

MATHEMATICS DEPARTMENT SEMINAR SCHEDULE

February 10 – February 14, 2003

All seminars are held in Boyd Graduate Studies unless otherwise noted

MONDAY, February 10, 2003

Group Representation and Cohomology

2:30p.m., Room 302

Speaker: Graham Matthews, University of Georgia

Title of talk: *Projective Resolutions, continued*

Topology

2:30p.m. Room 326

No Meeting this week

Faculty and Graduate Social

3:00 p.m., Room 409

Coffee, Tea, Cookies

Number Theory Seminar

3:30 p.m., Room 304

Speaker: Bill McCallum, University of Arizona

Title of talk: *The Arithmetic of Fermat Curves*

Abstract: We start with a general introduction to the geometry and arithmetic of Fermat curves. We then describe conjectures about algebraic points on Fermat curves, and the descent techniques of Tzermias which can be used to attack these conjectures. Finally we describe some recent joint work with Tzermias in which calculations of the Shafarevich-Tate group of the jacobian of a Fermat curve has led to progress on these conjectures for Fermat curves of low degree.

CATS

4:40 p.m., Room 306 Boyd Graduate Studies

Speaker: Rod Canfield, Professor, UGA Computer Science Dept.

Title of talk: *The Cauchy Integral Formula and Enumeration - I.*

Abstract: Cauchy (1789-1857) is credited with discovering the Cauchy Integral Formula. When a function $f(z)$ is defined by a power series

$$f(z) = \sum_{n=0}^{\infty} a_n z^n,$$

(z varies over complex numbers) the CIF allows you to express the coefficient a_n in terms of the numbers $f(z)$ as z varies around a circle.

This is a useful technique in combinatorial enumeration, analytic number theory, mathematical physics, etc etc.

The two-part lectures will be intended to make the student, who is assumed to be familiar with complex numbers but NOT to have ever taken a course in complex analysis, an expert on the technique.

These lectures are tied in to the enumeration of bipartite graphs, some research done jointly with Brendan McKay. There was a lecture last Fall about a computer program for calculating said numbers. That lecture is independent of this one, but the overall goal is to work towards presenting the results of that research.

TUESDAY, February 11, 2003

VIGRE

2:00-3:15 p.m., Room 304

Speaker: William McCallum, University of Arizona

Title of talk: VIGRE review

Abstract: Professor McCallum is the chairman of committee to review our VIGRE program. The other members of the committee are Professors Jim Wilson and Rod Canfield of UGA. They will use this VIGRE seminar to meet with department graduate students and discuss the VIGRE program at UGA. All graduate students are strongly encouraged to attend this important meeting. Tell the committee what you like and what you don't like about VIGRE! (Mathematics faculty will not attend the meeting.)

Student Number Theory

3:30 p.m., Room 222

Speaker: Charles Pooh, University of Georgia

Title of talk: *It's as easy as abc (Part II)*

Analysis

3:30p.m., Room 322

No Meeting this week

WEDNESDAY, February 12, 2003

Wavelet Analysis

10:10-11:10 a.m., Room 524

Speaker: Haipeng Liu, University of Georgia

Title of talk: *Regular compactly supported wavelets in sobolev spaces, continued*

Graduate Student Seminar

2:30 p.m., Room 302

No Meeting this week

Algebraic Geometry

2:30 p.m., Room 303

Speaker Sevin Recillas, Instituto de Matemáticas UNAM, Morelia (visiting UGA during February)

