Fall 2006
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
November 27th – December 3rd

Monday, November 27

3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Not meeting this week --- 3866 EH
3:10-4:30pm **Arithmetic/Number Theory Seminar** --- TBA --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Erik Low (Univ. of Oslo) *Embedding Riemann surfaces in C^2* --- 3096 EH
4:10-6:00pm **Geometry & Physics** --- Yuan-Pin Lee (Utah) *Invariance of quantum cohomology ring under flop* --- 3088 EH
4:10-6:00pm **Group Theory/Lie Theory Seminar** --- Kimball Martin (Columbia) *Distinguished representations for GL (2,D)* --- 4088 EH

Tuesday, November 28

12:10-1:00pm **Student Algebraic Geometry Seminar** --- Brian Jurgelewicz (UM) *Abel's Theorem and Residues* --- 1068 EH
2:10-3:00pm **Geometry Seminar** --- David Fisher (Indiana) *First Cohomology and Local Rigidity* --- 4088 EH
3:10-4:00pm **Algebra Seminar** --- Not meeting this week --- 3096 EH
4:10-5:00pm **Colloquium** --- Rick Schoen (Stanford) *The Yamabe Problem: An Interaction between Geometry and Relativity* --- 1360 EH

Wednesday, November 29

2:10-3:00pm "**What is … " Seminar** --- Andreas Blass (UM) *"What is … exponentiation of singular cardinals?"* --- 245 Dennison
3:10-4:00pm **Student Arithmetic Seminar** --- Mahesh Agarwal (UM) TBA --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- Katarina Bodova (UM) *Fokker-Planck Equation* --- 3096 EH
3:10-4:00pm **Geometric Function Theory Seminar** --- Not meeting this week --- 4096 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- Not meeting this week --- 4088 EH
4:10-5:00pm **Student Analysis Seminar** --- Felipe Ramirez (UM) *Ergodic Theory* --- 3866 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Chuck Cadman (UM) *A relation between relative and twisted Gromov-Witten invariants* --- 3088 EH

Thursday, November 30

3:10-4:00pm **Commutative Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Hyekyung Min (UM) *Optimal Dividend Distribution Control Models* --- 3088 EH
3:10-4:00pm **Topology Seminar** --- Anne Thomas (U Chicago) *Lattices in automorphism groups of polyhedral complexes* --- 4096 EH
3:10-5:00pm **Analysis Study Seminar** --- Mario Bonk (UM) *Asymptotic cones (continued)* --- 2866 EH
4:10-5:00pm **Differential Equations** --- Jeff Schenker (LAS/MSU) *Edge and bulk currents in $2D$ disordered magnetic systems* --- 4096 EH
4:10-5:00pm **Math Club** --- Zach Maddock (UM) TBA --- 2nd Floor Nesbitt Room
4:10-5:00pm **Student Combinatorics** --- Ryan Kinser (UM) *Cluster Algebras and Quiver Representations* --- 3866 EH
4:10-5:30pm **Logic Seminar** --- Alexei Kolesnikov (UM) *Demystifying non-excellence, Part II* --- 3096 EH
4:30-5:30pm **Theoretical Computer Science Seminar** --- Shengyu Zhang (Caltech) TBA --- CSE 3941
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Friday, December 1

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Michael Falk (UM) *Localization of plastic flow in amorphous solids: developing PDE descriptions of collective atomistic behavior* ---1084 EH

3:10-4:00pm **Student Geometry/Topology** --- Not meeting this week due to the UM & MSU Geometry and Topology Student Conference on December 2nd & 3rd --- 3096 EH

4:10-5:00pm **Combinatorics** --- Benny Sudakov (Princeton) *Pseudo-random graphs: properties and applications* --- 3866 EH

4:10-5:00pm **Several Complex Variables Seminar (Special Seminar)** --- Han Peters (U of Wisconsin) *Degree Estimates for Polynomials constant on a Hyperplane* --- 3096 EH

EVENTS THIS WEEK:

University of Michigan and Michigan State University
Geometry and Topology Student Conference
December 2-3, 2006

The University of Michigan will be hosting a student seminar for students in geometry and topology at the University of Michigan and Michigan State University. The current schedule (subject to change many times) is that we will begin Saturday, December 2, 2006, around 10:00AM with coffee, light refreshments, announcements, and then we will have 3-5 talks throughout the day on Saturday. We will have a few more talks Sunday morning leaving enough time for the MSU crew to drive home.
The plan is to get students in related fields at UM and MSU to meet each other, learn about new areas of geometry and topology, learn about other research fields, and provide students with the valuable experience of speaking at a conference.

