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

Monday, November 19

3:10-4:00pm **Student Analysis Seminar** --- Marshall Williams (UM) *Differentiation on Metric Spaces* --- 3866 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- Not meeting this week --- 2866 EH
3:10-5:00pm **Number Theory and Representation Theory Seminar** --- Junecue Suh (MIT) *Newton integral motives over finite fields* --- 4096 EH
4:10-5:00pm **Several Complex Variables Seminar** --- Zeljko Cuckovic (U of Toledo) *Special Toeplitz operators that improve integrability* --- 3096 EH
4:10-6:00pm **Geometry & Physics** --- Pan Peng (Harvard) *On a proof of the Labastida-Marino-Ooguri-Vafa conjecture* --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Not meeting this week --- 3088 EH

Tuesday, November 20

2:10-3:00pm "**What is … " Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Ben Weinkove (Harvard) *Symplectic forms, Kahler metrics and the Calabi-Yau equation* --- 4088 EH
3:10-4:00pm **Algebra Seminar** --- Ryan Kinser (UM) *The Rank of a Quiver Representation* --- 3088 EH
3:10-4:00pm **Student Representation Theory/Lie Theory Seminar** --- TBA --- 4096 EH
4:10-5:00pm **Colloquium** --- Blake Temple (UC Davis/UM Visiting Scholar) *A Mechanism for the Propagation of Nonlinear Time-Periodic Sound Waves* --- 1360 EH

Wednesday, November 21

3:10-4:00pm **Geometric Function Theory Seminar** --- Not meeting this week --- 4096 EH
3:10-4:00pm **Student Arithmetic Seminar** --- Not meeting this week --- 3866 EH
3:10-4:00pm **Student AIM Seminar** --- Not meeting this week --- 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** --- Not meeting this week --- 4088 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Not meeting this week --- 3088 EH

Thursday, November 22

2:10-3:00pm **Student Algebraic Geometry Seminar** --- Not meeting this week --- 3866 EH
2:10-3:00pm **Study Seminar (Pt. 1)** --- Not meeting this week --- 3096 EH
3:10-4:00pm **Study Seminar (Pt. 2)** --- Not meeting this week --- 4088 EH
3:10-4:00pm **Financial/Actuarial Mathematics Seminar** ---Not meeting this week --- 3088 EH
3:10-4:00pm **Commutative Algebra Seminar** --- Not meeting this week --- 3096 EH
3:10-4:00pm **Topology Seminar** --- Not meeting this week --- 4096 EH
4:10-5:00pm **Differential Equations** --- Not meeting this week --- 4088 EH
4:10-5:00pm **Math Club** --- Not meeting this week --- 2nd Floor Nesbitt Room
4:10-5:00pm **Student Combinatorics** --- Not meeting this week --- 3866 EH

Friday, November 23

10:50-12:00pm **EECS Theory Seminar** --- Not meeting this week --- CSE 3941
3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Not meeting this week ---1084 EH
3:10-4:00pm **Student Geometry/Topology** --- Not meeting this week --- 3096 EH
4:10-5:00pm **Combinatorics** --- Not meeting this week --- 3866 EH

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. 19 – NOV. 25, 2007

Student Analysis Seminar
Monday, November 19, 3:10-4:00pm
3866 EH
Marshall Williams (UM)
Differentiation on Metric Spaces

In the past decade there have been a number of generalizations of concepts from calculus on smooth manifolds. In this talk I will describe some these generalizations, which let us do analysis in highly non-smooth settings. In particular, I will explain how to make sense of words like “gradient” and “coordinate chart” in a metric space. Both of these words will make sense in any space, subject to just two restrictions: namely, the space must be “finite dimensional”, and have “sufficiently many” curves of finite length. I will make both of these ideas precise in the talk.

Number Theory and Representation Theory Seminar
Monday, November 19, 3:10-5:00pm
4096 EH
Junecue Suh (MIT)
Newton integral motives over finite fields

Serre showed, decades ago, that there cannot be a "rational singular cohomology" (i.e., a cohomology with Q-coefficients yielding the Q_{\ell}-\'etale cohomology when tensored) in characteristic p>0: if there were, the (quaternion) endomorphism algebra of a super-singular elliptic curve would act on a two-dimensional rational vector space. Suitably assuming Tate's conjecture, however, we construct such a cohomology theory, applicable to varieties that are *ordinary* (hence avoiding Serre's examples), a condition that is believed to be generically satisfied. As an application, we give a partial and conditional answer to questions of Serre and of Katz on the Poincar\'e pairing on mod-\ell cohomology groups..

