

Winter 2011
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.html>
Ann Arbor, MI 48109-1043
April 18 – April 24, 2011

Monday, April 18

- 3:10-4:00pm **Student Algebraic Geometry Seminar** — Mihai Fulger (UM) — *A little on Zariski decompositions* — 3866 EH
- 3:10-5:00pm **Group Theory/Lie Theory/Number Theory Seminar** — Evgeny Shinder (Northwestern) — *Motivic cohomology of some non-split algebraic groups* — 4096 EH
- 3:10-5:00pm **Working Seminar on Semiclassical Analysis and Symplectic Geometry** — TBA — 2866
- 4:10-5:00pm **Applied and Interdisciplinary Mathematics (Special Seminar)** — Edriss Titi (Weizmann Institute & UC, Irvine) — *On the Question of Global Regularity for Three-dimensional Navier-Stokes Equations and Relevant Geophysical Models* — 340 West Hall (Note: Day, Time & Room Change) JOINT WITH DIFFERENTIAL EQUATIONS SEMINAR
- 4:10-5:00pm **Several Complex Variables and Complex Dynamics Seminar** — Dan Burns (UM) — *Holomorphic extension into the complex domain and the homogenous complex Monge-Ampère equation* — 3096 EH
- 4:10-5:00pm **Student Combinatorics Seminar** — Yi Su (UM) — *An algebraic approach of (affine) Stanley symmetric functions* — 3866 EH
- 4:10-5:00pm **UM PDE Reading Group** — TBA — 3088 EH
- 4:10-6:00pm **Geometry & Physics Seminar** — Yefeng Shen (Michigan) — *Gromov-Witten theory of elliptic orbifold SP^1* — 4088 EH

Tuesday, April 19

- 12:10-1:00pm **Mathematical Biology Forum** — Krishna Garikapati (UM) — *The non-equilibrium thermodynamics and kinetics of focal adhesion dynamics* — Palmer Commons Boardroom 3
- 2:00-3:00pm **Graduate Thesis Defense** — Eugene Eisenstein — *Inversion of Adjunction in High Codimension* — 257 Dennison
- 2:10-3:00pm **"What is ...?" Seminar** — Giovanni Forni (University of Maryland) — *What is... an invariant distribution?* — 3096 EH
- 3:10-4:00pm **Algebra Seminar** — TBA — 3096 EH
- 3:10-4:00pm **Student Commutative Algebra Seminar** — TBA — 2866 EH
- 3:10-4:00pm **Student Geometry/Topology Seminar** — TBA — 4088 EH
- 3:10-4:00pm **"What is ...?" (Special Seminar)** — Bertrand Remy (Universite Claude Bernard Lyon) — *What is ... a building?* — 1360 EH (Note: Time & Room Change)
- 4:10-5:00pm **Colloquium** — Giovanni Forni (Univ of Maryland) — *Quantitative equidistributions of nilflows and Weyl sums* — 1360 EH

Wednesday, April 20

- 1:10-2:00pm **Student AIM Seminar** — TBA — 3866 EH
- 2:10-3:30pm **Algebraic Geometry (Special Seminar)** — 1) Mihai Fulger, 2) Michael Von Korff, 3) Zhixian Zhu — 1) *Local volumes*, 2) *F-Signature of affine toric varieties*, 3) *Singularity of theta divisor via jet schemes* — 3088 EH (Note: Time Change)
- 3:10-4:00pm **Student Arithmetic Seminar** — Alex Mueller (UM) — TBA — 3866 EH
- 3:10-4:00pm **UM PDE Reading Group** — TBA — 4088 EH
- 4:10-5:00pm **Student Analysis Seminar** — TBA — 4096 EH
- 4:10-5:30pm **Logic Seminar** — TBA — 3096 EH

Thursday, April 21

- 10:00-11:00am **Graduate Thesis Defense** — Gerardo Hernandez — *An Algebra of Singular Semiclassical Pseudodifferential Operators, and Numerical Methods for Shallow Water and Porous Media Flows* — 3096 EH
- 2:10-3:00pm **Topics in Algebraic Geometry Seminar** — TBA — 3096 EH
- 3:10-4:00pm **Commutative Algebra Seminar** — TBA — 3096 EH
- 3:10-4:00pm **Financial/Actuarial Mathematics Seminar** — TBA — 3088 EH
- 3:10-4:00pm **Topology Seminar** — Juan Souto (UM) — *Abstract commensurator of the Johnson kernels* — 2866 EH
- 4:10-5:00pm **Math Club** — TBA — 2nd floor Nesbitt
- 4:10-5:00pm **RTG Study Seminar** — Christopher Mooney (UM) — *CAT(1) Rigidity -- Finishing Lytchak's Theorem* — 3096 EH
- 5:15-6:30pm **Teaching Mathematics Seminar** — Deborah Ball (UM School of Ed) — *Investigating Student Understanding of Derivative—interview analysis* — 3088 EH

