

Fall 2007
University of Michigan-Department of Mathematics
<http://www.math.lsa.umich.edu/seminars/index.shtml>
Ann Arbor, MI 48109-1043

November 26th – December 2nd

Monday, November 26

- 3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Amanda Knecht (UM) TBA --- 2866 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Anna Felikson (IUM) *Coxeter groups, their subgroups, and Kac-Moody algebras* --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Elizabeth Wolcan (Chalmers University) *Decomposition of residue currents* --- 3096 EH
4:10-6:00pm **Geometry & Physics** --- Not meeting this week --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, November 27

- 2:10-3:00pm **"What is ... " Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Xiaodong Wang (MSU) *Harmonic Functions, Entropy, and a Characterization of the Hyperbolic Space* --- 4088 EH
3:10-4:00pm **Algebra Seminar** --- Sue Sierra (UM) *The classification of birationally commutative projective surfaces (preliminary report)* --- 3088 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- TBA --- 4096 EH
4:10-5:00pm **Colloquium** --- Victor Guillemin (MIT) *Classical and quantum Birkhoff canonical forms in one dimension* --- 1360 EH

Wednesday, November 28

- 3:10-4:00pm **Geometric Function Theory Seminar** --- TBA --- 4096 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Johnson Jia (UM) *Congruences between modular forms* --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- TBA --- 4088 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics** --- Joel Merker (ENS) *Local CR geometry, CR orbits, Hilbert transform in Holder spaces and the local Bishop equation* --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Hannah Markwig (UM) TBA --- 3088 EH

Thursday, November 29

- 2:10-3:00pm **Student Algebraic Geometry Seminar** --- TBA --- 3866 EH
2:10-3:00pm **Study Seminar (Pt. 1)** --- Jon Handy (UM) *The Wolff's Proof of the Corona Theorem, Part 2* --- 3096 EH
3:10-4:00pm **Study Seminar (Pt. 2)** --- Jon Handy (UM) *The Wolff's Proof of the Corona Theorem, Part 2* --- 4088 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Not meeting this week --- 3088 EH
3:10-4:00pm **Commutative Algebra Seminar** --- Kazuma Shimomoto (Minnesota) *On Grothendieck's lifting problem* --- 3096 EH
3:10-4:00pm **Topology Seminar** --- Natasa Sesum (Columbia Univ) TBA --- 4096 EH
4:10-5:00pm **Differential Equations** --- Yanyan Li (Rutgers U) *Gradient Estimates for Elliptic Equations and Systems from Composite Material* --- 4088 EH
4:10-5:00pm **Math Club (Undergraduate Colloquium)** --- John Boller (U of Chicago) *Spinning around and around* --- 1360 EH
4:10-5:00pm **Student Combinatorics** --- Ryan Kinser (UM) *Numerical invariants of representations of graphs (quiver representations)* --- 3866 EH
4:10-5:30pm **Logic Seminar** --- Peter Krautzberger (Free University of Berlin) *Algebra in the Stone-Čech compactification (and why it might interest set theorists)* --- 3096 EH

Friday, November 30

- 10:50-12:00pm **EECS Theory Seminar** --- Runyao Duan (UM) TBA --- CSE 3941
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- John Tyson (Virginia Tech)
TBA ---1084 EH
3:10-4:00pm **Student Geometry/Topology** --- Jose Manuel Gomez-Guerra(UM) *Stable Homotopy of
Spheres I* --- 3096 EH
4:10-5:00pm **Combinatorics** --- Keith Ball (UCL & UM Gehring Visiting Professor) *Plank and
coefficient problems* --- 3866 EH
4:10-5:30pm **Working Seminar in Several Complex Variables and Complex Dynamics (Special
Seminar)** --- Egmont Porten (Mid Sweden Univ) *Geometry of CR orbits and holomorphic
extension* --- Location TBA

EVENTS THIS WEEK

**RTG Workshop on CR Geometry
Saturday & Sunday, December 1st & 2nd
Speakers: Joel Merker (ENS) and Egmont Porten (Mid Sweden U)**

UPCOMING EVENTS

**Rainich Lecture
Jan. 15-17, 2008
Speaker: Gang Tian**

**Ziwet Lecture
Feb. 5, 2008
Speaker: Curtis McMullen**

ABSTRACTS FOR THE WEEK OF NOV. 26 – DEC. 2, 2007

**Number Theory and Representation Theory Seminar
Monday, November 26, 3:10-5:00pm
4096 EH
Anna Felikson (IUM)
*Coxeter groups, their subgroups, and Kac-Moody algebras***

We describe properties of reflection subgroups (i.e., subgroups generated by reflections) in Coxeter groups and apply our results to investigate regular subalgebras of Kac-Moody algebras.

