

Fall 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043

September 15th – September 21st

Monday, September 15

- 3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Amanda Knecht (UM) *Introduction to Rationally Connected Varieties* --- 2866 EH
3:10-5:00pm **Group Theory/Lie Theory/Number Theory Seminar** --- Brian Conrad (Stanford) *Finiteness theorems for algebraic groups over function fields* --- 4096 EH
5:15-6:30pm **Teaching Mathematics** --- TBA --- 3096 EH

Tuesday, September 16

- 2:10-3:00pm **“What is ...” Seminar** --- Michael Anderson (SUNY Stony Brook) *What is ... geometric gluing?* --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Ian Biringer (U Chicago) *Rank and Geometry of Closed Hyperbolic 3-Manifolds* --- 4096 EH
3:10-4:00pm **Algebra Seminar** --- Not meeting this week --- 3096 EH
4:10-5:00pm **Colloquium** --- Michael Anderson (SUNY Stony Brook) *Surgery constructions of Einstein metrics* --- 1360 EH

Wednesday, September 17

- 3:10-4:00pm **Geometric Function Theory Seminar** --- Pekka Pankka (UM) --- *Finite distortion, value distribution, and cohomology* --- 4096 EH
3:10-4:00pm **Student Representation Theory Seminar** --- TBA --- 3096 EH
4:10-5:00pm **RTG Working Seminar in Several Complex Variables and Complex Dynamics** --- Not meeting this week --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Joel Kamnitzer (Toronto) *Equivalences of derived categories from geometric sl_2 actions* --- 3088 EH

Thursday, September 18

- 2:10-3:00pm **Commutative Algebra Seminar (Special Time)** --- Neil Epstein (UM) *Two extensions of Hilbert-Kunz multiplicity* --- 3096 EH
3:10-4:00pm **Several Complex Variables and Complex Dynamics Seminar (Special Time/Day)** --- Peter Ebenfelt (UCSD) *Cauchy-Riemann (CR) transversality of holomorphic mappings* --- 3866 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Not meeting this week --- 3088 EH
3:10-4:00pm **Topology Seminar** --- Enrique Torres-Giese (UM) TBA --- 4096 EH
4:10-5:00pm **Differential Equations** --- Chunjing Xie (UM) *Steady Subsonic Euler Flows through Two Dimensional Nozzles* --- 4088 EH
4:10-5:00pm **Math Club** --- Djordje Milicevic (UM) *The smallest uncountable ordinal and other tales* --- 2nd floor Nesbitt Common Room
4:10-5:00pm **Student Combinatorics** --- Speaker TBA (UM) *Horn Conjecture I* --- 3088 EH
4:10-5:00pm **Reading Group in Probabilistic Methods in Geometric Functional Analysis and Combinatorics** --- 1360 EH
4:10-6:00pm **Geometry & Physics** --- Zheng Hua (Wisconsin) *Derived category of toric stacks* --- 4096 EH
4:10-6:00pm **RTG Study Seminar** --- Mario Bonk (UM) *Horned spheres and wild reflections* --- 3866 EH

Friday, September 19

- 10:10-11:00am **Student Quadratic Forms Seminar** --- TBA --- 4096 EH

Friday, September 19 ... continued

- 11:10-12:00pm **Theoretical Computer Science Seminar** --- *Research overviews from Martin Strauss, Quentin Stout, and Kevin Compton* --- 3941 CSE
- 3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Russell Golman (UM) *Quantal Response Equilibria with Heterogeneous Agents* --- 1084 EH
- 3:10-4:00pm **Student Geometry/Topology** --- Aaron Magid (UM) *The Geometry and Topology of Surfaces* --- 3096 EH
- 3:10-4:00pm **Colloquium (Special Seminar)** --- Peter Ebenfelt (UCSD) *Rigidity of holomorphic mappings of real hypersurfaces into hyperquadrics* --- 1360 EH
- 4:10-5:00pm **Combinatorics** --- Dave Anderson (UM) *Schubert polynomials and Hessenberg varieties* --- 3866 EH

ABSTRACTS FOR THE WEEK OF SEPT. 15 – SEPT. 21, 2008

Topics in Algebraic Geometry Seminar

Monday, September 15, 3:10-4:00pm

2866 EH

Amanda Knecht (UM)

Introduction to Rationally Connected Varieties

We will start the semester with an overview of definitions and examples of RC varieties. Then I will present some reasons why Arithmetic Geometers care about these things.

Group Theory/Lie Theory/Number Theory Seminar

Monday, September 15, 3:10-5:00pm

4096 EH

Brian Conrad (Stanford)

Finiteness theorems for algebraic groups over function fields

If X is a smooth variety over a global field k , G is an affine algebraic group over k equipped with an action on X , and x is a point in $X(k)$ then it is natural to ask how the property of x' in $X(k)$ being in the $G(k)$ -orbit of x compares with being in the $G(k_v)$ -orbit of x for all places v of k . In general there is a non-trivial "local-to-global" obstruction space, but one can ask if it is finite. Even when G is semisimple, this finiteness problem leads to the consideration of the isotropy group G_x that is generally not connected or reductive (or even smooth when $\text{char}(k) > 0$). In the number field case the finiteness of these obstruction spaces was proved by Borel and Serre long ago, but their method used characteristic 0 in an essential way.

