

## **SPECIAL LECTURES**

### **UMBRELLA SEMINAR**

Algebraic Geometry, Model Theory, Number Theory

September 27th (Monday) 2010 at 5:30 - 7:00 GC 4102

Speaker: Professor Jan Denef (Katholieke Universiteit Leuven, Belgium)

Title: Geometric proof of Ax-Kochen

Abstract: We will sketch a new proof of the Theorem of Ax and Kochen that any projective hypersurface over the  $p$ -adic numbers has a  $p$ -adic rational point, if it is given by a homogeneous polynomial with more variables than the square of its degree  $d$ , assuming that  $p$  is large enough with respect to the degree  $d$ . Our proof is purely geometric and (unlike all previous ones) does not use methods from mathematical logic. It is based on a theorem of Abramovich and Karu about weak toroidalization of morphisms. The method also yields a proof of a conjecture of Colliot-Thelene and generalizations. An earlier more complicated version of our proof was based on Cutkosky's Theorem on Local Monomialization of Morphisms, but to prove for example the Ax-Kochen-Ersov transfer principle along these lines we need the theorem of Abramovich and Karu.

### **ARITHMETIC GEOMETRY TEAM**

February 26 (Thursday) 2009 at 1:30 - 2:30 pm; Room 4214-03 (thesis room)

Speaker: Francois Loeser, (École Normale Supérieure, Paris)

Title: Some Applications of Model Theory to Algebraic Geometry

Abstract: I will illustrate the importance of the concept of definability in the study of valued fields by three different recent

applications of Model Theory to Arithmetic Geometry:

- (1) Proving global results on  $p$ -adic functions without using the mean value theorem nor connectedness (joint work with R. Cluckers and G. Comte).
- (2) A generalization of Ax-Kochen-Ersov for integrals (joint work with R. Cluckers).
- (3) Berkovich spaces as pro-definable sets (joint work with E. Hrushovski).

November 6 (Thursday) 2008 at 1:30 pm; Room 4214-03 (thesis room)

Speaker: Frans Oort (Utrecht University, visiting Columbia)

Title: Moduli Space of Abelian Varieties

Abstract: In this talk I will give a survey of my lectures at Columbia University this fall. I prove: a conjecture by Manin, a conjecture by Grothendieck, and the Hecke orbit conjecture. The emphasis will be on explaining methods about stratifications and foliations in positive characteristic, which give access to these difficult problems.

May 1st (Thursday) 2008 at 2:00-4:00pm Thesis Room

Speaker: Yu Yasufuku (Brown Univ.)

Title: "Vojta's Conjecture and Blowups."

Abstract: Vojta's conjecture is a powerful conjecture in Diophantine geometry, but it is not known in most cases. In this talk, I will prove the conjecture for repeated blowups of  $P^2$  (with respect to suitably-defined integral points), using Corvaja and Zannier's result on gcd's. I will also discuss higher-dimensional cases, as well as some general relationships between Vojta's conjecture on a variety and Vojta's conjecture on its blowup.

February 28th (Thursday) 2008 at 2:00-4:00pm Thesis Room

Speaker: Rachel OLLIVIER (ENS Paris, Visiting Columbia)

Title: "Mod  $p$  representations of  $GL(2)$ : from the finite case to the  $p$ -adic case."