

M*A*T*H COLLOQUIUM

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

WEDNESDAYS at 4:00 P.M.

DARWIN HALL ROOM 108

COFFEE at 3:45 P.M.

- February 7** **How Mathematical Ability Evolved.** Keith Devlin, Dean of the School of Science, Saint Mary's College of California, and Senior Researcher, Center for the Study of Language and Information, Stanford University, will discuss his latest book, *The Math Gene: How Mathematical Thinking Evolved and Why Numbers Are Like Gossip*. When we do mathematics, we must be using mental capacities that evolved long before mathematics came along. What are those abilities and what survival advantages led to their finding their way into the human gene pool? And if everyone has these abilities—as an evolutionary account will imply—why do so many people find math impossibly hard?
- February 14** **Calculus Toolkits.** Bill Barnier, Mathematics, Sonoma State University, will introduce students Matthew Adkins and Andrew McFarland, Kenneth Cabeen and Carey Eheler, Nicole Damele, Nicholas Hoffman, Lisa Moran, Donald Siemon, Patty Smith and Yolanda Woods, and Amy Zigler from the Fall 2000 Math 180 class, who will demonstrate colorful accessible Mathematica "toolkits" that illustrate concepts like the definition of the derivative or perform a useful function such as encryption.
- February 21** **Mathematical Models on the Atomic Scale.** Doug Martin, Chemistry, Sonoma State University, will discuss how scientists measure properties of invisible molecules. Often, mathematical models are developed which allow scientists to interpret their data. In this talk we will see an example of this process in action. Along the way we will ask if there is a difference between what mathematicians call "mathematical modeling" and scientists call "science".
- February 28** **The Fundamental Theorem of Arithmetic without the Axiom of Infinity.** Steve Wilson, Mathematics, Sonoma State University, investigates the role the Axiom of Infinity plays in the Fundamental Theorem of Arithmetic and how to get around it.
- March 7** **The Search for the Scorpion Submarine.** Stan Benkoski, Mathematics, West Valley College, will discuss the mathematics used in the search for the Scorpion (a nuclear powered submarine) which disappeared without a trace in 1968 during a westbound transit across the North Atlantic. The search for the Scorpion lasted for 5 months and one observer called it the "most difficult search operation ever undertaken and pressed to a successful conclusion." The mathematics of the search included hyperbolas, Monte Carlo techniques, Bayes Theorem, and Lagrange multipliers.
- March 14** **Probabilistic Models of Queuing Networks.** Amber Puha, Mathematics, CSU San Marcos, will introduce some simple models that attempt to mathematically describe the behavior of some queuing systems. Waiting in line is a fact of life—do you want the answers

to questions like “how long should a job expect to wait in line?”, or “in the long run, how many jobs should one expect to be in the system at any one time?” Students who have had one semester of probability should have an appropriate amount of preparation to follow this talk.

- March 21** **Calculus, Topology and the Discovery of Interior Fixed Points.** Robert Brown, Mathematics, UCLA, will trace a portion of the history of calculus and topology to illustrate two themes. The first is that topology, a branch of mathematics that was developed in the 20th century, can be viewed in part as a natural extension of mathematicians’ efforts, from the 17th century onward, to clarify the foundations of calculus. The second is that, in contrast to sciences in which a new theory supplants all previous ones, in mathematics new developments generally arise as extensions of previous discoveries. No prerequisites beyond calculus will be required in order to understand this talk.
- March 28** **Applications of the Two-Parameter Poisson-Dirichlet Distribution.** Matt Carlton, Statistics, Cal Poly SLO, will discuss the statistical and biological applications of this family of distributions. This includes a larger class of discrete random measures, a new distribution on the probability simplex, and various results applicable to species sampling.
- April 4** **A Set Theoretic Cosmology for Mathematics.** David Ballard, Mathematics, Sonoma State University, will describe and discuss a current ongoing collaborative mathematical research effort which may actually provide mathematics with a likely story of itself. The Hopi, the Navajo, the Eskimo all have their own creation myth. The Judeo/Christian/Islamic folk also have theirs. Even the physicists (BANG!!, right?). What about mathematics?
- April 11** **Spring Break**
- April 18** **Screening Test Methodology.** Wes Johnson, Statistics and Chair of the Graduate Group in Epidemiology, UC Davis, will discuss some recent progress in screening test methodology. The standard goals are to find individuals in a population that have a particular characteristic of interest, like HIV infected blood units that have been donated for transfusion, or drug users in the transportation industry. It is also of interest to estimate various parameters, like the sensitivity and specificity of the screening tests, the prevalence of the characteristic in the population and the prevalence in the screened population.
- April 25** **Product Forecasting.** Mike Bryan, Sales Analyst, Amy’s Kitchen in Santa Rosa, will present the process of product forecasting through the use of statistical methods.
- May 2** **Genetic Algorithms.** Scott Gordon, Computer Science, Sonoma State University, will discuss computer programs that evolve solutions to problems by emulating the processes of biological evolution: mutation, genetic crossover, natural selection, and survival of the fittest. They have been used in geological exploration, scheduling, semiconductor layout, and many other real-world applications. Various genetic algorithms will be described, including some that have been developed here at SSU.
- May 9** **Phi on the Boundary of Algebra and Geometry.** Jeff Hrdlicka, Mathemagician, Starmast Productions, will explore some of the many connections between algebraic and geometric structures. Just as the most interesting areas of the Mandelbrot set occur at its boundary, so the realms where algebra and geometry intersect provide interesting mathematical perspectives, especially when the intersection includes the golden ratio phi.
- May 16** **How's Your Credit?** Elizabeth Shamseldin, Fair, Isaac and Company in San Rafael, will discuss the process of creating and managing the statistical models used in the consumer credit industry, including credit score models. She will talk about issues from data management to model building with an explanation of what your credit score really means. Accessible to all students.

Talks may change owing to unforeseen circumstances, and it is advisable to check with the Mathematics Department to see if the particular talk you want is being given at the time and date scheduled.



SONOMA STATE UNIVERSITY

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