

Winter 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
January 28th – February 3rd

Monday, January 28

- 3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Mircea Mustata (UM) *The definition of a log structure* --- 2866 EH
- 3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Zhengjie Xu (UM) *Inverse Scattering for the Benjamin-Ono Equation* --- 3088 EH
- 3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Pasha Tumarkin (MSU) *Hyperbolic reflective lattices and Coxeter polytopes* --- 4096 EH
- 4:10-5:00pm **Several Complex Variables Seminar** --- Jean Ruppenthal (U of Bonn) *A ∂ -theoretical Proof of Hartogs' Extension Theorem on Stein spaces with isolated singularities* --- 3096 EH
- 4:10-6:00pm **Geometry & Physics (Joint seminar with Algebraic Geometry)** --- Joe Harris (Harvard) TBA --- 4088 EH
- 5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, January 29

- 2:10-3:00pm **Student Analysis Seminar (Note: Unusual Date/Time)** --- Jasun Gong (UM) *Sobolev Spaces and Geometry* --- Room TBA
- 2:10-3:00pm **"What is ... " Seminar** --- Mattias Jonsson (UM) *What is ... holomorphic dynamics?* --- 3096 EH
- 3:10-4:00pm **Geometry Seminar** --- Xiaofeng Sun (Harvard) *Good Geometry and Applications to Curve Moduli* --- 4088 EH
- 3:10-4:00pm **Student Algebraic Geometry Seminar** --- Kyle Hoffman (UM) *Reimann conditions of algebraizability, Reimann-Roch for tori [D, 6.1, 6.2]* --- 3088 EH
- 4:10-5:00pm **Colloquium** --- Joe Harris (Harvard) *Uniformity of rational points on curves* --- 1360 EH
- 5:00-6:00pm **Social Hour** --- Upper Atrium

Wednesday, January 30

- 3:10-4:00pm **Geometric Function Theory Seminar** --- TBA --- 4096 EH
- 3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- Ricardo Portilla (UM) *Quivers 3: Homological Algebra of Quiver Representations* --- 3088 EH
- 3:10-4:00pm **Student Arithmetic Seminar** --- Wansu Kim (UM) *p-adic uniformization of an elliptic curve with multiplicative reduction* --- 3866 EH
- 3:10-4:00pm **Student AIM Seminar** --- TBA --- Room TBA
- 4:10-5:00pm **Complex Analysis Seminar** --- Peter Miller (UM) *D-bar Problems in Random Matrix Theory* --- 3096 EH
- 4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- Anna Siano (UM) *Peak functions* --- 4088 EH
- 4:10-6:00pm **Algebraic Geometry Seminar** --- Brian Conrad (UM) TBA --- 3088 EH

Thursday, January 31

- 3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- TBA --- 3088 EH
- 3:10-4:00pm **Commutative Algebra Seminar** --- Mel Hochster (UM) *Phantom homology (cont.)* --- 3096 EH
- 3:10-4:00pm **Topology Seminar** --- TBA --- 4096 EH
- 4:10-5:00pm **Differential Equations** --- Peter Smereka (UM) *Long Time Behavior of a Modified Becker-D \ddot{u} ring System* --- 4088 EH
- 4:10-5:00pm **Math Club** --- Djordje Milicevic (UM) *Transcendental numbers* --- 2nd floor Nesbitt Common Room

Thursday, January 31 ...continued

- 4:10-5:00pm **Student Combinatorics** --- Luis Serrano (UM) *Hyperplane Arrangements I* --- 3866 EH
4:10-6:00pm **Study Seminar** --- Pekka Pankka (UM) *Harmonic functions on polynomially growing groups (after Kleiner) part 2* --- 3088 EH

Friday, February 1

- 10:50-12:00pm **EECS Theory Seminar** --- Bei Zeng (MIT) *Codeword Stabilized Quantum Codes* --- CSE 3941
2:10-3:00pm **Topics in Geometry** --- Joel Fish (UM) *Pseudoholomorphic curve techniques used for the Weinstein Conjecture* --- 3866 EH
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Jing Shi (Wayne State) *Numerical Methods for Multidimensional Tunneling Transitions: A Quantum Transition State Theory* --- 1084 EH
3:10-4:00pm **Student Geometry/Topology** --- Ben Schmidt (UM) *Questions about geodesics in Riemannian manifolds* --- 3096 EH
4:10-5:00pm **Combinatorics** --- TBA --- 3866 EH

UPCOMING EVENTS

Ziwet Lectures

Feb. 5-7, 2008

Speaker: Curtis McMullen

Series Title: *Dynamics and moduli spaces*

Schedule:

Tuesday, February 5, 4:00-5:00pm --- Room TBA
Billiards and Teichmueller Theory

Wednesday, February 6, 4:00-5:00pm --- 1360 EH
Islands on algebraic surfaces

Thursday, February 7, 3:00-4:00pm --- Room 1360 EH
Topology of numbers

These talks will present progress and open problems at the interface between dynamical systems and moduli spaces of complex manifolds and Euclidean lattices.

