Fall 2007
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
September 24th – September 30th

Monday, September 24

3:10-4:00pm	**Student Analysis Seminar** --- Jasun Gong (UM) *Fractals and Measure Theory* --- 3866 EH
3:10-4:00pm	**Topics in Algebraic Geometry** --- Radu Laza (UM) *An overview of compactification of Moduli Spaces of surfaces of general type* --- 2866 EH
3:10-5:00pm	**Number Theory and Representation Theory Seminar** --- A. Raghuram (Oklahoma U) *On the special values of L-functions* --- 4096 EH
4:10-5:00pm	**Several Complex Variables Seminar** --- Alexander Izzo (Bowling Green State U) *Function Algebras on the Spere Invariant under Groups Actions* --- 3096 EH
4:10-6:00pm	**Geometry & Physics** --- Albrecht Klemm (Wisconsin) *Topological String Theory on Compact Calabi-Yau* --- 4088 EH

Tuesday, September 25

2:10-3:00pm	"**What is … " Seminar** --- Mircea Mustata (UM) *What is … the Minimal Model?* --- 3096 EH
3:10-4:00pm	**Geometry Seminar** --- Zuoqin Wang (MIT) *The twisted Mellin transform and spectral measures on toric varieties* --- 4088 EH
3:10-4:00pm	**Student Seminar on Representation Theory/Lie Theory** --- Marc Krawitz (UM) TBA --- Room TBA
4:10-5:00pm	**Colloquium** --- Sam Payne (Stanford) *Sumner B. Myers Prize Colloquim: Toric Vector Bundles* --- 1360 EH

Wednesday, September 26

3:10-4:00pm	**Student Arithmetic Seminar** ---Hester Graves (UM) *Motzkin's Lemma! What is it good for?* --- 3866 EH
3:10-4:00pm	**Student AIM Seminar** --- Simon Wojczyszyn (UM) *Eigenmodes of Planar Drums* --- 3096 EH
3:10-4:00pm	**Geometric Function Theory Seminar** --- Jasun Gong (UM) *Derivations and Currents on Metric Spaces* --- 4096 EH
4:10-5:30pm	**Working Seminar in Several Complex Variables and Complex Dynamics** --- Sonmez Sahutoglu (UM) *A hull with no analytic structure (after Stolzenberg)* --- 4088 EH
4:10-6:00pm	**Algebraic Geometry Seminar** --- Thomas Markwig (UM-Visiting Scholar) *Tropical elliptic curves and their j-invariant* --- 3088 EH

Thursday, September 27

2:10-3:00pm	**Student Algebraic Geometry Seminar** --- Eugene Eisenstein (UM) *Fano --->Rationally Connected* --- 3866 EH
2:10-3:00pm	**Study Seminar (Pt. 1)** --- Pekka Pankka (UM) *The mapping class group II* --- 3096 EH
3:10-4:00pm	**Study Seminar (Pt. 2)** --- Pekka Pankka (UM) *The mapping class group II (cont.)* --- 4088 EH
3:10-4:00pm	**Commutative Algebra Seminar** --- Mel Hochster (UM) *Tor, Ext, and local cohomology … continued* --- 3096 EH
3:10-4:00pm	**Financial/Actuarial Mathematics Seminar** --- Not meeting this week --- 3088 EH
3:10-4:00pm	**Topology Seminar** --- Not meeting this week --- 4096 EH
4:10-5:00pm	**Differential Equations** --- Bin Cheng (UM) *On the stability of rotational shallow water equations* --- 4096 EH
4:10-5:00pm	**Math Club** --- Sam Payne (Stanford) *Bidding games: theory and practice* --- 2nd Floor Nesbitt Room
4:10-5:00pm	**Student Combinatorics** --- Luis Serrano (UM) *Schubert Calculus III* --- 3866 EH

4:10-5:30pm **Logic Seminar** --- Kenneth Harris (UM) *A real with positive effective packing dimension which computes no 1-random real* --- 3096 EH

Friday, September 28

11:00-12:00pm **EECS Theory Seminar** --- Michael Wakin (UM) TBA --- CSE 3941
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Jing-Rebecca Li (INRIA, France) *Fast solver for the heat equation in unbounded domains* ---1084 EH
3:10-4:00pm **Complex Analysis Seminar** --- Peter Duren (UM) *Extremal Problems in Bergman Spaces* --- 4088 EH
3:10-4:00pm **Student Geometry/Topology** --- Marc Krawitz (UM) *The fundamental group of a compact semisimple Lie group is finite* --- 3096 EH
4:10-5:00pm **Woodroofe Distinguished Lecture (Special Seminar)** --- Ruth J. Williams (U of CA, San Diego) *Stochastic Networks with Resource Sharing* ---340 West Hall
4:10-5:00pm **Combinatorics** --- Brendon Rhoades (U. Minnesota) TBA --- 3866 EH

