Adriano M. Garsia* (garsia@math.ucsd.edu). Recent progress on the Shuffle Conjecture: Macdonald Polynomials and Parking Functions.

The Frobenius characteristic $DH_n(X; q, t)$ of Diagonal Harmonics, under the diagonal action of $S_n$ was shown by Mark Haiman in 2000 by Algebraic Geometry to be the image of the elementary symmetric function $e_n$ by the operator $\nabla$ that is an eigen-operator for the modified Macdonald basis $\tilde{H}_\mu[X; q, t]$ with eigenvalue $T_\mu = t^{n(\mu)}q^{n(\mu')}$. It was conjectured in 2002, by Haglund, et all that,

$$DH_n(X; q, t) = \sum_{PF} t^{\text{area}(PF)} q^{\text{dinv}(PF)} Q_{\text{ides}(PF)}[X]$$

where the sum is over Parking Functions in the $n \times n$ lattice square, “area” and “dinv” are two elementary Parking Functions statistics and $Q_{\text{ides}(PF)}[X]$ is the fundamental Gessel quasi symmetric function indexed by the i-descent set of the diagonal permutation of the Parking function $PF$. In this talk we cover some of the recent progress in the resolution of this conjecture. (Received September 17, 2011)