Title of talk: *Decomposition of Jacobians of complex curves with automorphisms*

Problem Solving Group

2:30 p.m., Room 322

Faculty and Graduate Social

3:00 p.m., Room 409

Coffee, Tea, Cookies

Numerical Analysis

3:30 p.m., Room 410

TBA

Lie Theory

3:30 p.m., Room 303

No Meeting this week

Arithmetic Geometry/Number Theory

3:30 p.m., Room 304

Speaker: Dino Lorenzini, University of Georgia

Title of talk: *Ranks of certain elliptic curves, following Mazur.*

THURSDAY, February 13, 2003**Faculty and Graduate Social**

3:00 p.m., Room 409

Coffee, Tea, Cookies

Colloquium

3:30 p.m., Room 304

Speaker: Dr. Xin Guo, IBM, New York

Title of talk: *Regime Switching Models: A Random Walk Beyond the Black-Scholes*

Abstract: Of late, regime switching-based models have had tremendous impact in diverse areas ranging from speech recognition to mathematical finance. Regime switching is a double-edged sword---while on one hand it adds realism to the underlying model, on the other, it makes the mathematics more challenging. In the talk, we shall begin with a brief account of the classical Black-Scholes-Merton's model and the option pricing methodology. We will then discuss a regime switching model in the context of option pricings and outline some techniques for solving the relevant optimal stopping problems.

Finally, we will state some challenging mathematical issues that are related to this work.

FRIDAY, February 14, 2003

Geometry

2:20 p.m., Room 322

Speaker: TBA

Title of talk: TBA

Special Algebraic Geometry and Number Theory Seminar

10:00 a.m., Room 302

Speaker: Luc Illusie, Université Paris-Sud, Orsay, and visiting the Univ. of Minnesota

Title of talk: *"Semistable reduction and independence of l for traces of Galois twisted correspondences, after T. Saito"*

Upcoming Events

MONDAY, February 17, 2003

Faculty and Graduate Social

3:00 p.m., Room 409

Coffee, Tea, Cookies

Colloquium

3:30 p.m., Room 304

Speaker: Jorge Cortés Monforte, University of Illinois

Title of talk: *Geometric Methods For Control and Coordination Of Autonomous Systems*

Abstract: In this talk we present recent progress on motion planning and control algorithms for single and multiple vehicle systems. This work is motivated by applications to autonomous robotic systems and mobile sensing networks. On the basis of our approach is the idea of exploiting the geometric structures behind the differential equations governing the evolution of mechanical control systems. For single-input systems, we present results on controllability, on series expansions describing the evolution of the trajectories, and on averaging under high amplitude and high frequency forcing. For multiple vehicle systems, we focus on decentralized control laws for the coordination of networks performing spatially distributed sensing tasks. The technical approach relies on a collection of tools from Nonlinear Control Theory, Geometric Mechanics, Nonsmooth Analysis and Distributed Algorithms.

THURSDAY, February 20, 2003

Faculty and Graduate Social

3:00 p.m., Room 409
Coffee, Tea, Cookies

Colloquium

3:30 p.m., Room 304

Speaker: Pavel Lushnikov, Los Alamos National Laboratory

Title of talk: *Nonlinear Theory of the excitation of surface waves by wind due to the Kelvin-Helmholtz instability*

Abstract: The interface of two ideal fluids is unstable to linear perturbations if the relative speed (wind) of two fluids exceeds a threshold value, which depends on the surface tension and the acceleration of gravity, as was discovered by Kelvin and Helmholtz in 19th century. Does nonlinearity saturate the linear instability or cause a finite time singularity at the boundary surface? To answer that question a nonlinear theory of the Kelvin-Helmholtz instability is developed on a basis of the Hamiltonian description of a boundary surface of two ideal fluids. Perturbation theory exploits a small-angle approximation of surface elevation. The basic nonlinear process is the wave-wind interaction which differs significantly from the nonlinear interaction in the absence of wind. It is shown that nonlinearity does not saturate the linear instability but, on the contrary, leads to an explosive growth of the amplitude. Near the instability threshold, the envelope of surface elevation is described by a nonlinear (2+1)-dimensional Klein-Gordon equation. An exact analytical proof of singularity formation in a finite time is given and depends on the initial condition for the nonlinear Klein-Gordon equation. Singularity formation allows one to explain satellite and airplane observations of the very sharp dependence of the fraction of sea surface covered by foam on the wind velocity. Implication of the proposed theory to recent year experimental observation of Kelvin-Helmholtz instability at the interface between superfluid $^3\text{He-A}$ and superfluid $^3\text{He-B}$ is discussed.

WEDNESDAY, February 26, 2003

Faculty and Graduate Social

3:00 p.m., Room 409
Coffee, Tea, Cookies

Colloquium

3:30 p.m., Room 304

Speaker: Cristian Popescu

Title of talk: *TBA*

Abstract: TBA