

Winter 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
April 14th – April 20th

Monday, April 14th

- 3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Howard Thompson (Spring Arbor) *Log smooth deformation theory* --- 2866 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Peter Miller (UM) *Dbar Methods and Support Endpoints for Nonanalytic Equilibrium Measures* --- 3088 EH
3:10-4:00pm **Geometric Function Theory Seminar (Special Meeting)** --- Hrant Hakobyan (U of Toronto) *Conformal dimension of Cantor sets and products* --- 4096 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Kai-Wen Lan (Harvard) *Compactifications of PEL-type Shimura varieties* --- 4096 EH
4:10-6:00pm **Geometry & Physics** --- Eric Katz (U Texas at Austin) *Tropical Curves and Monodromy* --- 4088 EH
4:10-5:00pm **Several Complex Variables Seminar** --- TBA --- 3096 EH
5:15-6:30pm **Teaching Mathematics** --- Patricio Herbst (UM-School of Ed) TBA --- 3088 EH

Tuesday, April 15th

- 2:10-3:00pm **"What is ... " Seminar** --- Igor Dolgachev (UM) *What is ... GIT?* --- 3096 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Satyan Devadoss (Williams College) *Topology of Particle Collisions* --- 4088 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- Kyle Ormsby (UM) *Introduction to algebraic K-theory* --- 3088 EH
4:10-5:00pm **Colloquium** --- Karsten Grove (Notre Dame) *Positive curvature: Past and Present* --- 1360 EH

Wednesday, April 16th

- 2:10-3:00pm **Financial/Actuarial Mathematics Seminar (Special Time)** --- Hao Xing (UM) *Regularity of the optimal exercise boundary of American options for jump diffusions* --- 4088 EH
3:10-4:00pm **Colloquium (Special Session)** --- Bertrand Remy (U of Lyon) *On buildings, and group actions on Euclidean and non-Euclidean ones* --- 1360 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** --- TBA --- 3096 EH
4:10-5:00pm **Complex Analysis Seminar** --- TBA --- 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** --- Paolo Cascini (UCSB) *On the Minimal Model Program* --- 3088 EH

Thursday, April 17th

- 2:10-3:00pm **AIM Special Seminar** --- Oleg Kirillov (TU Darmstadt) *Sensitivity analysis of distributed Hamiltonian and reversible systems prone to the dissipation-induced instabilities* --- 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** --- TBA --- 4088 EH
4:10-5:00pm **Math Club** --- TBA --- 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 17th ...continued

4:10-6:00pm **Study Seminar** --- TBA --- 3088 EH

Friday, April 18th

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

11:10-12:00pm **Topics in Geometry (Special Time)** --- Dan Burns (UM) *Spectral flow, cont.* --- 3866 EH

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- TBA --- 1084 EH

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

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

UPCOMING EVENTS

Algebraic Geometry Student Special Session

Monday, April 21, 9:00am-12:00pm

4088 EH

(All talks are 20 minutes, with 10 minute breaks between. The talks will be followed by a lunch at Pizza House)

9:10 - Brian Jurgelewicz: *Around the McKay Correspondence*

Let V be an ADE or exceptional unimodular surface singularity. One can associate a graph to V in two completely different ways. The goal is to explain why the two graphs are in fact the same. In the ADE case, one obtains a satisfying explanation for this phenomena by realizing V as a moduli space for representations of a certain algebra. In an attempt to argue similarly for other singularities, we are led to consider compactification of quiver moduli spaces. This turns out to be a very interesting problem in its own right.

9:40 - Shin-Yao Jow: *Mori dream spaces and the weak Lefschetz principle for nef cones*

Let X be a smooth projective complex variety of dimension at least 4, and let D be a smooth ample divisor of X . It follows from the weak Lefschetz theorem that the restriction map induces an isomorphism between the Neron-Severi spaces $N^1(X)$ and $N^1(D)$. It is thus natural to ask how the two nef cones $Nef(X)$ and $Nef(D)$ relate.

Since the pullback of nef line bundles are nef, obviously $Nef(D)$ contains $Nef(X)$, and in general $Nef(D)$ can be strictly bigger. In this talk we will describe a class of Mori dream spaces X which has the property that $Nef(D)=Nef(X)$ for all smooth ample divisors D .