Friday, April 22

- 10:30-11:30am **Theoretical Computer Science Seminar** — TBA — 3941 CSE
- 11:00-12:00pm **Graduate Thesis Defense** — Manuel Rodrigo Parra — *Currents and Equidistribution in Holomorphic Dynamics* — 3088 EH
- 3:10-4:00pm **Geometry Seminar** — TBA — 3096 EH
- 3:00-4:00pm **Graduate Thesis Defense** — Qian Yin — *Lattices Maps and Combinatorial Expansion* — 2866 EH
- 3:00-4:30pm **Kottwitz Seminar** — Mitya Boyarchenko (UM) — TBA — 4088 EH
- 4:10-5:00pm **Combinatorics Seminar** — TBA — 3866 EH
- 4:10-5:00pm **Student Logic Seminar** — TBA — 3088 EH

UPCOMING EVENTS

NEW PERSPECTIVES IN NONLINEAR PDE'S – MAY 2-6, 2011

STOCHASTIC ANALYSIS FOR FINANCE & INSURANCE – MAY 17-20, 2011

**FRG-RTG WORKSHOP ON L-FUNCTIONS, GALOIS REPRESENTATIONS & IWASAWA THEORY
– MAY 17-22, 2011**

IBL WORKSHOP ON INQUIRY BASED LEARNING – MAY 21-25, 2011

ABSTRACTS FOR THE WEEK OF APRIL 18 – APRIL 24, 2011

Student Algebraic Geometry Seminar
Monday, April 18, 3:10-4:00pm
3866 EH
Mihai Fulger (UM)
A little on Zariski decompositions

Zariski decompositions are a useful tool in the study of volumes of Cartier divisors on projective surfaces. It shows how from an asymptotic perspective, a pseudo-effective divisor behaves a lot like a nef divisor. We define Zariski decompositions on surfaces in the projective and in the relative setting. We compute examples and list a few applications. If time permits, we will also discuss generalizations to higher dimension.

Group Theory/Lie Theory/Number Theory Seminar
Monday, April 18, 3:10-5:00pm
4096 EH
Evgeny Shinder (Northwestern)
Motivic cohomology of some non-split algebraic groups

We consider algebraic groups $GL_1(D)$, $SL_1(D)$, where D is a division algebra of prime degree over a field F , and associated motives in the category of motivic complexes $DM(F)$. Following an idea of Suslin, we relate motives of these groups to the motive of Voevodsky's simplicial scheme X , associated to the Severi-Brauer variety of D .

AIM (Special Seminar)
Monday, April 18, 4:10-5:00pm
340 West Hall
Edriss Titi (Weizmann Institute & UC, Irvine)
On the Question of Global Regularity for Three-dimensional Navier-Stokes Equations and Relevant Geophysical Models

The basic problem faced in geophysical fluid dynamics is that a mathematical description based only on fundamental physical principles, the so-called the "Primitive Equations", is often prohibitively expensive computationally and hard to study analytically. In this talk I will survey the main obstacles in proving the global regularity for the three-dimensional Navier-Stokes equations and their geophysical counterparts. Even though the Primitive Equations look as if they are more difficult to study analytically than the three-dimensional Navier-Stokes equations I will show in this talk that they have a unique global (in time) regular solution for all initial data. Inspired by this work I will also provide a new global regularity criterion for the three-dimensional Navier-Stokes equations involving the pressure. This is joint work with Chongsheng Cao.

Several Complex Variables & Complex Dynamics Seminar
Monday, April 18, 4:10-5:00pm
3096 EH
Dan Burns (UM)
Holomorphic extension into the complex domain and the homogenous complex Monge-Ampère equation

Given a real analytic Riemannian manifold (M, g) , there is determined a unique solution u of the homogeneous complex Monge-Ampère equation (HCMA) on a neighborhood of M in its complexification, associated to g . A classic result of Boutet de Monvel from the late seventies says that a real analytic function h on M has a holomorphic extension to $u < r$ if and only if $h = \exp(r\sqrt{\Delta})f$, for some f in L^2 . This is valid for small values of r . I will give examples where this breaks down, i.e., where there is a maximal $r < \infty$ for which this is valid, with a speculation as to why it breaks down there. I will also discuss related results in terms of semi-groups of elliptic Toeplitz operators and other examples of solutions of HCMA. This is joint work, part with Victor Guillemin and part with Zhou Zhang

