Recent Combinatorial Results Involving Macdonald Polynomials and Diagonal Harmonics

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The theory of nonsymmetric Macdonald polynomials was developed by Cherednik, Macdonald and Opdam. Like their symmetric counterparts, they have versions for arbitrary root systems, which satisfy an orthogonality relation and a norm evaluation (generalizing Macdonald's constant term conjecture), and which feature in a generalization of Selberg's integral. Their construction of these polynomials was existential, and up to now no particularly nice expressions for them were known. In this talk we overview some of this history, and then present an explicit combinatorial formula for the type A versions of these polynomials, which is recent joint work with M. Haiman and N. Loehr. We then discuss connections of our formula to the theory of symmetric functions and earlier conjectures involving the character of diagonal harmonics. Time permitting, some recent results on diagonal harmonics will be highlighted.

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