Quadratic forms and Linear algebraic groups
Formes quadratiques et groupes algébriques linéaires
(Org: **Stefan Gille** (University of Alberta) and/et **Kirill Zaynullin** (University of Ottawa))

COLIN INGALLS, Carleton University
Quasi-universal representations for finite dimensional algebras

This is joint work with Emily Cliff and Charles Paquette. Given a finite dimensional algebra, we can associate a quiver and choose a dimension vector. Work of Alistair King shows that, if the dimension vector is unimodular, then given a choice of stability condition, there is a moduli space of stable representations with a universal representation. We extend this result to show that even when the dimension vector is divisible, the moduli space constructed by King has a quasi-universal representation.

MIKHAIL KOTCHETOV, Memorial University
Graded algebras and quadratic forms

In the study of group gradings on semisimple associative and Lie algebras over the fields of complex and real numbers, there appear some geometric structures on finite abelian groups, for example quadratic and alternating bilinear forms on elementary abelian 2-groups, which can be regarded as vector spaces over the field of size 2. In this talk, based on a joint work with Alberto Elduque and Adrián Rodrigo-Escudero, we will consider the case of associative algebras with involution and explain how such structures appear and what role they play in the classification of gradings.

NICOLE LEMIRE, University of Western Ontario
Toric Models of Algebraic Tori

We discuss some explicit constructions of toric models of low-dimensional algebraic tori, following work of Kunyavskii in dimension 3. We use these constructions to understand some computational results about the birational properties of low-dimensional algebraic tori.

EOIN MACKALL, University of Maryland
(Formal) Representability of Chow groups using Milnor K-theory

We'll talk about recent work on representability (and formal representability) of various sheafifications of K-cohomology functors associated to a variety. The talk will focus on examples and speculations in particularly nice situations, for example for projective homogeneous varieties under semisimple algebraic groups over an algebraically closed field.

ERHARD NEHER, University of Ottawa
Knebusch's norm principle revisited

Given a field extension K/F of finite degree d, Knebusch's norm principle for a quadratic form q over F says that the norm of the set of non-zero values of the extended quadratic form q_K is a product of at most d nonzero values of q. We discuss this principle and some of its consequences in a setting, where the field F is replaced by a semilocal ring and the field K by a finite étale extension. The talk is based on joint work with Philippe Gille (Lyon).

DANNY OFEK, University of British Columbia
On the essential dimension of cycle modules

Essential dimension is a natural measure of complexity for algebraic objects. We will present a new elementary technique for proving lower bounds on the essential dimension of elements of cycle modules as defined by Markus Rost. Examples of cycle modules include Milnor K-theory, Quillen K-theory, Etale cohomology of torsion sheaves and more. As a corollary, we deduce the first meaningful lower bounds on the essential dimension of Brauer classes in good characteristic. This is joint work with Zinovy Reichstein.

ZINOVY REICHSTEIN, University of British Columbia
The Jordan property of Cremona groups and essential dimension

Essential dimension is an interesting numerical invariant of a finite group. In this talk I will survey the properties of this invariant and explain how advances in the Minimal Model Program lead to new insights into its asymptotic behavior.

CAMERON RUETHER, Memorial University of Newfoundland
Cohomological Obstructions to Quadratic Pairs over Schemes.

The concept of quadratic pair was introduced by Knus, Merkurjev, Rost, and Tignol in The Book of Involutions to work with quadratic forms and groups of type D in characteristic 2. This notion was generalized by Calmés and Fasel to the setting of Azumaya algebras over an arbitrary base scheme, also with groups of type D in mind. We will review these definitions before discussing recent work with Philippe Gille and Erhard Neher. We define two cohomological obstructions attached to an Azumaya algebra with orthogonal involution. The weak obstruction prevents the existence of a quadratic pair, and the strong obstruction prevents potential quadratic pairs from being described as in the field/ring case. Interestingly, both these obstructions are trivial over affine schemes, and so quadratic pairs have noticeably different behaviour when working over arbitrary schemes. To demonstrate that this behaviour is possible, we will also present examples where one or both obstructions are non-trivial.

JOSHUA RUITER, Grinnell College
Coding for algebraic groups

Root systems and pinnings are vital to the structure theory of algebraic groups. Motivated by a conjecture of Borel and Tits regarding rigidity of abstract homomorphisms, it can be useful to explicitly know various structure coefficients associated to a pinning. These structure coefficients arise in commutators of root subgroups, and conjugations by Weyl group elements. I'll describe recent work with undergraduate students on building code in Matlab to calculate these kinds of structure coefficients.