

Winter 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
March 17th – March 23rd

Monday, March 17

- 3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Kyungyong Lee (UM) *Smoothings of normal crossing varieties* --- 2866 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Not meeting this week --- 3088 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Tong Liu (U. Penn) *A bound on ramification of p -torsion semistable representations* --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Klas Diederich (U of Wuppertal) *Segre varieties and the reflection geometric principle in several complex variables* --- 3096 EH
4:10-6:00pm **Geometry & Physics** --- TBA --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, March 18

- 2:10-3:00pm **"What is ... " Seminar** --- Jinho Baik (UM) *What is ... random matrices?* --- 3096 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Damin Wu (Ohio Sate) *Complete Kahler-Einstein metric on quasi-projective manifolds* --- 4088 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- TBA --- 3088 EH

Wednesday, March 19

- 3:10-4:00pm **Geometric Function Theory Seminar** --- TBA --- 4096 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- Ricardo Portilla (UM) *Arithmetic Groups and Symmetric Spaces* --- 3088 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Johnson Jia (UM) *Automorphic L-Functions* --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- Arvind Baskaran (UM) *Crystal Growth: An Excuse to do Math* --- 3096 EH
4:10-5:00pm **Complex Analysis Seminar** --- 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** --- TBA --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Harry Tamvakis (U of Maryland) *A Giambelli formula for isotropic Grassmannians* --- 3088 EH

Thursday, March 20

- 3:10-4:00pm **Commutative Algebra Seminar** --- Mel Hochster (UM) *Phantom homology (cont.)* --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Thomas Buchmueller (UM) *Underwriting Regulations and Adverse Selection in Private Health Insurance in Australia* --- 3088 EH
3:10-4:00pm **Topology Seminar** --- Karsa Rafi (U Chicago) TBA --- 4096 EH
4:10-5:00pm **Differential Equations** --- Fei-Ran Tian (OSU) *Initial Value Problem of the Whitham equations for the Camassa-Holm equation* --- 4088 EH
4:10-5:00pm **Math Club** --- Dave Morris (University of Lethbridge) *Hamiltonian checkerboards* --- 2nd Floor Nesbitt Common Room
4:10-5:00pm **Student Combinatorics** --- Alan Stapledon (UM) *Show Me the Polytope!* --- 3866 EH
4:10-5:30pm **Logic Seminar** --- TBA --- 3096 EH
4:10-6:00pm **Study Seminar** --- Juan Souto (UM) *McShane's identity* --- 3088 EH

Friday, March 21

- 10:50-12:00pm **EECS Theory Seminar** --- Runyao Duan (Tsinghua U) *Zero-error classical capacity of noisy quantum channels* --- DOW 1017
- 2:10-3:00pm **Topics in Geometry** --- Zhou Zhang (UM) *First estimates* --- 3866 EH
- 3:10-4:00pm **Colloquium (Sumner Meyers Prize Lecture)** --- Bryden Cais (McGill University) *From differential forms to Galois representations (and back again): a survey of Serre's conjecture* --- 1360 EH
- 3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Peter Smereka (UM) *Efficient Computation of Heteroepitaxial Growth Using Kinetic Monte Carlo* --- 1084 EH
- 3:10-4:00pm **Student Geometry/Topology** --- Not meeting this week --- 3096 EH
- 4:10-5:00pm **Combinatorics** --- Not meeting this week --- 3866 EH

ABSTRACTS FOR THE WEEK OF MAR. 17– MAR. 23, 2008

Topics in Algebraic Geometry Seminar

Monday, March 17, 3:10-4:00pm

2866 EH

Kyungyong Lee (UM)

Smoothings of normal crossing varieties

In deformation theory it is often useful to consider only deformations that are compatible with a log structure. I will talk about the theorem saying that a normal crossing variety has a log structure of semistable type if and only if it is d-semistable. I'll focus on examples.