We thank the geometry/topology research group at Michigan for providing funding to subsidize transportation and other costs yet to be determined.

As of now, registration consists of talking to one of the organizers: Aaron Magid (UM), Jose Manuel Gomez-Guerra (UM), and Adam Knapp (MSU).
Contact Information:
Aaron: magid(at)umich(dot)edu
Jose: josmago(at)umich(dot)edu
Adam: knappa(at)math(dot)msu(dot)edu

Canary Fest
Conference in honor of Dick Canary's 45th birthday
December 2 & 3, 2006
4088 EH

Saturday, December 2

09:30-10:15 Yair Minsky
11:00-11:45 Jeff Brock
14:00-14:45 Chris Leininger
15:00-15:45 Martin Bridgeman
16:30-17:15 Rich Schwartz

Sunday, December 3

09:30-10:15 Mike Wolf
11:00-11:45 Sergio Fenley
13:30-14:15 Francis Bonahon

Saturday, 09:30-10:15
Yair Minsky (Yale)
Coarse geometry of the mapping class group

Abstract: I will discuss joint work with Behrstock and ongoing work with Behrstock, Kleiner and Mosher on the asymptotic cone of the mapping class group. In particular I will discuss a solution to the Brock-Farb rank conjecture, and give a progress report on our attempt to establish quasi-isometric rigidity via curve-complex methods.

Saturday, 11:00-11:45
Jeff Brock (Brown)
TBA

Abstract: Not yet available

Saturday, 14:00-14:45
Chris Leininger (UIUC)
Trees and mapping class groups

Abstract: I'll talk about joint work with Richard Kent and Saul Schleimer on the curve complex, trees, and mapping class groups for punctured surfaces.

Saturday, 15:00-15:45
Martin Bridgeman (Boston College)
TBA

Abstract: Not yet available

Saturday, 16:30-17:15
Rich Schwartz (Brown)
Outer billiards on the Penrose kite has an unbounded orbit

Abstract: Outer billiards is simple dynamical system, based on a convex polygon, that serves as a toy model for celestial mechanics. This system was introduced in the 1950's by B. Neumann and later popularized by J. Moser. All along, one of the central questions has been: Is there a convex shape for which the system has an unbounded orbit? I recently discovered that the answer is "yes", and the convex shape is the Penrose kite, the convex quadrilateral that arises in the Penrose tiling. In my talk I will outline my proof that the example works, and illustrate the ideas with a video-game like computer interface I wrote, called Billiard King.

Sunday,09:30-10:15
Mike Wolf (Rice)
TBA

Abstract: Not yet available

Sunday, 11:00-11:45
Sergio Fenley (Florida State)
What can a flow say about (the large scale or asymptotic structure of) a manifold?

Abstract: Pseudo-Anosov flows are extremely common amongst 3-manifolds and they are intimately related to the topology. We show they are also strongly connected with the asymptotic structure and the large scale geometry of the universal cover M~. We show that certain pseudo-Anosov flows produce a flow ideal boundary R to the universal cover. This ideal boundary is a 2-sphere and the fundamental group acts naturally on R. The action on R is an uniform convergence group, which gives a proof that the fundamental group G of M is Gromov hyperbolic, R is homeomorphic to the Gromov ideal boundary of G and the action on R is conjugate to the action of G in its boundary. In this way the large scale geometric properties of the group and the universal cover are described using only the dynamics of the pseudo-Anosov flow. We also show such flows are quasigeodesic and there are consequences for foliations.

Sunday, 13:30-14:15
Francis Bonahon (USC)
Traces for representations in SL(2, C)

Abstract: Abstract: Given a representation r of the fundamental group of a surface in SL(2,C) and given a closed curve c on the surface, how do you compute the trace of r(c)? I will give a combinatorial computation of this trace in terms of the shear-bend coordinates describing r. The advantage of this description is that it has a natural quantization, which provides a solution to the problem of defining coordinate-independent quantum traces on the quantum Teichmuller space. This is joint work with Chris Hiatt.

