1077-05-1935 **Joel Brewster Lewis*** (jblewis@math.mit.edu), 77 Massachusetts Avenue, Cambridge, MA 02139, and **Ricky Ini Liu**, **Alejandro H. Morales**, **Greta Panova**, **Steven V Sam** and **Yan X Zhang**. *Matrices with restricted entries and q-analogues of permutations.*

Classical formulas show that the number of invertible $n \times n$ matrices over a finite field with q elements is a natural q-analogue of $n!$, and more generally that the number of $n \times n$ matrices of rank r is a q-analogue of the number of ways to place r nonattacking rooks on an $n \times n$ board. In this talk, we study the functions that count matrices of given rank over a finite field with specified positions equal to 0. We show that the number invertible matrices with zero diagonal is a natural q-analogue of the number of derangements (i.e., permutations with no fixed points). More generally, we show that the number of matrices of given rank with certain entries equal to 0 is a q-analogue of rook placements with restricted positions.

In addition, we study the question of when the number of matrices with given size, rank, and prescribed entries equal to 0 is a polynomial in the size q of the field. We also consider a variety of related questions concerning symmetric and skew-symmetric matrices. Most of our proofs are elementary, and we frame some of our results in the context of Lie theory. (Received September 21, 2011)