

Winter 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
April 7th – April 13th

Monday, April 7th

- 3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Karl Schwede (UM) *Moduli of curves from the point of view of log geometry* --- 2866 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Robert Buckingham (UM) *Universality Limits for Spectra of Random Matrices, III* --- 3088 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Dmitriy Boyarchenko (U Chicago) *Character sheaves on unipotent groups* --- 4096 EH
4:10-6:00pm **Geometry & Physics** --- Barbara Fantechi (IAS – SISSA) TBA --- 4088 EH
4:10-5:00pm **Several Complex Variables Seminar** --- David Barrett (UM) *Real hypersurfaces in two-dimensional projective space* --- 3096 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, April 8th

- 2:10-3:00pm **“What is ...” Seminar** --- Sasha Barvinok (UM) *What is ... a contingency table?* --- 3096 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Cagatay Kutluhan (UM) *Seiberg-Witten-Floer Homology and symplectic forms on $S^1 \times M^3$* --- 4088 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- TBA --- 3088 EH
4:10-5:00pm **Colloquium** --- Sorin Popa (UCLA) *Some Recent Results with W' Rigidity* --- 1360 EH
5:00-6:00pm **Social Hour** --- Upper Atrium

Wednesday, April 9th

- 3:10-4:00pm **Geometric Function Theory Seminar** --- TBA --- 4096 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- Dave Constantine (UM) *A geometric view of $SL(2, R)$* --- 3088 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Julian Rosen (UM) *Irrationality Measure and the “Sidewalk” Function* --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- TBA --- 3096 EH
4:10-5:00pm **Complex Analysis Seminar** --- Erwin Miña-Díaz (Indiana U - Purdue U, Fort Wayne) *Asymptotic representation and zero distribution of Carleman orthogonal polynomials* --- 3096 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- Lina Lee (UM) *Ohsawa-Takegoshi extension theorem* --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Alfred Chen (NTU and U of Utah) *On birational geometry of threefolds with terminal singularities* --- 3088 EH

Thursday, April 10th

- 3:10-4:00pm **Commutative Algebra Seminar** --- Mel Hochster (UM) *Phantom homology (cont.)* --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Richard Mattison (President, Ramstone Capital) *Option Pricing in P -Space: An Actuarial Approach* --- 3088 EH
3:10-4:00pm **Topology Seminar** --- TBA --- 4096 EH
4:10-5:00pm **Differential Equations** --- Li Chen (Tsinghua/Harvard) *Analysis on Some Parabolic Systems (strongly coupled or higher order)* --- 4088 EH
4:10-5:00pm **Math Club** --- Anna Siano (UM) *Solving differential equations via symmetry groups* --- 2nd Floor Nesbitt Common Room
4:10-5:00pm **Student Combinatorics** --- TBA --- 3866 EH
4:10-5:30pm **Logic Seminar** --- TBA --- 3096 EH

Thursday, April 10th ... continued

4:10-6:00pm **Study Seminar** --- Anna Lenzhen (UM) *Thurston's Classification Theorem* --- 3088 EH

Friday, April 11th

10:50-12:00pm **EECS Theory Seminar** --- TBA --- CSE 3941

2:10-3:00pm **Topics in Geometry** --- TBA --- 3866 EH

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Gerard Roe (U of Washington)
Knowability and No Ability in Climate Change Prediction --- 1084 EH

3:10-4:00pm **Student Geometry/Topology** --- TBA --- 3096 EH

4:10-5:00pm **Combinatorics** --- TBA --- 3866 EH

EVENTS THIS WEEK

Center for Cognitive Architecture Presents:

Wednesday, April 9, 1:30 to 3:00 pm

4448 East Hall

Stephen Grossberg

"Towards a Unified Theory of Neocortex: From Vision to Cognition"

Great Lakes SIAM Spring Meeting: Snapshots of Applied Mathematics

Saturday April 12, 10:00 am to 5:30 pm
East Hall 1360

Great Lakes SIAM Spring Meeting: Snapshots of Applied Mathematics Speakers and Titles

Gregory Beylkin, University of Colorado at Boulder - *Fast algorithms for adaptive application of integral operators in high dimensions*

Lenya Ryzhik, University of Chicago - *Reaction-diffusion fronts in random media*

Keith Promislow, Michigan State University - *Pore formation in Polymer Electrolytes*

Alfred Hero, University of Michigan - *Blind sparsity constrained inverse problems in volumetric imaging*

ABSTRACTS FOR THE WEEK OF APRIL 7 - APRIL 13

Topics in Algebraic Geometry Seminar

Monday, April 7, 3:10-4:00pm

2866 EH

Karl Schwede (UM)

Moduli of curves from the point of view of log geometry

We will discuss the paper *Log smooth deformation and moduli of log smooth curves* by Fumiharu Kato. A reprint can be found here <http://www.math.kyoto-u.ac.jp/~kato/Data/moduli.pdf>.

