THE FIELDS INSTITUTE SEMINARS

ARITHMETIC AND GEOMETRY OF HIGHER DIMENSIONAL VARIETIES

WITH SPECIAL EMPHASIS ON

CALABI–YAU VARIETIES AND MIRROR SYMMETRY

ABSTRACTS
March 27, 2004

10:00am: James D. Lewis (University of Alberta)

Algebraic Cycles and Mumford Invariants

I will discuss some recent results stemming from joint work with Shuji Saito and myself, on certain arithmetical Hodge theoretic invariants on algebraic cycles, on projective algebraic manifolds.

11:15am: Andreas Rosenschon (SUNY Buffalo)

2-Torsion in Algebraic K-Theory

12:30–2.00pm Lunch

2:00pm: Masoud Kahlkali (University of Western Ontario)

Fourier–Mukai Transform and Complex Noncommutative Geometry

Noncommutative differential geometry in the sense of Alain Connes largely concerns with extensions of differential topological tools for real manifolds to noncommutative real spaces. Thus de Rham cohomology and Chern-Weil theory have found their appropriate noncommutative analogues in cyclic homology and Chern-Connes character map. Noncommutative holomorphic differential geometry is on the other hand "terra incognito". In this talk I will explain results obtained, mostly by A. Schwarz and A. Polishchuck , which amounts to the existence of a rich theory of noncommutative elliptic curves. In particular I'll explain a noncommutative analogue of the Fourier-Mukai transform for noncommutative tori due to them. Time permiting, I'll also explain relations with the the Baum-Connes conjecture, due to J. Kaminker.

3:15pm: Matt Kerr (UCLA)

Mumford's Theorem and Membrane Integrals

One of the central results in nineteenth century algebraic geometry is Abel's theorem, which in part shows how certain transcendental integrals behave as (complete) invariants of rational equivalence classes of points on a curve. In the last half-century or so there has been substantial effort to understand how the situation generalizes to higher dimension (e.g., points on an algebraic surface), including recent work of Griffiths-Green, Lewis, M. Saito-Rosenschon, S. Saito and Voisin.

More precisely, this talk will concern the Chow group of zero-cycles on an algebraic variety. After a brief review of the curve case, we recall various results on the inadequacy of the classical Albanese map for detecting rational inequivalence – chief (and chronologically the first) among them Mumford's theorem. We'll give several concrete examples (many of them recent work) of zero-cycles in the Albanese kernel, and discuss how certain membrane integrals and currents arise in the attempt to formulate Hodge-theoretic invariants (integrals) to detect them. We will describe some of our work on the subject and conclude with some interesting open problems.

4:15pm: Robert Osburn (Queen's University)

Congruences for Traces of Singular Moduli

The values of the usual j-invariant at imaginary quadratic arguments are known as singular moduli. These are algebraic integers which have important applications in number theory. In this talk, we discuss recent results of Zaiger, Ono, and Ahlgren on properties of traces of singular moduli, an extension of their results, and mention open problems.

6:00pm: Workshop Dinner

March 28, 2004

10:00pm: Ivan Dimitrov (Queen's University)

Flag Realizations of Homogeneous Ind-Spaces

We define infinite dimensional analogs of the flag varieties. We first introduce the notion of a generalized flag and define the corresponding generalized flag ind-varieties as the ind-varieties consisting of all generalized flags commensurable with a given one. It turns out that the generalized flag ind-varieties coincide with the homogeneous ind-spaces of the classical ind-groups. We also discuss some structure questions - we compute the Picard groups, establish a criterion for projectivity, etc.

11:15am June Zhu (McMaster University)

Limit Behavior for Zeta-Functions of Generic Artin-Schreier Covers

In this talk we shall present some new results regarding the moduli of all totally ramified p-covers (Artin-Schreier curves $y^p - y = f(x)$) at arbitrarily k points of the projective line P^1. In particular, we study the distribution of the p-adic valuation of the reciprocal roots of their zeta-functions as p approaches infinity. We will explain how this can be done based on Dwork's p-adic method for exponential sums. If time allows, we also explain how the zeta-functions vary (p-adically) as coefficients of $f(x)$ vary (p-adically).