Algebraic Combinatorics

(Org: **Mike Zabrocki** (York, Canada))

CAROLINA BENEDETTI, York University, Fields Institute

Non-crossing and Non-nesting polytopes

N. Thiem defined unipotent polytopes in connection to certain representations of the unipotent group of upper triangular matrices over a finite field. In this talk we will define two subpolytopes of the unipotent polytope $U(\beta, P)$ where P is the line poset on n and β is the composition (1^n). These two subpolytopes arise as the convex hull of non-crossing and non-nesting partitions of $[n]$, respectively. We will explore the combinatorics of these polytopes and their connection with the root lattice of type A. This is current work with N. Bergeron , L. Colmenarejo and F. Saliola.

LAURA COLMENAREJO, York University, Fields Institute

A quantum Murnaghan Nakayama rule for Schubert polynomials.

We present a quantum Murnaghan Nakayama rule for the multiplication of any Schubert polynomial by a Schur polynomial (the Schubert polynomial of a Grassmannian permutation). For this, we consider the action on the left (on the values) presented by N. Bergeron and F. Sotille, and the action on the right (on the position) presented by Postnikov. Both actions present properties related to cyclic invariance. We also describe a classic interval representative for any "hook interval". This is a current work with C. Benedetti, N. Bergeron, F. Saliola and F. Sotille.

ADRIANO GARSIA, UC San Diego

Science Fiction and Macdonald Polynomals

In the 1998 paper "Science Fiction and Macdonald Polynomals" a variety of conjectures were formulated which are still unproven. Since these conjectures reveal some truly remarkable properties of the modified Macdonald basis , it is worth while to rekindle the interest in this topic. That paper predates Mark Haiman's proof of the $n!$ Conjecture. In this talk we will present the results that have been recently obtained in our attempts to prove some of these conjectures.

ROSA ORELLANA, Dartmouth College

Pieri rules for symmetric group characters

The irreducible characters of the symmetric group are symmetric polynomials evaluated at the eigenvalues of permutation matrices. In fact, these characters can be realized as symmetric functions that form a non-homogeneous basis for the ring of symmetric functions. The structure coefficients for the (outer) product of these functions are the stable Kronecker coefficients. In this talk we describe the Pieri rules for this new basis. This is joint work with Mike Zabrocki

MARINO ROMERO, UC San Diego

On the Delta Conjecture at $q = 1$

The Delta Conjecture of Haglund, Remmel, and Wilson gives a combinatorial interpretation for the symmetric function $\Delta_{e_k} e_n$. We will prove this conjecture at $q = 1$. Doing so will give a general approach for computing Delta operator expressions at $q = 1$, and we will explore some of the structures that arise.