Several Complex Variables Seminar
Monday, April 7, 4:10-5:00pm
3096 EH
David Barrett (UM)
Real hypersurfaces in two-dimensional projective space

This talk will examine geometric aspects of real hypersurfaces in two-dimensional projective space, the dual complement construction and a related characterization of the Leray integral transform.

“What is ... ” Seminar
Tuesday, April 8, 2:10-3:00pm
3096 EH
Sasha Barvinok (UM)
What is ... a contingency table?

A contingency table is just a non-negative integer matrix with prescribed row and column sums. In the talk, I'll try to explain why people think that such matrices deserve a special name and discuss a variety of combinatorial, probabilistic and algorithmic questions, many yet to be answered satisfactorily, about such matrices. In particular, how many non-negative integer matrices with prescribed row and column sums are there? If not exactly, then approximately? asymptotically?

Geometry Seminar
Tuesday, April 8, 3:10-4:00pm
4088 EH
Cagatay Kutluhan (UM)
Seiberg-Witten-Floer Homology and symplectic forms of $S^1 \times M^3$

The purpose of this talk is to motivate and exhibit a proof of the following result due to Cliff Taubes and the speaker: Let M be a closed, oriented 3-manifold. Suppose that $S^1 \times M$ admits a symplectic form subject to a monotonicity condition. Then the Seiberg-Witten Floer homology over \mathbb{Z} of M for the canonical spin^c structure is isomorphic to \mathbb{Z} .

Colloquium
Tuesday, April 8, 4:10-5:00pm
1360 EH
Sorin Popa (UCLA)
Some Recent Results with W^* Rigidity

Two measure preserving actions of countable groups on probability spaces, $G \curvearrowright X$, $L \curvearrowright Y$, are W^* -equivalent if their associated von Neumann algebras $L^\infty(X) \rtimes G$, $L^\infty(Y) \rtimes L$ are isomorphic. This is weaker than orbit equivalence of actions, requiring an isomorphism of probability spaces $D : X \rightarrow Y$ with $LD(t) = D(Gt)$, $t \in X$ a.e., which in turn is weaker than “classical” conjugacy of actions. Free ergodic measure preserving actions of amenable groups are undistinguishable under W^* -equivalence (Connes '76), in fact even under orbit equivalence (Ornstein-Weiss '80). But a rich and deep rigidity theory underlies the non-amenable case. I will present some recent results in this direction, one of which shows that any isomorphism of von Neumann algebras associated with Bernoulli actions $G \curvearrowright [0, 1]^G$, $L \curvearrowright [0, 1]^L$, of Kazhdan groups G, L , comes from a conjugacy of the actions.

Student Representation Theory/Lie Theory Seminar
Wednesday, April 9, 3:10-4:00pm
3088 EH
Dave Constantine (UM)
A geometric view of $SL(2, \mathbb{R})$

In this talk I'll present a geometric view of $SL(2, \mathbb{R})$ as a (double cover of) the unit tangent bundle of the hyperbolic plane (actually this is $PSL(2, \mathbb{R})$). I'll discuss geodesic and horocycle flows as actions of particular subgroups of $SL(2, \mathbb{R})$ and we'll see how some algebraic computations tell us things about the behavior of the orbits of these flows.

Complex Analysis Seminar
Wednesday, April 9, 4:10-5:00pm
3096 EH
Erwin Miña-Díaz (Indiana U - Purdue U, Fort Wayne)
Asymptotic representation and zero distribution of Carleman orthogonal polynomials

We will discuss several results about the asymptotic behavior of Carleman polynomials, i.e., polynomials $p_n(z)$, $n = 0; 1; 2; \dots$ (p_n of exact degree n), that are orthonormal with respect to area measure over the interior of an analytic Jordan curve L . We shall show that each p_n of sufficiently large degree can be expanded in a series (that depends on n) of certain recursively generated integral transforms. The asymptotic behavior of p_n is then easily obtained by analyzing that of the series as $n \rightarrow \infty$. In particular, one obtains at once Carleman's formula describing the strong asymptotic behavior of p_n on the exterior of L , as well as an integral representation for p_n inside L . We then exploit this integral representation to extend the validity of Carleman's formula toward a maximal domain D , and obtain precise results on the location and limiting distribution of the zeros of the Carleman polynomials in case the domain D has a piecewise analytic boundary.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, April 9, 4:10-5:30pm
4088 EH
Lina Lee (UM)
Ohsawa-Takegoshi extension theorem

I will try to give a sketch of an alternate proof of the extension theorem by Diederich-Herbert using negligible weights. We will also discuss the application to Bergman metric estimation.

