N.C. State University
Mathematics Newsletter

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Website: http://www.math.ncsu.edu/undergrad/

What's inside?

Meet Dr. Mark Hoefer
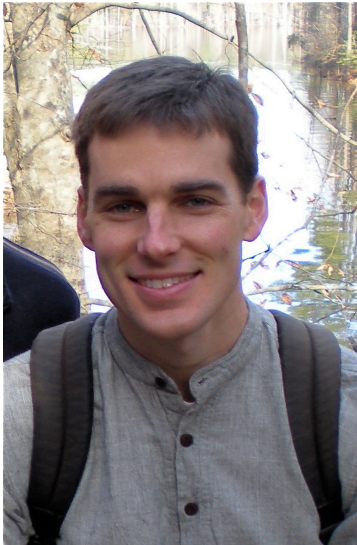
Meditating in India, cycle touring in Tasmania, walking around town with my wife Jill and our puppy Piper, or doing physical applied math in SAS Hall are some of the ways I appreciate spending my time.

From the momentous day in high school when I realized that the laws of physics can be described in mathematical terms (e.g. calculus), I have been drawn to the study of physical applied math. It still amazes me when long mathematical or numerical calculations, seemingly divorced from anything tangible, predict a result that is observable in experiment. My research has been applied to nonlinear waves in quantum mechanics, nanomagnets, nonlinear optics, and other fluids.

In line with my scientific explorations are my investigations of the interaction between mind and body with the help of Vipassana meditation (Vipassana means to see things as they really are). I stumbled into my first Vipassana course in Dehra Dun, India in 1998, fresh out of my undergraduate studies. Since then I have been fortunate enough to travel a great deal and experience a number of fascinating cultures. This is one reason why the diversity and richness of the academic environment in general, and in particular here at NCSU, are so valuable to me.

Most days you will find me walking or riding my bike to campus from Gardner Street. During time off I enjoy spending time with my family, hiking in the hills, sipping tea, and volunteering.
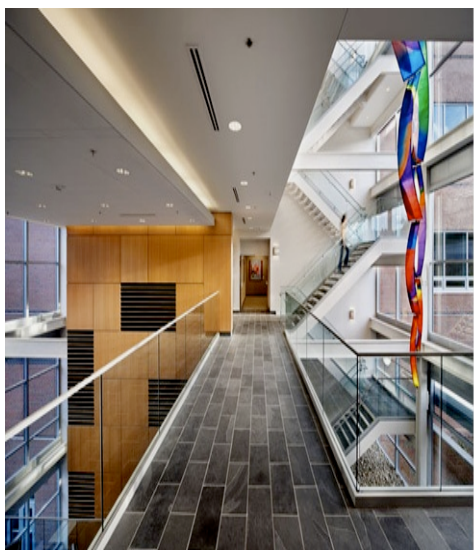
Course Highlights

MA 402 - Computational Mathematics: Models, Methods and Analysis
*Prerequisite: Programming proficiency (Matlab, C++, Java, Fortran, or other language) and PY 2** . Corequisite: MA 341*

Introduction to high performance computing and numerical modeling. Matrix models and boundary value problems with an emphasis on heat and mass transfer. Assessments of all approximations in the computational engineering and science process. More details are at http://www4.ncsu.edu/eos/users/w/white/www/white/ma402/ma402adv.pdf

MA 430 – Mathematics Models in the Physical Sciences
Prerequisite: MA 341 or 301; and MA 405

The purpose of this course is to introduce students to certain ideas and concepts in physics from a mathematics perspective. Unlike versions of the course taught in recent years, it is our intent to deemphasize unnecessary abstraction by focusing on topics, which are amenable to students familiar with basic vector calculus and linear algebra. The topics to be covered include:
1) the notions of energy and angular momentum in Newtonian physics and their role in solving Kepler's problem, and
2) an introduction to basic special relativity and Minkowski geometry. Other topics to be covered will be selected from the following list according to the interests of those who register for the course: the Schwarzschild model of a star and an analysis of Schwarzschild black holes; Euclidean and Lorentzian tensors; the development of exterior calculus, differential forms, and their applications; elementary axiomatic thermodyamics at the level of the book by Fermi.

MA 437: Applications of Algebra
Prerequisite: MA 403 or 407, MA 405

What allows CD's to play even when scratched? What lets you send your bankcard number securely over the web? How can you design efficient experiments to give meaningful statistical results? How can we decide if an industrial robot can perform a desired manufacturing job? What are some of the principal mathematical tools of computer aided geometric design? What allows us to enumerate isomers in organic chemistry? The answers to these questions all involve applications of abstract algebra - a tool that, precisely because of its abstract nature and power, has the versatility to be applied to so many fields. In this course we will use the algebra you earned in MA 403/407 and MA 405 to answer the above questions. We will look at mathematical topics in error correcting codes, cryptography, algorithmic manipulation of polynomials (resultants and Groebner bases), block designs, and Polya counting theory. We will use the book "Applications of Abstract Algebra with MAPLE" by Klima, Sigmon and Stitzinger as well as new notes produced by the instructor. The grade will be given on the basis of homework and a project. This course will also be offered as an honors option. Contact the instructor, Michael Singer, singer@math.ncsu.edu, if you have any questions.

