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The Dimer Model in 3 dimensions

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The dimer model, also referred to as domino tilings or perfect matching, are tilings of the $\mathbb{Z}^d$ lattice by boxes exactly one of whose sides has length 2 and the rest have length 1. This is a very well-studied statistical physics model in two dimensions with many tools like height functions and Kasteleyn determinant representation coming to its aid. The higher dimensional picture is a little daunting because most of these tools are limited to two dimensions. In this talk I will describe what techniques can be extended to higher dimensions and give a brief account of a large deviations principle for dimer tilings in three dimensions that we prove analogous to the results by Cohn, Kenyon and Propp (2000).

This is joint work with Scott Sheffield and Catherine Wolfram.