

Winter 2007
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043
February 19th – February 25th

Monday, February 19

- 3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Not meeting this week --- 3866 EH
3:10-4:30pm **Arithmetic/Number Theory Seminar** --- Lionel Fourquaux (ENS Lyon) TBA --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Not meeting this week --- 3096 EH
4:10-5:00pm **Colloquium (Special Seminar)** --- Various Speakers (Ford, Gen. Dynamics, Merit Networks, Beigebag.com) *You Have Options* --- 1360 EH
4:10-6:00pm **Geometry & Physics** --- Not meeting this week --- 3088 EH
4:10-6:00pm **Group Theory/Lie Theory Seminar** --- Richard Borcherds (UC Berkeley) *Automorphic forms on orthogonal groups* --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Michael Weiss (UM) *Mathematical Knowledge for Teaching Geometry: The Case of Math 431 (Continued)* --- 4096 EH

Tuesday, February 20

- 12:10-1:00pm **Student Algebraic Geometry Seminar** --- Brian Jurgelwicz (UM) *Line Bundles on Toric Varieties I* --- 3088 EH
2:10-3:00pm **"What is ... " Seminar** --- Richard Borcherds (UC Berkeley) *What is ... the Monster* --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Anna Wienhard (U of Chicago) *The Teichmueller component for $SL(4, R)$ and foliated projective structures* --- 4088 EH
3:10-4:00pm **Algebra Seminar** --- Seva Joukhovitski (LSU) *Brave new quadratic forms (aka triangular Balmer-Witt groups)* --- 3096 EH
4:10-5:00pm **Colloquium** --- Richard Borcherds (UC Berkeley) *What is quantum field theory?* --- 1360 EH
5:00-6:00pm **Social Hour** --- Upper Atrium

Wednesday, February 21

- 3:10-4:00pm **Student Arithmetic Seminar** --- --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- Joel Lepak (UM) *Blind Multiuser Detection* --- 3088 EH
3:10-4:00pm **Geometric Function Theory Seminar** --- Urs Lang (ETH, Zurich) *Quasi-minimizing varieties in spaces of nonpositive curvature* --- 4096 EH
4:10-5:00pm **Student Analysis Seminar** --- Greg McNulty (UM) *Low Lying Zeros of L-Functions: Part 1* --- 3866 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- John Erik Forneaess (UM) *Approximation of partially smooth functions* --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Max Lieblich (Princeton) *The Brauer group of a function field and local-to-global principles* --- 3088 EH

Thursday, February 22

- 3:10-4:00pm **Commutative Algebra Seminar** --- Not meeting this week --- 3096 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Not meeting this week --- 3088 EH
3:10-4:30pm **Topology Seminar (Non-standard room)** --- Mladen Bestvina (Univ. of Utah) TBA --- 3088 EH
3:10-5:00pm **Study Seminar** --- Mario Bonk (UM) *Manifolds that are homeomorphic, but not diffeomorphic VI* --- 2866 EH
4:10-5:00pm **Differential Equations** --- Virgil Pierce (OSU) *Geometry of Integrable Lattice Hierarchies* --- 4096 EH
4:10-5:00pm **Math Club** --- Ellen Veomett (UM) *Scissors Congruence* --- 2nd Floor Nesbitt Room

Thursday, February 22 ...continued

- 4:10-5:30pm **Logic Seminar** --- Not meeting this week --- 3096 EH
4:30-5:30pm **Theoretical Computer Science Seminar** --- Dungjade Shiwattana (UM) *Aggregation of Partial Rankings, p-Ratings and Top-m Lists* --- CSE 3941
5:10-6:00pm **Student Combinatorics** --- Ellen Veomett (UM) *Basics of Polytopes II* --- 3866 EH

Friday, February 23

- 3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Aaron King (UM) *Rapid loss of immunity is necessary to explain historical cholera epidemics* ---1084 EH
3:10-4:00pm **Student Geometry/Topology** --- Not meeting this week --- 3096 EH
3:10-4:30pm **Birational Geometry Reading Seminar** --- *Reading seminar on the paper of Birkar, Cascini, Hacon and McKernan on the finite generation of the canonical ring* --- 3088 EH
4:10-5:00pm **Combinatorics** --- Not meeting this week --- 3866 EH