MA 444H- Problem Solving Strategies for Competitions

North Carolina State University participates in a national mathematics competition known as the William Lowell Putnam Competition. We believe that you might have the ability and interest in mathematics to consider participating in this competition. We invite you to join a special class that meets once a week to help students prepare for the competition. You are invited to register for the one-credit course MA 444H, Problem Solving Strategies for competitions, which is scheduled to meet from 3:00 to 3:50 Wednesdays. The course is taught by faculties of mathematics department who have some experience with math competitions. Among them are some silver and bronze medalists from International Mathematics Olympiad. The course is graded by F and S so it will not lower your GPA. If you would like to know more about the Putnam Competition you can contact Xiao-Biao Lin in SAS 3218, or by email (xblin@math.ncsu.edu).

MATH RIDDLE

Bob & John form a team together. Bob is as old as John will be when Bob is twice as old as John was when Bob was half as old as the sum of their current ages. John is as old as Bob was when John was half as old as he will become over ten years.

How old are Bob and John?

Find the Solution at:
www.math.ncsu.edu/undergrad/newsletter/

MA 351-Introduction to Discrete Mathematical Models

MA 401- Applied Differential Equations II

MA 402- Computational Mathematics: Models, Methods & Analysis

MA 408- Foundations of Euclidean Geometry

MA 413- Short-Term Actuarial Models

MA 421- Introduction to Probability

MA 426- Mathematical Analysis II

MA 427- Introduction to Numerical Analysis I

MA 430- Mathematical Models in the Physical Sciences

MA437-Applications of Algebra

MA 430- Mathematics Models in Physical Sciences

MA 440- Game Theory

MA 444H- Problem Solving Strategies for Competitions

MA 521- Abstract Algebra I

Math Honors Program

- **David Brown** graduated last fall and is currently in graduate school in mathematics at **Worchester Polytech**.
- **Seven** students have joined the program since last October and we anticipate that **thirteen** students will graduate in May.
- **Jacob Ward** returned from the **Budapest Semester** in Mathematics and **Becky Maust** returned from a study abroad semester in **India**.
- Several students are currently doing research with math faculty and will be presenting their research at the end of the semester so keep an eye out for announcements about undergrad research presentations!

Overview of Honors Program

Thirty-one students are currently participating in the Math Honors Program **20-25%** of students graduating with a Math BS complete the Math Honors Program **80%** of those students go on to graduate school

- Schools include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA
- 14 NSF Fellowships
- 4 DoD Fellowships
- 6 Goldwater Scholarships
- 3 Gates Fellowships

As well as taking more challenging courses to complete their math degrees, math honors program members also participate in research either at NC State or in a summer REU (Research Experience for Undergraduates). Since 1992, 41 students have studied abroad, including 32 at the Budapest Semesters in Mathematics. NC State is in the top 10 in terms of number of students who have attended the Budapest Semesters and the only public university in the top 10. Two students have participated in the Math in Moscow Program. Participation in those programs has played a large role in the success of our students being accepted into excellent graduate schools. Dr. Paur is happy to talk to any student interested in participating in the Math Honors Program – either stop by her office in SAS 3144 or email her at sopaur@math.ncsu.edu for an appointment. Invitations to join the Honors program will be extended sometime during pre-registration. More information about the program can be found on the Math Honors website at www.math.ncsu.edu/honors.

SIAM-SEAS Conference

The 34th annual meeting of the Southeast-Atlantic Section of the Society for the Industrial & Applied Mathematics (SIAM-SEAS 2010) will be held at North Carolina State University, Raleigh, NC, **March 20-21, 2010**.

Principal Speakers:

- **Mark Ablowitz**, Professor, University of Colorado at Boulder
- **Michael Berry**, The University of Tennessee
- **Amy Langville**, College of Charleston
- **Ronald Mickens**, Clark Atlanta University

Math Circles

The NC State Mathematics Department is launching a local Math Circle. A Math Circle is a gathering of young people who are interested in learning new mathematics in a fun & enriching environment. More details about the NC State Math Circle in the Triangle may be found at www.math.ncsu.edu/MathCircles/

NC STATE UNIVERSITY

Department of Mathematics
Campus Box 8204
**Raleigh, NC 27695**

Undergraduates:

- Alex Chin, Mathematics, awarded the Park Scholarship.

Faculty Research:

- Assistant Professor **Seth Sullivant** has been awarded a prestigious Packard Fellowship for Science and Engineering. Professor Sullivant is one of 16 recipients of the 2009 Packard Fellowships for Science and Engineering and the only mathematician receiving the award this year.
- Professor **Erich Kaltofen** has been selected as a Fellow of the Association for Computing Machinery (ACM), the world's largest educational and scientific computing society.
- **Patricia Hersh** is the 2010-11 recipient of the Ruth I. Michler Memorial Prize.
- **Tim Kelley's** research group on linear/nonlinear equations and multilevel methods is currently featured on NC State's http://www.ncsu.edu/itd/hpc/main.php

Faculty Academic:

- **Dr. John Griggs** was recently named 2010 Alumni Distinguished Undergrauate Professor.
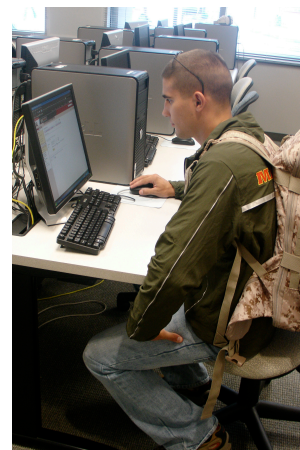
Check out the Multimedia Center, SAS 2105. We have over 25 Computers and drop in Tutoring from 8am-5pm Monday – Friday.