FALL 2005

M*A*T*H COLLOQUIUM

63rd SERIES

Wednesdays 4p.m. * Rachel Carson Hall 68

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 Erdös

Aug 31 **THE CYCLOID; HELEN OF GEOMETRY.** JOHN MARTIN, SANTA ROSA JUNIOR COLLEGE

The cycloid has been called the Helen of Geometry not only because of its beauty but also because of the quarrels it provoked among 17th century mathematicians. The presenter will examine some of its beautiful properties (one being that the area under one arch of the cycloid is equal to three times the area of the generating circle) and see what caused some of the greatest mathematicians of the Scientific Revolution to get so worked up.

Sep 7 **RSA VERSUS CAYLEY-PURSER; A COMPARISON OF MODERN PUBLIC-KEY CRYPTOSYSTEMS**. STEVE SCHLUCHTER, SAINT MARY'S COLLEGE OF CALIFORNIA [☺ Pizza after talk ☺]

The presenter will explain the RSA encryption algorithm, the math behind it, and how to use it successfully. The mathematics of Cayley-Purser, a faster encryption system developed in mid 1990's, will also be discussed. Further, we will explore the mathematics behind the successful cracking of Cayley-Purser, leaving RSA as the industry standard in public key cryptography.

Sep 14 **AN INTRODUCTION TO ALGEBRAIC CURVES**. STUART SMITH, CALIFORNIA STATE UNIVERSITY, EASTBAY (FORMERLY 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. In this talk, an elementary introduction to the subject with many illustrations and some historical background will be presented.

Sep 21 **LOOKING INSIDE AN 8TH GRADE MATH CLASSROOM.** EDITH MENDEZ, SONOMA STATE UNIVERSITY

What are the decisions a teacher needs to make in leading a mathematical discussion? What does a mathematics educator look for in this discussion? What can be learned from research into one classroom? The mathematics, pedagogy, and teacher knowledge will be explored with a video excerpt from an 8th grade class discussion.

Sep 28 **OPPORTUNITIES FOR MATHEMATICIANS IN BUSINESS DECISION ANALYSIS.** JEFFREY L. REICH, CHEVRON TEXACO; SSU ALUMNUS

Decision analysis--the forecasting of profit that would result from a business decision, given uncertainty about the future--is well suited to mathematicians familiar with algorithms, logic, and probability. The presenter will give a survey of mathematical topics with examples that are useful in the real world.

Oct 5 **FALLACIES IN ELEMENTARY STATISTICS.** ANN WATKINS, CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

The presenter will have some fun demolishing several enticing examples that are commonly used in elementary statistics textbooks to illustrate the mean, median, and mode. Some mathematics backed up by a little data show that these concepts are not as intuitive as they appear.

Oct 12 **TEACHING AND LEARNING MATHEMATICS IN THE CENTURY OF DATA**. BILL FINZER, KEY CURRICULUM TECHNOLOGIES

Without computers, data were dry lists of numbers. With computers, data show pictures, music, and ideas. Not only are the ideas of mathematics particularly intertwined with data, but teaching and learning mathematics takes on new relevance in the presence of data. Once attuned to the possibilities, data jump from behind mathematical models and simulations. Lifting the corner of a blanket of data reveals powerful mathematical concepts. Some examples of classroom use of data and their far-reaching implications will be discussed.

Oct 19 **LORE OF THE TRIANGLE; FROM EUCLID TILL YESTERDAY**. RICK LUTTMANN, SONOMA STATE UNIVERSITY. [☺ Pizza after talk ☺]

The presenter will review some well-known properties of triangles and then some more recent results he encountered over 30 years as an Associate Editor of the Problem Section of the American Mathematical Monthly. Topics will include Special Points, the Vantage Point Theorem, the Nine-Point Circle, Steiner's, Ceva's and Desargues' Theorems, Pascal's Magic Hexagons, Nine Surprises, Seven Miracles, and more.

Oct 26 **BLOW-UP PROBLEM IN COMPRESSIBLE GAS DYNAMICS.** TIANHONG LI, STANFORD UNIVERSITY

Euler equations can describe the conservation of mass, momentum and energy of gas dynamics or compressible fluids. It is unknown whether the gas with finite mass blows up in density even with high inward initial velocity. The presenter will discuss some special solutions to the Euler equations. There is blow-up for infinite mass, but no blow-up for finite mass. This problem is a good application of the direction field analysis in ODE (Ordinary Differential Equations).

Nov 2 **GET RESULTS.** TEED ROCKWELL, SONOMA STATE UNIVERSITY

Some people have trouble with mathematics because most of their inner life consists of words, not images. In order to help students develop the visual pattern recognition skills needed for doing proofs in propositional logic, special exercises were designed for them. The result was a dramatic rise in students' performance. The presenter will discuss these exercises and show how these principles can be applied to teaching other branches of mathematics.

Nov 9 **GROUPS AND CRYSTALS.** TATIANA SHUBIN, SAN JOSE STATE UNIVERSITY

There are millions of diverse species of living organisms but only about 4000 different rocks. Yet it is generally much easier to distinguish living creatures, such as cats and dogs, than various rocks. Onyx, jasper, chalcedony, agate, and quartz are made of the same chemical "bricks". Only variant patterns of the bricks make them different. This leads us to mathematics, since classification of patterns is the realm where mathematics reigns supreme. The speaker will show how similar rocks are really different, and how objects as disparate as numbers, equations, and crystals are in fact pretty similar.

Nov 16 **CLUTCHING FOR SURVIVAL: THE CALIFORNIA CONDOR RESTORATION PROJECT.** THOMAS O'NEIL, CALIFORNIA POLYTECHNIC STATE UNIVERSITY, SAN LUIS OBISPO

The presenter will talk about what several groups of Cal Poly mathematics students did to support the California Condor Restoration Project over a four-year period. This will include using condor traits to model and construct a population projection program. The creation of a database containing every condor in captivity or in the wild, living or dead since 1987, will also be discussed.

Nov 23 **THANKSGIVING BREAK**

Nov 30 **AN INTRODUCTION TO BOTH MARKOV CHAINS AND GENETICS**. STEVE BLASBERG, WEST VALLEY COLLEGE [☺ Pizza after talk ☺]

Many well-known problems in genetics can be solved analytically by the use of the mathematical theory of Markov chains. A brief introduction to Markov chains and a demonstration of their applicability to such questions as the Brother-Sister Mating Problem and other scandalous situations will be presented.

SONOMA STATE UNIVERSITY

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Talks may change: Please confirm with the Mathematics Office before a specific talk