Mathematics Newsletter
News for the Undergraduate
Undergraduate_Mathematics@ncsu.edu

Meet Dr. Ralph Smith

Raised on a small ranch in Wyoming, Dr. Smith developed a strong sense of commitment and perseverance. He received his undergraduate degree from Harvard and went on to receive his PhD from Montana State. He subsequently obtained three years of post-doctoral experience at The Institute for Computer Applications in Science and Engineering (ICASE) at NASA Langley Research Center in Hampton, Virginia. After leaving ICASE, he went to Iowa State University where he was an assistant professor in the Department of Mathematics. Dr. Smith joined NCSU faculty in 1998 and he is now a full professor, Associate Director of the Center for Research in Scientific Computation (CRSC), and Associate Director of the Statistical and Applied Mathematical Sciences Institute (SAMSI) in Research Triangle Park.

Dr. Smith's research interests include mathematical modeling of smart materials, numerical methods for physical systems, parameter estimation, and control theory. He is presently the PI on a five year Research Training Group (RTG) initiative, entitled "Mathematics of Materials," that is funded by the National Science Foundation and co-investigated with Professors Haider, Gremaud, Medhin, and Shearer. One of the objectives of this program is to provide research opportunities for undergraduates, graduate students, and post-docs focused on emerging applications at the interface between mathematics, materials science, physics, biology and engineering. The projects under investigation include multifunctional materials, polymers and composites including carbon nanotubes, orthopaedic biomaterials, dynamics of thin material layers, and material behavior of laser welding.

When not engaged professionally, Dr. Smith is an avid runner and classical pianist. He shares his love of music by volunteering at local senior citizen homes. This summer he ran in the Grand Father Mountain Marathon. This 26.2-mile race winds it way through the mountains from Boone to Grandfather Mountain with a change of over 1000 ft in altitude and over 2000 ft of climbing due to the mountainous terrain. One of the challenges of the race is the fact that the last 13 miles are all uphill. Dr. Smith finished in 3 hrs and 14 minutes, averaging 7:24 miles, which placed him 1st in his age group, 1st in Masters, and 14th overall.

Advanced Math Courses

These classes may be used as Advanced Math electives.

Spring 2008
MA 325 – Intro to Applied Math
MA 401 – Applied Differential Equations II
MA 408 – Foundations of Euclidean Geometry
MA 410 – Theory of Numbers
MA 413 – Short-Term Actuarial Models
MA 416 – Intro Combinatorics
MA 421 - Introduction to Probability
MA 426 – Math Analysis II
MA 428 – Intro to Numerical Analysis II
MA 432 – Math Models in Life & Soc. Sci.
MA 437 – Applications of Algebra
MA 501 – Adv. Math for Engr. & Sci I
MA 502 – Adv. Math for Engr. & Sci II
MA 512 – Adv. Calculus II
MA 513 – Intro Complex Variables
MA 520 – Linear Algebra
MA 521 – Abstract Algebra I
MA 537 – Nonlinear Dynamics & Chaos
MA 544 – Comp. Experiments in Math Prob
MA 555 – Intro Manifold theory
MA 583 – Intro Parallel Computing
MA 587 – Finite Element PDE
MA 591C –SPTP – Cryptography
MA 591E –SPTP – DE Models Bio
MA 591M- SPTP Multivar CAL
MA 591S –ST-Supersymmetry
MA 591X –SPTP Calc of Var

You are Invited to
Colloquium
Richard P. Stanley
Massachusetts Institute of Technology
"A Survey of Plane Tilings"
October 24th at 4:00 p.m. in 1404 Williams Hall. For more information please visit the math web page.

Riddle #1 (Answer at www.math.ncsu.edu/undergrad)
A boat has a ladder that has six rungs, each rung is one foot apart. The bottom rung is one foot from the water. The tide rises at 12 inches every 15 minutes. High tide peaks in one hour. When the tide is at it's highest, how many rungs are under water?