Algebraic Geometry Seminar
Wednesday, April 9, 4:10-6:00pm
3088 EH

Alfred Chen (NTU and U of Utah)

On birational geometry of threefolds with terminal singularities

The Riemann-Roch formula is a very powerful tool in studying algebraic curves and surfaces. For threefolds, it's unavoidable to introduce varieties with mild singularities from the viewpoint of minimal model program

Miles Reid calculated the contribution of singularities to Riemann-Roch formula. He introduced the notation of "basket of quotient singularities" and showed the contribution of a single terminal singularity can be realized by certain virtual basket of quotient singularities.

We study the basket of singularities in a more systematic way and obtained various results including:

1. non-vanishing of plurigenera (resp. antiplurigenera) for threefolds of general type (resp. weak Q-Fano threefolds).

2. lower bound of canonical volume (resp. anti-canonical volume) for threefolds of general type (resp. weak Q-Fano threefolds).

3. effective birationality of pluricanonical map for threefolds of general type.

We will also describe the relation between flips and "unpacking", which provide another viewpoint to see the termination of flips.

Most of the topics are joint work with Meng Chen and Christopher Hacon.

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

Mel Hochster (UM)

Phantom homology (cont.)

This set of several lectures 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.

Financial/Actuarial Mathematics Seminar
Thursday, April 10, 3:10-4:00pm
3088 EH
Richard Mattison (President, Ramstone Capital)
Option Pricing in P-Space: An Actuarial Approach

Option pricing in the broadest sense of pricing contingent cash flows is clearly a major focus of Actuarial Science. Most of this actuarial pricing work is done using realistic probability distributions and realistic return expectations, yet one of the cornerstones of modern finance, the Black-Scholes equation, uses unrealistic probabilities and the risk free rate. This paper provides a methodology for pricing options using realistic probabilities (P-Space) and state price deflators. It also shows that these P-Space option prices match Black-Scholes option prices when stock returns are assumed to be normally distributed, and proves that in this case the P-Space call equation is equivalent to the Black-Scholes call equation. The paper also provides the connection among the key option pricing variables: expected return, standard deviation, and the risk free rate.

Differential Equations
Thursday, April 10, 4:10-5:00pm
4088 EH
Li Chen (Tsinghua/Harvard)
Analysis on Some Parabolic Systems (strongly coupled or higher order)

In this talk, I will give a brief outline of the works we have done on some strongly coupled parabolic systems and a fourth order parabolic equation, on which such classical techniques as comparison principle for parabolic equations could not work. The models are from diffusion systems in semiconductor simulation and population models in biomathematical model. Our ideas are mainly based on the exponential transformation and entropy inequalities. We will give the global existences and large time behavior of the weak solutions.

Math Club
Thursday, April 10, 4:10-5:00pm
2nd Floor Nesbitt Common Room
Anna Siano (UM)
Solving differential equations via symmetry groups

Equations of the form $dy/dx = f(x)g(y)$ are simple to solve because we can separate terms involving only x from terms involving only $y = y(x)$. In fact, the deeper property that lets us solve these is the presence of a nontrivial Lie group symmetry; i.e., a continuous family of transformations that takes each solution curve into another. We will discuss how to transform first-order ODE's into separable equations in case their sets of solution curves are invariant under some nontrivial group symmetry in some coordinates.

Study Seminar
Thursday, April 10, 4:10-6:00pm
3088 EH
Anna Lenzhen (UM)
Thurston's Classification Theorem

I will talk about Bers' proof of the theorem.

Applied and Interdisciplinary Mathematics Seminar
Friday, April 11, 3:10-4:00pm
1084 EH
Gerard Roe (U of Washington)
Knowability and No Ability in Climate Change Prediction

What kind of information from the climate science community is the most useful for policy makers, and which uncertainties matter most? Constraining climate sensitivity - the long-term increase in global mean temperature expected from the doubling of atmospheric carbon dioxide - has been one of the main benchmark goals of climate science. However uncertainties in our estimates of climate sensitivity have not lessened substantially in past decades. Both models and observations yield broad probability distributions for climate sensitivity, with small but finite probabilities of very large increases. We show that the shape of these probability distributions is an inevitable and general consequence of the nature of the climate system. Further, we show that the breadth of the distribution and, in particular, the probability of large temperature increases are relatively insensitive to decreases in uncertainties associated with the underlying climate processes.