10:10 - Eugene Eisenstein: *A characteristic zero perspective on some results of S. Takagi*

A multiplier ideal is an important tool in algebraic geometry, especially in birational geometry. It is a subtle invariant of a singular variety. A number of important formulas for this ideal are known. These formulas, combined with cohomological positivity properties of multiplier ideals, have striking geometric applications, for example Siu's theorem on the deformation invariance of plurigenera. Shunsuke Takagi used positive characteristic methods to prove a number of generalizations of these formulas. I will present an approach to proving these results and some new related results, with somewhat greater generality and precision, using characteristic zero algebro-geometric techniques.

10:40 - Kevin Tucker: *Jumping Numbers on Algebraic Surfaces with Rational Singularities*

One can associate to an ideal sheaf on a complex algebraic surface with rational singularities certain local invariants called jumping numbers. I will present an algorithm for finding the jumping numbers of the ideal by understanding the contributions of reduced divisors on a fixed resolution. This shows, in particular, how to compute the jumping numbers of a plane curve from the numerical data of its minimal resolution.

Algebraic Geometry Student Special Session ... abstracts continued

11:10 - Paul Johnson: *Hurwitz numbers: The big picture and a small proof*

Hurwitz theory counts genus g covers of \mathbb{P}^1 with certain ramifications. It's a simple kind of enumerative geometry of curves, and provides a bridge from more complicated enumerative geometries to algebra and combinatorics. For example, Hurwitz theory is essential to our understanding of $\overline{\mathcal{M}}_{g,n}$, and of the Gromov-Witten theory of curves.

I'll give an insta-micro-intro to this story, and then present an elementary proof, joint with Michigan's own postdocs Renzo Cavalieri and Hannah Markwig, that double Hurwitz numbers are piecewise polynomial. Our proof was inspired by tropical geometry.

11:40 - Alan Stapledon: *Weighted Ehrhart Theory and Orbifold Cohomology*

If P is a lattice polytope, then one can define a polynomial $\delta_P(t)$, which encodes the number of lattice points in any fixed dilation of P . The polynomial $\delta_P(t)$ is a classic combinatorial invariant, called the Ehrhart δ -polynomial of P .

We will present a new geometric interpretation of the coefficients of $\delta_P(t)$. That is, they are sums of dimensions of orbifold cohomology of a toric stack.

**Affine manifolds and Mirror Symmetry
Workshop
4088 EH
April 25 - 27, 2008**

**Quasiconformal Mappings and Analysis on Metric Spaces
A conference in memory of Juha Heinonen
May 12 - 16, 2008**

**Commutative Algebra and its Interactions
A conference in honor of Mel Hochster
July 31 - August 5, 2008**

ABSTRACTS FOR THE WEEK OF APRIL 14 - APRIL 20

**Topics in Algebraic Geometry Seminar
Monday, April 14, 3:10-4:00pm
2866 EH
Howard Thompson (Spring Arbor)
*Log smooth deformation theory***

We will discuss the paper Log smooth deformation theory by Fumiharu Kato in light of his paper Functors of log Artin rings.

Geometric Function Theory Seminar (Special Meeting)
Monday, April 14, 3:10-4:00pm
4096 EH
Hrant Hakobyan (U of Toronto)
Conformal dimension of Cantor sets and products

We will give several new examples of sets which are minimal for conformal dimension. In particular we will show that there are sets of length 0 and conformal dimension 1 on the line. Tyson has shown that if X is q -regular and contains a curve family of nontrivial modulus then it is minimal for conformal dimension. We generalize this result and in particular obtain the following statement. Given a subset E of the line \mathbb{R} $E \times Y$ is minimal for conformal dimension for every compact Y if and only if E is minimal itself.

Number Theory and Representation Theory Seminar
Monday, April 14, 3:10-5:00pm
4096 EH
Kai-Wen Lan (Harvard)
Compactifications of PEL-type Shimura varieties

In this lecture, we will try to explain the essential ingredients in the construction of toroidal and minimal compactifications of smooth integral models of (general) PEL-type Shimura varieties, following the approaches of Faltings and Chai. Since this is a rather archaic problem, our goal will be to identify the main difficulties that are absent in the special cases worked out in the literature, and to explain why there could be a uniform solution to such difficulties.

