Noncommutative Algebra and Noncommutative Geometry
Algèbre et géométrie non commutative
(Org: **Jason Bell** (University of Waterloo) and/et **Colin Ingalls** (Carleton University))

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EMILY CLIFF, Université de Sherbrooke
Twisted sheaves and quasi-universal bundles

This is based on joint work with Colin Ingalls and Charles Paquette. For a quiver $Q = (Q_0, Q_1)$ and dimension vector $d = (d_i)_{i \in Q_0}$ we study a coarse moduli M space of quiver representations. Let d be the greatest common divisor of the numbers d_i. In the case that $d = 1$, it is known that M admits a universal family U of representations, and hence is a fine moduli space: that is, U is a sheaf of kQ-modules on M such that for every point $m \in M$ corresponding to a kQ-module V_m, the fibre U_m of U at m is isomorphic to the representation V_m. However, this fails when $d > 1$ (Reineke–Schröer, Hoskins–Schaffhauser); instead M admits a *quasi-universal* family $\tilde{U}$ whose fibre $\tilde{U}_m$ is isomorphic to a direct sum of copies of the representation V_m. In this talk, we will introduce the notion of twisted sheaves and sketch the construction of the sheaf $\tilde{U}$.

HONGDI HUANG, Rice University
Weighted Poisson projective planes

In this talk, we will discuss graded unimodular Poisson structures on a weighted polynomial algebra $A = \Bbbk[x, y, z]$ defined by weighted homogeneous potentials Ω of degree being the sum of weights on x, y, z. These graded Poisson algebras correspond to weighted Poisson projective planes. Using Poisson valuations, we characterize the Poisson automorphism groups for A and $A/(\Omega - \xi)$ when the irreducible Ω has an isolated singularity and $\xi \in \Bbbk$. Besides, we will talk about the (co)homological invariant of these unimodular Poisson algebras determined by irreducible potentials.

ELLEN KIRKMAN, Wake Forest University
Homological Regularities

Let A be a noetherian connected graded $\Bbbk$-algebra with a balanced dualizing complex, and let X be a cochain complex of graded left A-modules. The elements of X possess both an internal and various homological degrees, and it is useful to study the relationships between these degrees. Jørgensen and Dong-Wu extended the study of Tor-regularity and Castelnuovo-Mumford regularity from commutative algebras to noncommutative algebras. We consider these regularities further, and define new numerical invariants that involve linear combinations of internal and homological degrees. This is joint work with Robert Won and James J. Zhang.

CHARLES PAQUETTE, Royal Military College of Canada
Semi-invariant rings and complete intersections

Rings of semi-invariants of quivers (with relations) capture a lot of the geometry of the module varieties over finite dimensional algebras. They can be used to construct moduli spaces of representations, and their weight spaces can give us information on the representation type of the algebra. Not much is known about the structure of these rings, in general. In this talk, we will analyse the cases where we have an irreducible component with orbits of small co-dimension and show that under some conditions, we get that these semi-invariant rings are complete intersections. This is joint work with Deepanshu Prasad and David Wehlau.

MATTHEW SATRIANO, University of Waterloo
Noncommutative surfaces and stacky surfaces

Understanding the extent to which noncommutative objects are determined by commutative ones is an important theme in noncommutative geometry, and is an underlying principle of the noncommutative McKay correspondence. We prove that there is a dictionary between noncommutative surfaces and smooth stacky surfaces which gives equivalences on the level of derived categories. This is joint work with Eleonore Faber, Colin Ingalls, and Shinnosuke Okawa.

KENT VASHAW, Massachusetts Institute of Technology
On the decomposition of tensor products of monomial modules for finite 2-groups

Dave Benson conjectured recently that a tensor power $V^{\otimes n}$ of an odd-dimensional indecomposable representation for a finite 2-group G has a unique odd-dimensional indecomposable summand, and that the function sending n to the dimension of this summand is quasi-polynomial. We explore the analogous conjecture for graded representations of a related finite group scheme, and give some of first nontrivial verifications of this conjecture. This project is joint with George Cao.

PADMINI VEERAPEN, Tennessee Tech University
Cocycle twists and Manin's universal quantum groups

We examine 2-cocycle twists of a family of infinite-dimensional Hopf algebras, known as Manin's universal quantum groups, denoted by $\underline{\mathrm{aut}}(A)$, which Manin showed, universally coact on connected graded quadratic algebras, A. In this talk, we consider $\underline{\mathrm{aut}}(A)$ under a more general setting, namely, when A is a finitely generated algebra subject to m-homogeneous relations and show how $\underline{\mathrm{aut}}(A)$ can be twisted by 2-cocycles. This is joint work with V. C. Nguyen, H. Huang, C. Ure, K. B. Vashaw, and X. Wang.

XINGTING WANG, Howard University
Poisson Valuation

We will talk about Poisson valuation and its application in computing Poisson automorphism groups of Poisson elliptic algebras. It is joint work with Hongdi Huang, Xin Tang and James Zhang.

JAMES ZHANG, University of Washington
Pivotal Automorphisms

Pivotal automorphisms of an algebra will be introduced and be calculated for the polynomial algebras by using valuations of n-Lie Poisson algebras. Joint work with Hongdi Huang, Xin Tang, and Xingting Wang.