UPCOMING EVENTS

Ziwet Lecture
Feb. 5, 2008
Speaker: Curtis McMullen

Rainich Lecture
Mar. 18, 2008
Speaker: Gang Tian

ABSTRACTS FOR THE WEEK OF SEPT. 24 – SEPT. 30, 2007

Student Analysis Seminar
Monday, Sept. 24, 3:10-4:00pm
3866 EH
Jasun Gong (UM)
Fractals and Measure Theory

Following N. White's recent talk on Hausdorff measures and Hausdorff dimension, we will discuss the notion of topological dimension and relate it to previous topics, as well as give additional examples and further constructions from the literature. These may include Minkowski dimension, packing measures, and digressions into analysis on metric spaces.

Attending the first talk is not a prerequisite for this one; we'll review previous notions as needed.

Number Theory and Representation Theory Seminar
Monday, Sept. 24, 3:10-5:00pm
4096 EH
A. Raghuram (Oklahoma U)
On the special values of L-functions

An L-function is a function of one complex variable that is attached to some interesting arithmetic or geometric data. The values of an L-function at certain special points give structural information about these data. In the study of special values of L-functions, one needs to identify their (possibly) transcendental parts. This information is contained in certain periods attached to the data. In this talk I will explore the idea of proving relations amongst these periods, which in turn gives relations between the corresponding special values. I will begin by looking at some classical formulae that one might encounter in an advanced course in calculus, and proceed from there to describe some recent results, obtained in collaboration with Freydoon Shahidi, on relations between certain periods attached to automorphic forms on GL(n).

Several Complex Variables Seminar
Monday, September 24, 4:10-5:00pm
3096 EH
Alexander Izzo (Bowling Green State U)
Function Algebras on the Spere Invariant under Groups Actions

We will answer a question raised by Ronald Douglas in connection with his work on a conjecture in operator theory due to William Arveson. Let S denote the unit sphere in $\mathbb{C}$n. If A is a function algebra on S that contains the ball algebra A(S) and whose maximal ideal space is S, and if A is invariant under the action of the n-torus on S, does it follow that A = C (S) ? When n=1, Wermer's maximality theorem gives immediately that the answer is yes. In higher dimensions the answer depends on the dimension.

Geometry & Physics
Monday, September 24, 4:10-6:00pm
4088 EH
Albrecht Klemm (Wisconsin)
Topological String Theory on Compact Calabi-Yau

We describe the recent progress which lead to a solution of topological string theory on the quintic up to genus 51. We address all genus results on K3 fibred Calabi-Yau spaces in the fibre direction. We discuss ideas from matrix theory which could lead to a complete solution of topological string theory on compact Calabi-Yau.

Geometry Seminar
Tuesday, September 25, 3:10-4:00pm
4088 EH
Zuoqin Wang (MIT)
The twisted Mellin transform and spectral measures on toric varieties

The topic of this lecture is the twisted Mellin transform. In one dimension this transform is an operator on L^2 functions on the real line which intertwines the differential operator, (d/dx)f(x) and the finite difference operator f(x+1)-f(x) and has a number of other interesting combinatorial properties as well. Its n-dimensional generalization turns out to play an important role in the asymptotics of spectral measures on toric varieties.

Student Seminar on Representation Theory/Lie Theory
Tuesday, September 25, 3:10-4:00pm
Marc Krawitz (UM)
Room TBA
TBA

Weyl proved that a compact semi-simple Lie group over a field of characteristic zero has finite fundamental group. There are many proofs of this theorem, using very different techniques, and I will present n >= 1 of them.

Colloquium
Tuesday, September 25, 4:10-5:00pm
1360 EH
Sam Payne (Stanford)
Sumner B. Myers Prize Colloquim: Toric Vector Bundles

Vector bundles on toric varieties that carry a lift of the action of the dense torus are approachable, in part, through combinatorial methods, yet still exhibit a wide range of exotic and poorly understood phenomena. As our understanding grows, these toric vector bundles may become a useful testing ground for general questions about vector bundles on algebraic varieties. I will survey many of the known results about toric vector bundles and discuss relations with a few intriguing open questions. For instance, does every complete algebraic variety have a nontrivial vector bundle on it?