Number Theory and Representation Theory Seminar

Monday, March 17, 3:10-5:00pm

4096 EH

Tong Liu (U. Penn)

A bound on ramification of p-torsion semistable representations

Let p be an odd prime, K a p -adic field with absolute ramification index e , and T a p -torsion semi-stable representation over K with Hodge-Tate weights in $\{0, \dots, r\}$ in the sense that T is killed by p and T can be written as a quotient of lattices in a semi-stable representation over K with Hodge-Tate weights in $\{0, \dots, r\}$. We prove there exists an explicit constant c only depending on e and r such that the ramification group $G^\wedge(c)$ acts on T trivially.

Several Complex Variables Seminar

Monday, March 17, 4:10-5:00pm

3096 EH

Klas Diederich (U of Wuppertal)

Segre varieties and the reflection geometric principle in several complex variables

We will consider how the so-called Segre varieties become the tools for showing that any proper holomorphic map from a bounded domain in \mathbb{C}^n with smooth real-analytic boundary onto a domain of the same kind can be holomorphically extended to an open neighborhood of the closure of the first domain. The talk will give a survey of known result and focus on methods of proof without going too much into technical details.

**“What is ...” Seminar
Tuesday, March 18, 2:10-3:00pm
3096 EH
Jinho Baik (UM)
*What is ... random matrices?***

If we consider a Hermitian matrices whose entries are randomly chosen, the eigenvalues are some random points on the real line. How do these random points look like? Such question was first asked (and answered) in physics where various random matrix models arise naturally. More curiously, there are also some mathematical problems, which apparently have no matrix structure, but nevertheless behave like the eigenvalues of a random matrix. Examples include the zeros of Riemann-zeta function, the longest increasing subsequences of a random permutation, and the configuration of a random tiling. Also observed is the bus arrival times at a bus stop in the city of Cuernavaca in Mexico. We will discuss some of such universal feature of random matrices.

**Geometry Seminar
Tuesday, March 18, 3:10-4:00pm
4088 EH
Damin Wu (Ohio State)
*Complete Kahler-Einstein metric on quasi-projective manifolds***

In this talk we will discuss the Kahler-Einstein metric on quasi-projective manifold, which has bounded curvature and Poincare growth near the boundary divisor. We will establish certain necessary and sufficient conditions on the existence of such a metric, by studying the degenerate Monge-Ampere equations. These conditions are related to certain positivity of the logarithmic canonical bundle.

**Student Representation Theory/Lie Theory Seminar
Wednesday, March 19, 3:10-4:00pm
3088 EH
Ricardo Portilla (UM)
*Arithmetic Groups and Symmetric Spaces***

We'll introduce the notion of arithmetic groups and talk about importance of arithmetic subgroups of $SL_2(\mathbb{R})$.

**Student AIM Seminar
Wednesday, March 19, 3:10-4:00pm
3096 EH
Arvind Baskaran (UM)
*Crystal Growth: An Excuse to do Math***

I will use crystal growth as an excuse to talk about some techniques used to study this problem. I will use the first few minutes defining the free energy for this system, then spend half of the remaining time talking about Kinetic Monte Carlo as a tool to understand the dynamics based on the free energy. Then I will use the remaining time to talk about a continuum approach to study the same.

Complex Analysis Seminar
Wednesday, March 19, 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).

Algebraic Geometry Seminar
Wednesday, March 19, 4:10-6:00pm
3088 EH

Harry Tamvakis (U of Maryland)
A Giambelli formula for isotropic Grassmannians

Let X be a symplectic Grassmannian which parametrizes isotropic subspaces in a vector space equipped with a nondegenerate skew symmetric form. Unlike the usual type A Grassmannian, where Schubert calculus has been studied extensively for well over a century, the cohomology ring of X is less well understood. We will discuss our work on a Giambelli formula which expresses an arbitrary Schubert class in this ring as a polynomial in certain special Schubert class generators. We also introduce theta polynomials, a family of combinatorially explicit polynomials whose algebra agrees with the Schubert calculus on X . This is joint work with Anders Buch and Andrew Kresch.

Commutative Algebra Seminar
Thursday, March 20, 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 20, 3:10-4:00pm
3088 EH

Thomas Buchmueller (UM)
Underwriting Regulations and Adverse Selection in Private Health Insurance in Australia

The regulation of health insurance is an important and often controversial issue. Rules intended to improve access to insurance for high risk consumers have the potential to reduce overall coverage by inducing adverse selection. This paper examines the issue of adverse selection in the context of the market for private health insurance in Australia, where premiums are required to be community rated. In 2000, the Australian government reformed the community rating rules in an effort to reverse a long decline in private insurance coverage by attracting a greater number of younger consumers into the market. I estimate the cost of adverse selection prior to this reform and evaluate the effect of the policy on the composition of the private insurance risk pool and on the main determinant of premiums, benefits paid by insurers.