Geometry & Physics
Monday, April 14, 4:10-6:00pm
4088 EH
Eric Katz (U Texas at Austin)
Tropical Curves and Monodromy

Tropical Geometry is a way of associating piecewise-linear objects called tropical varieties to algebraic varieties. These tropical varieties encode certain geometric properties of the algebraic varieties. I will explain how tropical geometry captures data about the cohomology of the algebraic variety, in particular about the monodromy action on the cohomology for a particular family of varieties. I will focus on the case of curves in detail. This is joint work with David Helm, Hannah Markwig, and Thomas Markwig.

Geometry Seminar
Tuesday, April 15, 3:10-4:00pm
4088 EH
Satyan Devadoss (Willams College)
Topology of Particle Collisions

Our story is motivated by the configuration space of particles on spheres. In the 1970s, Deligne and Mumford constructed a way to keep track of particle collisions in this space using Geometric Invariant Theory. In the 1980s, this (compactified) moduli space was remarkably used by Gromov and Witten as invariants arising from string field theory. In the 1990s, Kontsevich and Fukaya generalized these ideas when studying deformation quantization to include particles collisions on spheres with boundary. This talk, using visual brushstrokes, focuses on the topology of real points of particle collisions. Their real analogs can be understood from several viewpoints, from tiling of convex polytopes, to blowups of hyperplane arrangements, to underlying operad structures. In particular, we focus on the (Fulton-MacPherson) compactifications of particles on the Poincare disk, leading to open-closed string field theory.

Colloquium
Tuesday, April 15, 4:10-5:00pm
1360 EH
Karsten Grove (Notre Dame)
Positive curvature: Past and Present

The standard sphere is the simplest and most perfect example of a space with positive curvature: It is the most symmetric one and it has constant curvature. We will describe developments in positive curvature based on such extreme properties, and see how this has led to what is known today. The talk will focus on manifolds with large amount of symmetry and the search for new examples.

Financial/Actuarial Mathematics Seminar (Special Time)
Wednesday, April 16, 2:10-3:00pm
4088 EH
Hao Xing (UM)
Regularity of the optimal exercise boundary of American options for jump diffusions

We will discuss the free boundary problem associated to the American option pricing problem for jump diffusions. Because of the jump in the underlying process, this problem is a free boundary problem for parabolic integro-differential equations. Using the tools in proving regularity results for parabolic differential equations and especially the Stefan problem, we will show that the optimal exercise boundary/free boundary of the American option is continuously differentiable (except at the maturity). Moreover, we will upgrade its regularity and show it is infinitely differentiable under an appropriate regularity assumption on the jump distribution. Our regularity result improves the result of Yang, Jiang and Bian in 2006 by removing a technical assumption on the parameters. This is a joint work with Erhan Bayraktar.

Colloquium (Special Session)
Wednesday, April 16, 3:10-4:00pm
1360 EH
Bertrand Remy (U of Lyon)
On buildings, and group actions on Euclidean and non-Euclidean ones

Buildings are cellular spaces admitting group actions that lead to a better understanding of the groups under consideration. The class of groups relevant to this contains semisimple algebraic groups and their arithmetic subgroups (when it makes sense). It also contains some interesting groups which are now known to be non-linear (no matrix interpretation).

We will introduce the notion of a building and focus on those which carry a natural non-positively curved singular metric, in an elementary sense we will make explicit (this covers all buildings except the spherical ones). By definition, buildings are gluings of tilings (or generalizations of them) called apartments, submitted to incidence conditions which make the whole spaces very symmetric. We will illustrate the dichotomy between buildings having Euclidean tilings as apartments, and the others. For the first case, we will recall some very basic facts from Bruhat-Tits theory, and for the other we will quickly review new infinite finitely presented simple groups.

Algebraic Geometry Seminar
Wednesday, April 16, 4:10-6:00pm
3088 EH
Paolo Cascini (UCSB)
On the Minimal Model Program

The aim of the Minimal Model Program is to generalize the classification of complex projective surfaces, known in the early 20th century, to higher dimensional varieties. Besides providing a historical introduction, we will discuss some recent results and new aspects of this Program.

AIM Special Seminar
Thursday, April 17, 2:10-3:00pm
3088 EH
Oleg Kirillov (TU Darmstadt)
Sensitivity analysis of distributed Hamiltonian and reversible systems prone to the dissipation-induced instabilities

Commutative Algebra Seminar
Thursday, April 17, 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.