

Fall 2009
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
October 12th – October 18th

Monday, October 12

- 2:10-3:00pm **Topics in Algebraic Geometry** --- Mihai Fulger (UM) *Crash Course in GIT* --- 3866 EH
3:10-5:00pm **Group Theory/Lie Theory/Number Theory Seminar** --- Wei Zhang (Harvard) *An arithmetic fundamental lemma for unitary groups in three variables* --- 4096 EH
4:10-5:00pm **Several Complex Variables and Complex Dynamics Seminar** --- No Seminar – SCV Conference at Purdue
4:10-5:00pm **Student Combinatorics** --- Max Glick (UM) *The cohomology of the Grassmannian* --- 3866 EH
4:10-6:00pm **Geometry & Physics** --- Christopher Woodward (Rutgers) *Mirror theorems as special cases of quantum non-abelian localization*--- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting --- 3096 EH

Tuesday, October 13

- 2:10-3:00pm **“What is ...” Seminar** --- William Goldman (U of Maryland) *What is ... an affine manifold?* -- - 3096 EH
3:10-4:00pm **Student Geometry/Topology** --- Rodrigo Parra (UM) *Geometry of Complex Dynamics* --- 4096 EH
4:10-5:00pm **Colloquium** --- William Goldman (U of Maryland) *Complete affine 3-manifolds and hyperbolic structures on surfaces* --- 1360 EH

Wednesday, October 14

- 3:10-4:00pm **Student Arithmetic Seminar** --- Johnson Jia (UM) *The Langlands Program and L-functions*-- - 3866 EH
3:10-4:00pm **Geometric Function Theory Seminar** ---Grigoris Paouris (Texas A&M) *Concentration of mass on Convex bodies: Few results and several open questions* --- 4096 EH
4:10-5:00pm **Student AIM Seminar** --- --- 3866 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Yusuf Mustopa (UM) *Subordinate Loci on Symmetric Products and Syzygies of Points* --- 3088 EH
4:30-6:00pm **Logic Seminar** --- Francois Dorais (UM) *Generic Ultrapowers in Second-Order Arithmetic*-- 3096 EH

Thursday, October 15

- 12:00-1:00pm **Mathematical Biology Seminar** --- --- 4096 EH
3:10-4:00pm **Commutative Algebra Seminar** --- Kevin Tucker (UM) *On the Behavior of Test Ideals Under Generically Etale Finite Morphisms*--- 3096 EH
3:10-4:00pm **Topology Seminar** ---TBA --- 4096 EH
4:10-5:00pm **Financial/Actuarial Mathematics Seminar** --- Sebastian Jaimungal (Dept. of Statistics, U of Toronto) *Hitting Time Problems with Applications to Finance and Insurance* --- 3088 EH
4:10-5:00pm **Differential Equations** --- Jeff Rauch (UM) *Finite Speed and Uniqueness in the Cauchy Problem for Symmetrizable Hyperbolic Systems* --- 4088 EH
4:10-5:00pm **Math Club** --- Hyman Bass (UM) *Pieces of Cake* --- 2nd floor Nesbitt Common Room

Friday, October 16

- 10:30-11:30am **Theoretical Computer Science Seminar** --- Dror Baron TBA --- 3941 CSE
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Steve Baer (Arizona State U) *New insights into dynamic bifurcation problems: slow acceleration and de-acceleration through a Hopf bifurcation* --- 1084 EH
3:10-4:00pm **Intersection Theory Study Seminar** --- Jose Gonzalez TBA --- 3866 EH
3:10-4:00pm **Geometry Seminar** --- Lars Louder (UM) TBA --- 3096 EH
4:10-5:00pm **Combinatorics** --- No Seminar this week--- 3866 EH

UPCOMING EVENTS

Ziwet Lectures

October 27, 28, 29, 2009

Cedric Villani

Professeur de l'Ecole Normale Supérieure de Lyon

Directeur de l'Institut Henri Poincaré

Marjorie Lee Browne Colloquium

January 18, 2010

Rodrigo Bañuelos

Purdue University

Michigan Conference on Topology and Physics

Feb 6-7, 2010

Rainich Lectures

March 16, 17, 18, 2010

Terence Tao

UCLA

ABSTRACTS FOR THE WEEK OF OCTOBER 12 - 18, 2009

Group Theory/Lie Theory/Number Theory Seminar

Monday, October 12, 3:10-5:00pm

4096 EH

Wei Zhang (Harvard)

