Equivariant Schubert calculus and beyond
Calcul de Schubert équivariant et plus encore
(Org: **Edward Richmond** (Oklahoma State) and/et **Kirill Zainoulline** (University of Ottawa))

REUVEN HODGES, UC San Diego
Levi-spherical Schubert varieties

I will present a root-system uniform, combinatorial classification of Levi-spherical Schubert varieties for any generalized flag variety G/B of finite Lie type. This will be applied to the study of multiplicity-free decompositions of a Demazure module into irreducible representations of a Levi subgroup.

DENNIN HUGH, The Ohio State University
Bijective proofs of derivative formulas for Schubert polynomials

Recently, Gaetz and Gao extended a lowering operator ∇ on weak order, first introduced by Stanley, to an $\mathfrak{sl}_2$ poset representation, thus proving the strong Sperner property of weak order. Hamaker, Pechenik, Speyer, and Weigandt later showed that ∇ can be realized as a certain differential operator on Schubert polynomials which, in particular, gives a short proof of the Macdonald reduced word identity. In this talk, we give bijective proofs of this and related derivative identities for Schubert polynomials and β-Grothendieck polynomials using the combinatorics of pipe dreams.

MINYOUNG JEON, University of Georgia
Mather classes of Schubert varieties via small resolutions

The Chern-Mather class is a characteristic class, generalizing the Chern classes of tangent bundles of nonsingular varieties to singular varieties. It uses the Nash-blowup for singular varieties instead of the tangent bundles. In this talk, we consider Schubert varieties, known as singular varieties in most cases, in the even orthogonal Grassmannians and discuss the work computing the Chern-Mather classes of the Schubert varieties by the use of the small resolutions of Sankaran and Vanchinathan with Jones' technique. We also describe the Kazhdan-Lusztig class of Schubert varieties in Lagrangian Grassmannians, as analogous results if time permitted.

NATHAN LESNEVICH, Washington University in St Louis
Splines on Cayley Graphs of the Symmetric Group

A spline is an assignment of polynomials to the vertices of a polynomial-edge-labeled graph, where the difference of two vertex polynomials along an edge must be divisible by the edge label. The ring of splines is a combinatorial generalization of the GKM construction for equivariant cohomoloy rings of flag, Schubert, Hessenberg, and permutohedral varieties. We consider spline rings where the underlying graph is the Cayley graph of a symmetric group generated by an arbitrary collection of transpositions. In this talk, we will give an example of when this ring is not a free module over the polynomial ring, and give a connectivity condition that precisely describes when particular graded pieces are generated by equivariant Schubert classes.

GEORGE SEELINGER, University of Michigan
K-theoretic Catalan functions

In 2008, Thomas Lam identified a family of symmetric functions known as k-Schur functions with the Schubert classes in the homology of the affine Grassmannian, in analogy with Schur functions serving as representatives for the (co)homology of the usual Grassmannian. Of additional interest, under an isomorphism between the quantum cohomology of the flag variety and the homology of the affine Grassmannian, known as the Peterson isomorphism, the quantum Schubert polynomials are sent to the k-Schur functions, up to suitable localization. Subsequently, much work had been done to carry out an analogous program in the K-theoretic generalization, but significant parts of the combinatorics of the symmetric function Schubert representatives remained elusive. In this talk, I will present how some new insights in the (co)homological setting enabled a K-theoretic refinement to give a direct understanding of some of the missing combinatorics surrounding the K-homology of the affine Grassmannian and the K-theoretic Peterson isomorphism.

MIHAIL TARIGRADSCHI, Rutgers University
Classifying cominuscule Schubert varieties up to isomorphism

Cominuscule flag varieties generalize Grassmannians to other Lie types. Schubert varieties in cominuscule flag varieties are then indexed by posets of roots labeled long/short. These labeled posets generalize the Young diagrams that index Schubert varieties in Grassmannians. We discuss the question of how these posets determine the isomorphism class of a Schubert variety.

RUI XIONG, University of Ottawa
Automorphisms of the Quantum Cohomology of the Springer Resolution and Applications

In this talk, we introduce quantum Demazure-Lusztig operators acting on the equivariant quantum cohomology of the Springer resolution. Our main result is a presentation of the torus-equivariant quantum cohomology in terms of generators and relations. We also provide explicit descriptions for the classical types and recover earlier results for complete flag varieties.

WEIHONG XU, VirginiaTech
A presentation for the quantum K ring of partial flag manifolds

We give a conjectured generalization of the Whitney presentation for the (equivariant) quantum K ring of Grassmannians by Gu, Mihalcea, Sharpe, and Zou to all partial flag manifolds, and prove it for Fl(1, n-1, n). The presentation arises from realizations of partial flag manifolds as Gauged Linear Sigma Models and highlights the structure of these manifolds as towers of Grassmann bundles. We also verify the specialization of this conjecture in quantum cohomology by comparing it with a presentation given by Gu and Kalashnikov using the abelian/non-abelian correspondence in mathematics. This is joint work with Gu, Mihalcea, Sharpe, Zhang, and Zou.