

Fall 2008
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
October 20th – October 26th

Monday, October 20

- 3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Not meeting "Fall Break" --- 2866 EH
3:10-5:00pm **Group Theory/Lie Theory/Number Theory Seminar** --- Not meeting "Fall Break" --- 4096 EH
4:10-5:00pm **Several Complex Variables and Complex Dynamics Seminar** --- Not meeting "Fall Break" --- 3096 EH
4:10-5:00pm **Student Combinatorics** --- Not meeting "Fall Break" --- 3866 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting "Fall Break" --- 3096 EH

Tuesday, October 21

- 2:10-3:00pm **"What is ... " Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Not meeting "Fall Break" --- 4096 EH
3:10-4:00pm **Algebra Seminar** --- Lucy Moser-Jauslin (U of Bourgogne, Dijon) *The Koras-Russell threefold and Danielewski hypersurfaces* --- 3096 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- TBA --- 3088 EH
4:10-5:00pm **Colloquium** --- Not meeting "Fall Break" --- 1360 EH
4:10-5:00pm **Student AIM Seminar** --- TBA --- 3088 EH

Wednesday, October 22

- 3:10-4:00pm **Geometric Function Theory Seminar** --- Not meeting this week --- 4096 EH
3:10-4:00pm **Student Representation Theory Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Chris Hall (UM) *Covers and Permutations* --- 3866 EH
4:10-5:00pm **RTG Working Seminar in Several Complex Variables and Complex Dynamics** --- Not meeting this week --- 3096 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Wing Suet Li (Georgia Tech) *Horn inequalities for finite von Neumann algebras* --- 3088 EH

Thursday, October 23

- 3:10-4:00pm **Commutative Algebra Seminar** --- Dale Cutkosky (U of Missouri) *Asymptotic growth of algebras associated to power of ideals* --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- TBA --- 3088 EH
3:10-4:00pm **Topology Seminar** --- Matt Clay (U of Oklahoma) *Growth rate of intersection numbers for free group automorphisms* --- 4096 EH
4:10-6:00pm **Geometry and Physics Seminar** --- Hisham Sati (Yale) *Fivebrane structures in string theory and M-theory* --- 4096 EH
4:10-5:00pm **Differential Equations** --- TBA --- 4088 EH
4:10-5:00pm **Math Club** --- Jack Waddell (UM) *Sit, Stand, and Spin: Unusual Waves in Curious Media* --- 2nd floor Nesbitt Common Room
4:10-5:00pm **Reading Group in Probabilistic Methods in Geometric Functional Analysis and Combinatorics** --- 3096 EH
4:10-6:00pm **RTG Study Seminar** --- Lars Lauder (UM) *A topological characterization of hyperbolic groups (After Bowditch) (cont.)* --- 3866 EH

Friday, October 24

- 11:10-12:00pm **Theoretical Computer Science Seminar** --- Andrey Goder (UM) *"A Lower Bound on the Competitive Ratio of Truthful Auctions" by Goldberg et al.* --- CSE 3941
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- John Schotland (U of Penn) *Optical Tomography* --- 1084 EH

Friday, October 24 ... continued

3:10-4:00pm **Student Geometry/Topology** --- Julian Rosen (UM) "*Exotic*" Manifolds --- 3096 EH
4:10-5:00pm **Combinatorics** --- David Speyer (Clay/M.I.T.) *Tropical linear spaces* --- 3866 EH

ABSTRACTS FOR THE WEEK OF OCT. 20 – OCT. 26, 2008

Algebra Seminar

**Wednesday, October 21, 3:10-4:00pm
3096 EH**

Lucy Moser-Jauslin (U of Bourgogne, Dijon)

The Koras-Russell threefold and Danielewski hypersurfaces

The Koras-Russell threefold X is a hypersurface of \mathbb{C}^4 defined by the equation $P=x^2y+z^2+t^3+x=0$. It is a smooth and contractible threefold, however it is not algebraically isomorphic to \mathbb{C}^3 . This was first shown by L. Makar-Limanov using an invariant defined from the set of actions of the group $(\mathbb{C}, +)$ on the threefold. We will give another hypersurface Y in \mathbb{C}^4 which is isomorphic to X but for which the isomorphism given between X and Y does not extend to an isomorphism of \mathbb{C}^4 . Thus we can construct two inequivalent embeddings of X into affine four dimensional space. The techniques are based on the study of embeddings of Danielewski surfaces. We will also discuss other results concerning this point of view of the Koras-Russell threefold. This work was done in collaboration with A. Dubouloz and P.M. Poloni.

Student Arithmetic Seminar

**Wednesday, October 22, 3:10-4:00pm
3866 EH**

Chris Hall (UM)

Covers and Permutations

We'll describe a concrete combinatorial problem involving a symmetric group S_n and b -tuples of elements in S_n satisfying certain properties. We'll also describe a correspondence between b -tuples and covers of the projective line. For fixed n and b , there is a natural permutation action of a braid group on the b -tuples, and we'll describe the action and state some (mostly open) questions that arise.