ABSTRACTS FOR THE WEEK OF NOV. 27 – DEC. 3, 2006

Geometry & Physics
Monday, November 27, 4:10-6:00pm
3088 EH
Yuan-Pin Lee (Utah)
Invariance of quantum cohomology ring under flop

It is known that flops preserve the dimension of cohomology algebra over Q, but do not preserve the ring structure. In this talk, I will show that the quantum rings are invariant under simple flops and Mukai flops. If time permits, an approach to study the properties of higher genus Gromov--Witten invariants will also be discussed. This is joint work with H. Lin, C. Wang (and Y. Iwao on higher genus).

Group Theory/Lie Theory Seminar
Monday, November 27, 4:10-6:00 pm
4088 EH
Kimball Martin (Columbia)
Distinguished representations for GL(2,D)

A representation of a group is said to be distinguished if it admits a nonzero linear form satisfying a certain invariance property. In principle, distinguishedness characterizes the image of functorial transfers. We will discuss the relative trace formula and how it may be applied to study distinguished representations. Specifically we will show, under certain hypotheses, that a distinguished representation GL(2,D) transfers to a distinguished representation of GL(4). Using results on exterior-square L-functions, we conclude that these representations lie in the image of a functorial transfer from GSp(4).

Student Algebraic Geometry Seminar
Tuesday, November 28, 12:10-1:00pm
1068 EH
Brian Jurgelewicz (UM)
Abel's Theorem and Residues

We discuss bilinear relations for differentials on curves and give a neat proof of one of the oldest theorems in algebraic geometry: Abel's theorem on sums of elliptic integrals. The role played by residues will receive special attention.

Geometry Seminar
Tuesday, November 28, 2:10-3:00pm
4088 EH
David Fisher (Indiana)
First Cohomology and Local Rigidity

In 1964, Andre Weil showed that a homomorphism π from a finitely generated group Γ to a Lie group G is {\em locally rigid} whenever $H^1(\G,\mathfrak g)=0$. Here π is locally rigid if any nearby homomorphism is conjugate to π by a small element of G, and $\mathfrak g$ is the Lie algebra of G. I will discuss extensions of Weil's criterion to the case when G is the group of diffeomorphims of a compact manifold. I first proved this extension a couple years ago, but only produced a computable condition for local rigidity of isometric actions. In more recent work with T.Hitchman, we have found computable variants on Weil's criterion only assuming that the initial action is affine. These criteria and their applications will be the main focus of my talk.

Colloquium
Tuesday, November 28, 4:10-5:00pm
1360 EH
Rick Schoen (Stanford)
The Yamabe Problem: An Interaction between Geometry and Relativity

In this lecture we will discuss the geometric question of construction of Riemannian metrics of constant scalar curvature. This problem turns out to have an intimate connection with gravitational mass in relativity. We will discuss this connection and survey the recent activity on the Yamabe problem which has provided a much more thorough understanding of constant scalar curvature metrics both from a variational and heat equation point of view.

We will discuss the compactness conjecture and its consequences for general (not necessarily minimizing) solutions of the Yamabe problem made by the speaker over 15 years ago. Through the work of several researchers this had been established in some cases (low dimensions, locally conformally flat), but the full conjecture has been open. We will describe recent work concerning the general case.

"What is … " Seminar
Wednesday, November 29, 2:10-3:00pm
245 Dennison
Andreas Blass (UM)
"What is … exponentiation of singular cardinals?"

First, I plan to explain the meanings of the three long words in the title. I also intend to explain why the topic is reasonable (What happened to non-singular cardinals? What happened to addition and multiplication?) and what the classical results say about it. Finally, I'll describe (without proof) more recent results of Shelah that not only provide surprising restrictions on possible answers to the title question but also provide new insight into some of the fundamental techniques of modern set theory.

Student AIM Seminar
Wednesday, November 29, 3:10-4:00pm
3096 EH
Katarina Bodova (UM)
Fokker-Planck Equation

In Quantum Physics a position of a particle can not be determined precisely but only with a certain probability. Newton's Law is replaced by the Fokker-Planck equation, also known in Statistics as the Forward Kolmogorov equation, which describes the evolution of a probability density function of position and velocity. The Fokker-Planck equation is also a tool to study noisy systems; its solution captures influence of random perturbations to deterministic dynamics. An example of such a problem appears in numerical mathematics. In a process of solving a differential equation a round-off error is introduced. An important question which arises is how does a small level of noise influence a numerical solution.

