Winter 2008
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
February 11th – February 17th

Monday, February 11

3:10-4:00pm **Student Analysis Seminar** --- TBA --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Howard Thompson (Spring Arbor) TBD --- 2866 EH
3:10-4:00pm **Working Group in Integrable Systems and Asymptotics** --- Zhengjie Xu (UM) *Inverse Scattering for the Benjamin-Ono Equation, III* --- 3088 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Jayce Getz (IAS) *The relative trace formula with a view towards simple Shimura varieties* --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Andreea Nicoara (Harvard U) *Equivalence of types* --- 3096 EH
4:10-6:00pm **Geometry & Physics** --- TBA --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, February 12

2:10-3:00pm "**What is … " Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Roman Sauer (Chicago) *Spectral density and isospectral profiles on amenable groups* --- 4088 EH
3:10-4:00pm **Student Algebraic Geometry Seminar** --- Alan Stapledon (UM) *Duality of complex tori* --- 3088 EH
4:10-5:00pm **Colloquium** --- Not meeting this week --- 1360 EH

Wednesday, February 13

3:10-4:00pm **Geometric Function Theory Seminar** --- TBA --- 4096 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- Brian Jurgelewicz (UM) *GIT for quivers* --- 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** --- Anne-Katrin Herbig (U of Wien) *Global regularity of the Bergman projection and the Diederich-Fornaess exponent* --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Bumsig Kim (KIAS) *A compactification of the space of maps from curves* --- 3088 EH

Thursday, February 14

3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Not meeting this week --- 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** --- Tony Bloch (UM) *Hill's equation with random forcing terms* --- 4088 EH
4:10-5:00pm **Math Club** --- Amanda Knecht (UM) *Partitions of integers* --- 2nd floor Nesbitt Common Room
4:10-5:00pm **Student Combinatorics** --- Speaker TBA (UM) *Hyperplane Arrangements III* --- 3866 EH
4:10-5:30pm **Logic Seminar** --- Joe Miller (U of Connecticut) *Extracting information is hard* --- 3096 EH
4:10-6:00pm **Study Seminar** --- Marshall Williams (UM) *Rectifiable sets in metric and Banach spaces (after Ambrosio and Kirchheim), part 2* --- 3088 EH

Friday, February 15

10:50-12:00pm **EECS Theory Seminar** --- Brian Wyman (UM) TBA --- CSE 3941

2:10-3:00pm **Topics in Geometry** --- Dan Burns (UM) *Seiberg-Witten-Floer homology for a contact 3-manifold (continued)* --- 3866 EH

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Todd Kapitula (Calvin College) *The Dynamics of Matter Waves in Bose-Einstein Condensates* --- 1084 EH

3:10-4:00pm **Student Geometry/Topology** --- Nina White (UM) *Lie Groupoids and Orbifold Groupoids* --- 3096 EH

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

UPCOMING EVENTS

Graduate Student Recruitment Weekend
March 14 & 15, 2008

ABSTRACTS FOR THE WEEK OF FEB. 11 – FEB. 17, 2008

Number Theory and Representation Theory Seminar
Monday, February 11, 3:10-5:00pm
4096 EH
Jayce Getz (IAS)
The relative trace formula with a view towards simple Shimura varieties

Let E be a number field, and G a connected reductive group with involution i. A conjectural philosophy of Jacquet is that an automorphic representation of G with a nonzero period against G^I should be a functorial transfer of an automorphic representation on some other group H.
Using a version of the relative trace formula, we prove theorems confirming this expectation in certain cases when G is a classical unitary group and a Galois automorphism of E gives rise to i. As a corollary, we provide a large class of cohomologically nontrivial cycles on simple Shimura varieties, generalizing work of Harder-Langlands-Rapoport et al. in the GL(2) case.
This is joint work in progress with Eric Wambach.

Several Complex Variables Seminar
Monday, February 11, 4:10-5:00pm
3096 EH
Andreea Nicoara (Harvard U)
Equivalence of types

In 1979 Joseph J. Kohn showed that the subellipticity of the ∂-Neumann problem on a pseudoconvex domain with real-analytic boundary is equivalent to the termination of a certain algorithm he devised that constructed subelliptic multipliers and to the condition that all holomorphic varieties have finite order of contact with the boundary of the domain. This three-way equivalence for the more general case of a smoothly-bounded pseudoconvex domain is called the Kohn Conjecture. I will describe my solution to the Kohn Conjecture involving algebraic geometry over the non-Noetherian ring of smooth functions as well as Catlin's notions of boundary systems and multitypes.

Geometry Seminar
Tuesday, February 12, 3:10-4:00pm
4088 EH
Roman Sauer (Chicago)
Spectral density and isospectral profiles on amenable groups

We explain known and new relations between the return probability of random walks, isoperimetric inequalities, and the low-frequency behaviour of the Laplace operator on Cayley-graphs of amenable groups and on manifolds with amenable fundamental groups. The motivating starting point is Kesten's characterization of amenability. This is based on joint work with Alexander Bendikov and Christophe Pittet.