Algebraic Geometry Seminar

**Wednesday, October 22, 4:10-6:00pm
3088 EH**

Wing Suet Li (Georgia Tech)

Horn inequalities for finite von Neumann algebras

The Horn inequalities give a characterization of eigenvalues of self-adjoint n by n matrices A, B, C with $A+B+C=0$. The proof requires tools from algebraic geometry. In this talk I will talk about our recent result of Horn conjecture that is valid for self-adjoint operators in arbitrary finite factors. Though the proof has little algebraic geometry involved, it is conceivable that the relevant algebraic geometry could be developed in this setting.

Commutative Algebra Seminar
Thursday, October 23, 3:10-4:00pm
3096 EH

Dale Cutkosky (U of Missouri)
Asymptotic growth of algebras associated to power of ideals

I will talk on some of the results in my recent paper on finite generation of algebras associated to powers of ideals with Juergen Herzog and Hema Srinivasan.

Geometry and Physics Seminar
Thursday, October 23, 4:10-6:00pm
4096 EH

Hisham Sati (Yale)
Fivebrane structures in string theory and M-theory

We consider geometric and topological aspects of the 'dual formulations' of string theory and M-theory. We observe that the magnetic dual version of the Green-Schwarz anomaly cancelation condition can be read as a higher analog of String structure, which we call Fivebrane structure. This involves lifts to higher connected covers of the structure groups. Such structures also appear when considering the dual of the C-field in M-theory. We characterize the topological obstructions to the existence of Fivebrane structures and describe some aspects of their geometry. We also describe twists of such structures which can be thought of as generalizations of the twist of Spin^c -structures. The latter show up in the description of D-branes and the former are expected to be related to certain NS-branes and M-branes. This is joint work with Urs Schreiber and Jim Stasheff.

Math Club
Thursday, October 23, 4:10-5:00pm
2nd floor Nesbitt Common Room
Jack Waddell (UM)

Sit, Stand, and Spin: Unusual Waves in Curious Media

What do bees on a hive, cells on the heart, and fans in a football stadium have in common? Each is an example of an excitable medium, which is characterized by one of three states at each point: active, refractory, or excitable. Excitable media are capable of supporting odd and beautiful wave modes, including circles and spirals, but the same waves that save bees from wasps can send a heart into tachycardia. We'll explore these phenomena and some simple models that describe them.

RTG Study Seminar
Thursday, October 23, 4:10-6:00pm
3866 EH

Lars Lauder (UM)
A topological characterization of hyperbolic groups (After Bowditch) (cont.)

A nonelementary word hyperbolic group G acts by homeomorphisms on its boundary, a perfect, metrisable compactum. The associated action on the space of distinct triples in the boundary is properly discontinuous and cocompact. I will give a proof, due to Bowditch, of the converse: If G acts properly discontinuously and cocompactly on the space of distinct triples of a perfect metrisable compactum, then G is actually hyperbolic.

Applied and Interdisciplinary Mathematics Seminar
Friday, October 24, 3:10-4:00pm
1084 EH
John Schotland (U of Penn)
Optical Tomography

There is considerable interest in the development of optical methods for biomedical imaging. The physical problem consists of recovering the optical properties of a medium in which light propagates by multiple scattering. This talk will review recent work on related inverse scattering problems for the radiative transport equation and efficient image reconstruction algorithms for large data sets. Numerical simulations and experimental data from model systems are used to illustrate the results.

Student Geometry/Topology
Friday, October 3:10-4:00pm
3096 EH
Julian Rosen (UM)
"Exotic" Manifolds

Topological manifolds are interesting, but it is often useful to have a differentiable structure. Pick your favorite topological manifold (mine is the projective plane). One can ask, "What kind of differentiable structure can I put on this manifold?" In the case of the projective plane, there is exactly one possible differentiable structure (up to diffeomorphism). For topological manifolds of higher dimension, however, the answer is not so simple. There are topological manifolds that do not admit ANY differentiable structure, as well as manifolds that admit infinitely-many pairwise non-diffeomorphic differentiable structures. There is also an interesting class of manifolds admitting finitely-many different differentiable structures. The so-called exotic spheres are one example, and this will be the focus of this talk.

Combinatorics
Friday, October 24, 4:10-5:00pm
3866 EH
David Speyer (Clay/M.I.T.)
Tropical linear spaces

Tropical geometry is a recipe for finding combinatorial analogues of constructions from algebraic geometry. Applying this recipe to linear spaces and Grassmannians, we discover tropical linear spaces and the tropical Grassmannian. Tropical linear spaces behave strikingly like standard linear spaces: there are analogues of orthogonal complement, intersection and span. Their combinatorics are governed by decompositions of matroids into smaller matroids. Studying these decompositions leads us to discover a matroid invariant which is best described through the geometric notions of Grassmannians and K-theory. Computing this invariant leads us back to the combinatorics of symmetric functions and Ehrhart polynomials, and suggests new questions to ask about Ehrhart polynomials and matroids. This talk will not assume any knowledge of algebraic geometry, or of matroids. Some of the earlier work I will discuss was done jointly with Bernd Sturmfels.