

ARITHMETIC AND GEOMETRY OF ALGEBRAIC VARIETIES
WITH SPECIAL EMPHASIS ON
CALABI–YAU VARIETIES AND MIRROR SYMMETRY
MARCH 7–8, 2015

ABSTRACTS

Barron, Tatyana (University of Western Ontario)

Quantization on hyperkähler and multisymplectic manifolds

Abstract: Multisymplectic manifolds is a large class of manifolds that includes hyperkähler manifolds, and a standard example of a hyperkähler manifold is a K3 surface. I will talk about quantization, which is a process of assigning to a smooth function on a manifold a linear operator on the space of holomorphic sections of a line bundle.

Harder, Andrew (University of Alberta)

The geometry of Landau-Ginzburg models

Abstract: The mirror to an n -dimensional Fano variety X is a variety Y of dimension n equipped with a map w to the complex line. The pair (Y, w) is called the Landau-Ginzburg model of X . I will discuss the geometry of Landau-Ginzburg models of Fano threefolds, in particular how their classical geometric invariants such as Hodge numbers, can be interpreted in terms of mirror symmetry.

Lewis, James (University of Alberta)

Nodal rational curves and a going-up theorem for K-theory induced normal functions

Abstract: This is a joint work with Pedro Luis del Angel, Chuck Doran, and possibly many others. Inspired by ideas from Bloch, Collino, and Kerr, we explain a setting on how a limiting K_m induced AJ map can specialize to the AJ map of a K_n cycle on a special fiber, for $n > m$.

Molnar, Alex (Queen's University)

Arithmetic with generalized Borcea-type Calabi-Yau threefolds

Abstract: We discuss a construction of Calabi–Yau threefolds using a triple product of elliptic curves that allows us to study the associated L-functions of the respective threefolds. In some cases the Calabi-Yau threefolds are rigid and of CM-type, and we discuss a conjecture of Yui about their intermediate Jacobians, and a relation between the L-functions of each of the Calabi–Yau threefolds and their intermediate Jacobian.

Perunicic, Andrija (Queen's University)

Counting Points via Frobenius on Twisted D-Modules

Abstract: I will demonstrate how to count points on certain weighted-projective hypersurfaces using a Lefschetz fixed point theorem. In particular, I will show how to recognize the cohomology of the hypersurface in terms of D-modules, and use this to calculate the trace of Frobenius appearing in the fixed-point theorem. The D-modules involved appear in a form of mirror symmetry called Berglund-Hubsch duality, so I will examine possible applications to arithmetic mirror symmetry.

Sala, Francesco (University of Western Ontario)

Sheaves on root toric stacks and cyclic quiver varieties

Abstract: I will describe a (conjectural) relation between moduli spaces of (framed) sheaves on some 2-dimensional root toric stacks and Nakajima cyclic quiver varieties. In the second part of the talk, I will discuss an application of this relation to the study of certain infinite-dimensional algebras and of supersymmetric gauge theories in four dimension.

Thompson, Alan (University of Waterloo)

Toward a compactification of the moduli space of K3 surfaces of degree two

Abstract: I will describe recent progress in joint work with V. Alexeev, in which we are attempting to construct an explicit geometric compactification of the moduli space of K3 surfaces of degree two.

Yui, Noriko (Queen's University)

Update on automorphy of some Calabi–Yau threefolds

Abstract: Let X be a Calabi–Yau threefold defined over \mathbf{Q} . When $h^{2,1}(X) \geq 1$, the Galois representation associated to the third cohomology group $H_{\text{et}}^3(X, \mathbf{Q}_\ell)$ has dimension ≥ 4 . The automorphy question of X gets rather challenging. I will discuss the splitting property of $H_{\text{et}}^3(X, \mathbf{Q}_\ell)$ into smaller dimensional pieces, which leads us to motivic modularity/automorphy. This approach yields some examples of modular/automorphic Calabi–Yau threefolds.