Differential Equations
Thursday, March 20, 4:10-5:00pm
4088 EH

Fei-Ran Tian (OSU)
Initial Value Problem of the Whitham equations for the Camassa-Holm equation

Like the KdV equation, the Camassa-Holm equation with small dispersion can be viewed as a dispersive approximation to the inviscid Burgers equation. Although the zero dispersion limit for the Camassa-Holm equation has not been established, the modulation equations (i.e., Whitham equation) have been derived. Unlike the KdV case, the Whitham equations are non-strictly hyperbolic. In this talk, we will discuss the initial value problem related to these Whitham equations.

Math Club
Thursday, March 20, 4:10-5:00pm
2nd Floor Nesbitt Common Room
Dave Morris (University of Lethbridge)
Hamiltonian checkerboards

Place a checker on one square of a checkerboard. Asking whether a checker can make a tour of the board leads to some difficult questions, and to connections with interesting fields of mathematics such as number theory, topology, and group theory.

Student Combinatorics
Thursday, March 20, 4:10-5:00pm
3866 EH

Alan Stapledon (UM)
Show Me the Polytope!

Show me the (rational) polytope and I will show you three different proofs of Ehrhart Reciprocity. One combinatorial, one using Serre duality and a third using Poincare duality for orbifold cohomology.

Study Seminar
Thursday, March 20, 4:10-6:00pm
3088 EH
Juan Souto (UM)
McShane's identity

McShane proved that a certain function, a series whose coefficients are determined by the lengths of the simple closed geodesics, is constant over Teichmueller space of the punctured torus.

This remarkable identity, and its many generalizations, has recently obtained much attention because of its crucial role in Mirzakhani's computation of the volume of Moduli space. In this talk I will explain the proof of McShane's identity.

Colloquium (Sumner Meyers Prize Lecture)
Friday, March 21, 3:10-4:00pm
1360 EH
Bryden Cais (McGill University)

From differential forms to Galois representations (and back again): a survey of Serre's conjecture

Since the time of the ancient Greeks, mathematicians have been interested in understanding solutions of equations with rational coefficients. In modern times, it is customary to study the field of all solutions to all equations at once; thanks to Galois, we now know that the absolute Galois group of the rationals acts on this space, and encodes a wealth of information about its structure. This is a very rich and complicated group, so to glimpse its inner workings we are led to study its representations. The 1-dimensional case was the "crown jewel" of nineteenth century algebraic number theory, and there is a largely conjectural framework for classifying arbitrary representations, initiated by Langlands in the 1970's, which asserts a profound link between algebra, geometry, and analysis.

I will survey in a down-to-earth manner a specific instance of this framework, namely Serre's conjecture on 2-dimensional mod p Galois representations, which provides a precise dictionary for translating between such representations and holomorphic differential forms on certain algebraic curves. I will then explain how this dictionary translates refined representation-theoretic phenomena into congruence conditions between differential forms.

Applied and Interdisciplinary Mathematics Seminar
Friday, March 21, 3:10-4:00pm
1084 EH

Peter Smereka (UM)

Efficient Computation of Heteroepitaxial Growth Using Kinetic Monte Carlo

Simulation of heteroepitaxial growth using kinetic Monte Carlo (KMC) is computationally challenging due to the long-range nature of elastic interactions. This talk will address several ideas that we have developed in order to improve the efficiency of our algorithms. First, the Fourier-multigrid method for fast computation of the elastic displacement field will be discussed. Next, the principle of energy localization will be stated, which when combined with the expanding box method allows one to accurately compute changes in elastic energy using local calculations. A technique for obtaining inexpensive upper bounds on transition rates will be presented. These ideas are combined to allow one to simulate heteroepitaxy using KMC in physically interesting regimes. This is joint work with G. Russo and T. Schulze.