Geometry and representation theory around quotients (mini-session)
Géométrie et théorie de la représentation des quotients
(Org: **Lisa Jeffrey** (Toronto) and/et **Steven Rayan** (Saskatchewan))

PETER CROOKS, Northeastern University
Symplectic reduction along a subvariety

In its most basic form, symplectic geometry is a mathematically rigorous framework for classical mechanics. Noether's perspective on conserved quantities thereby gives rise to quotient constructions in symplectic geometry. The most classical such construction is Marsden-Weinstein-Meyer reduction, while more modern variants include Ginzburg-Kazhdan reduction, Kostant-Whittaker reduction, Mikami-Weinstein reduction, symplectic cutting, and symplectic implosion.

I will provide a simultaneous generalization of the quotient constructions mentioned above. This generalization will be shown to have versions in the smooth, holomorphic, complex algebraic, and derived symplectic contexts. As a corollary, I will derive a concrete and Lie-theoretic construction of "universal" symplectic quotients.

This represents joint work with Maxence Mayrand.

ELOISE HAMILTON, University of Cambridge
An overview of Non-Reductive Geometric Invariant Theory and its applications

Geometric Invariant Theory (GIT) is a powerful theory for constructing and studying the geometry of moduli spaces in algebraic geometry. In this talk I will give an overview of a recent generalisation of GIT called Non-Reductive GIT, and explain how it can be used to construct and study the geometry of new moduli spaces. These include moduli spaces of unstable objects (for example unstable Higgs/vector bundles), hypersurfaces in weighted projective space, k-jets of curves and curve singularities.

ELANA KALASHNIKOV, University of Waterloo
An analogue of Greene–Plessar mirror symmetry for the Grassmannian

The most basic construction of mirror symmetry compares the Calabi–Yau hypersurfaces of $\mathbb{P}^n$ and $\mathbb{P}^n/G$, where G is a certain finite group. These examples first appeared in the 90s in the work of Greene–Plessar. In the intervening decades, this original construction has been generalized to Fano toric varieties and weighted projective spaces. But in addition to projective spaces being the simplest example of a toric variety and of a weighted projective spaces, they are also the simplest example of a Grassmannian. Moreover, there is a natural analogue of the finite group G for the Grassmannian $Gr(n,r)$. In this talk, I'll explain how toric degenerations, blow-ups, variation of GIT and mirror symmetry relate the Calabi–Yau hypersurfaces of $Gr(n,r)$ and $Gr(n,r)/G$. This is joint work with Tom Coates and Charles Doran.

JENNA RAJCHGOT, McMaster University
Symmetric quivers and symmetric varieties

Since the 1980s, mathematicians have found connections between orbit closures in type A quiver representation varieties and Schubert varieties in type A flag varieties. For example, singularity types appearing in type A quiver orbit closures coincide with those appearing in Schubert varieties in type A flag varieties; combinatorics of type A quiver orbit closure containment is governed by Bruhat order on the symmetric group; and classes of type A quiver orbit closures in equivariant cohomology and K-theory (as well as classes of associated degeneracy loci) can be expressed in terms of formulas involving Schubert polynomials, Grothendieck polynomials, and other objects from Schubert calculus.

After recalling some of this story, I will motivate and discuss the related setting of Derksen-Weyman's symmetric quivers and their representation varieties. I will show how one can adapt results from the ordinary type A setting to unify aspects of the equivariant geometry of type A symmetric quiver representation varieties with Borel orbit closures in a corresponding symmetric variety G/K (G = general linear group, K = orthogonal or symplectic group). This is joint work with Ryan Kinser and Martina Lanini.