Winter 2008
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
March 24th – March 30th

Monday, March 24

3:10-4:00pm	**Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm	**Topics in Algebraic Geometry Seminar** --- Yogesh More (UM) *Log Smoothness* --- 2866 EH
3:10-4:00pm	**Working Group in Integrable Systems and Asymptotics** --- Robert Buckingham (UM) *Universality Limits for Spectra of Random Matrices, II* --- 3088 EH
3:10-5:00pm	**Number Theory and Representation Theory Seminar** --- Peter Trapa (Utah) *Relationships between characters of real and p-adic groups* --- 4096 EH
4:10-6:00pm	**Geometry & Physics** --- Vasiliy Dolgushev (UC Riverside) *Formality theorems and their applications in deformation quantization* --- 4088 EH
5:15-6:30pm	**Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, March 25

2:10-3:00pm	"**What is … " Seminar** --- Robert Lazarsfeld (UM) *What is … a multiplier ideal?* --- 3096 EH
3:10-4:00pm	**Algebra Seminar** --- Travis Schedler (U of Chicago) *Differential operators in noncommutative geometry* --- 3096 EH
3:10-4:00pm	**Geometry Seminar** --- Manfred Einsiedler (Ohio Sate) *Spectral gap and effective equidistribution* --- 4088 EH
3:10-4:00pm	**Student Algebraic Geometry Seminar** --- TBA --- 3088 EH
4:10-5:00pm	**Colloquium** --- Randy LeVeque (U of Washington) *High-Resolution Finite Volume Methods and Applications to Tsunami Modeling* --- 1360 EH

Wednesday, March 26

3:10-4:00pm	**Geometric Function Theory Seminar** --- TBA --- 4096 EH
3:10-4:00pm	**Student Representation Theory/Lie Theory Seminar** --- TBA --- 3088 EH
3:10-4:00pm	**Student Arithmetic Seminar** --- TBA --- 3866 EH
3:10-4:00pm	**Student AIM Seminar** --- Geri Izbicki (UM) TBA --- 3096 EH
4:10-5:00pm	**Complex Analysis Seminar (rescheduled from last week)** --- Maria J. Martin (Univ. Autonoma Madrid and UM) *Holomorphic self-maps of the disk intertwining with linear fractional maps* --- 3096 EH
4:10-5:30pm	**Working Seminar in Several Complex Variables and Complex Dynamics** --- Chris Hammond (UM) *Analytic functionals and the Fantappié Transformation* --- 4088 EH
4:10-6:00pm	**Algebraic Geometry Seminar** --- Jim Borger (Australian National U and U of Chicago) *Witt vectors, Lambda-rings, and absolute algebraic geometry* --- 3088 EH

Thursday, March 27

3:10-4:00pm	**Commutative Algebra Seminar** --- Mel Hochster (UM) *Phantom homology (cont.)* --- 3096 EH
3:10-4:00pm	**Financial/Actuarial Mathematics Seminar** --- Ahmet Duran (UM) *Spectral Analysis in Mathematical Finance: Intelligent Walk* --- 3088 EH
3:10-4:00pm	**Topology Seminar** --- Chris Leininger (UIUC) *Universal Cannon -- Thurston maps and the complex of curves* --- 4096 EH
4:10-5:00pm	**Topology Seminar (Special Seminar)** --- Javier Aramayona (Illinois) *Simplicial embeddings of pants complexes are geometric* --- 4096 EH
4:10-5:00pm	**Differential Equations** --- Sijue Wu (UM) *Almost global wellposedness of the 2-D full water wave equation* --- 4088 EH
4:10-5:00pm	**Math Club** --- Dave Anderson (UM) *The octonions* --- 2^{nd} Floor Nesbitt Common Room
4:10-5:00pm	**Student Combinatorics** --- Ajinkya More (UM) *Combinatorial Designs* --- 3866 EH
4:10-5:30pm	**Logic Seminar** --- TBA --- 3096 EH
4:10-6:00pm	**Study Seminar** --- TBA --- 3088 EH