Student AIM Seminar
Wednesday, September 26. 3:10-4:00pm
3096 EH
Simon Wojczyszyn (UM)
Eigenmodes of Planar Drums

The two-dimensional wave equation leads to the Laplace eigenvalue problem (which is also relevant for quantum mechanics). We shall discuss some general properties of this problem using many beautiful pictures of eigenmodes. Topics to be discussed will include:
(1) The eigenmodes of the L-shaped domain (and reasons for why the MATLAB logo looks like it looks).
(2) We will answer a famous question: 'Can one hear the shape of a drum?'
(3) We shall explain how quantum mechanics is related to vibrations of drums.
(4) Line splitting, localization and resonance of eigenmodes.
(5) Eigenvalue avoidance.
(6) How degenerate eigenvalues arise despite lack of symmetries in the domain.

Geometric Function Theory Seminar
Wednesday, September 26, 3:10-4:00pm
4096 EH
Jasun Gong (UM)
Derivations and Currents on Metric Spaces

In this talk we will examine the role of N. Weaver's theory of derivations in the subject of analysis on metric spaces. In particular, we will relate this theory to that of currents on metric spaces, as introduced by L. Ambrosio and B. Kirchheim. We will also discuss some results in the cases of the line R^1 and the plane R^2.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, September 26, 4:10-5:30pm
4088 EH
Sonmez Sahutoglu (UM)
A hull with no analytic structure (after Stolzenberg)

We will read a paper by Stolzenberg. In this paper the author constructs a compact set *K* in two dimensional complex space such that the polynomial hull of *K* does not contain an analytic disc.

Student Algebraic Geometry Seminar
Thursday, September 27, 2:10-3:00pm
3866 EH
Eugene Eisenstein (UM)
Fano --->Rationally Connected

This is the continuation of last week's lecture on bend and break. Mori's bend and break technique are a collection of lemmas that all revolve around a simple and very geometric idea: a curve that bends with some appropriate number of points fixed must, in the limit, break off into a rational component and some other curves. Having explained some of the reasons the lemmas are important last week, we will apply them to show that Fano varieties have a rational curve through every point. Time permitting, I will outline the proof that Fano varieties are rationally connected (there is a rational curve through any two points).

Study Seminar (Pt. 1) & (Pt. 2)
Thursday, September 27, (Pt. 1) 2:10-3:00 & (Pt. 2) 3:10-4:00
(Pt. 1) 3096 EH & (Pt. 2) 4088 EH
Pekka Pankka (UM)
The mapping class group II

Let S be a smooth closed simply connected 2-manifold. By definition the mapping class group of S is the quotient M(S) = Homeo^+(S)/Homeo_0(S), where Homeo^+(S) is the group of all orientation preserving homeomorphisms on S and Homeo_0(S) is the group of all homeomorphisms on S isotopic to the identity. This talk is the second of a lecture series that will provide an introduction to this subject.

Commutative Algebra Seminar
Thursday, September 27, 3:10-4:00pm
3096 EH
Mel Hochster (UM)
Tor, Ext, and local cohomology …. continued

For the first several weeks of the semester, I will be giving some talks on elementary homological algebra: the functors Tor and Ext, and then an introductory treatment of local cohomology. I will write up these lectures and make them available from my Web page. This is intended to supplement the background of students in Math 711, but others who are interested in this material are welcome.

Differential Equations
Thursday, September 27, 4:10-5:00pm
4096 EH
Bin Cheng (UM)
On the stability of rotational shallow water equations

We study the stabilizing effect of rotational forcing in the nonlinear setting of two-dimensional shallow-water and Euler equations. We prove that when rotational force dominates the pressure, it prolongs the life-span of smooth solutions for t\lesssim \ln\delta^{-1} where new parameter \delta is the ratio of the (inverse of) squared Froude number measuring the amplitude of pressure, relative to the (inverse of) Rossby number, measuring the dominant rotational force. The strong rotation also imposes certain periodicity to the flow in the sense that there exists a ``nearby'' periodic-in-time approximation of the exact solution. In the opposite regime of large \delta's, the flow is dispersive so that the divergence field substantially decays in finite time.

