

# M \* A \* T \* H COLLOQUIUM

New Location!  
Rachel Carson 68

Wednesdays  
4 p.m.

The Mathematics Department of Sonoma State University presents a series of informal talks open to the public.

*Mathematics is the process of turning coffee into theorems.* Paul Erdős

- FEB 09 Observing the Sun & Moon from Different Parts of the World.** Helmer Alslaksen, National University of Singapore  
We will discuss the motion of the Sun and the Moon from a "hemispherically correct" point of view, with special emphasis on the needs of "latitudinally challenged" observers. What does the orbit of the Moon around the Sun look like? Which day does the Sun rise earliest in San Francisco, Singapore or Sydney? How can we tell the difference between a waxing crescent Moon and a waning crescent Moon in San Francisco, Singapore or Sydney?
- FEB 16 Modeling Pollution Problems with Delays.** Clement E. Falbo, Sonoma State University  
Mixing Problems that assume "well stirred" or "instantaneous distribution" are less realistic than models that assume nonzero delays in mixing. We use Delay Differential Equations (DDEs) to introduce "structured distribution" for mixing and pollution problems. We will show how to solve DDEs with readily available software such as EXCEL or even with MATHEMATICA.
- FEB 23 Mathematica Toolkits.** Elaine McDonald's Fall 2004 Math 180 Students, Sonoma State University  
Joshua Clement, Rob Cunningham, Michelle Jensen, Julie Kellogg, and others will present their class projects on precognitive ability, animated Taylor series, a diagnostic test for diabetes, and constructing staircases. *Pizza after talk.*
- MAR 02 Folding and Unfolding in Computational Geometry.** Lynn Stauffer, Sonoma State University  
Computational geometry is a field of study that joins mathematical reasoning and computer algorithms. Folding of flat material and unfolding of a surface in 3D are important processes in applications. We will discuss 1D linkages, 2D foldings, and unfolding of polyhedra with applications in protein folding, computational origami, and manufacturing. Open problems will be highlighted.
- MAR 09 Using Simulation-Based Optimization Methods to Solve Groundwater Flow Problems.** Genetha Anne Gray, Sandia National Labs  
Minimizing costs is important for the design of groundwater supply and remediation systems. Such design problems can be posed as optimization problems in which the variables: number of wells, well locations, and well pumping rates. These groundwater applications are significant challenges and serve as an excellent benchmarking tool. In this talk, we will describe a set of groundwater problems and explain how they were used to test and compare several optimization methods. We will focus on one method, APPSPACK, and show how results compare with the solutions from other optimization algorithms.
- MAR 16 Graphical Degree Sequences.** Tom Roby, California State University, Hayward  
Graphs and partitions are well-known fundamental objects in combinatorics. Less well known is the connection between them via the notion of "graphical degree sequence," a list of vertex degrees of a graph. We will examine many natural questions. Which partitions are graphical? When is there a unique graph with a given degree sequence? What special class of graphs corresponds to partitions into distinct parts? We will also mention accessible open problems. *Pizza after talk.*
- MAR 23 An Introduction to Algebraic Curves.** Stuart Smith, California State University, Hayward  
The theory of algebraic curves is one of the oldest and richest areas in all of mathematics. Starting with the conic sections in ancient times, this fascinating subject has produced some of the most beautiful results in geometry, analysis, and algebra. This talk will give an elementary introduction to the subject with lots of illustrations and some historical background.
- MAR 30 SPRING RECESS**
- APR 06 Problem Solving.** Alan H. Schoenfeld, University of California, Berkeley  
What does it take to be a good problem solver? Knowing a lot? That doesn't hurt, of course. But there's lots more: problem solving strategies, metacognition (what's that?), and beliefs play an important role. (Beliefs? In Math?) Does this sound crazy? Well, you can find out.
- APR 13 When Topology Meets Chemistry.** Erica Flapan, Pomona College  
Mirror image symmetry is important in predicting the behavior of molecules. Recently, knots and links and other non-planar molecules have been synthesized. These are so large that they no longer have the rigidity that is characteristic of small molecules. To understand the symmetries of such molecules we need to understand their deformations. Topology is used to analyze how geometric objects can be deformed and which properties of such objects will be preserved by deformations. In this talk we will discuss how topology helps us analyze the symmetries of flexible molecules.
- APR 20  Math Festival Day  Biological Sequence Analysis.** Terry Speed, The Walter & Eliza Hall Institute, Australia  
Biological macromolecules such as nucleic acids and proteins may be regarded as sequences or strings of letters. For DNA, the letters are A, C, G and T; while they are A, C, G and U for RNA; and the 20-letter alphabet for the biological amino acids in the case of proteins. Many chemical features of such molecules of structural or functional importance can be described in statistical terms involving these letters. The human (and other) genome project generates enormous numbers of DNA sequences. A great deal of effort is devoted to identifying functionally and structurally important features. We will illustrate how statistical models and methods play a large role in such annotation. *Math Festival Dinner after talk.*
- APR 27 The "Coin Exchange Problem" of Frobenius.** Matthias Beck, San Francisco State University  
How many ways are there to change 42 cents? How many ways will there be when all the pennies are gone? How about if nickels were worth four cents? The Frobenius problem asks for the largest integer that cannot be changed, given coins of denominations  $a_1, \dots, a_r$ . This famous problem is solved for  $d = 2$ , somewhat solved for  $d = 3$ , and wide open for  $d > 3$ . We will outline some elementary approaches to the Frobenius problem.
- MAY 04 Visualization in Mathematics via The Geometer's Sketchpad.** Steven Rasmussen, Key Curriculum Press  
Visualization tools like The Geometer's Sketchpad have had a profound impact on school mathematics, especially the way students learn geometry. But mathematical visualization via Sketchpad is not limited to the domain of geometry, nor to pre-college mathematics. We will look for new visual insights into mathematics in areas ranging from operations with numbers to complex analysis.
- MAY 11 Computer Simulations of the Human Arterial System.** Rebecca Honeyfield, University of California, Davis  
General discussion of a computational model of blood flow in the human arterial system. Emphasis will be placed on using a one dimensional model in conjunction with a three dimensional model to examine flow behavior of diseased arteries. *Pizza after talk.*

SONOMA  
STATE UNIVERSITY

Mathematics Department

(707) 664-2368

(707) 664-3535 FAX

www.sonoma.edu/math