Recently in joint work with Gabber and G. Prasad we have developed a theory of "pseudo-reductive groups" which is a very useful tool to prove results for general affine algebraic groups in the function field case that were previously known only in the reductive case. In particular, this work makes it possible to prove the analogue of the Borel-Serre finiteness result over function fields (away from $\text{char. } 2$ for now). The first part of the talk will explain a bit about the theory of pseudo-reductive groups, and the rest of the talk will show how it is used to establish the finiteness of the local-to-global obstruction spaces in the function field case (in $\text{char. } > 2$). If time permits we will also discuss an application to the problem of whether the k -isomorphism class of a projective k -variety is determined (up to "finite ambiguity") by its k_v -isomorphism class for all places v of k (a problem solved by Mazur over number fields, once again making essential use of characteristic 0).

“What is ... ” Seminar
Tuesday, September 16, 2:10-3:00pm
3096 EH
Michael Anderson (SUNY Stony Brook)
What is ... geometric gluing?

An informal discussion of geometric gluing/surgery, a method to construct solutions of geometric problems in many contexts from simpler given, but singular solutions. Its closely related to structures at the boundaries of moduli spaces.

Geometry Seminar
Tuesday, September 16, 3:10-4:00pm
4096 EH
Ian Biringer (U Chicago)
Rank and Geometry of Closed Hyperbolic 3-Manifolds

We will discuss how the geometry of a closed hyperbolic 3-manifold is influenced by the minimal number of generators for its fundamental group. In particular, we will see connections with Heegaard genus and the first eigenvalue of the Laplacian, and derive a finiteness theorem for certain commensurability classes of arithmetic Kleinian groups. Joint with Juan Souto

Colloquium
Tuesday, September 16, 4:10-5:00pm
1360 EH
Michael Anderson (SUNY Stony Brook)
Surgery constructions of Einstein metrics

The focus of the talk is a generalization of Thurston's Dehn surgery theory of hyperbolic 3-manifolds to Einstein manifolds of any dimension. The analogy is particularly strong in dimension 4, and gives rise to large new families of Einstein metrics, (as well as a new proof of Thurston's theory in dimension 3). To set the stage, we will discuss the idea of constructing smooth Einstein metrics by smoothing singular metrics (the singular perturbation or "gluing" method). Time permitting, we'll also discuss the possibility of other types of surgery or gluing methods for Einstein metrics.

Geometric Function Theory Seminar
Wednesday, September 17, 3:10-4:00pm
4096 EH
Pekka Pankka (UM)
Finite distortion, value distribution, and cohomology

A corollary of the Mattila-Rickman equidistribution theorem states that a geometrically controlled branched covering map (i.e, a quasiregular mapping) into a closed manifold must visit every set as often as its relative size indicates. I will discuss this corollary for more general branched covering maps (mappings of finite distortion). This result is a key ingredient in a cohomological boundedness theorem for closed manifolds admitting entire mappings of bounded mean distortion.

Algebraic Geometry Seminar
Wednesday, September 17, 4:10-6:00pm
3088 EH
Joel Kamnitzer (Toronto)
Equivalences of derived categories from geometric sl_2 actions

I will discuss a new technique for constructing equivalences of derived categories of coherent sheaves. This allows us to construct equivalences between the derived categories of cotangent bundles to Grassmannians. Our work generalizes the spherical twists of Seidel-Thomas and is based on work of Chuang-Rouquier. More generally we construct actions of Lie algebras on the derived category of quiver varieties. This lifts Nakajima's action on their cohomology. This is joint work with Sabin Cautis and Anthony Licata.

Commutative Algebra Seminar (Note: Special Time)
Thursday, September 18, 2:10-3:00pm
3096 EH
Neil Epstein (UM)
Two extensions of Hilbert-Kunz multiplicity

Let (R, m) be a quasi-unmixed Noetherian local ring of prime characteristic $p > 0$. Given two ideals $J \subseteq I$, where J is m -primary, I and J have the same tight closure iff they have the same Hilbert-Kunz multiplicity. A more general theorem holds, which covers the case where I/J has finite length, due to Hochster and Huneke. But what if I/J isn't a finite-length module? To cover this case, we give two extensions of Hilbert-Kunz multiplicity, both of which reduce to the ordinary Hilbert-Kunz multiplicity in the m -primary case, but in general are different from each other. The first version characterizes tight closure "up to unmixedness". The second version, which is a kind of analogue to j -multiplicity, gives a sufficient condition for the tight closures to agree, and in some cases this condition is known to be necessary and sufficient. This is joint work with Yongwei Yao.