Math Club
Thursday, September 27, 4:10-5:00pm
2nd Floor Nesbitt Room
Sam Payne (Stanford)
Bidding games: theory and practice

What if you play your favorite combinatorial game, such as nim, tic-tac-toe, or chess, but instead of alternating moves you bid each time for the right to move? The basic theory of such games is simple and elegant, with a surprising relation to "random" games, in which the right to move is determined by a coin flip. In practice, these bidding games are fun and disorienting. Even tic-tac-toe becomes a challenge.

Student Combinatorics
Thursday, September 27, 4:10-5:00pm
3866 EH
Luis Serrano (UM)
Schubert Calculus III

Schubert polynomials, introduced by Lascoux and Schutzenberger, are a tool to answer certain questions in algebraic geometry. In particular, they represent Schubert classes in the cohomology of flag varieties. They possess many algebraic and combinatorial properties. For example, they form a linear basis for the space of polynomials. In this talk, we will briefly introduce the geometry and study some of the combinatorics behind Schubert polynomials, such as Bruhat order, etc.

Logic Seminar
Thursday, September 27, 4:10-5:30pm
3096 EH
Kenneth Harris (UM)
A real with positive effective packing dimension which computes no 1-random real

A relatively longstanding question in algorithmic randomness is whether there is a real of positive effective Hausdorff dimension which computes no 1-random real. The only way that was known to produce a real of postive Hausdorff dimension, which was not itself 1-random, was to "water" down a 1-random real in an entirely effective way that allowed the recovery of the original 1- random. So, what was required to solve this problem was to produce reals of positive Hausdorff dimension in an entirely new way. Joe Miller announced last weekend at a conference on algorithmic randomness in Chicago that he solved this open problem positively.

The proof is still in print.

At the same talk Noam Greenberg sketched a proof (Greenberg and Downey) of an open question along similar lines: Is there a real of positive effective packing dimension which computes no 1-random real. The argument is a "measure-theoretic" forcing argument which weaves together a Spector forcing construction (to produce a minimal Turing degree) with measure-theoretic requirements. A modest background in Computability will be assumed; I will provide enough details of Kolmogorov complexity and algorithmic randomness for understanding the problems and the construction of Greenberg and Downey.

Applied and Interdisciplinary Mathematics Seminar
Friday, September 28, 3:10-4:00pm
1084 EH
Jing-Rebecca Li (INRIA, France)
Fast solver for the heat equation in unbounded domains

We describe a fast solver for the heat equation. The emphasis will be on unbounded domains and moving boundaries. The new algorithm relies on several tools: the spectral approximation of the free-space heat kernel, the nonuniform fast Fourier transform, and accurate quadrature methods for the evaluation of heat layer potentials. Unlike finite difference and finite element techniques, diffusion into an infinite medium is satisfied analytically, avoiding the need for artificial boundary conditions on a finite computational domain. The method is explicit, unconditionally stable, and requires an amount of work of the order O(M N log N), where N is the number of discretization points in physical space and M is the number of time steps. An example from dendritic solidification will be presented.

Complex Analysis Seminar
Friday, September 28, 3:10-4:00pm
4088 EH
Peter Duren (UM)
Extremal Problems in Bergman Spaces

There is an elegant theory of dual extremal problems in Hardy spaces, based primarily on the Hahn-Banach theorem. Things are more difficult in Bergman spaces, but there has been some recent progress. This will be an expository overview of the Hardy space model and attempts to implement it in Bergman spaces. The talk will be accessible to non-specialists.

Woodroofe Distinguished Lecture (Special Seminar)
Friday, September 28, 4:10-5:00pm
340 West Hall
Ruth J. Williams (U of CA, San Diego)
Stochastic Networks with Resource Sharing

Stochastic networks are used as models for complex systems involving dynamic interactions subject to uncertainty. Application domains include manufacturing, the service industry, telecommunications, and computer systems. Networks arising in modern applications are often highly complex and heterogeneous, with network features that transcend those of conventional queueing models. The control and analysis of such networks present challenging mathematical problems.
In this talk, a concrete application will be used to illustrate a general approach to the study of stochastic networks using more tractable approximate models. Specifically, we consider a connection-level model of Internet congestion control that represents the randomly varying number of flows present in a network where bandwidth is shared fairly amongst elastic documents. This model, introduced by Massoulie and Roberts, can be viewed as a stochastic network with simultaneous resource possession. Elegant fluid and diffusion approximations will be used to study the stability and performance of this model. The talk will conclude with a summary of the current status and description of open problems associated with the further development of approximate models for general stochastic networks.
This talk is based in part on joint work with W. Kang, F. P. Kelly, and N. H. Lee