THE FIELDS INSTITUTE SEMINARS

ARITHMETIC AND GEOMETRY OF HIGHER DIMENSIONAL VARIETIES

WITH SPECIAL EMPHASIS ON

CALABI–YAU VARIETIES AND MIRROR SYMMETRY

ABSTRACTS
October 4, 2003

10:00am: James D. Lewis (University of Alberta)
Algebraic Cycles and Mumford Invariants

In this talk, I will explain what the space of Mumford invariants are, and how they related to a conjectured Bloch-Beilinson filtration on algebraic cycle groups. I will discuss some problems that are being jointly worked out by myself and Shuji Saito.

11:15am: Helena Verrill (Louisiana State University)

The A_4 Family of Calabi–Yau Threefolds

Using the A_4 root lattice, and the refelxive polyhedron spanned by the simple roots, one may use Batyrev's construction to produce a family of Calabi-Yau threefolds. I will discuss this family, and in particular, the singular members, which when resolved give rigid varieties. This is joint work with Klaus Hulek.

2:00pm: Xi Chen (University of Alberta)

Noether–Lefschetz for Regulators on K_1 of Surfaces

We first give a elementary new proof of the vanishing of the regulator on $K_1(Z)$ where $Z \subset \mathbf{P}^3$ be a general surface of degree $d \geq 5$, using a Lefschetz pencil argument. By a similar argument we then show the triviality of the regulator for K_1 of a general product of two curves. This is joint work with James Lewis.

3:15pm: Kentaro Hori (University of Toronto)

Aspects of Mirror Symmetry

4:45pm: Chuck Doran (Columbia University)

Integral Structures, Toric Geometry, and Homological Mirror Symmetry

We establish the isomorphisms over $\mathbf{Z}$ of cohomology/K-theory, global monodromy, and invariant symplectic forms predicted by Kontsevich's Homological Mirror Symmetry Conjecture for certain one dimensional families of Calabi-Yau threefolds with $h^{2,1} = 1$. These families arise as hypersurfaces or complete intersections in Gorenstein toric Fano varieties, and their mirrors are described by the Batyrev-Borisov construction. Our method involves (1) classifying all rank four integral variations of Hodge structure over $\mathbf{P}^1 \setminus \{0, 1, \infty\}$ with maximal unipotent local monodromy about 0 and local monodromy about 1 unipotent of rank 1, and (2) checking, using properties of nef partitions of reflexive polytopes, that the $\mathbf{Z}$-VHS of our Calabi-Yau families match those picked out by the K-theory of their mirrors via the HMS Conjecture. This is joint work with John Morgan.

October 5, 2003

10:00pm: Kumar Murty (University of Toronto)

Splitting of abelian varieties

It is well known that an absolutely simple abelian variety over a number field might become reducible at almost all places. We exhibit several families for which this is NOT the case.

11:15am Ivan Dmitrov (Queen's University)

Homogeneous spaces of classical ind-groups

I will discuss the homogeneous spaces G/P, where G is a classical ind-group, such as $GL(\infty)$, and P is a parabolic subgroup of G. For example, I will give a criterion for G/P to be projective and I will describe a flag realization of G/P. Then I will state some analogs of Borel-Weil-Bott's Theorem.