UPCOMING EVENTS:

**Graduate Program Recruiting Weekend
March 9th & 10th**

ABSTRACTS FOR THE WEEK OF FEB. 19 – FEB. 25, 2007

**Colloquium (Special Seminar)
Monday, February 19, 4:10-5:00pm
1360 EH**

**Various Speakers (Ford, Gen. Dynamics, Merit Networks, Beigebag.com)
*You Have Options***

Have you been wondering what you might do with a PhD in mathematics? Have you wondered what your alternatives are to academia and what opportunities you have? Come hear what four local professionals are doing!

We will have a panel discussion of four local professionals: Gahl Berkooz (Ford), Jon Engelbert (beigebag.com), Manish Karir (Merit Networks), and Ben Shapo (General Dynamics). Find out what they do, how they use mathematics in their daily jobs, how they arrived at their current jobs, and what opportunities there are for you in similar jobs. Two of the panelists have or currently run their own businesses, two of them collaborate with university researchers, and one of them is looking for help with a specific project.

Group Theory/Lie Theory Seminar
Monday, February 19, 4:10-6:00pm
4088 EH
Richard Borcherds (UC Berkeley)
Automorphic forms on orthogonal groups

Many automorphic forms on indefinite orthogonal groups $O(2,n)$ can be constructed explicitly as infinite products, and are then called automorphic products. The earliest example of this is the Dedekind eta function, which Euler found a well known infinite product for, and which is (more or less) an automorphic form on $O(2,1)$. Some of the automorphic products on higher dimensional orthogonal groups are related to some of the sporadic simple groups in a rather mysterious way.

Geometry Seminar
Tuesday, February 20, 3:10-4:00pm
4088 EH
Anna Wienhard (U of Chicago)
The Teichmüller component for $SL(4,R)$ and foliated projective structures

The Teichmüller space of a Riemann surface S can be realized as the moduli space of hyperbolic structures on S . Associating to a hyperbolic structure its holonomy representation, it is naturally embedded into the space of representation of the fundamental group of S into $PSL(2,R)$. There are higher Teichmüller components defined by Hitchin (and in a different way by Fock and Goncharov) as connected components of the space of representations of the fundamental group of S into $PSL(n,R)$. For $PSL(3,R)$ Goldman and Choi showed many years ago that this Teichmüller component is the moduli space of convex projective structures on S . In my talk I will explain joint work with O. Guichard showing that the Teichmüller component for $PSL(4,R)$ is the moduli space of certain convex foliated projective structures on the unit tangent bundle of S .

Algebra Seminar
Tuesday, February 20, 3:10-4:00pm
3096 EH
Seva Joukhovitski (LSU)
Brave new quadratic forms (aka triangular Balmer-Witt groups)

Triangular Witt groups (TWGs) were introduced by Paul Balmer as an extension of classical Witt group functors. TWGs have good functorial properties (form a cohomology theory) and coincide with classical Witt groups when applied to appropriate categories. This dual nature of TWGs allowed Balmer and others to successfully address some open problems about classical Witt groups of rings and schemes. At the same time TWGs do not form an oriented cohomology theory, that is unlike K -groups do not satisfy any projective bundle theorem - type property. Therefore one can't normally apply usual computational techniques developed in K -theory to TWGs, and different methods need to be found. In this talk I will give a brief introduction into triangular Witt groups and then present a result about TWGs of punctured vector bundles. This result generalizes that of Balmer and Gille about punctured affine bundles which in turn is a generalization of a classical theorem of Ranicki on a Witt ring of a Laurent polynomial ring.

Colloquium
Tuesday, February 20, 4:10-5:00pm
1360 EH
Richard Borcherds (UC Berkeley)
What is quantum field theory?

There are many completely different mathematical definitions of a quantum field theory, most of which seem to have nothing to do with any of the other definitions. The only thing they all have in common is that none of the definitions are satisfied by any known realistic quantum field theories.

