ARITHMETIC AND GEOMETRY OF ALGEBRAIC VARIETIES
WITH SPECIAL EMPHASIS ON
CALABI–YAU VARIETIES AND MIRROR SYMMETRY
MARCH 15–16, 2014

ABSTRACTS

Chen, Xi (University of Alberta)

On Vojta's $1 + \varepsilon$ Conjecture

Abstract: Vojta's $1 + \varepsilon$ conjecture is a height inequality on a curve over a number field. I consider the function field version of this conjecture, i.e., a height inequality bounding the genus of a curve on a surface in terms of its numerical invariants. I will talk about my proof of this conjecture, following an idea of M. McQuillan. My original proof contained a gap which was recently fixed. I will focus on the fixing of this gap.

Garcia–Raboso, Alberto (University of Toronto)

A twisted nonabelian Hodge correspondence

Abstract: Let X be a smooth complex projective variety. The nonabelian Hodge correspondence of Simpson establishes an equivalence between categories of vector bundles on X equipped with two different kinds of operators: flat connections on one side, and Higgs fields on the other. I will discuss categories of twisted vector bundles on X equipped with operators generalizing flat connections and Higgs fields, and prove an equivalence between them.

Haessig, Douglas (University of Rochester)

Dwork's unit root L-function in the rank one case

Abstract: We will discuss some recent work concerning the rank one case of Dwork's Conjecture on unit root L-functions.

Lewis, James (University of Alberta)

A Variation of the Beilinson-Hodge Conjecture

Abstract: Based on some recent joint work of J. Lewis, and others, we formulate a variation of the Beilinson–Hodge conjecture pertaining to varieties defined over the complex numbers. In this talk, we explain the motivation for this conjecture, and some evidence in support of it.

Moraru, Ruxandra (University of Waterloo)

A Kobayashi–Hitchin correspondence for generalized Kaehler manifolds

Abstract:In this talk, we discuss an analogue of the Hermitian–Einstein equations for generalized Kaehler manifolds proposed by N. Hitchin. We explain in particular how these equations are equivalent to a notion of stability, and that there is a Kobayahsi–Hitchin-type of correspondence between solutions of these equations and stable objects. The correspondence holds even for non-Kaehler manifolds, as long as they are endowed with Gauduchon metrics (which is always the case for generalized Kaehler structures on 4-manifolds). This is joint work with Shengda Hu and Reza Seyyedali.

Pasten, Hector (Queen's University)

Conjectures about periods of elliptic curves

Abstract: I will discuss some conjectures on periods of elliptic curves. These conjectures are closely related to the ABC conjecture, and in several cases one can show unconditional results.

Perunicic, Andrija (Queen's University)

p-adic Berglund-Hübsch-Krawitz Duality and Arithmetic Mirror Symmetry

Abstract: Berglund-Hübsch-Krawitz (BHK) duality is a well-known construction of mirror pairs. In this talk, I will describe a p-adic version of BHK duality inspired by Borisov's adaptation of BHK duality to the language of vertex algebras utilized in Batyrev-Borisov mirror symmetry. This restatement allows us to consider the action of Frobenius with some interesting arithmetic applications.

Rose, Simon (Queen's University)

Computing the Gromov-Witten invariants of an elliptically fibred threefold over $DP8$

Abstract: We will review (briefly) the construction of Hirzebruch of a certain CY3 over a del Pezzo surface of degree 8. This has shown up in physics, where they produce via physical arguments a number of generating functions of BPS states that turn out to be modular. In this talk we will go over a mathematical derivation of these generating functions, which relies on work of Klemm, Maulik, Pandharipande, and Scheidegger for computing the Gromov-Witten invariants of K3-fibred CY3s. This work is joint with N. Yui.

Noriko Yui (Queen's University)

Non-rigid Calabi–Yau threefolds over the rationals and their modularity

Abstract: Let X be a Calabi–Yau threefold. Let $X^\vee$ be its mirror (family) of Calabi–Yau threefolds. Suppose that both X and $X^\vee$ are defined over the rationals. We will consider non-rigid Calabi–Yau threefolds X with small Hodge numbers $h^{1,1}(X)$, or $h^{2,1}(X) > 0$ so that $B_3(X)$ or $B_3(X^\vee)$ are small. Thus, the dimension of the Galois representations associated to X or $X^\vee$ are small.

Our goal is to establish the modularity of X or $X^\vee$. This may be achieved when the Galois representation of the middle cohomology of X or $X^\vee$ decomposes into smaller dimensional motives. We will discuss some examples, where the middle cohomology happens to contain a 2-dimensional motive, which corresponds to a rigid Calabi–Yau threefold.