Several Complex Variables Seminar
Monday, November 26, 4:10-5:00pm
3096 EH
Elizabeth Wulcan (Chalmers University)
Decomposition of residue currents

I will discuss a joint work with Mats Andersson. In a previous work we have defined, given an ideal $J \subset \mathbb{C}[z_1, \dots, z_n]$ and a free resolution of J , a vector valued residue current R whose annihilator ideal $\text{ann } R$ is precisely J . We show that R admits a natural decomposition $R = \sum R_p$, where the sum runs over the associated primes $\{p\}$ of J , such that R_p has support on the variety V_p of p and $J = \bigcap \text{ann } R_p$ is a minimal primary decomposition of J . The currents R_p are defined as certain restrictions (in a sense that will be made clear) of R to varieties and more generally constructible sets; in particular, if J has no embedded primes R_p is the restriction of R to V_p .

Colloquium
Tuesday, November 27, 4:10-5:00pm
1360 EH
Victor Guillemin (MIT)
Classical and quantum Birkhoff canonical forms in one dimension

In the first part of this talk I'll discuss some inverse spectral results for the one-dimensional Schroedinger operator that go back to the early years of quantum mechanics and also discuss the classical antecedents for these results (which go back to work of Abel in the early nineteenth century.) I will then describe some (very recent) improvements on these results involving classical and quantum Birkhoff canonical forms.

Geometry Seminar
Tuesday, November 27, 3:10-4:00pm
4088 EH
Xiaodong Wang (MSU)
Harmonic Functions, Entropy, and a Characterization of the Hyperbolic Space

Complete Riemannian manifolds with nonnegative Ricci curvature have been intensively studied and well understood. Riemannian manifolds with a negative lower bound for Ricci curvature are considerably more complicated and less understood. It turns out the bottom of spectrum of the Laplace operator plays an important role. I will first survey some recent results on such manifolds with positive bottom of spectrum. Then I will discuss a new rigidity theorem which characterizes hyperbolic manifolds. The proof uses ideas from potential theory and Brownian motion on Riemannian manifolds.

Algebra Seminar
Tuesday, November 27, 3:10-4:00pm
3088 EH
Sue Sierra (UM)
The classification of birationally commutative projective surfaces (preliminary report)

Let R be a Noetherian graded domain with cubic growth, such that its graded quotient ring is of the form $K[z, z^{-1}, \sigma]$ for a (commutative) field K . Such a ring R is called a birationally commutative projective surface. We show that any birationally commutative projective surface is determined by geometric data and give a classification of such surfaces. This generalizes work of Stafford and Rogalski on surfaces that are generated in degree 1.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, November 28, 4:10-5:30pm
4088 EH

Joel Merker (ENS)

Local CR geometry, CR orbits, Hilbert transform in Holder spaces and the local Bishop equation

The talk will be designed for non-experts. CR manifolds carry a constant rank induced tangential antiholomorphic distribution which, generically, is not Frobenius-integrable. Beyond Chow's or Nagano's Lie bracket spanning condition, Sussmann orbits are the adequate concept in the smooth category. Usually, holomorphic discs attached to CR manifolds are constructed in Hölder spaces, because of their flexibility for norm computations, Picard iteration, and implicit function theorem.

Study Seminar (Pt. 1) & (Pt. 2)
Thursday, November 29, (Pt. 1) 2:10-3:00 & (Pt. 2) 3:10-4:00
(Pt. 1) 3096 EH & (Pt. 2) 4088 EH

Jon Handy (UM)

The Wolff's Proof of the Corona Theorem, Part 2

Carleson's original proof of the corona theorem for the unit disc in 1962 was very difficult, but in 1980 Thomas Wolff discovered a much simpler, graceful proof. (Word spread so quickly he never had to publish the proof himself!) Since the theory of Hardy spaces is not as fashionable as it once was, we will begin this week by examining the interaction of the geometry of analytic functions in the disc with the geometry of the boundary (the unit circle) and with measures in the disc with certain geometric properties. (continued)

Commutative Algebra Seminar
Thursday, November 29, 3:10-4:00pm
3096 EH

Kazuma Shimomoto (Minnesota)
On Grothendieck's lifting problem

The talk will give a summary of known results related to this problem. The main focus is on the class of rings of positive characteristic. Interesting geometric consequences of the main theorem will be discussed.

