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Revisiting r-Quasisymmetric Polynomials

In an unpublished manuscript from 2005, F. Hivert introduced a one-parameter family of (non-multiplicative) actions of the symmetric group S_n on the space of polynomials in n commuting variables. It happens that the classical symmetric polynomials form the space of invariants at parameter $r = \infty$ and the classic(?) quasisymmetric polynomials form the space of invariants at parameter $r = 1$. It also happens that for each integer $1 \leq r \leq \infty$, the space r-QSym of level-r invariants forms a ring, which brings us to the subject of the present work. We revisit two conjectures of Hivert regarding quotients of r-QSym by ∞-QSym, first proven by Garsia and Wallach (2007), and look for some representation-theoretic and combinatorially-rich bases along the way. (This is joint work with Sarah Mason.)