Friday, March 28

10:50-12:00pm **EECS Theory Seminar** --- Xiaolin Shi (UM) TBA --- CSE 3941
2:10-3:00pm **Topics in Geometry** --- TBA --- 3866 EH
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Kevin Ross (Stanford) *Optimal Stopping and Free Boundary Characterizations for Some Brownian Control Problems* --- 1084 EH
3:10-4:00pm **Student Geometry/Topology** --- TBA --- 3096 EH
4:10-5:00pm **Several Complex Variables Seminar (Non-Standard Day/Room)** --- Feng Rong (Syracuse U) *Singularities of holomorphic maps of $\mathbb{C}^n$ tangent to the identity* --- 4088 EH
4:10-5:00pm **Combinatorics** --- TBA --- 3866 EH

ABSTRACTS FOR THE WEEK OF MAR. 24– MAR. 30, 2008

Topics in Algebraic Geometry Seminar
Monday, March 24, 3:10-4:00pm
2866 EH
Yogesh More (UM)
Log Smoothness

We will define the notion of log smoothness, and illustrate it with examples.

Number Theory and Representation Theory Seminar
Monday, March 24, 3:10-5:00pm
4096 EH
Peter Trapa (Utah)
Relationships between characters of real and p-adic groups

This talk, which is based on joint work with D. Ciubotaru, is about a natural geometric relationship between spaces of Langlands parameters for split real and p-adic groups. (In the real case, one must use the reformulation of the parameters introduced by Adams-Barbasch-Vogan.) The relationship of parameters has certain representation theoretic consequences, most of which are related to the computation of irreducible characters of Lusztig's unipotent representations (on one hand) and Harish-Chandra modules (on the other).

Geometry & Physics
Monday, March 24, 4:10-6:00pm
4088 EH
Vasiliy Dolgushev (UC Riverside)
Formality theorems and their applications in deformation quantization

In the first part of my talk I will go over the algebraic mosaic which will include differential graded (DG) Lie algebra, Maurer-Cartan elements, DG Lie algebra modules, and quasi-isomorphisms. Using this language I will be able to state formality theorems for Hochschild (co)chains of the algebra of functions on a smooth manifold. The second part of my talk will be devoted to applications. I will speak about the classification of star-products and description of traces on deformation quantization algebras. If time permits I will talk about a special role of unimodular Poisson structures in deformation quantization.

Algebra Seminar
Tuesday, March 25, 3:10-4:00pm
3096 EH
Travis Schedler (U of Chicago)
Differential operators in noncommutative geometry

Motivated by Van den Bergh's recent `double Poisson' algebras, we introduce a new formalism of differential operators for a general associative algebra A. It replaces Grothendieck's notion for commutative algebras in such a way that derivations of a commutative algebra are replaced by Der(A, A □ A), the A-bimodule of `double derivations' of A. The algebra D(A) of differential operators is filtered, and its associated graded is commutative in some `twisted' sense. Parallel to the commutative case, there is an induced double Poisson structure on gr(A), which identifies gr(A) with Van den Bergh's `double Schouten-Nijenhuis algebra', TA Der(A, A □ A), which is a noncommutative version of polyvector fields on a variety.

A crucial step of our construction is replacing A with a certain `Fock space' F(A), which carries the structure of a wheeled PROP.

We then consider the case where A is the path algebra of a quiver, which may be viewed as a `noncommutative' version of affine space. The original motivation for the above constructions was to construct a `wheeled BV' structure on the double Schouten-Nijenhuis algebra of A, which justifies calling A a `wheeled Calabi-Yau' algebra. In this case, D(A) generalizes the quiver version of the Moyal star product on Rn, and is also a quiver version of Turaev's skein algebra of links on surfaces.

Geometry Seminar
Tuesday, March 25, 3:10-4:00pm
4088 EH
Manfred Einsiedler (Ohio State)
Spectral gap and effective equidistribution

The dynamics on homogeneous spaces has many interesting connections to number theory. One of the main problems here is to understand the distribution of closed orbits for subgroups H of the ambient Lie group G. In joint work with G. Margulis and A.Venkatesh we prove an error rate in the equidistribution for semisimple subgroups H acting on congruence quotients of G. This makes use of spectral gap in the form of property (tau). We will discuss the relationship between spectral gap, effective decay of matrix coefficients, and effective equidistribution, as well as the main ideas of our argument.

