

MATHEMATICS DEPARTMENT SEMINAR SCHEDULE

March 3 – March 7, 2003

All seminars are held in Boyd Graduate Studies unless otherwise noted

MONDAY, March 3, 2003

VIGRE Research Group

10:30-12:30, Room 524

Speaker: Ivan Cheltsov, University of Georgia

Title of talk: *"Birational geometry of 3-folds"*

Group Representation and Cohomology

2:30p.m., Room 410

Speaker: Jo, JangHyun

Title of talk: *Projective Complete cohomological dimension of a group*

Abstract: Let G be an arbitrary group. The projective complete cohomological dimension of G , denoted by $\text{pcpd } G$, is defined to be the least integer n for which $H^i(G, W) \cong W$ for $i > n$, where $H^i(G, W)$ is the complete cohomology of G . We study the properties of projective complete cohomological dimension of a group and then using this, we give the partial answers of some conjectures.

Topology

2:30p.m. Room 326

Speaker: Will Kazez, University of Georgia

Title of talk: *Closed transversals for laminations*

Faculty and Graduate Social

3:00p.m., Room 409

Coffee, Cookies, Tea

Mathematics and Engineering Colloquium

3:30pm, Room 328 Grad Studies Bldg.

Speaker: Professor MingQing Xiao Department of Mathematics Southern Illinois University

Title of talk: *Feedback Control Of Compression Systems*

Abstract: In recent years, control of compression systems has become a topic of much research interest to control engineers. One of the major challenges in the design and operation of compression systems is handling the instabilities that arise in the unsteady fluid structural dynamics. This is because when a turbo-machine, such as a jet engine, operates near its optimal operating point, the flow can become unstable. Two kinds of instability phenomena, rotating stall and surge, are of major concern in compression systems, as they can lead to undesirable reduction in performance and even damage to engine components during operations.

In this talk, I will present some of our recent results in controlling compression systems. I will first introduce the full-order compression system model, the so-called Moore-Greitzer model, and show that it is not (topologically) equivalent to its linearized version near the point where the pressure rise closes to its maximum. I will then show that the Moore-Greitzer model features a center manifold near this maximum pressure rise, which makes it possible to translate the study of the behavior of the local flow in the compressor into a study of the flow of two scalar ODE's on the center manifold. Using the normal form of a nonlinear system obtained through integral averaging, I will introduce a nonlinear state feedback controller, which accomplishes the tasks of preventing the closed-loop system from entering either rotating stall or surge and causing the closed-loop pressure rise coefficient to approach its maximum with the elimination of hysteresis. I will close by presenting numerical simulations of open-loop and closed-loop models, to illustrate the analysis and the results.

TUESDAY, March 4, 2003

VIGRE

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

Speaker: David (Jim) Blair, University of Georgia

Title: *Chains of Spheres*

Abstract: Our VIGRE group has been studying necklaces and chains of spheres; particularly the problem of how large of a necklace is required to encircle two chains, assuming all spheres are of the same size. This talk will be a survey of our methods and results to date.

Student Number Theory

3:30 p.m., Room 222

No Meeting this week

WEDNESDAY, March 5, 2003

Wavelet Analysis

10:10-11:10 a.m., Room 542

Speaker: Kyunglim Nam, University of Georgia

Title of talk : *Compactly supported tight frames and sibling frames.*

Graduate Student Teaching Seminar

2:30 p.m., Room 302

Speaker: Clint McCrory, University of Georgia

Title of talk: *VIGRE and Math Ed*

Abstract: The mathematicians who recently reviewed our VIGRE grant suggested that we should develop opportunities for our graduate students to work with faculty and graduate students in the UGA Mathematics Education Department. I will talk about what's going on in Math Ed these days, what roles Math graduate students can play, and what's in it for us.

Algebraic Geometry

2:30 p.m., Room 303

Speaker: Ivan Cheltsov, University of Georgia

Title of talk: *"Birational rigidity of a four-dimensional smooth complete intersection of a quadric and a quartic not containing a plane", part 2*

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

Speaker: Paul Wenston, University of Georgia

Title of talk: *The numerical approximation of the thin film equation*

Lie Theory

3:30 p.m., Room 303

No Meeting this week

Arithmetic Geometry/Number Theory

3:30 p.m., Room 304

Speaker: Matt Baker, University of Georgia

Title of talk: *Large and small points in arithmetic geometry*

Abstract: We give a broad outline of the Bombieri-Vojta proof of the Mordell conjecture, and explain the analogy with the Beukers-Schlickewei proof of finiteness of solutions to the S-unit equation. We will discuss in particular the role of "small" versus "large" points in these proofs. If time permits, we will also discuss "specialization" arguments which allow one to reduce theorems about varieties over the complex numbers to theorems about varieties over a number field.

THURSDAY, March 6, 2003

Faculty and Graduate Social

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

Mathematics and Engineering Colloquium

3:30 p.m., Bldg. 1140, Forestry, Rm. 100

Speaker: Professor Weijiu Liu, Department of Mechanical Engineering
Massachusetts Institute of Technology

Title of talk: *Mixing in Chaotic Advection Flows and Feedback Flow*

Abstract: Why study mixing? Fluid mixing is often encountered in engineering applications and it is carried out in order to achieve good performance in some processes like the mixing of air and fuel in combustion engines. Persistent patterns in chaotic fluid mixing have been observed in experiments and numeric simulations but could not be described mathematically. With the help of Floquet theory, we will present an answer to this open problem.

Why flow control? In engineering applications we often need to control a flow to behave in a desirable way. For instance, we need to design a control to stabilize a laminar flow which is preferred in engineering. In this talk we also show boundary feedback controls designed for 2D channel flow.

FRIDAY, March 7, 2003

Geometry

2:20 p.m., Room 322

Speaker: Aaron Abrams, Joe Fu, Chad Mullikin, University of Georgia

Title of talk: *The Alexander-Berg-Bishop theorem on nonpositively curved Riemannian manifolds with boundary*

Upcoming Events

MONDAY, March 31, 2003

Cantrell Lecture Series

4:00 p.m., Room 202, Physics

Speaker: Dr. Joan Birman, Barnard College, Columbia University

Title of talk: *Scientific publication: a mathematician's viewpoint*

Abstract: Digital computers have brought enormous changes in the way mathematicians work. One of them relates to an issue which sounds trivial, even though it is not: the art of mathematical typesetting died just as budget problems forced universities to cut back secretarial support. Mathematicians had to learn how to type their own papers! That led to an interesting mathematical problem which was solved by Donald Knuth, the inventor of a new “language” called “ \TeX ”. In this talk I'll discuss \TeX , how it works and how it has led to a small revolution in mathematical publishing (which the commercial publishers are just beginning to appreciate). I'll describe the process by which math journals are created, and the multiple roles that mathematicians play in that process. I'll discuss the new economic pressures. In particular I'll tell you about two new professional journals which just may be winning a battle which has the potential to put the giants in the scientific publishing world out of business.