Note: all talks will be accessible to a general audience, and none is a prerequisite for any other.

ABSTRACTS FOR THE WEEK OF JAN. 28– FEB. 3, 2008

Number Theory and Representation Theory Seminar
Monday, January 28, 3:10-5:00pm
4096 EH
Pasha Tumarkin (MSU)
Hyperbolic reflective lattices and Coxeter polytopes

A hyperbolic lattice is called reflective if its orthogonal group contains a reflection subgroup (i.e. a subgroup generated by reflections) of finite index. I will discuss the current standing and recent progress in the classification problem of hyperbolic reflection groups, both arithmetic and not.

Several Complex Variables Seminar
Monday, January 28, 4:10-5:00pm
3096 EH
Jean Ruppenthal (U of Bonn)
A ∂ -theoretical Proof of Hartogs' Extension Theorem on Stein spaces with isolated singularities

Let X be a connected normal Stein space of pure dimension $d \geq 2$ with isolated singularities. By solving a weighted ∂ -equation with compact support on a desingularization of X , we derive Hartogs' Extension Theorem on X by the ∂ -idea of Ehrenpreis.

Student Analysis Seminar (Note: Unusual Date/Time)
Tuesday, January 29, 2:10-3:00pm
Room TBA
Jasun Gong (UM)
Sobolev Spaces and Geometry

This talk will be expository and will survey various topics, in which facts from geometry will imply facts from function theory and vice versa. Among these, we will recall some basic facts about Sobolev spaces and then discuss the relationship between Sobolev embedding theorems and isoperimetric inequalities.

If time permits, we will also discuss some recent directions of generalization, namely to certain types of metric measure spaces.

"What is ..." Seminar
Tuesday, January 29, 2:10-3:00pm
3096 EH
Mattias Jonsson (UM)
What is ... holomorphic dynamics?

I will discuss some constructions and results from holomorphic dynamics, focusing on iteration problems in several complex variables.

Geometry Seminar
Tuesday, January 29, 3:10-4:00pm
4088 EH
Xiaofeng Sun (Harvard)
Good Geometry and Applications to Curve Moduli

In this talk I will describe some recent work on controlling the characteristic forms of singular metrics on bundles over quasi-projective varieties. We generalize the goodness of Mumford and study the behavior of the generalized goodness under the path of continuity and Kahler-Ricci flow. As results, we apply this theory to the moduli space of Riemann surfaces and derive various algebraic and topological consequences such as the Gauss-Bonnet theorem, the stability of log bundles, Chern number inequalities and rigidity.

Colloquium
Tuesday, January 29, 4:10-5:00pm
1360 EH
Joe Harris (Harvard)
Uniformity of rational points on curves

Faltings' theorem that there are only finitely many solutions to a diophantine equation of genus 2 or more has naturally led to speculation about possible extensions: how the theorem might be generalized to higher dimensions, and how the number of solutions behaves when we vary the coefficients of the problem, to name two. In this talk we'll discuss some of these generalizations, and describe a surprising logical connection between them.

Student Representation Theory/Lie Theory Seminar
Wednesday, January 30, 3:10-4:00pm
3088 EH
Ricardo Portilla (UM)
Quivers 3: Homological Algebra of Quiver Representations

This week we'll finish talking about some algebraic properties of path algebras and discuss canonical projective resolutions associated to a quiver representation.

Student Arithmetic Seminar
Wednesday, January 30, 3:10-4:00pm
3866 EH
Wansu Kim (UM)
p-adic uniformization of an elliptic curve with multiplicative reduction

Any elliptic curve over \mathbb{C} is isomorphic, as a complex Lie group, to \mathbb{C}/Λ for some lattice $\Lambda \subset \mathbb{C}$ (i.e. an elliptic curve has a "complex uniformization"). Even though this fact is very useful in studying elliptic curves over \mathbb{C} , it is not very helpful in answering arithmetic questions regarding elliptic curves over a number field.

In this talk, we will discuss a p-adic analogue of the uniformization theorem for a certain class of elliptic curves (namely elliptic curves with multiplicative reduction). The interesting new feature is that the p-adic uniformization "respects" the natural Galois actions, hence it gives a lot of arithmetic information for this special kind of elliptic curve.

I will spend most of the time giving basic definitions and motivation, rather than giving a detailed proof which is quite painful and unenlightening. I will not assume of the audience any familiarity with elliptic curves.