Colloquium
Tuesday, March 25, 4:10-5:00pm
1360 EH
Randy LeVeque (U of Washington)
High-Resolution Finite Volume Methods and Applications to Tsunami Modeling

Hyperbolic systems of partial differential equations often arise when modeling phenomena involving wave propagation or advective flow. Finite volume methods are a natural approach for conservation laws of this form since they are based directly on integral formulations and are applicable to problems involving shock waves and other discontinuities. High-resolution shock-capturing methods developed originally for compressible gas dynamics can also be applied to many other hyperbolic systems. A general formulation of these methods has been developed in the CLAWPACK software that allows application of these methods, with adaptive mesh refinement, to a variety of problems in fluid and solid dynamics.

Colloquium abstract continued ……..

I will describe these methods in the context of some recent work on modeling geophysical flow problems, particularly in the study of tsunamis. Accurate prediction of their propagation through the ocean and interaction with coastal topography is essential in issuing early warnings and in the study of historical tsunamis. Modeling wave motion at the shore is complicated by the fact that grid cells change between wet and dry as the wave moves in and out. Special Riemann solvers have been developed to deal with dry states in order to capture the shoreline location on a recangular grid. Propagation of small amplitude waves over deep ocean when the bathymetry varies on much larger scales than the wave amplitude will also cause numerical problems unless the method is properly formulated. Adaptive mesh refinement is desirable in order to allow much greater resolution near the shore than in the open ocean, but introduces new difficulties with varying bathymetry and dry cells. I will describe some recent progress and joint work with David George.

Complex Analysis Seminar (rescheduled from last week)
Wednesday, March 26, 4:10-5:00pm
3096 EH
Maria J. Martin (Univ. Autonoma Madrid and UM)
Holomorphic self-maps of the disk intertwining with linear fractional maps

We characterize in most cases the holomorphic self-maps of the unit disk that intertwine two given linear fractional self-maps of the disk. The proofs are based on iteration and a detailed analysis of the solutions of Schroeder's and Abel's equations. In particular, we characterize the maps that commute with a given linear fractional map (in the cases that are not already known) and, as an application, determine all ``roots'' of such maps in the sense of iteration (if any).

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, March 26, 4:10-5:30pm
4088 EH
Chris Hammond (UM)
Analytic functionals and the Fantappié Transformation

We will follow Chapter 3 of the monograph "Analytic Functionals and Complex Convexity" by Andersson, et al., which among other things, describes the relationship between the dual space of O(kE) and O(kE*), for $k \leq -1$, where E is a □-convex set and E*is its dual complement.

Algebraic Geometry Seminar
Wednesday, March 26, 4:10-6:00pm
3088 EH
Jim Borger (Australian National U and U of Chicago)
Witt vectors, Lambda-rings, and absolute algebraic geometry

I'll give an introduction to Witt vectors and Lambda-rings, and I'll explain how they're two different ways of looking at the same concept. I'll discuss the resulting "Lambda-equivariant" algebraic geometry, how it relates to usual algebraic geometry, and how it is fundamentally arithmetic.

Commutative Algebra Seminar
Thursday, March 27, 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, March 27, 3:10-4:00pm
3088 EH
Ahmet Duran (UM)
Spectral Analysis in Mathematical Finance: Intelligent Walk

I will present a new method of profitable investment strategy for portfolio risk management. Moreover, we implement a rule based expert system for the real-time financial decision making process by using the power of spectral analysis.

This is joint work with my financial mathematics student Michael Bommarito (U of M).

Topology Seminar
Thursday, March 27, 3:10-4:00pm
4096 EH
Chris Leininger (UIUC)
Universal Cannon --- Thurston maps and the complex of curves

I'll describe joint work with Mj (Mitra) and Schleimer in which we construct a type of universal Cannon--Thurston map associated to the Birman Exact Sequence for mapping class groups and the action on the complex of curves. As a consequence, we show that the Gromov boundary of 1-punctured surface curve complexes are locally path connected and path connected.

