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Probability and combinatorics: hopping particles and Macdonald polynomials

The asymmetric simple exclusion process (ASEP) is a model of particles hopping on a one-dimensional lattice. It was initially introduced by Macdonald-Gibbs-Pipkin to provide a model for translation in protein synthesis. On the other hand, Macdonald polynomials are a remarkable family of multivariate polynomials which generalize Schur polynomials and Hall-Littlewood polynomials. I'll explain how the study of the ASEP on a ring leads to new formulas for Macdonald polynomials.