An arithmetic fundamental lemma for unitary groups in three variables

In this talk I will present a relative trace formula approach to the Gross-Zagier formula and its higher dimensional generalization (a derivative version of the global Gross-Prasad conjecture) for unitary groups. In particular, an arithmetic fundamental lemma (AFL) is proposed. Some results proved recently will be presented, including the AFL for unitary groups in three variables.

Student Combinatorics

Monday, October 12, 4:10-5:00pm

3866 EH

Max Glick (UM)

The cohomology of the Grassmannian

The Grassmannian $Gr(m,n)$ is the space of dimension m subspaces of a fixed dimension $m+n$ complex vector space. These generalizations of projective spaces (the case $m=1$) play an important role in various branches of geometry. The cohomology ring of such spaces bear a striking resemblance to the ring of symmetric functions introduced in Luis' talk. Specifically, the cohomology ring admits an additive basis, indexed by partitions, which play the role of the Schur functions, and which multiply according to similar rules. I will outline the computation of the cohomology ring and discuss the connection to symmetric functions.

Geometry & Physics Seminar
Monday, October 12, 4:10-6:00pm
4088 EH

Christopher Woodward (Rutgers)
Mirror theorems as special cases of quantum non-abelian localization

I will describe work in progress with F. Ziltener, E. Gonzalez, and S. Venugopalan, describing a "quantum non-abelian localization" formula (qnal) which computes Gromov-Witten invariants of GIT/symplectic quotients via a "diagram of cohomological field theories". When the quotient is a smooth projective toric variety the formula reproduces some results of Givental etc. in the Fano case, and Iritani etc. in the non-Fano case sometimes called "mirror theorems". In the case of non-abelian quotients the formula produces a (quantum corrected) version of the "abelian/non-abelian correspondence" conjecture of Ciocan-Fontanine etc.

Colloquium
Tuesday, October 13, 4:10-5:00pm
1360 EH

William Goldman (U of Maryland)
Complete affine 3-manifolds and hyperbolic structures on surfaces

Flat Riemannian manifolds arise as quotients of Euclidean space by discrete groups of isometries, and correspond to classical crystallographic groups. Such structures can equivalently be defined as systems of local coordinates into affine space where the coordinate changes are locally isometries. The theorems of Bieberbach provide an effective classification of such structures. Analogous questions for manifolds with flat connections, or equivalently, quotients by groups of affine transformations are considerably more difficult, and presently unsolved. In this talk I will describe how the classification in dimension three, reduces to a question on hyperbolic geometry on open 2-manifolds.

Student Arithmetic Seminar
Wednesday, October 14, 3:10-4:00pm
3866 EH

Johnson Jia (UM)
The Langlands Program and L-functions

I plan to offer a quick introduction to the Langlands program and discuss its role in number theory. The talk will be primarily based on Blasius and Rogawski's paper, "Zeta functions of Shimura varieties".

Geometric Function Theory Seminar
Wednesday, October 14, 3:10-4:00pm
4096 EH

Grigoris Paouris (Texas A&M)
Concentration of mass on Convex bodies: Few results and several open questions

We will review several questions related to the concentration of mass on convex bodies: The Hyperplane Conjecture, The central limit theorem, large deviations and small ball probability estimates, Kannan-Lovasz-Simonovits Conjecture and infimum convolutions inequality. We will discuss main ideas on some positive results on those questions.

Logic Seminar
Wednesday, October 14, 4:30-6:00pm
3096 EH

Francois Dorais (UM)
Generic Ultrapowers in Second-Order Arithmetic

I will present a very general method to translate ultrafilter proofs and other non-standard arguments into the context of subsystems of second-order arithmetic. This process allows to translate proofs that are generally considered to be non-constructive into more constructive arguments. Several second-order principles (e.g.,

Cohesive Sets, Weak Koenig's Lemma, Partition Theorems) arise naturally in this translation process. I will discuss how these arise as well as selected applications to Reverse Mathematics.

