MAXWELL COLLOQUIUM ON COMBINATORIAL ALGEBRAIC GEOMETRY, FRIDAY OCTOBER 4, 2013 AT ICMS

10:00-10:50 AM **Alastair Craw: Noncommutative toric geometry**
I'll describe how to construct the minimal bimodule resolution of certain noncommutative toric algebras as the cellular resolution of a natural cell complex in a real n-torus. I'll describe work of Prabhu-Naik which provides an application of these ideas to the study of smooth toric Fano varieties.

11:00-11:50 AM **Alex Fink: Matroid toric varieties in the Grassmannian**
Matroids are a gadget which capture the combinatorics of linear dependence. A realization of a matroid is a vector configuration, which can be seen as a point of a Grassmannian. The protagonist of this talk will be the subvariety which is the closure of the orbit of this point under the torus action that scales the vectors. We will explain how a sizable number of matroid functions of algebraic and combinatorial interest are encoded in this subvariety, including the Tutte polynomial and some representation-theoretic and tropical-geometric data.

1:30 - 2:20 PM **Tom Coates: Mirror Symmetry and Fano Manifolds**
I will describe recent progress in understanding the classification of 3-dimensional Fano manifolds via mirror symmetry. This is joint work with Akhtar, Corti, Galkin, Golyshev, Kasprzyk, and Prince.

2:30 - 3:20 PM **Daniel Plaumann: Hyperbolic Polynomials and sums of squares**
A real polynomial is hyperbolic if it defines a hypersurface consisting of maximally nested ovaloids. These polynomials appear in many areas of mathematics, including convex optimisation, combinatorics and differential equations. We investigate the relation between determinantal representations of hyperbolic polynomials and sums of squares representations of positive polynomials. In particular, we will explain the connection with matroid theory for the case of multi-affine polynomials coming from the work of Brndn, Wagner and Wei. (Joint work with Mario Kummer and Cynthia Vinzant)

4:00 - 5:00 PM **Bernd Sturmfels: Tropicalization of Classical Moduli Spaces**
Algebraic geometry is the study of solutions sets to polynomial equations. Solutions that depend on an infinitesimal parameter are studied combinatorially by tropical geometry. Tropicalization works especially well for varieties that are parametrized by monomials in linear forms. Many classical moduli spaces (for curves of low genus and few points in the plane) admit such a representation, and we here explore their tropical geometry. Examples to be discussed include the Segre cubic, the Igusa quartic, the Burkhardt quartic, and moduli spaces of marked del Pezzo surfaces. Matroids, hyperplane arrangements, and Weyl groups play a prominent role. Our favorites are E6, E7 and G32. This is joint work with Qingchun Ren and Steven Sam.