Complex Analysis Seminar
Wednesday, January 30, 4:10-5:00pm
3096 EH
Peter Miller (UM)
D-bar Problems in Random Matrix Theory

A d-bar problem is a kind of generalization of a Riemann- Hilbert problem. We will describe how some d-bar problems arise in the context of the orthogonal polynomial approach to random matrix theory.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, January 30, 4:10-5:30pm
4088 EH
Anna Siano (UM)
Peak functions

Let D be a smoothly bounded pseudoconvex domain in \mathbb{C}^n of *finite type* at some point $p \in \partial D$. And let \mathcal{O}^{α} be the algebra of holomorphic functions on D that are C^{α} up to the boundary. We say that $f \in \mathcal{O}^{\alpha}$ is a peak function at p if $f(p)=0$ and $|f| < 1$ on $D \setminus \{p\}$. An open question is whether there exists a function $f \in \mathcal{O}^{\alpha}$ that peaks at p for some $\alpha > 0$. We survey some known results.

Commutative Algebra Seminar
Thursday, January 31, 3:10-4:00pm
3096 EH
Mel Hochster (UM)
Phantom homology (cont.)

This is the second of several lectures that will deal with phantom homology. The idea is that one may have a complex such that the cycles are in the tight closure of boundaries. The homology at that spot is said to be "phantom." If one makes a base change to a ring, such as a regular ring, in which submodules are always tightly closed, the image of the homology of the complex vanishes. This technique leads to deep theorems that are difficult or, so far as we know, impossible to prove by other methods. Familiarity with the basic notions of tight closure theory will be assumed.

Differential Equations
Thursday, January 31, 4:10-5:00pm
4088 EH
Peter Smereka (UM)
Long Time Behavior of a Modified Becker-Döring System

A modification, based on asymptotic behavior, of the Becker-Döring system is introduced in which the concentration of monomers is slaved to the concentrations of the other clusters. This modified system has the same continuum limit as usual Becker-Döring system. For one member of these it is proved, for compact initial data, that all solutions will converge to a unique self-similar solution as time tends to infinity.

Math Club
Thursday, January 31, 4:10-5:00pm
2nd floor Nesbitt Common Room
Djordje Milicevic (UM)
Transcendental numbers

If your idea of a crazy real number is something like $11 + 3 \cos 20^\circ$, think again. Your random Joe Number is not likely to have square equal to 11 or some other integer. In fact it is also unlikely to be a sum (or some other concoction) of such beauties...

We first discuss the notion of transcendental numbers and why most numbers fall into this class. To recognize and construct transcendental numbers we will use Diophantine approximations. We will state the Lindemann-Weierstrass and Gelfond-Schneider theorems, often said to be among "the most beautiful theorems in mathematics", and talk about different types of transcendental numbers as well as some generalizations and open problems.

Also: what does all this stuff have to do with squaring the circle?

Study Seminar
Thursday, January 31, 4:10-6:00pm
3088 EH
Pekka Pankka (UM)
Harmonic functions on polynomially growing groups (after Kleiner) part 2

A recent paper of Bruce Kleiner gives a new proof of Gromov's theorem on virtual nilpotency of finitely generated groups of polynomial growth. The proof is based on finite dimensionality of the space of harmonic functions (of a small polynomial growth) on a Cayley graph of the group. I will focus on this part of the paper. (continued)

Applied and Interdisciplinary Mathematics Seminar
Friday, February 1, 3:10-4:00pm
1084 EH
Jing Shi (Wayne State)
Numerical Methods for Multidimensional Tunneling Transitions: A Quantum Transition State Theory

Quantum tunneling plays crucial roles in some physical and chemical processes, ranging from quantum cosmology to enzymatic reactions. The quantum nature of the motion often comes along with multidimensionality, namely the coupled motion of many degrees of freedom. The high dimensionality of the potential energy surface poses a great challenge in both theoretical and numerical descriptions of tunneling. Numerical simulation based on the Schrodinger equation is often prohibitively expensive. We develop an efficient and accurate numerical method to calculate the tunneling transition, based on the path integral formulation ('instanton') of quantum transition state theory. It is free from any further ad hoc assumptions ('adiabatic' or 'sudden') and does not require pre-defined reaction coordinates. The application to hydrogen tunneling transfer in polyatomic molecules will also be demonstrated.

Student Geometry/Topology
Friday, February 1, 3:10-4:00pm
3096 EH

Ben Schmidt (UM)

Questions about geodesics in Riemannian manifolds

Geodesics in a Riemannian manifold M are curves that locally minimize energy between pairs of points. Their behavior in the large, however, depends more upon the topology and geometry of M . I'll discuss some questions that aim to relate global aspects of geodesics to the geometry of M .