Cohomological Methods in Quadratic Forms and Algebraic Groups
Méthodes cohomologiques pour les formes quadratiques et les groupes algébriques
(Org: **Stefan Gille** and/et **Nikita Karpenko** (Alberta))

VLADIMIR CHERNOUSOV, University of Alberta
On genus of spinor groups

Two simple algebraic groups defined over a base field K are in the same genus if they have the same isomorphism classes of maximal K-tori. The question if a genus of an absolutely simple algebraic group is finite arises in geometry. While there are definitive results over number fields (which we will briefly review), the theory of characterization of absolutely simple algebraic groups having the same isomorphism classes of maximal tori over general fields is only emerging. In the talk we will consider the case of spinor K-groups where K is the function field of a curve defined over a number field. Joint work with A. Rapinchuk and I. Rapinchuk.

ALEXANDER DUNCAN, University of South Carolina
Automorphisms of del Pezzo surfaces in positive characteristic

We investigate the possible automorphism groups of del Pezzo surfaces of degree less than 4 in arbitrary characteristic. For such surfaces, the sets of effective divisors in the Picard groups and their intersection theory are closely related to the root systems E6, E7 and E8. Indeed, any automorphism group embeds into the Weyl group of these root systems. We discuss how this connection can be exploited to determine the possible automorphism groups and illuminate their geometry.

PHILIPPE GILLE, CNRS, Lyon
Octonions II

We describe octonion algebras over rings, with special emphasis on related torsors and subgroup schemes of group schemes of type G_2.

CAROLINE JUNKINS, Western University
On the topological filtration for generalized Severi-Brauer varieties

For a generalized Severi-Brauer variety X and its corresponding central simple algebra A, the Grothendieck group $K_0(X)$ can be described via combinatorial data related to the index and exponent of A. In this talk, we consider how this data relates to the topological filtration of $K_0(X)$ and to the Chow group of X. This is part of ongoing work with Nicole Lemire and Daniel Krashen.

MARC-ANTOINE LECLERC, University of Ottawa
The hyperbolic formal affine Demazure algebra

In a recent paper in 2013, A. Hoffnung, J. Malagón-López, A. Savage and K. Zainoulline constructed a generalization of an Hecke algebra starting from a formal group law and a finite root system. In this talk we discuss how to generalize their construction to a Kac-Moody root system in the case of a hyperbolic formal group law. This is joint work with E. Neher and K. Zainoulline.

NICOLE LEMIRE, University of Western Ontario
Pushforwards of Tilting Sheaves

In joint work with A. Dhillon and Y. Yan, we investigate the behaviour of tilting sheaves under pushforward by a finite Galois morphism. We determine conditions under which such a pushforward of a tilting sheaf is a tilting sheaf. We then produce some examples of Severi Brauer flag varieties and arithmetic toric varieties in which our method produces a tilting sheaf, adding to the list of positive results in the literature. We also produce some counterexamples to show that such a pushfoward need not be a tilting sheaf.

JAN MINAC, Western University

A Magical Spell of Massey Products on Galois p-extensions

Cinderella's fairy godmother could turn a pumpkin into a carriage, mice into horses, and rags into riches. Equally astonishingly, M. Rost and V. Voevodsky described a remarkably simple Galois cohomology and possibly related to these developments are some current automatic constructions of Galois p-extensions due to the vanishing of certain Massey products in Galois cohomology.

Has a charming "Massey spell" been cast on Galois p-extensions of general fields?

I will discuss this possibility by reviewing some of the work of M. Hopkins and K. Wickelgren, I. Efrat and E. Matzri, and my joint work with N. D. Tan. Some previous related work of S. Chebolu, I. Efrat, and myself; will also be recalled.

ERHARD NEHER, University of Ottawa

Octonions I

We describe octonion algebras over rings, with special emphasis on related torsors and subgroup schemes of group schemes of type G_2.

ALEXANDER NESHITOV, University of Ottawa

Motives of twisted flag varieties and representations of Hecke-type algebras.

This is a report on the joint work in progress with N. Semenov, V. Petrov and K. Zainoulline. Motivated by the motivic Galois group approach, we relate the category of cobordism-motives of twisted flag varieties for a linear algebraic group G with the category of integer (or modular) representations of the associated Hecke-type algebra H for G introduced and studied in a series of papers by Calmes, Savage, Zhong and others. In this way, we translate various motivic discrete invariants (e.g. J-invariant of linear algebraic groups), results about indecomposable motives and upper motives (Karpenko-Merkurkev-Vishik), etc, into the language of respective integer/modular representations of H.

ROBERTO PIRISI, University of Ottawa

Cohomological invariants of algebraic stacks

Cohomological invariants are arithmetic analogues of characteristic classes in topology, in which singular cohomology is replaced with Galois cohomology, and topological spaces with spectra of fields. Given an affine algebraic group G, a cohomological invariant for G is a way to functorially assign to each principal G-bundle over the spectrum a field k an element of the Galois cohomology of k. These invariants form a graded ring, which has been computed for many classes of algebraic groups by several authors, including Rost, Serre, Merkurjev and many others.

In my talk I will show how to extend the classical theory to a theory of cohomological invariants for Deligne-Mumford stacks and in particular for the stacks of smooth genus g curves. The concept of general cohomological invariants turns out to be closely tied to the theory of unramified cohomology, which was introduced by Saltman, Ojanguren and Colliot-Thélène and is widely used to study rationality problems.

I will also show how to compute the additive structure of the ring of cohomological invariants for the algebraic stacks of hyperelliptic curves of all even genera and genus three.

ZINOVY REICHSTEIN, University of British Columbia
The Hermite-Joubert Problem over p-fields

An 1861 theorem of Ch. Hermite asserts that for every field extension E/F of degree 5 there exists an element $a \in E$ such that $F(a) = E$ and the minimal polynomial of a over F is of the form

$$f(x) = x^5 + b_2x^3 + b_4x + b_5 \, .$$

An easy application of Newton's formulas shows that this is equivalent to $\mathrm{tr}_{E/F}(a) = \mathrm{tr}_{E/F}(a^3) = 0$. A similar result for etale algebras of degree 6 was proved by P. Joubert in 1867. In this talk, based on joint work with Matthew Brassil, we will discuss the following (still largely open) question: Can these classical theorems be extended to field extensions of degree $n \geqslant 7$?

STEPHEN SCULLY, Alberta

KIRILL ZAYNULLIN, University of Ottawa
Motives of torsor quotients via representations

We introduce and discuss a new techniques which relates motivic direct summands of torsor quotients to blocks of certain Hecke-type algebras.

CHANGLONG ZHONG, SUNY-Albany
Hyperbolic Demazure algebra

In this talk I will mention recent joint work with C. Lenart and K. Zainoulline on Demazure algebra for hyperbolic formal group law. First I will talk about the left and right Hecke action. Then I will focus on hyperbolic formal group law and mention some interesting relationship between hyperbolic Demazure algebra and Kazhdan-Lusztig basis. This will lead to some computation of the newly defined KL Schubert classes.