting point for the breakthrough work of Kenyon who proved, already 20 years ago, that the scaling limit of the height function in bounded domains approximated by the square lattice with vanishing mesh is the Dirichlet (or zero boundary conditions) Gaussian free field. This was the first mathematically rigorous example of conformal invariance in planar statistical mechanics. In this talk, I will focus on a natural modification of the model where one allows the vertices on the boundary of the graph to remain unmatched. This is the so-called monomer-dimer model (or dimer model with free boundary conditions) (in our case the presence of monomers is restricted to the boundary). This modification complicates the classical analysis in several ways and I will discuss how to circumvent the arising obstacles. In the end, the main result that we obtain is that the scaling limit of the height function of the monomer-dimer model in the upper half-plane approximated by the square lattice with vanishing mesh is the Neumann (or free boundary conditions) Gaussian free field.This is based on joint work with Nathanael Berestycki (Vienna) and Wei Qian (Paris).

Tuesday, January 12, 2021 05:30pm - 06:15pm
online via Zoom

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