ABSTRACTS

Jenny August *The tilting theory of contraction algebras*
Contraction algebras are a class of finite dimensional, symmetric algebras introduced by Donovan and Wemyss as a tool to study the minimal model program in geometry. In this talk, I will give an introduction to these algebras, before then going on to describe how an associated hyperplane arrangement (a simple picture) controls something that, for a general algebra, is considered extremely complicated; namely, the entire derived equivalence class of such an algebra. If time permits, I will then discuss ongoing work which aims to use these results to understand the stability manifold of a contraction algebra.

Alastair Craw *Birational geometry of symplectic quotient singularities*
For a finite subgroup $G of SL(2, C)$ and for $n \geq 1$, the Hilbert scheme $X = Hilb^{[n]}(S)$ of *n* points on the minimal resolution *S* of the Kleinian singularity C^2/G provides a crepant resolution of the symplectic quotient C^{2n}/G_n, where G_n is the wreath product of *G* with S_n. I'll explain why every projective, crepant resolution of C^{2n}/G_n is a quiver variety, and why the movable cone of *X* can be described in terms of an extended Catalan hyperplane arrangement of the root system associated to *G* by John McKay. This is recent joint work with Gwyn Bellamy.

Dougal Davis *The elliptic Grothendieck-Springer resolution*
For a simple algebraic group *G*, the *GIT* quotient of the Lie algebra by the adjoint action is an important object in geometric representation theory. Since the action is not free, this is very far from being a genuine quotient; in fact, the morphism from the Lie algebra to the adjoint quotient is a flat family of affine varieties with many singular fibres. After pulling back along a Weyl group covering of the base, this family has a natural simultaneous resolution of singularities, called the Grothendieck-Springer resolution. As a very basic application, one can use the Grothendieck-Springer resolution to show that the codimension 2 singularities of the most singular fibre are du Val of the same type as *G*. In this talk, I will explain a closely related picture for the stack of principal *G*-bundles on an elliptic curve, with an extension of the morphism from the stack of semistable bundles to its coarse moduli space in place of the adjoint quotient map. I will introduce an analogue of the Grothendieck-Springer resolution for this map and use it to describe the codimension 2 singularities of the locus of unstable bundles in some examples.

Akishi Ikeda *q-stability conditions and C^*-equivariant quantum cohomology for the local P^1*
In the recent work with Yu Qiu, we introduced the notion of a q-stability condition which provides an appropriate framework to consider a Bridgeland stability condition on the derived category of C^*-equivariant coherent sheaves on an algebraic variety with the C^*-action. The aim of this talk is to compute the space of q-stability conditions on the derived category of C^*-equivariant coherent sheaves on the local P^1 (cotangent bundle of P^1) with the fiber scaling C^*-action. In particular, we see that this space can be identified with the C^*-equivariant quantum cohomology of the local P^1 and the central charge is written by using the equivariant *I*-function of the local P^1 around the large volume limit.

Shahn Majid *Quantum geometries over finite fields*
Translation invariant quantum differentials on $F_p[x]$ are classified by monic irreducibles *m*. We determine the quantum de Rham cohomology in the regular case where m has nonzero trace. This leads us to an inductive system of finite dimensional commutative Hopf algebras A_d with a connected quantum differential calculus for each *m* of degree *d*. We study A_1 over F_p and A_2 over F_2 in detail. We exhibit first results on the classification of finite quantum Riemannian geometries over F_2, namely up to algebra dimension 3. The talk will be based on recent works with E. Bassett and A. Pachol. If time, I will also mention recent work with R. Aziz solving the dual basis problem for quantum groups at roots of unity. Both sets of results hint at connections with number theory.

Olivier Schiffmann *Cohomological Hall algebras of coherent sheaves on a curve and finite quot schemes*
We consider a Hall multiplication on the cohomology of the stack of vector bundles (or better, coherent sheaves) on a smooth projective curve. We relate this in particular to the classical problems of counting the number of points of finite quot schemes (equivalently, counting maximal subbundles of general vector bundles) and determining the cohomology ring of the moduli space of stable vector bundles. This involves a certain family of representations of a Yangian-like algebra.

Špela Spenko *Comparing commutative and noncommutative resolutions of singularities*
Quotient varieties for reductive groups admit the canonical Kirwan (partial) resolution of singularities, and quite often also a noncommutative resolution. We will compare the two via derived categories (in terms of the Bondal-Orlov conjecture). This is a joint work with Michel Van den Bergh.