Algebraic, birational, arithmetic and Kahler geometry: Recent developments
Géométrie algébrique, birationnelle, arithmétique et kahlerienne : développements récents
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JASON BELL, University of Waterloo

NILS BRUIN, Simon Fraser University
(2,2,2) - Isogeny Descent on Jacobians of Plane Quartics

A classical method for exhibiting non-trivial elements in the Tate-Shafarevich group of Jacobians compares Selmer groups of various isogenies. In this presentation we consider Jacobians of plane quartics that have a (2,2,2)-isogeny to another principally polarized abelian variety. An interesting complication is that such an abelian variety may not be a Jacobian: it may only be a quadratic twist of a Jacobian. We describe how, at least in the case of completely split 2-torsion, one can determine which quadratic twist and how one can still compute Selmer groups. This talk describes joint work with Damara Gagnier and with Emiel Haakma.

MICHAEL CHITAYAT, University of Padova

MICHAEL GROECHENIG, University of Toronto

KATRINA HONIGS, SFU
Quadratic forms and linear systems on abelian surfaces

Although there is an explicit isomorphism that relates the Hilbert scheme of points on an abelian surface to compactified Jacobians of curves in a linear system on the dual abelian surface, computing its action directly is challenging. However, quadratic forms can be used to determine some concrete information about symmetric elements of these moduli spaces. As an application, we prove a novel result: there exist abelian surfaces containing curves with singularities of arbitrarily high multiplicity. This work is joint with Graham McDonald and Peter McDonald.

JOEL KAMNITZER, McGill
Web varieties and smooth components of Springer fibres

A Springer fibre is the set of flags compatible with a given nilpotent matrix. Springer fibres have irreducible components parametrized by standard Young Tableaux. Most components of Springer fibres are singular, but some are smooth. I will explain a construction for producing smooth components starting with combinatorial objects called webs. In examples, all of the smooth components arise from this construction. This is joint work with Pierre Baumann, Oliver Pechenik, and Stephan Pfannerer.

PETER MCDONALD, Simon Fraser University
The Briançon-Skoda theorem for pseudo-rational singularities

The Briançon-Skoda theorem gives a comparison between the integral closure of powers of a finitely generated ideal with its ordinary powers. The theorem was originally proved via analytic methods for coordinate rings of smooth varieties over the complex numbers in 1974. In 1981, Lipman and Sathaye showed the result holds for any regular local ring. Since then, there have been many generalizations of the original comparison statement to rings with mild singularities, and it was long expected to hold for rings with pseudo-rational singularities. In this talk, I'll discuss recent results unifying and generalizing much of this work that settles the Briançon-Skoda theorem for rings with pseudo-rational singularities (and, more generally, for birational derived splinters). This is joint work with Linquan Ma, Rebecca R.G., and Karl Schwede.

NEGARIN MOHAMMADI, Simon Fraser University

DANNY OFEK, University of British Columbia
Recent progress toward computing the essential dimension of semisimple groups

Let G be an algebraic group over a field. The essential dimension of G, denoted $\mathrm{ed}(G)$, measures how much can generically free G-representations be compressed using G-equivariant rational maps. Often G-torsors classify a class of algebraic objects, in which case $\mathrm{ed}(G)$ measures the complexity of a general member of that class. For example, $\mathrm{ed}(\mathrm{PGL}_n)$ is the number of algebraically independent parameters needed to define a generic division algebra of degree n. We will explain the historical development of the project of computing $\mathrm{ed}(G)$ for all semisimple groups G and report on recent progress.

ZINOVY REICHSTEIN, University of British Columbia
On the Cremona dimension of a finite p-group

The Cremona dimension of a finite group G is the minimal dimension of a rationally connected variety which admits a faithful action of G. In this talk, based on joint work with Giulio Bresciani and Angelo Vistoli, I will discuss new lower bounds on the Cremona dimension of a finite p-group.

MATTHEW SATRIANO, University of Waterloo
Crepant resolutions of log-terminal singularities and non-negativity of stringy Hodge numbers

Crepant resolutions have inspired connections between birational geometry, derived categories, representation theory, and motivic integration. Stringy Hodge numbers are invariants of log-terminal varieties designed to capture the Hodge theoretic information of a crepant resolution, even when no crepant resolution exists. In this talk, we will characterize log-terminal singularities as those admitting a crepant resolution by a stack. We will use this characterization to obtain a cohomological interpretation of stringy Hodge numbers. We will also give a complete classification of when stringy Hodge numbers are non-negative, including counter-examples to Batyrev's non-negativity conjecture. This is based on joint work with Jiahui Huang and Jeremy Usatine.

AMAL VAYALINKAL, University of Toronto

XIA XIAO, University of Quebec at Montreal

YULUN XU, University of Toronto
Regularization and Hölder continuity for complex Hessian equations on Hermitian manifolds

Let (M, ω) be a compact Hermitian manifold, and let Γ be a symmetric convex cone. We develop a quantitative regularization method for Γ-admissible functions. As an application, we prove Hölder continuity for every bounded pluripotential solution of complex m-Hessian equations whose right-hand sides belong to L^p, for $p > \frac{n}{m}$. These results extend to a more general class of complex Hessian equations satisfying the structural condition used by Guo–Phong–Tong.

YUKAI ZHANG, University of Toronto

BORIS ZUPANCIC, McGill University

Reduction of Singularities in Poisson Geometry via Weighted Blowups

Hironaka's theorem on resolution of singularities via blowups fails in Poisson geometry, since blowups generally destroy Poisson structures. However, there exists a more general operation called a weighted blowup, which may provide a viable alternative. Weighted blowups have proven useful in the recent literature on resolution of singularities; for instance, in the non-Poisson setting, Abramovich-Temkin-Włodarczyk have shown that fast functorial resolution of singularities can always be achieved by sequentially blowing up the worst singularities via a canonical choice of weighted blowup. We take a similar approach to show that appropriate choices of weighted blowups produce reduction of singularities in low dimensional Poisson geometry. In joint work with Simon Lapointe, Mykola Matviichuk and Brent Pym, we obtain: (1) a criterion for lifting a Poisson structure to a weighted blowup, (2) a classification of normal forms of Poisson varieties not admitting any weighted blowup, in low-dimension, and (3) a theorem on the extent to which weighted blowups can reduce the singularities of Poisson varieties, in low-dimension.