ARITHMETIC AND GEOMETRY OF ALGEBRAIC VARIETIES
WITH SPECIAL EMPHASIS ON
CALABI–YAU VARIETIES AND MIRROR SYMMETRY
NOVEMBER 3-4, 2012

ABSTRACTS

Chen, Xi (University of Alberta)

Finite generation of Cox ring and Rationality of Euler-Chow Series

Abstract: It is conjectured that the Cox ring of a variety is finitely generated if and only if its Euler-Chow series is rational. We will give a counter-example to the conjecture and also evidences supporting the conjecture if we further assume that the variety is rational. This is a joint work with Javier Elizondo and Yanhong Yang.

Doran, Charles, F. (University of Alberta)

Calabi-Yau threefolds fibered by K3 surfaces of high Picard rank

Abstract: We will discuss the construction and applications of Calabi-Yau threefolds admitting fibrations by certain lattice-polarized K3 surfaces of high Picard rank.

Gonzalez-Dorrego, M. R. (Universidad Autónoma de Madrid)

Smooth subvarieties on singular varieties

Abstract: Let k an algebraically closed field. Let $char\ k = 0$.

Let Z be a reduced irreducible nonsingular nonsingular $(n-1)$-dimensional variety such that $2Z = X \cap F$, where X is a normal n-fold with canonical singularities and F is a $(N-1)$-dimensional variety in $\mathbf{P}^N$. Assume that $Z \cap \mathrm{Sing}(X) \neq \emptyset$. We study the singularities of X through which Z passes. We also consider Fano cones.

Pasten, Hector (Queen's University)

Modular forms and effective diophantine approximation

Abstract: In this talk, we will explain how to get effective results in diophantine approximation by using the theory of modular forms. This provides an algebro-geometric approach to effective diophantine results, a topic classically studied by means of analytic techniques. This is joint work with Ram Murty.

Pearlstein, Greg (Michigan State University)

The zero locus of the infinitesimal invariant

Abstract: Let ν be a normal function on a complex manifold X. The infinitesimal invariant of ν has a well-defined zero locus inside the tangent bundle TX. When X is quasi-projective, and ν is admissible, we show that this zero locus is constructible in the Zariski topology. (Joint work with C. Schnell)

Rose, Simon (Queen's University)

Hyperelliptic curves on abelian surfaces via quasi-modular forms

Abstract: We provide a conjectural generating function which counts the number (suitably defined) of hyperelliptic curves on a polarized abelian surface in terms of explicit quasi-modular forms. This is obtained

using the Yau-Zaslow formula for counting rational curves on a smooth K3 and the crepant resolution conjecture.

Ilia Smirnov (Queen's University)

Smooth Complete Intersections with Definite Intersection Form

Abstract: Indefinite unimodular forms over the integers are completely determined by their rank, signature and type; in particular, for a fixed rank r, the number of integral indefinite unimodular forms is bounded above by $2r$. On the other hand, the number of definite forms grows very rapidly past rank 24 — for example, the numbers of definite unimodular forms of ranks 32 and 40 are bounded below by 10^7 and 10^{51}, respectively. Despite this, it seems to be a general principle that smooth projective varieties over the complex numbers with definite intersection form are 'rare'. In this talk, we confirm this principle in the case of smooth complete intersections, obtaining a complete list and identifying the lattices that appear. Beautifully, one of these is the famous E_8 lattice.

van Garrel, Michel (Caltech)

A mirror theorem for the open complement

Abstract: The homological mirror symmetry conjecture (HMS) was originally formulated by Kontsevich for Calabi-Yau 3-folds. It has since been adapted to include Fano varieties and more recently, Auroux formulated a version of the conjecture for the open complement $X \setminus D$, where X is a compact Kähler manifold and D is an anticanonical divisor. For the case where X is a Del Pezzo surface (and D is an elliptic curve), together with Pomerleano we prove a consequence of HMS for $X \setminus D$, namely that the Hochschild cohomology of the mirror M to $X \setminus D$ is isomorphic to the symplectic cohomology of $X \setminus D$. In this talk, we will focus on describing HMS for $X \setminus D$ from an algebraic point of view and elaborate on elements of this surprising connection between the two seemingly unrelated varieties $X \setminus D$ and M.

Vera Pacheco, Franklin (University of Toronto)

Resolving some singularities while preserving others

Abstract: Resolution of singularities consists in constructing a non-singular model of an algebraic variety. This is done by applying a proper birational map that is a local isomorphism at the smooth points. Often too much information is lost about the original variety if the smooth points are the only ones where the desingularization map is a local isomorphism. In these cases, a desingularization preserving some minimal singularities is necessary. This suggests the question of whether, given a class of singularity types S, it is possible to remove with a birational map all singularities not in S while still having a local isomorphism over the singularities of type S. We will talk about several instances of this problem and techniques that can be used to solve them. Joint works with Edward Bierstone, Sergio Da Silva, and Pierre Milman (University of Toronto/Fields Institute).