Several Complex Variables Seminar
Monday, November 19, 4:10-5:00pm
3096 EH
Zeljko Cuckovic (U of Toledo)
Special Toeplitz operators that improve integrability

We study mapping properties of Toeplitz operators on strongly pseudoconvex domains, whose symbol is a positive power of the distance to the boundary. (Joint work with J. McNeal)

Geometry & Physics
Monday, November 19, 4:10-6:00pm
4088 EH
Pan Peng (Harvard)
On a proof of the Labastida-Marino-Ooguri-Vafa conjecture

There have been a lot of marvelous results revealed by string theory, which deeply relate different aspects of mathematics. All these mysterious relations are connected by a core idea in string theory called "duality". Based on large N Chern-Simons/topological string duality, in a series of papers, J.M.F. Labastida, M. Marino, H. Ooguri and C. Vafa conjectured certain remarkable new algebraic structure of link invariants and the existence of infinite series of new integer invariants in the topological string theory. In this talk, I will discuss a proof of this conjecture and its relation to other problems, for example, the famous volume conjecture.

Algebra Seminar
Tuesday, November 20, 3:10-4:00pm
3088 EH
Ryan Kinser (UM)
The Rank of a Quiver Representation

A quiver representation can be thought of as a diagram of vector spaces. The rank of a linear map is a useful, well understood numerical invariant in linear algebra, so we would like to generalize this concept to an arbitrary quiver representation. We do this by defining a functor which gives the ``global rank of a quiver representation'' and prove that it has nice properties which make it a generalization of the rank of a linear map. We demonstrate how to construct other ``rank functors'' for a quiver Q, which induce ring homomorphisms (called ``rank functions'') from the representation ring of Q to Z. These rank functions give discrete numerical invariants of quiver representations, useful for computing tensor product multiplicities of representations and determining some structure of the representation ring. Time permitting, we will discuss the fact that rank functors commute with the Schur operations on quiver representations (in characteristic 0) and hence induce lambda-ring homomorphisms.

Colloquium
Tuesday, November 20, 4:10-5:00pm
1360 EH
Blake Temple (UC Davis/UM Visiting Scholar)
A Mechanism for the Propagation of Nonlinear Time-Periodic Sound Waves

The compressible Euler equations were derived by Leonard Euler in 1752 as an extension of Newton's laws of motion to the setting of continuous media. In that year, Euler derived the equations from physical principles, linearized the equations, and thereby confirmed D'Ambert's idea that sound waves are oscillations in the density that evolve according to the linear wave equation. Hence came the linear theory of sound, with modes of vibration, harmonics, and everything that is the starting point of the theory of music today. Since Euler's time, it has been unknown whether the fully nonlinear equations could support oscillatory time-periodic solutions analogous to the sinusoidal oscillations of sound waves in the linearized theory. For most of the last 250 years, experts have believed that time-periodic solutions of the compressible Euler equations which propagate like sound waves, were physically impossible due to the ubiquitous formation of shock waves. (Formation of shock waves from smooth solutions was first demonstrated by Riemann.) This intuition was supported in 1970 by a famous paper of Peter Lax and James Glimm, in which they proved that solutions of the compressible Euler equations starting from time-periodic initial data must form shock waves and decay away by shock wave dissipation at a rate $1/t$...but their theorem required the simplifying assumption that the entropy (or temperature) be constant, required so that the complexity of the system dropped from 3 to 2 coupled equations. In this talk I discuss joint work with Robin Young in which we derive the simplest nonlinear wave pattern that is consistent with periodic evolution when the entropy is not constant, and discuss progress in the authors' program to prove that such time-periodic solutions solve the compressible Euler equations exactly.

Geometry Seminar
Tuesday, November 20, 3:10-4:00pm
4088 EH
Ben Weinkove (Harvard)
Symplectic forms, Kahler metrics and the Calabi-Yau equation

Yau's theorem on Kahler manifolds states that there exists a unique Kahler metric in every Kahler class with prescribed volume form. This has many applications in complex geometry. I will discuss results on Donaldson's program of extending the Calabi-Yau theory to symplectic manifolds. In a different direction, I will talk about the problem of existence of constant scalar curvature Kahler metrics, which can also be considered a generalization of Yau's theorem.
Here are some links to preprints:
Tosatti, V., Weinkove, B., Yau, S.T. Taming symplectic forms and the Calabi-Yau equation, http://www.arxiv.org/abs/math/0703773
Song, J., Weinkove, B. On the convergence and singularities of the J-flow with applications to the Mabuchi energy, http://www.arxiv.org/abs/math/0410418
Phong, D.H., Song, J., Sturm, J., Weinkove, B. The Moser-Trudinger inequality on Kahler-Einstein manifolds, http://www.arxiv.org/abs/math/0604076