St. Olaf Mathematics Department

Math Mess

Department of Mathematics
St. Olaf College
Northfield, MN 55057

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This Week's Mathematics Colloquium

Title: Mathematical Models for the Spread of Epidemics
Speaker: Mac Hyman, Los Alamos National Laboratory
Time: Tuesday, November 4th, 1:30 pm - treats at 1:15
Place: SC 182

This Week's Colloquium

Mathematical models based on the underlying transmission mechanisms of the disease can help the medical/scientific community understand and anticipate the spread of an epidemic and evaluate the potential effectiveness of different approaches for bringing an epidemic under control. Even more important than the successes with these specific diseases has been the development of frameworks and concepts for understanding epidemiology. The primary goal of our modeling effort is to understand the spread of infectious diseases, including influenza, smallpox, and HIV to estimate and subsequently predict the impact of control measures on their spread. Modeling can reduce the uncertainty of the estimates of disease prevalence and aid in the development of scientific understanding of the mechanisms of the disease and of the epidemic. It can also estimate the benefits and the costs of projected interventions and project the requirements that an epidemic will place on the health care system. Thus, the modeling techniques can join with biological, epidemiological, behavioral, and social science studies to produce better projections and better understanding of the epidemic.

Mac Hyman is the president of the Society for Industrial and Applied Mathematics (SIAM) and the leader of the Mathematical Modeling and Analysis Group at Los Alamos National Laboratory. He received his BS from Tulane University and his PhD from the Courant Institute of Mathematics Sciences at NYU. His research interests include mathematical biology, nonlinear dynamical systems, and the numerical solution of differential equations. When away from his day job, he is a dancer, plays (at) the piano, and spends as much time as he can skiing off the top of mountains in northern New Mexico. For more information, see http://math.lanl.gov/~mac/.

To Be or Not To Be

It's time for the mathematics department gala celebration of why mathematics should be part of your life and how you can make that happen. The annual To Be or Not To Be night is taking place on Tuesday, November 4th at 6:30 PM (food at served at 6:00 PM) in the Science Center lobby and SC282. This is a great chance to:

- ?? Find out about careers that use mathematics (and salary info too!)
- ?? See how to put together a math major that complements your other interests.

?? Find out which math courses go well with other majors.
?? Find out which math course you should take next and why.
?? Learn about the different parts of the math program (stats, cs, math ed).
?? Introduce the math department faculty and staff.
?? Eat Free Food! (subs, pizza, and root beer floats)

Best of all, after a brief presentation you can talk to math department faculty about any aspect of the program. This is a great time to ask those burning questions about how mathematics fits your interests and career plans. This legendary annual event is one not to be missed. Come for the food! Come for the information! Come for the fun!

More Course Offerings

Spring:

Math 234: Structures of Higher Mathematics (D. Molnar)
The Structures course, normally offered in Budapest during interim, aims to better prepare students for the "theory" courses of the major, ERA and Abstract Algebra. The primary focus of the course will be proof-writing techniques. Other topics such as set theory, number theory, graph theory, will be selected according to interest, with an eye towards preserving some of the Hungarian flavor. Linear Algebra is a prerequisite. Recommended for first-year students who meet the prerequisite.

Math 382: Seminar in Analytical Mathematics (Prof. J. Dietz)
The flavor of the spring senior seminar will be algebra. Specifically, you will learn about techniques in the study of automorphisms of groups (one of my research areas for the last several years). You will learn advanced group theory, advanced ring theory (possibly including some Lie algebra stuff), and the group theory software package "GAP" (available for free, for those of you who can't wait). Along with the usual homework, students will conduct research throughout the term. Math 252 is a prerequisite. The seminar will count as a "Core" course toward the major.

New Faculty Spotlight: Amelia Taylor

Amelia, a Colorado native, is a '94 graduate of St. Olaf college. She went to Purdue University for graduate school and then moved with her advisor to the University of Kansas where she earned her Ph.D. in 2000. She returns to the hill after 3 years as a VIGRE postdoctoral fellow at Rutgers University.

Amelia's research in is computational commutative algebra: she finds, programs, and studies the complexity of algorithms to compute pure algebraic objects, thus combining the pure mathematics of commutative ring and module theory with computer science. So, you will find her teaching everything from abstract algebra to CS.

The rest of the time (is there any?) she is playing ultimate frisbee, climbing, skiing or training for these three activities. She is also an alum of both BSM and Term in Asia.

Need Summer Work?

Ever wondered if your strong computer science and programming skills could be put to good use in pure mathematics? Do you have a desire to explore mathematics and implement algorithms? Then you are the student I am looking for. I have a research project that studies algorithms for computing the Hilbert Polynomial, a key invariant used in commutative algebra. The main motivation is decreasing the space complexity of this computation, but the road to get there has ended up being interesting in itself. The project has combinatorics, commutative algebra, simplicial complexes AND computer science. Minimum requirements for this summer research job: By June 2003, interested students must have successfully completed Abstract Algebra (Math 252) and Software Design and Implementation (CS

272). Having completed Data Structures is preferred. Interested students should contact Amelia Taylor (OMH 205) for more information.

Research Experiences for Undergraduates

Wondering how you will spend your summer? Across the country there are many opportunities to do research or participate in other summer mathematics programs. There are too many to list. Many programs are designed for students who have just completed their junior year, however, there are more and more programs also aimed at students havingcompleted their first and second years as well. In a typical REU (Research Experience for Undergraduates) you work on a research project for 6-8 weeks during the summer. There are faculty supervisors and in some programs you work in a group and others you work more independently. In most programs you are given housing and often a small stipend to cover food and other expenses. It is intense and an awesome experience. Programs these days vary more and more, so you should investigate a few and talk to faculty here. My favorite mathematics opportunities page is http://www.math.unl.edu/~ncuwm/opps03.html. It starts with links to REU pages, but lists some other programs as well. This page is updated fairly frequently, but some of the sites it links to are not. You should explore these pages, and talk to Jill Dietz (OMH 306) or Amelia Taylor (OMH 205).

Last Week's Problem

Clicker the Robot intends to travel through every room in an n-by-n grid. There are three possible moves that Clicker can make: one square to the right, one square up, or one square diagonally down and to the left. For which values of n is it possible for Clicker to travel by some sequence of such moves through every square in the grid exactly once?

Heather Wood '07 and Noah Loome '05 correctly determined that Clicker will only be able to complete such a route when n is not two more than a multiple of three. (Others had previously solved this problem unintentionally.) To see why it is possible when n = 3k or n = 3k+1, just do it (and maybe use induction). To see why it is impossible when n = 3k+2, take the 5-by-5 grid and color the squares so that Clicker starts on Red, and any move from Red must go to Blue, Blue to Yellow, and Yellow back to Red. Then count the number of squares of each color. What's wrong?

Problem of the Week

This week's problem is from the 1997 North Central contest, although it feels so fresh it could easily be asked today. This problem was designated "no calculators".

If $x = (1 + \sqrt{1997})/2$, then what is the value of $(4x^3 - 2000x - 1997)^{2003}$? Justify your answer.

*** Please submit all solutions by Wednesday at 5 o'clock to David Molnar by e-mail (molnar@stolaf.edu) or by placing them in his box at OMH 201.

If you would like to receive a copy of the Math Mess in your P.O. Box weekly, please e-mail Donna Brakke at brakke@stolaf.edu.

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