Topology Seminar (Special Seminar)
Thursday, March 27, 4:10-5:00pm
4096 EH
Javier Aramayona (Illinois)
Simplicial embeddings of pants complexes are geometric

We will show that, for most surfaces, every simplicial embedding of one pants complex into another is induced by an embedding of surfaces.

We will discuss some consequences of our work and, time permitting, we will give some details of the proof.

Differential Equations
Thursday, March 27, 4:10-5:00pm
4088 EH
Sijue Wu (UM)
Almost global wellposedness of the 2-D water wave equation

We consider the problem of global in time existence and uniqueness of solutions of the 2-D infinite depth full water wave equation. It is known that this equation has a solution for a time period $[0, T/\epsilon]$ for initial data of type $\epsilon\Phi$, where T depends only on Φ. We show that for such data there exists a unique solution for a time period $[0, e^{T/{\epsilon}}]$. This is achieved by better understandings of the nature of the nonlinearity of the water wave equation.

Math Club
Thursday, March 27, 4:10-5:00pm
2nd Floor Nesbitt Common Room
Dave Anderson (UM)
The octonions

The complex numbers form a ``2-dimensional'' algebra; they give a way to multiply (and divide) pairs of real numbers. Can you do the same in 3 dimensions? Hamilton spent almost 10 years in the mid-19th century wondering about this, before he gave up and worked out how to make a 4-dimensional algebra instead, called the quaternions. Not long after, Graves and Cayley found an 8-dimensional version: the octonions. I will speak about how to construct all of these numbers and more, and explain what they have to do with sphere packing and the following remarkable theorem: a product of two sums of 8 perfect squares is also a sum of 8 perfect squares.

Student Combinatorics
Thursday, March 27, 4:10-5:00pm
3866 EH
Ajinkya More (UM)
Combinatorial Designs

What started as a collection of puzzles and toy problems, has now grown into a full fledged discipline of mathematical thought. Combinatorial Design theory is a relatively young branch of pure mathematics with several applications to engineering, statistical and computer science related problems. The fundamental question that we try to answer here is: How to arrange elements of a finite set into subsets so as to satisfy certain appropriate "balance properties". I shall introduce some elementary concepts in the theory including incidence structures, block designs, Steiner systems and resolvability. No background in the subject will be assumed.

Applied and Interdisciplinary Mathematics Seminar
Friday, March 28, 3:10-4:00pm
1084 EH
Kevin Ross (Stanford)
Optimal Stopping and Free Boundary Characterizations for Some Brownian Control Problems

We study a singular stochastic control problem with state constraints in two dimensions. We show that the value function is continuously differentiable and its directional derivatives are the value functions of certain optimal stopping problems. Guided by the optimal stopping problem we then introduce the associated no-action region and the free boundary and show that, under appropriate conditions, an optimally controlled process is a Brownian motion in the no-action region with reflection at the free boundary. This proves a conjecture of Martins, Shreve and Soner (SIAM J. Control Optim., 34: 2133-2171, 1996) on the form of an optimal control for this class of singular control problems. An important issue in our analysis is that the running cost is Lipschitz but not differentiable. This lack of smoothness is one of the key obstacles in establishing regularity of the free boundary and of the value function. We show that the free boundary is Lipschitz and that the value function is C^2 in the interior of the no-action region. We then use a verifcation argument applied to a suitable C^2 approximation of the value function to establish optimality of the conjectured control. This is a joint work with Amarjit Budhiraja.

Several Complex Variables Seminar (Non-Standard Day/Room)
Friday, March 28, 4:10-5:00pm
4088 EH
Feng Rong (Syracuse U)
Singularities of holomorphic maps of $\mathbb{C}^n$ tangent to the identity

Abate proved that every holomorphic map of $\mathbb{C}^2$ tangent to the identity at an isolated fixed point has parabolic curves. One of the main ingredients of his proof is a reduction theorem on the "singularities" of such maps. We are going to talk about similar reduction theorems in higher dimensions and related results. We will mainly focus on the basic ideas and definitions rather than the details of any proof.