Honors Program

Five students, Meghan McIntyre, Matthew Mumpower, Ellie Ransom, David Roberson and Travis Tomlinson completed the Math Honors Program last spring. Meghan and David were valedictorians and are attending graduate school in mathematics at Duke and the University of Waterloo respectively. Matthew is in grad school in physics at NC State, and Travis applied to work in the America Corps program. New students joining the program last semester include Brittany Boudreaux, Jeff Elmoe, Sean Finch, Kelsey Hawkins, Brian Hestetune, David Pate, Billy Tallis and William Wheeless. Several students did REU's (Research Experiences for Undergraduates) last summer, including Nicole Kroeger, Chelsey Cooley, David Brown, Ralph Abbery and Eric Lownes. Chelsey Cooley is currently doing the Budapest Semesters in Mathematics.

Thirty-six students are currently participating in the Math Honors Program and invitations to join the program will be extended sometime during pre-registration. Every year approximately 20-25% of math graduates complete the Math Honors Program and about 80% of those students go on to graduate school. Schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Moreover, math honors students have received 12 NSF Fellowships and 3 DoD Fellowships for graduate school as well as many other honors including 5 Goldwater Scholarships and 2 Gates Fellowships. Besides taking more challenging courses to complete their math degrees, Math Honors Program members also research either at NC State or in a summer REU (Research Experience for Undergraduates). Many of them (23 at last count) have studied abroad, some focusing on mathematics, either at the Budapest Semesters in Mathematics or the Math in Moscow Program. Participation in those programs has played a big role in the success of our students in getting 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 HA 202 or email her at sopaur@math.ncsu.edu for an appointment. More information about the program can be found on the Math Honors website at http://www.math.ncsu.edu/honors.

***Congratulations to Carl Meyer** who was chosen to receive the 2007 Mathematics Department Alumni Award at Colorado State University.*

"The great book of nature can be read only by those who know the language in which it was written. And this language is mathematics..",
Galileo Galilei

Results for the 67th Putnam Math Competition:
Among the 15 NCSU contestants two finished in the top 500:   Yakov Berchenko-Kogan ranked 122
          Eric P. Lownes ranked 475
Congratulations for a job well done.

***Congratulations to Sandy Paur** for being awarded the 2007 Faculty Advisor Award!*

Upcoming Math Contests
(1) **The 29th Annual Virginia Tech Regional Mathematics Contest** will be held from 9:00a.m. to 11:30a.m. on Saturday October 27, 2007. We invite all interested NCSU undergraduate students to participate. The contest will be held in HA201. Walk-in registration starts at 8:45 in the same room.

(2) **The 68th Annual William Lowell Putnam Mathematics Competition** will be held on December 1, 2007 in HA201.
Time of the competition:
Walk-in Registration 9:40am
Morning Session 10:00am - 1:00pm
Afternoon Session 3:00pm - 6:00pm
All NCSU undergraduate students are eligible to participate for up to 4 times. Come to take the challenge, make new friends and have a Pizza lunch between the two sessions.

To obtain more information about the math competitions at NCSU and get practice problems, please contact Prof. Xiao-Biao Lin at 515-7440 or write to xblin@mah.ncsu.edu

---

***Congratulations to Jack Silverstein** who has been elected to fellowship in the Institute of Mathematical Statistics.*

Research Experience for Undergraduates
The NCSU Summer REU program was a tremendous success. Thirty-five students worked on projects on modeling projects in areas including Tissue Engineering, Cell Rearrangement, computer imaging, Weyl Groups, and Wavelets. Working in small groups these students learned to analyze data, conduct research, create a poster, write an abstract and a report of their findings. Some of these students will be traveling to San Diego in January to present their abstracts at a conference. If you think you would be interested in a summer research experience now is the time to begin to prepare. Many universities across the country offer these experiences with many varied research topics. If you are interested check out the following web site: http://www.nsf.gov/crssprgm/reu/reu_search.cfm.

Course Highlights

MA 544: Comp. Experiments in Mathematical Probability
Instructor: J. Silverstein

Explore the benefits of using computers to gain insight into mathematical behavior. Examples will be chosen from topics in probability theory which are not typically covered in other courses or which do not have a complete mathematical treatment at this time.

