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The multispecies TAZRP and modified Macdonald polynomials

Recently, a formula for the symmetric Macdonald polynomials $P_\lambda(X;q,t)$ was given in terms of objects called multiline queues, which also compute probabilities of a statistical mechanics model called the multispecies asymmetric simple exclusion process (ASEP) on a ring. It is natural to ask whether the modified Macdonald polynomials $\widetilde{H}_\lambda(X;q,t)$ can be obtained using a combinatorial gadget for some other statistical mechanics model. We answer this question in the affirmative. In this talk, we will give a new formula for $\widetilde{H}_\lambda(X;q,t)$ in terms of fillings of tableaux called polyqueue tableaux. We define a multispecies totally asymmetric zero range process (TAZRP) on a ring with parameter t, whose (unnormalized) stationary probabilities are computed by polyqueue tableaux, and whose partition function is equal to $\widetilde{H}_\lambda(X;1,t)$. This talk is based on joint work with Arvind Ayyer and James Martin.