Student Representation Theory/Lie Theory Seminar
Wednesday, February 13, 3:10-4:00pm
3088 EH
Brian Jurgelewicz (UM)
GIT for quivers

Let Q be a quiver, and Rep(Q,d) be the affine representation space, for some dimension vector d. The product general linear group, GL (d), acts on Rep(Q,d).
There is a bijection between orbits and isomorphism classes, under which closed orbits correspond to isomorphism classes of semi-simple representations. The space of closed orbits naturally forms an affine variety. But the story does not stop there.
We return to Rep(Q,d) and watch a representation move under a one-parameter subgroup. As it approaches the unique semi-simple object in its closure, it "decays"- i.e. there is a descending chain of submodules with semi-simple factors. This leads to semi-stable representations (those whose decays are all 'acceptable'). It then remains to construct a moduli space for closed orbits within the semi-stable locus. Our goal will be to strike a balance between theory and example.

Working Seminar in Several Complex Variables and Complex Dynamics
Wednesday, February 13, 4:10-5:30pm
4088 EH
Anne-Katrin Herbig (U of Wien)
Global regularity of the Bergman projection and the Diederich-Fornaess exponent

Suppose D is a smoothly bounded, pseudoconvex domain for which the Diederich-Fornæss exponent can be chosen arbitrarily close to 1. J.J. Kohn showed that this implies that the Bergman projection is globally regular. I will demonstrate a different proof of this fact which goes back to unpublished work of J.D. McNeal.

Commutative Algebra Seminar
Thursday, February 14, 3:10-4:00pm
3096 EH
Mel Hochster (UM)
Phantom homology (cont.)

This is the second of several lectures that 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

Math Club
Thursday, February 14, 4:10-5:00pm
2nd floor Nesbitt Common Room
Amanda Knecht (UM)
Partitions of integers

A partition of a positive integer is the number of ways of writing it as a sum of positive integers (up to reordering of the terms). For example, 4 can be partitioned in 5 ways (4, 2+2, 3+1, 2+1+1, 1+1+1+1). How many partitions of a given integer are there? How does this number grow as the positive integer grows? Does it reflect any arithmetic properties of positive integers (such as parity)? The study of such questions originated with Euler in 1748, and some of the most remarkable contributions to the subject were made by Ramanujan.
We will explore some of the properties of the partition function and consider various ways of expressing a positive integer as a sum of others. For example, the number of ways to write a positive integer as a sum of odds is the same as the number of ways to write it as a sum of distinct positive integers.

Logic Seminar
Thursday, February 14, 4:10-5:30pm
3096 EH
Joe Miller (U of Connecticut)
Extracting information is hard

Can randomness -- or more technically, "information" -- be effectively extracted from a semi-random source? A special case of this question was answered by von Neumann in 1951. He described a simple method for extracting an unbiased random sequence from the flips of a biased coin. A more general form of the question was asked by Reimann and Terwijn in the context of algorithmic randomness, so we will start with an introduction to Kolmogorov complexity, effective Hausdorff dimension, and Martin-L"of randomness. Kolmogorov complexity measures the information content of a finite binary string. Informally, the complexity of a string is defined to be the length of the shortest program that generates it. A closely related notion, effective (Hausdorff) dimension, measures the information density of infinite binary sequences. We can now formulate the question in terms of effective dimension: is there a sequence that has effective Hausdorff dimension 1/2 -- in other words, a half-random sequence -- that does not compute a sequence of higher effective dimension? As it turns out, such sequences exist. We will discuss this result and related work.

Study Seminar
Thursday, February 14, 4:10-6:00pm
3088 EH
Marshall Williams (UM)
Rectifiable sets in metric and Banach spaces (after Ambrosio and Kirchheim), part 2

We will discuss a paper by Luigi Ambrosio and Bernd Kirchheim analyzing rectifiable subsets of metric spaces (a set is k-rectifiable if it is, up to an H^k null set, a countable union of Lipschitz images of subsets of R^k). Using isometric embeddings into dual Banach spaces, the authors define a weak* differential, which is shown to be intrinsic in a suitable sense. Weak* differentiation is closely related to “metric differentiation”, introduced in an earlier paper of Kirchheim. We will discuss these differentiation theorems and their applications, including a Rectifiability criterion as well as area and coarea formulas. (continued).

Applied and Interdisciplinary Mathematics Seminar
Friday, February 15, 3:10-4:00pm
1084 EH
Todd Kapitula (Calvin College)
The Dynamics of Matter Waves in Bose-Einstein Condensates

The dynamics of matter waves in two-dimensional, magnetically trapped Bose-Einstein condensates are of great interest both mathematically and physically. I will outline the physical problem, show some of the structures that have been observed numerically, analytically, and experimentally, and then give an idea as to what type of analysis can be done on the problem. The analysis will primarily focus upon the existence and spectral stability of matter waves which arise as steady-state solutions in a rotating frame.

Student Geometry/Topology
Friday, February 15, 3:10-4:00pm
3096 EH
Nina White (UM)
Lie Groupoids and Orbifold Groupoids

Orbifolds are usually introduced as a generalization of manifolds-- instead of locally looking like $\mathbb{R}^n$, they locally look like quotients of $\mathbb{R}^n$ by the linear action of a finite group. In this talk, I'll take a different approach, following the first three sections of an introductory paper by Ieke Moerdijk, in which the theory of orbifolds is developed via (certain kinds of) groupoids. Using groupoids allows us to work with orbifolds via global objects, instead of via local objects like charts . In the second lecture (by Jose), we'll see why this approach is a bridge to \emph{global} invariants of an orbifold such as its homotopy-type and K-theory.