MA591X, Introduction to the Calculus of Variations
Instructor: X. Lin

Calculus of variations deal with problems in physics, engineering and applied mathematics that are governed by maximum or minimum principles. It can be viewed as a generalization of finding extremal problems in calculus. However, the minimizer is a critical point for some quantity, e.g., energy and satisfies the so called Euler-Lagrange differential equation. A classical problem is the ``Brachistochrone": Find a curve connecting two spatial points along which a particle can slide down in the shortest time. The other is ``Plateau's problem": Find the generator of a revolutional surface with minimal surface area. You can find more interesting topics from physics, electromagnetic, mechanical and biological systems from the link http://www4.ncsu.edu/~xblin/ma591x. This is an introductory course accessible to advance undergraduate and beginning graduate students. It is related to some more advanced courses in applied mathematics, e.g., control theory, Hamilton-Jacobi's theory, and the finite element method and may prepare the students for such courses.

MA591S Supersymmetries and Superanalysis
Instructor: R. Fulp

It is the intent of this course to develop those mathematical concepts needed to study those diverse areas of physics which use what are called Grassmann variables, There are no specific physics prerequisites for the course. Indeed the only prerequisites will be linear algebra at the level MA 405, multivariable calculus MA 242, and a willingness to deal with some proofs and manipulations with infinite series. The topics to be covered include, Grassmann algebras, supernumbers, supersmooth functions, superanalytic functions, Grassmann differentiation and integration, super vector spaces, supermatrices, the Berezinian, superfields, vectorsuperfields, basics of superelectromagnetism. No specific previous work in electromagnetism is needed as we develop what is needed in the course from a mathematical perspective. There will be less emphasis on proofs than in previous versions of the course.

MA 537: Nonlinear Dynamics and Chaos
Instructor: J. Franke

In recent years there has been an explosion of interest in nonlinear behavior, chaos, and fractals in the physical and biological sciences. Chaotic behavior has been observed in disciplines as diverse as meteorology, medicine, and economics. The course will introduce appropriate mathematical concepts, e.g., equilibrium, stability, bifurcation, and fractals. Software will be available to perform experiments and discover for themselves the fascinating behavior of nonlinear dynamical systems.

MA 796R Introduction to Combinatorial Theory,
Instructor: N. Reading (nathan_reading@ncsu.edu)

This course will present a broad outline of combinatorial enumeration and a narrower look (focusing on partially ordered sets or "posets") at combinatorial structures. Enumerative topics will include (among other topics) basic counting, generating functions, sieve methods, Lagrange inversion and Polya theory. Poset topics will include chain decompositions, distributive lattices, geometric lattices, Möbius functions and (algebraic) poset topology. The main prerequisite for the course is abstract algebra (groups, rings, fields). Previous experience with combinatorics will be helpful, but will not be assumed. In particular, graduate students with a solid mathematical background are probably prepared to take this class, even if they have no combinatorics background. Undergraduate students interested in this course should be aware that I will assume the kind of proficiency in reading, creating and writing mathematical arguments which is typical of graduate students. I would suggest that undergraduates contact me if they are interested in the course.

MA 591E Mathematical Modeling in Bio Sciences
Instructor: M. Olufsen

This course will discuss the art of mathematical modeling targeting students from both mathematics and biology. Students from biological sciences are expected to bring a problem that can be analyzed using mathematics, while mathematics students are expected to use their mathematical knowledge to help solve the proposed problems. During the course we will discuss a number of techniques for modeling including compartment models, Lotka Volterras predator prey models, and more advanced models from fluid dynamics and models predicting behavior of physiological systems. We will spend a significant amount of time discussing how modeling comes about, how is a model designed, what assumptions should be made, and how do we choose adequate model parameters. We will work on projects in groups or individually to solve or analyze problems related to the students research interests.

There are 4 men who want to cross a bridge. They all begin on the same side. You have 17 minutes to get all of them across to the other side. It is night and there is one flashlight. A maximum of two people can cross at one time. Any party who crosses, either 1 or 2 people, must have the flashlight with them. The flashlight must be walked back and forth, it cannot be thrown, etc. Each man walks at a different speed. A pair must walk together at the rate of the slower man. What order should they cross the bridge?

Man 1: 1 minute to cross
Man 2: 2 minutes to cross
Man 3: 5 minutes to cross
Man 4: 10 minutes to cross

NORTH CAROLINA STATE UNIVERSITY
Department of Mathematics
Campus Box 8205
Raleigh, NC 27695-8205