Enumerative Combinatorics

(Organizer and Chair / Responsable et président: **Marni Mishna** (Simon Fraser University))

MATHILDE BOUVEL, LaBRI, CNRS and Univ. Bordeaux (France)

Operators of equivalent sorting power and related Wilf-equivalences

We study partial sorting operators $\mathbf{A}$ on permutations that are obtained composing Knuth's stack sorting operator $\mathbf{S}$ and the reverse operator $\mathbf{R}$, as many times as desired. For any such operator $\mathbf{A}$, we provide a statistics-preserving bijection between the set of permutations sorted by $\mathbf{S} \circ \mathbf{A}$ and the set of those sorted by $\mathbf{S} \circ \mathbf{R} \circ \mathbf{A}$. This is based on an apparently novel bijection between permutations avoiding the pattern 231 and those avoiding 132 which preserves many permutation statistics and has unexpected consequences in terms of Wilf-equivalences.

Joint work with Michael Albert (University of Otago, New Zealand).

SERGI ELIZALDE, Dartmouth College

Bijections for lattice paths between two boundaries

We prove that on the set of lattice paths with north and east (unit) steps that lie between two boundaries B and T, the statistics 'number of east steps shared with B' and 'number of east steps shared with T' have a symmetric joint distribution. We give an involution that switches these statistics, and a generalization to paths that contain south steps. We show that a similar result relates to the Tutte polynomial of a matroid. Finally, we extend our main theorem to k-tuples of paths, providing connections to flagged SSYT and k-triangulations. This is joint work with Martin Rubey.

ALEJANDRO MORALES, LaCIM, Université du Québec à Montréal

Counting matrices over finite fields with zeroes on Rothe diagrams

A q-analogue of permutations with restricted positions is invertible matrices over a finite field of size q with support that avoids some entries. The number of such matrices may not be a polynomial in q (Stembridge) but for some nice cases the numbers are nice polynomials. We generalize a result of Haglund by showing that when the support lies in a skew shape, the number of such matrices is a polynomial with nonnegative coefficients. We also study the situation when the zeroes are the entries of the Rothe diagram of a permutation.

Joint work with Aaron Klein and Joel Lewis.

MARKUS NEBEL, Kaiserslautern University

The Combinatorics of RNA in the Polymere Zeta Model

Recently it has been observed that the computational prediction of RNA secondary structure can be speed-up by a linear factor on average. To this end, one has to assume the so-called polymere zeta property, i.e. two building blocks of an RNA molecule at distance m are paired (in folding) with probability b/m^c, for some constants $b, c > 0$. In this talk, we examine the averaged shape of an RNA folding in a polymere zeta model using generating functions and techniques form complex analysis. We find that some important structural motifs show a rather different behavior than observed in real world molecules.

BRUCE SAGAN, Michigan State University

A factorization theorem for m-rook placements

Consider a Ferrers diagram $B = (b_1, b_2, \ldots, b_n)$. Let $r_k(B)$ be the number of placements of k non-attacking rooks on B and $x{\downarrow_k} = (x)(x-1)\cdots(x-k+1)$. The famous Factorization Theorem of Goldman-Joichi-White states that $\sum_{k \geq 0} r_k(B) x{\downarrow_{n-k}} = \prod_j (x + b_j - j + 1)$. Briggs and Remmel considered a generalization of rook placements to m-rook placements which are related to wreath products $C_m \wr S_N$ where C_m is a cyclic group and S_N a symmetric group. They were able to prove a version of the Factorization Theorem in this setting, but only for certain B. We give a generalization which holds for all B. This is joint work with Loehr and Remmel.