Differential Equations
Thursday, November 29, 4:10-5:00pm
4088 EH

Yanyan Li (Rutgers U)

Gradient Estimates for Elliptic Equations and Systems from Composite Material

Gradient Estimates for Elliptic Equations and Systems from Composite Material ---

Abstract: We present some results on gradient estimates for elliptic equations and systems from composite material. The coefficients of the equations and systems are piecewise smooth. Degenerate elliptic equations are allowed. In the elliptic case, the estimates are, even though depending on the size of the surfaces of discontinuity of the coefficients, independent of the distance between these surfaces. For the degenerate case (e.g. the perfect conductivity problem), we present some recent and ongoing joint works with Ellen ShiTing Bao and Biao Yin.

Math Club (Undergraduate Colloquium)
Thursday, November 29, 4:10-5:00pm
1360 EH
John Boller (U of Chicago)
Spinning around and around

Does every rotation in space have a fixed line? Does every rotation in 4-dimensional space have a fixed plane? We are all familiar with Euclid's definition of an angle, classically phrased as "the inclination to one another of two distinct lines in a plane which meet one another", but how does this correspond to the geometry of higher-dimensional Euclidean space? We will study the structure of the group of all rotations in n -dimensional space for $n = 2, 3$, and even 4 , and hint at a surprising result concerning a 360 -degree rotation that does not quite bring you back to where you started.

Student Combinatorics
Thursday, November 29, 4:10-5:00pm
3866 EH
Ryan Kinser (UM)
Numerical invariants of representations of graphs (quiver representations)

We can "represent" a directed graph by assigning vector spaces to the vertices and linear maps to the edges, and identify two representations if they differ by a change of basis at some of the vertices. Some numbers associated to a representation, which are invariant under such base change, include dimensions of the spaces and ranks of the maps. In classifying the representations of a fixed graph Q , it would be nice to have as many of these numerical invariants as possible for Q .

For a certain class of directed graphs (trees with a unique sink), we can combinatorially construct lattices that parametrize all the invariants which "behave like" ranks. This will be demonstrated through examples, and the general procedure discussed, but probably no thorough proof will be given in this talk. The audience will only be assumed to know what rank of a linear map is, everything else will be defined during the talk.

Logic Seminar
Thursday, November 29, 4:10-5:30pm
3096 EH
Peter Krautzberger (Free University of Berlin)
Algebra in the Stone-Cech compactification (and why it might interest set theorists)

Ultrafilters have played a pivotal role in Ramsey-theory for a long time. The set of ultrafilters on a set S can be identified with the Stone-Cech-compactification (taking S to be discrete) and thereby yields topological tools for Ramsey-theory. For a semigroup one can then extend the semigroup operation to the set of ultrafilters and this extension adds very useful algebraic tools. The talk will strive to give a concise introduction to this field and to make some connections to set-theoretically more important ultrafilters.

Student Geometry/Topology
Friday, November 30, 3:10-4:00pm
3096 EH
Jose Manuel Gomez-Guerra(UM)
Stable Homotopy of Spheres I

This is the first talk in a two-part series. Stable homotopy -- the "nice" part of the homotopy groups of spheres -- has inspired much of the work in algebraic topology in the past six decades. While its definition is simple, it follows few simple patterns and is one of the most mysterious objects in modern mathematics. In this talk, we cover the definition of higher homotopy groups, the Freudenthal suspension theorem, the definition of the stable homotopy groups, and Serre's finiteness result.

Combinatorics
Friday, November 30, 4:10-5:00pm
3866 EH
Keith Ball (UCL & UM Gehring Visiting Professor)
Plank and coefficient problems

The plank problem of Tarski asks whether it is possible to cover a hole of diameter 1 with planks whose total width is less than 1. I will explain the solution of the problem and its modern developments including a very general solution of the coefficient problem in harmonic analysis. The methods are a mixture of analysis and combinatorics.

Working Seminar in Several Complex Variables and Complex Dynamics (Special Seminar)
Friday, November 30, 4:10-5:30pm
Location TBA
Egmont Porten (Mid Sweden Univ)
Geometry of CR orbits and holomorphic extension

The talk will be for a general audience. One of the fundamental questions in the study of CR functions on embedded CR manifolds is whether they extend holomorphically to open wedges in the ambient space. If the answer is positive, one can deduce very strong structural information. We will explain the optimal extension theorems which link holomorphic extension with the structure of CR orbits. The original proofs are due to Trépreau and Tumanov in the local, and to Jöricke and Merker in the global case. We will explain a recent, relatively simple argument which shows a very transparent link between differential geometry and extension properties and does apply to the local and global settings uniformly.