# ABC Algebra Workshop

University of Alberta - April 14-15, 2007

**Tentative Schedule**

Saturday April 14

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| 09:00-09.30 | Registration/Gathering |
| 09:30-10.30 | A. Pianzola (Alberta): *How many $N = 4$ superconformal algebras are there?* |
| 10.30-11.00 | Coffee break |
| 11.00-12.00 | Z. Reichstein (British Columbia): *Essential dimension* |
| 12.00-14.00 | Lunch break |
| 14.00-15.00 | H. Derksen (Michigan): *Quivers with potentials and their representations* |
| 15.00-15.30 | Coffee break |
| 15.30-16.30 | K. Purbhoo (British Columbia): *Classes of cycles in toric varieties via tropicalization* |
| 18.00-??.?? | Dinner at the Faculty Club |

Sunday April 15

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| 09:30-10.30 | A. Dhillon (Western Ontario): *Rational points and Galois actions on Fundamental Groups* |
| 10.30-11.00 | Coffee Break |
| 11.00-12.00 | J. Lewis (Alberta): *Arithmetic Invariants of Algebraic Cycles* |

All talks will be held in Central Academic Building (CAB) 273.

# Abstracts

Arturo Pianzola (Alberta)
*How many N = 4 superconformal algebras are there?*

ABSTRACT: Techniques from Galois cohomology have recently appeared in the study of infinite dimensional Lie algebras. I will review how Galois cohomology arises within this context, and then go on to show how this same techniques, after suitable modifications, can be used for classifying superconformal algebras.

Zinovy Reichstein (British Columbia)
*Essential dimension*

ABSTRACT: The essential dimension of an algebraic object (e.g., of an algebra, a quadratic form, an algebraic varietyi or a principal homogeneous space) is the minimal possible number of independent parameters required to define the underlying structure. In recent years this numerical invariant has been studied by a variety of algebraic, geometric and cohomological techniques. The goal of my talk will be to give an introduction to this subject and to survey the latest developments.

Harm Derksen (Michigan)
*Quivers with potentials and their representations*

ABSTRACT: A quiver Q is a directed graph. A potential S for this quiver is a linear combination of cyclic paths. We define a two-sided jacobian ideal J(S) in the path algebra of Q and the quotient is called the Jacobian algebra. These algebras appear in physics as Seiberg duality in mirror symmetry. For quivers with mutations we introduce mutations, which are generalizations of Bernstein-Gelfand-Ponomarev reflection functors. There is a close connection between quivers with potentials and cluster algebras which were introduced by Fomin and Zelevinsky. This is joint work with Jerzy Weyman and Andrei Zelevinsky.

Kevin Purbhoo (British Columbia)
*Classes of cycles in toric varieties via tropicalization*

ABSTRACT: Given an algebraic cycle Y inside a toric variety X, the tropicalization of Y is a weighted fan inside $\mathrm{R}^n$. Two naturals questions are: what information about Y is encoded in this fan? and how can one extract it? I will discuass an approach in which one extracts information by computing the tropicalization of Y intersected with a T-cartier divisor on X. Using this one can explicitly find T-representatives for the class of Y in the chow group $A_*(X)$. Everything can be done equivariantly, if Y is invariant under a subtorus.

Ajneet Dhillon(Western Ontario)
*Rational points and Galois actions on Fundamental Groups*

ABSTRACT: I will discuss some recent joint work with Jan Minac on studying the section conjecture for hyperelliptic curves. This conjecture aims to describe rational points in terms of certain group theoretic data that will be described in the talk.

James Lewis (Alberta)
*Arithmetic Invariants of Algebraic Cycles*

ABSTRACT: Let X be a smooth projective variety defined over a subfield of the complex numbers. We introduce a collection of arithmetic Hodge theoretic invariants of X, and show how they can be used to detect interesting algebraic cycles. Most of this talk is based on joint work with Shuji Saito.