Several Complex Variables and Complex Dynamics Seminar (Special Time/Day)
Thursday, September 18, 3:10-4:00pm
3866 EH
Peter Ebenfelt (UCSD)
Cauchy-Riemann (CR) transversality of holomorphic mappings

A holomorphic mapping is CR transversal to a CR submanifold M' of complex space if it is transversal to its complex tangent space. CR transversality can be forced on a mapping by imposing the condition that it sends another CR submanifold M into M' and the CR structure of M (or M') satisfies certain conditions. For instance, a consequence of the classical Hopf lemma is that any nonconstant mapping of a strictly pseudoconvex hypersurface into another is necessarily CR transversal. In this talk, we will discuss a number of recent, more general results in this direction.

Differential Equations
Thursday, September 18, 4:10-5:00pm
4088 EH
Chunjing Xie (UM)
Steady Subsonic Euler Flows through Two Dimensional Nozzles

In this talk, I will discuss existence, uniqueness, fine properties of two dimensional steady Euler flows through infinitely long nozzles. The one of the key points is to introduce the stream function, which can reduce Euler system into a single equation. When studying the equation for stream function, various elliptic estimates and blow up argument are involved.

Geometry & Physics
Thursday, September 18, 4:10-6:00pm
4096 EH
Zheng Hua (Wisconsin)
Derived category of toric stacks

A conjecture of Alastir King predicts existence of full strong exceptional collection of line bundles on toric stacks. In this talk I am going to explain some related results about this conjecture. In particular I will prove it for dimension 2 and for picard number 2. I also plan to say some application of these results to study the stability conditions on open Calabi-Yau stacks. This is a joint work with Lev Borisov.

RTG Study Seminar
Thursday, September 18, 4:10-6:00pm
3866 EH
Mario Bonk (UM)
Horned spheres and wild reflections

In the 1950's R.H. Bing showed that there are wild reflections on R^3 . By definition these are involutions that are not conjugate to linear involutions. In my talk I will discuss his construction which uses Alexander horned spheres and decomposition spaces.

Applied and Interdisciplinary Mathematics Seminar
Friday, September 19, 3:10-4:00pm
1084 EH
Russell Golman (UM)
Quantal Response Equilibria with Heterogeneous

In game theory, players choose actions to achieve a payoff - a measure of the attractiveness of an outcome of the game - that depends on all the players' choices. In a quantal response equilibrium, players observe payoffs disturbed by noise and thus make errors when trying to choose an optimal action in response to a given state of other players' choices. The state of all players' choices is consistent with this decision rule. This talk is about quantal response equilibria with heterogeneous agents. I consider a distribution of distributions of payoff shocks, modeled as a functional defined over distribution functions. Given heterogeneity defined by a particular functional, a representative agent would have the average quantal response function. I show existence of a representative agent as long as this average is an admissible quantal response function. However, this representative agent does not have a representative distribution of payoff shocks, nor any IID distribution in large enough games. I consider a specific case of heterogeneous logit responders and find that a mis-specified homogenous logit parameter will have downward bias.

Student Geometry/Topology
Friday, September 19, 3:10-4:00pm
3096 EH
Aaron Magid (UM)
The Geometry and Topology of Surfaces

We will investigate the moduli space of a surface (a.k.a. curves if your reasoning is complex) through its universal cover, Teichmuller space. This talk will be introductory, beginning with several equivalent ways to define Teichmuller space. The mapping class group (the group of homotopy classes of homeomorphisms of a surface) acts on Teichmuller space, giving the moduli space as the quotient. We will discuss (but not necessarily prove) some facts about the topology and geometry of Teichmuller space, and how one can use the mapping class group action to understand surface homeomorphisms.

Colloquium (Special Seminar)
Friday, September 19, 4:10-5:00pm
1360 EH
Peter Ebenfelt (UCSD)
Rigidity of holomorphic mappings of real hypersurfaces into hyperquadrics

The collection of holomorphic mappings of the complex plane sending a piece of the circle into itself is very large, infinite dimensional by any standard, and has no particularly interesting structure. In contrast, the collection of holomorphic mappings of complex 2-space sending a piece of the sphere into itself consists solely of automorphisms of the sphere and is hence, in particular, finite dimensional. This is a phenomenon that, when properly formulated, persists for holomorphic mappings sending a strictly pseudoconvex hypersurface into a sphere in a higher dimensional space, provided the difference in dimension is not too large. In this talk, we will describe this result, discuss an application to the study of isolated singularities, and explore what happens when pseudoconvexity is replaced by pseudoconcavity.

Combinatorics
Friday, September 19, 4:10-5:00pm
3866 EH
Dave Anderson (UM)
Schubert polynomials and Hessenberg varieties

Double Schubert polynomials are representatives for Schubert classes in the equivariant cohomology of a flag variety, distinguished by their pleasant combinatorial properties. Hessenberg varieties are certain subvarieties of the flag variety; it turns out that their (ordinary) cohomology classes are specializations of double Schubert polynomials. This motivates a combinatorial problem: find the expansion of a specialized double Schubert polynomial in the basis of (single) Schubert polynomials. I'll describe some results in this direction. This is joint work with Julianna Tymoczko.