Commutative Algebra Seminar
Thursday, October 15, 3:10-4:00pm
3096 EH

Kevin Tucker (UM)

On the Behavior of Test Ideals Under Generically Etale Finite Morphisms

Test ideals are important invariants in positive characteristic commutative algebra arising from the theory of tight closure, and correspond to multiplier ideals under reduction to characteristic $p > 0$. By analyzing the lifting properties of p^e -linear maps using the trace map, we are able to describe the behavior of test ideals under generically etale finite morphisms (joint with Karl Schwede). This generalizes previously known results on the behavior of test ideals under finite morphisms which are etale in codimension one.

Financial/Actuarial Mathematics Seminar
Thursday, October 15, 4:10-5:00pm
3088 EH

Sebastian Jaimungal (Dept. of Statistics, U of Toronto)

Hitting Time Problems with Applications to Finance and Insurance

The distribution of the first hitting time of a Brownian motion to a linear boundary is well known. However, if the boundary is nonlinear, this distribution is not in general identifiable. Nonetheless, the boundary and distribution satisfy a variety of beautiful integral equations due to Peskir. In this talk, I will discuss how to generalize those equations and lead to an interesting partial solution to the inverse problem: "Given a distribution of hitting times, what is the corresponding boundary?" By randomizing the starting point of the Brownian motion, I will show how a kernel estimator of the distribution with gamma kernels can be exactly replicated. Armed with these tools, there are two natural applications: one to finance and one to insurance. In the financial context, the Brownian motion may drive the value of a firm and through a structural modeling approach I will show how CDS spread curves can be matched. In the insurance context, suppose an individual's health reduces by one unit per annum with fluctuations induced by a Brownian motion and once their health hits zero the individual dies. I will show how life-table data can be nicely explained by this model and illustrate how to perturb the distribution for pricing purposes. This is joint work with Alex Kreinin and Angelo Valov.

Differential Equations Seminar
Thursday, October 15, 4:10-5:00pm
4088 EH

Jeff Rauch (UM)

Finite Speed and Uniqueness in the Cauchy Problem for Symmetrizable Hyperbolic Systems

Precise finite speed, in the sense of that the domain of influence is a subset of the union of influence curves through the support of the initial data is proved for hyperbolic systems symmetrized by pseudodifferential operators in the spatial variables. From this, uniqueness in the Cauchy problem at spacelike hypersurfaces is derived by a Holmgren style duality argument. Sharp finite speed is derived from an estimate for propagation in each direction. Propagation in a fixed direction is proved by regularizing the problem in the orthogonal directions. Uniform estimates for the regularized equations is proved using pseudodifferential techniques of Beals-Fefferman type.

Math Club
Thursday, October 15, 4:10-5:00pm
2nd floor Nesbitt Common Room
Hyman Bass (UM)
Pieces of Cake

Suppose that 7 people want to equally share 5 cakes (so that each one gets exactly $5/7$ of a cake). What is the smallest number of pieces into which the cakes must be cut in order for this equal distribution to be possible? What happens for s people sharing c cakes (where c is a positive integer)?

Applied and Interdisciplinary Mathematics Seminar
Friday, October 16, 3:10-4:00pm
1084 EH

Steve Baer (Arizona State U)

New insights into dynamic bifurcation problems: slow acceleration and de-acceleration through a Hopf bifurcation

From the periodicity of regional climate change to sustained oscillations in living cells, the transition between stationary and oscillatory behavior is often through a Hopf bifurcation. When a parameter slowly ramps through a Hopf bifurcation, stability loss is delayed considerably when compared to classical static theory. Inherent to biological, chemical, and physical systems, but often overlooked or misunderstood in the literature are nonlinear ramp problems where a parameter slowly accelerates or de-accelerates through the bifurcation point. In this talk I will show how slow nonlinear ramps can significantly increase or decrease the onset threshold, changing profoundly our understanding of stability loss and delay in dynamic bifurcation problems. I will apply the results to membrane accommodation in nerves, predicting the formation of pacemakers in the Belousov-Zhabotinsky reaction, and predicting the duration of the silent phase in elliptic bursting.