ABSTRACTS OF TALKS

Patrick Brosnan. University of Maryland

The Shareshian-Wachs Conjecture

In the talk, I will explain the Shareshian-Wachs conjecture and my recent work with Timothy Chow which proves it. The conjecture, which appeared on the arxiv in 2014, relates a certain action, called the dot action, of the symmetric group on the cohomology of Hessenberg varieties with a certain polynomial called the chromatic symmetric polynomial. The dot action was first defined by Tymoczko in the mid-2000s in terms of the equivariant cohomology of the Hessenberg variety (with respect to a certain torus). The chromatic symmetric polynomial of the conjecture is a certain refinement, due to Shareshian-Wachs, of a polynomial defined by Stanley in the early 90s. I will focus my talk on some of the geometric aspects of the proof, for example, a certain refinement of the local invariant cycle theorem of Beilinison-Bernstein-Deligne. I will also briefly mention another, completely independent and very interesting, proof of the conjecture which has been given by Guay-Paquet. And I will mention the connection between the Shareshian-Wachs conjecture and a certain conjecture of Stanley and Stembridge which is, to the best of my knowledge, still open.

Samuel Evens. University of Notre Dame

TBA

Stefan Gille. University of Alberta

On Rost nilpotence for three folds

We discuss the Rost nilpotence property and sketch a proof of this property for 3-dimensional toric models.

William Graham. University of Georgia

TBA

Thomas Hudson. KAIST, Korea

Segre classes and Kempf-Laksov formula in algebraic cobordism

A classical result in Schubert calculus, known as the Giambelli formula, describes the Schubert classes of the Grassmannian in terms of Schur polynomials evaluated at the Chern classes of the universal bundle. In this talk I will explain how this setting can be generalized from cohomology and the Chow ring to algebraic cobordism, the universal oriented cohomology theory. In the process a key role is played by a generalized version of Segre classes. This is a joint work with Tomoo Matsumura.

Takeshi Ikeda. Okayama University of Science, Japan

Double Grothendieck polynomials and the Kempf-Laksov resolutions

Recently, Kirillov and Naruse introduced the double Grothendieck polynomials for all classical Lie types. I will first provide an algebraic and combinatorial framework to understand the work focusing on the particular role of the K-theoretic Schur P- and Q-functions, which are representatives for the K-Schubert classes of the maximal isotropic Grassmannians. In the latter part of talk, I will explain how the Kempf-Laksov resolutions lead to determinantal or Pfaffian formulae for the double Grothendieck polynomials associated with the Grassmannian elements in type A, B, and C.

Saeid Molladavoudi. University of Ottawa

Cohomological pairings on Abelian symplectic quotients in quantum information theory

In this talk, by studying the geometry of associated moment polytope for a complex projective space of pure multi-qubit quantum states under special effective Hamiltonian action of maximal torus of the Local Unitary group with non-trivial characters, we explain how to obtain cohomology rings and a recursive wall-crossing algorithm to compute cohomological pairings over the corresponding Abelian symplectic quotients. We elaborate the discussion with explicit examples for the two-qubit model.

Oliver Pechenik. University of Illinois at Urbana-Champaign

Puzzles and equivariant K-theory of Grassmannians

The cohomology of the Grassmannian has a basis given by Schubert classes. The structure coefficients of this ring are the celebrated Littlewood-Richardson coefficients, and are calculated by any of the Littlewood-Richardson rules. This story has been extended to K-theory by A. Buch (2002) and to torus-equivariant cohomology by A. Knutson and T. Tao (2003). It is natural to unify these theories via a combinatorial rule for structure coefficients in equivariant K-theory. In 2005, A. Knutson and R. Vakil used puzzles to conjecture such a rule. Recently we proved the first combinatorial rule for these coefficients. Using our new rule, we construct a counterexample to the Knutson-Vakil conjecture and prove a mild correction to it. (Joint work with Alexander Yong)

Arun Ram. University of Melbourne, Australia

The geometric Peterson isomorphism

I will describe a combinatorial (alcove walk) labelling of the points of the moduli space of curves (of genus 0) in the flag variety. The idea is that this geometric labelling can explain the sometimes magical "quantum to affine phenomena relating quantum cohomology of the flag variety to the cohomology of the affine Grassmannian. This is joint work with Liz Milicevic.

Vijay Ravikumar. Chennai Mathematical Institute, India

Equivariant Pieri Rules for Isotropic Grassmannians

We describe a manifestly positive Pieri rule for the torus-equivariant cohomology of Grassmannians of Lie types B, C, and D. To the best of our knowledge, this is the first such formula for sub-maximal Grassmannians. We also give a simple proof of the equivariant Pieri rule for the (type A) complex Grassmannian. Our method involves reducing equivariant Pieri coefficients to restrictions of special Schubert classes at torus fixed points in the equivariant cohomology ring of a different Grassmannian. This is joint work with Changzheng Li.

Changjian Su. Columbia University

Stable basis and CSM classes in flag varieties

Stable basis, introduced by Maulik and Okounkov, turns out to be very important for calculating quantum cohomology of Nakajiama varieties. I will talk about stable basis for cotangent bundle of flag varieties. Pulling back to flag varieties, we get the CSM classes. Changing the sign of the equivariant parameter, we get the dual of the CSM classes. Part of this is joint work under progress with P.Aluffi, L.Mihalcea and J.Schrmann.

Julianna Tymoczko. Smith College

Generating the equivariant cohomology of affine Springer fibers

The finite Springer fiber is the collection of fixed flags under a given linear operator. Affine Springer fibers generalize this notion to the affine Grassmannian. Kazhdan-Lusztig studied them first, and Goresky-Kottwitz-MacPherson used them to prove a special case of the Fundamental Lemma. We will discuss some recent results that construct generating sets for the equivariant cohomology of affine Springer fibers.

Gufang Zhao. University of Massachusetts at Amherst

What elliptic cohomology might have to do with other generalized Schubert calculi?

This talk is a brief overview of my project in progress, joint with Toledano Laredo, Yaping Yang, and Changlong Zhong. I will start by recalling basic notions of equivariant elliptic cohomology. In a joint work with Zhong, we proved that the convolution algebra of equivariant elliptic cohomology of Steinberg variety is isomorphic to the elliptic affine Hecke algebra constructed by Ginzburg-Kapranov-Vasserot. The classification of irreducible representations of the elliptic affine Hecke algebra is given in terms of nilpotent Higgs bundles on the elliptic curve. Based on this, I will state a conjecture relating the elliptic affine Hecke algebra and monodromy of quantum difference operators of the Springer resolution. Finally, I will sketch a construction of the Drinfeld realization of elliptic quantum group using cohomological Hall algebra, which is expected to be Schur-Weyl dual to the elliptic affine Hecke algebra.