Student AIM Seminar
Wednesday, February 21, 3:10-4:00pm
3088 EH
Joel Lepak (UM)
Blind Multiuser Detection

Blind signal processing involves estimating transmitted waveforms without full knowledge of the characteristics of the transmission channel. We will examine the problem of detecting a single known waveform in the presence of both noise and strong interference from other waveforms of unknown form, a problem that arises in many wireless communication scenarios. Identifying the subspace spanned by the unknown signals is a commonly used tool; we'll outline methods for finding this subspace and what to do with it once we find it. Finally, we'll talk about how to improve detection if certain extra information about the interfering signals is known.

Geometric Function Theory Seminar
Wednesday, February 21, 3:10-4:00pm
4096 EH
Urs Lang (ETH, Zurich)
Quasi-minimizing varieties in spaces of nonpositive curvature

The talk will report on joint work with Bruce Kleiner. In hyperbolic spaces, there is a close relationship between their large-scale geometry and the boundary at infinity. Instances of this fact are e.g. the stability of quasi-geodesics, the visibility property, and the boundary homeomorphism induced by a quasi-isometry. We develop a theory of n -dimensional quasi-minimizing varieties (currents in the sense of geometric measure theory) in spaces of nonpositive curvature and of rank n , in an appropriate sense. The varieties in question have polynomial volume growth of order n . We prove several results regarding the existence, stability, persistence under deformations of the metric, quasi-isometry invariance, and asymptotic geometry of such quasi-minimizers, in analogy with the hyperbolic (rank one) case. At the same time, our approach encompasses the theory of quasi-flats which has played a major role in the proofs of various rigidity theorems.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, February 21, 4:10-5:30pm
4088 EH
John Erik Fornaess (UM)
Approximation of partially smooth functions

This is a report on joint work in progress with Erlend Wold and Yinxia Wang. The problem is to approximate continuous functions on laminated sets by smooth functions with good estimates.

Study Seminar
Thursday, February 22, 3:10-5:00pm
2866 EH
Mario Bonk (UM)
Manifolds that are homeomorphic, but not diffeomorphic VI

We continue the sequence of lectures devoted to John Milnor's work on 7-spheres.

Differential Equations
Thursday, February 22, 4:10-5:00pm
4096 EH
Virgil Pierce (OSU)
Geometry of Integrable Lattice Hierarchies

The Pfaff lattice hierarchy was introduced by Adler and van Moerbeke to describe the partition functions for random matrix models of orthogonal and symplectic type. We have shown that the finite versions of the Pfaff lattice are integrable systems in the Arnold-Liouville sense. The Pfaff lattice hierarchy is connected to the integrable hierarchies of Toda type, whose isospectral varieties have a rich geometric structure. We have computed the isospectral varieties for the finite Pfaff lattices. This geometric interpretation shows a striking difference between the orthogonal and symplectic random matrix situations, and provides a connection to the unitary random matrix models.

Math Club
Thursday, February 22, 4:10-5:00pm
2nd Floor Nesbitt Room
Ellen Veomett (UM)
Scissors Congruence

Say we have two pieces of construction paper; one in the shape of a square, and one in the shape of a triangle. Both the square and the triangle have the same area. We want to cut the triangle into finitely many pieces (using straight cuts) and rearrange the pieces so that they now form the square. Can we do it? What if we have a tetrahedron and cube of the same volume? In this lecture, we will use some unexpected tools to show why the answer to the first question is yes and why the answer to the second is no.

Applied and Interdisciplinary Mathematics Seminar
Friday, February 23, 3:10-4:00pm
1084 EH
Aaron King (UM)
Rapid loss of immunity is necessary to explain historical cholera epidemics

Survivors of severe cholera infections receive long-lasting immunity to reinfection. The significance of this immunity for epidemiology is unclear, however, due to the large fraction of cholera cases that are mild or asymptomatic. We analyzed 50 yr of cholera mortality data from 26 districts in historic Bengal using mechanistic, continuous-time Markov chain models and brand-new likelihood inference techniques. Our models fit the data dramatically better than all previously presented models and robustly predict that most exposures result not in infection but in short-term immunity, which wanes on a timescale of a few weeks. Our results afford a view of cholera dynamics very different from that presently prevailing and suggest a new focus for future investigations of cholera immunology and control.