Mathematical Biology Forum
Tuesday, April 19, 12:10-1:00pm
Palmer Commons Boardroom 3
Krishna Garikipati (UM)

The non-equilibrium thermodynamics and kinetics of focal adhesion dynamics

Focal adhesions are a type of matrix-attachment formed by certain cell types, prominently by fibroblasts. They play important roles in cell migration, signalling and cytoskeletal dynamics. The formation, growth and resorption of focal adhesions has been shown to be mechano-sensitive, and furthermore, they demonstrate a rich dynamic response. We consider a focal adhesion to be made up of molecular complexes, each consisting of a ligand, an integrin molecule, and associated plaque proteins. Free energy changes drive the binding and unbinding of these complexes and thereby control the focal adhesion's dynamic modes of growth, treadmilling and resorption. We have identified a competition among four thermodynamic driving forces for focal adhesion dynamics: (1) the work done during the addition of a single molecular complex of a certain size, (2) the chemical free energy change associated with the addition of a molecular complex, (3) the elastic free energy change associated with deformation of focal adhesions and the cell membrane, and (4) the work done on a molecular conformational change. We have developed a theoretical treatment of focal adhesion dynamics as a nonlinear rate process governed by a classical kinetic model. We also express the rates as being driven by out-of-equilibrium thermodynamic driving forces, and modulated by kinetics. The mechanisms governed by the above four effects allow focal adhesions to exhibit a rich variety of behavior without the need to introduce special constitutive assumptions for their response. For the reaction-limited case growth, treadmilling and resorption are all predicted by a very simple chemo-mechanical model. Treadmilling requires symmetry breaking between the ends of the focal adhesion, and is achieved by driving force (1) above. In contrast, depending on its numerical value (2) causes symmetric growth, resorption or is neutral, (3) causes symmetric resorption, and (4) causes symmetric growth. In addition to explaining focal adhesion dynamics, this treatment can be coupled with models of cytoskeleton dynamics and contribute to the understanding of cell motility.

“What is...?” Seminar
Tuesday, April 19, 2:10-3:00pm
3096 EH
Giovanni Forni (University of Maryland)
What is... an invariant distribution?

Invariant distributions are important objects in the smooth ergodic theory of weakly chaotic flows and maps. They appear naturally as obstructions to solve cohomological equations. Cohomological equations are crucial in the study of several kinds of questions, from conjugacy problems to the asymptotics of ergodic integrals. We will discuss some basic examples and some open problems.

“What is...?” (Special Seminar)
Tuesday, April 19, 3:10-4:00pm
1360 EH
Bertrand Remy (Universite Claude Bernard Lyon)
What is ... a building?

A building is a structure relevant to geometry and group combinatorics. The notion was invented by J. Tits in the early 60ies in order to provide a uniform construction of simple groups of Lie type over arbitrary fields. It was then exploited in order to better understand symmetric spaces and non-archimedean analogues. Considering automorphisms of exotic buildings leads today to new group-theoretic situations (e.g. construction of finitely generated simple groups, of equivariant compactifications etc).

Colloquium
Tuesday, April 19, 4:10-5:00pm
1360 EH
Giovanni Forni (Univ of Maryland)
Quantitative equidistributions of nilflows and Weyl sums

Bounds on Weyl sums (exponential sums of polynomial sequences) are an important classical topic in analytic number theory with at least a century of history (Hardy and Littlewood, Weyl, Vinogradov, Hua, Vaughan, Wooley and many others). In our joint work with L. Flaminio, following Furstenberg we approach the problem as a question on the equidistribution of nilflows (or linear skew-shifts). Our results are not far behind the best results obtained only very recently by number theoretical methods (Wooley, 2011) and we hope that our methods may yield further progress. Our work is based on ideas from the theory of dynamical systems such as finding solutions of cohomological equations, invariant distributions and renormalization, and it is part of a more general program to develop a theory of weakly chaotic, parabolic systems. Interval exchange transformations or translation flows, horocycle flows and nilflows are the main examples and our work is in fact an attempt at generalizing the Kontsevich-Zorich picture for the deviation of ergodic averages of interval exchange transformations.

Topology Seminar
Thursday, April 21, 3:10-4:00pm
2866 EH
Juan Souto (UM)
Abstract commensurator of the Johnson kernels

The Johnson kernels are the subgroups of the mapping class group which act trivially on the quotient of the surface group module terms of the lower central series; for instance, the first Johnson kernel is the Torelli group. We prove that the abstract commensurator of every Johnson kernel is the full mapping class group. This is joint work with Martin Bridson and Alexandra Pettet.