Financial/Actuarial Mathematics Seminar
Thursday, November 30, 3:10-4:00pm
3088 EH
Hyekyung Min (UM)
Optimal Dividend Distribution Control Models

Two optimal dividend models for a firm attempting to maximize its value are considered. In these models, the firm controls the flow of cash reserves by paying out dividends either with or without a recapitalization option taken into account. The underlying process in these models is described by an arithmetic Brownian motion. Solutions to these optimal control problems are obtained by solving a system of quasi-variational inequalities. It is shown that a unique solution exists for all parameters, using the properties of heat equation derived from the maximum principle. This is a joint work with Joseph Conlon.

Topology Seminar
Thursday, November 30, 3:10-4:00pm
4096 EH
Anne Thomas (U Chicago)
Lattices in automorphism groups of polyhedral complexes

Let G be a locally compact group. A discrete subgroup Γ of G is called a lattice if $\Gamma \backslash G$ has finite volume. We study lattices in G the automorphism group of a locally finite polyhedral complex X, such as a hyperbolic building. Questions considered include existence and covolumes of lattices, and (in joint work with Seonhee Lim) the asymptotics of the number of overlattices of a fixed lattice Γ.

Analysis Study Seminar
Thursday, November 30, 3:10-5:00pm
2866 EH
Mario Bonk (UM)
Asymptotic cones (continued)

Asymptotic cones are useful in studying the large scale behavior of a metric space. The definition of this concept is based on ultrafilters and ultralimits. I will discuss the basic definitions and present some applications.

Differential Equations
Thursday, November 30, 4:10-5:00pm
4096 EH
Jeff Schenker (LAS/MSU)
Edge and bulk currents in $2D$ disordered magnetic systems

The integer quantum Hall effect (IQHE) entails a very precise quantization of the Hall conductance in a 2D sample at very low temperatures. Depending on whether the currents in the sample are ascribed to the bulk or the edge, two apparently different conductances σ_B and σ_E have been used to explain this effect. In this talk, the definition of the two conductances and a proof that $\sigma_B = \sigma_E$ will be discussed along with related results involving the propagation of waves in $2D$ disordered magnetic systems.

Logic Seminar
Thursday, November 30, 4:10-5:30pm
3096 EH
Alexei Kolesnikov (UM)
Demystifying non-excellence, Part II

Model-theoretic excellence is a collection of properties that guarantee a smooth structure theory for certain non-elementary classes. For instance, an analog of Morley's theorem holds for excellent classes of atomic models. I will talk about a family of examples that show how things that seem nice for a while could, eventually, go terribly wrong.
I will continue discussing the examples.

Applied and Interdisciplinary Mathematics Seminar
Friday, December 1, 3:10-4:00pm
1084 EH
Michael Falk (UM)
Localization of plastic flow in amorphous solids: developing PDE descriptions of collective atomistic behavior

Metallic glasses and other amorphous solids fail by the severe localization of strain into "shear bands" which typically precede failure. I will discuss the methodology we use to model this problem on the atomic scale, molecular dynamics simulation. Using these simulations, we infer a set of partial differential equations that model the behavior of the atomic system in terms of a "disorder temperature" that describes the structural degrees of freedom in the glass. The suppositions of this theory can then be tested quantitatively against the atomistic model. To capture the localized deformation it is natural to extend these equations to include a length scale related to the transition between the plastically and elastically deforming regions. The resulting equation is similar in many ways to the Fisher-Kolmogorov equation, which also arises in the modeling on solidification fronts and other propagating interfaces. The solutions of this equation and the consequences for the physical problem will be discussed.

Combinatorics
Friday, December 1, 4:10-5:00pm
3866 EH
Benny Sudakov (Princeton)
Pseudo-random graphs: properties and applications

An (n,d,\lambda)-graph is a d-regular graph on n vertices so that the absolute value of each eigenvalue of its adjacency matrix, besides the largest one, is at most \lambda. I will survey some of the remarkable pseudo-random properties of such graphs in which \lambda is much smaller than d, describe various constructions, and present several applications of these graphs in the solution of problems in Extremal Combinatorics, Geometry and Complexity.

Several Complex Variables Seminar (Special Seminar)
Friday, December 1, 4:10-5:00pm
3096 EH
Han Peters (U of Wisconsin)
Degree Estimates for Polynomials constant on a Hyperplane

Joint work with John P. D'Angelo and Jiří Lebl.
Let p be a polynomial in n ≥ 2 variables with non-negative coefficients. Further suppose that p(x1,..., xn) is constantly equal to 1 on the hyperplane x1+...+xn=1. Let N be the number of distinct monomials of p. We study the following question: what is the maximal degree for fixed n and N?
We will also see how this question is related to proper holomorphic mappings between balls.