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**Lauren K Williams\*** ([lauren@math.harvard.edu](mailto:lauren@math.harvard.edu)), Department of Mathematics, Harvard University, 1 Oxford Street, Cambridge, MA , and **Sylvie Corteel**. *A Markov chain on permutation-tableaux whose quotient is the asymmetric exclusion process.*

The partially asymmetric exclusion process (PASEP) is an important model from statistical mechanics which describes a system of interacting particles hopping left and right on a one-dimensional lattice of  $N$  sites. It is partially asymmetric in the sense that the probability of hopping left is  $q$  times the probability of hopping right. Additionally, particles may enter from the left with probability  $\alpha$  and exit from the right with probability  $\beta$ .

It turns out that the (unique) stationary distribution of the PASEP can be expressed very naturally in terms of permutation tableaux (certain 0-1 tableaux that come indirectly from Postnikov's work on the nonnegative part of the Grassmannian). More precisely, we prove that in the steady state, the probability that the PASEP is in state  $\tau$  is a certain weight-generating function for all permutation tableaux of shape  $\lambda(\tau)$ . Our first proof of this result uses Derrida et al's "matrix ansatz." Our second proof works by constructing a Markov chain on the set of all permutation tableaux of a given length, which projects (in a very strong sense) to the PASEP. (Received September 03, 2006)