MathFest 2005

MAA & PI MU EPSILON

Student Paper Sessions
August 4-6, 2005

MAA Student Chapters

The MAA Student Chapters program was launched in January 1989 to encourage students to continue study in the mathematical sciences, provide opportunities to meet with other students interested in mathematics at national meetings, and provide career information in the mathematical sciences. The primary criterion for membership in an MAA Student Chapter is "interest in the mathematical sciences." Thus, the Student Chapter program supplements, but does not compete with, the chapters of Pi Mu Epsilon. Currently there are approximately 225 active Student Chapters on college and university campuses nationwide. Students are also members of the MAA Sections in their geographic region. Many of the MAA Sections provide special activities for students at their regularly scheduled meetings.

Pi Mu Epsilon

Pi Mu Epsilon is a National Mathematics Honor Society with over 300 chapters throughout the nation. Established in 1914, Pi Mu Epsilon is a non-secret organization whose purpose is the promotion of scholarly activity in mathematics among students in academic institutions and among staffs of qualified non-academic institutions. It seeks to do this by electing members on an honorary basis according to their proficiency in mathematics, and by engaging in activities designed to provide for the mathematical and scholarly development of its members. Pi Mu Epsilon regularly engages students in scholarly activity through its *Journal*, which has published student and faculty articles since 1949. In addition, the society awards monetary prizes for mathematics contests and awards established by chapters. Since 1952, Pi Mu Epsilon has been holding its annual National Meeting in conjunction with the summer meetings of the Mathematical Association of America.

Schedule of Student Activities

Except where noted, events are in the Albuquerque Convention Center

Wednesday, August 3

5:30 pm - 6:30 pm	MAA/PME Student Reception	Fiesta 1, Hyatt Hotel

Thursday, August 4

8:00 am - 11:30 am	PME Council Meeting	Fiesta 1, Hyatt Hotel
9:00 am - 5:00 pm	Student Hospitality Center	Ballroom A
1:00 pm - 2:57 pm	MAA Session #1	Taos Room
1:00 pm - 2:35 pm	PME Session #1	Picuris Room
1:00 pm - 2:57 pm	MAA Session #2	Cochiti Room
1:00 pm - 2:35 pm	PME Session #2	Santa Ana Room
3:00 pm - 5:35 pm	MAA Session #3	Taos Room
3:00 pm - 4:35 pm	PME Session #3	Picuris Room
3:00 pm - 5:15 pm	MAA Session #4	Cochiti Room
3:00 pm - 4:35 pm	PME Session #4	Santa Ana Room
5:00 pm - 5:45 pm	MAA Special Session on *Math Horizons*	Picuris/Santa Ana Rooms

Friday, August 5

9:00 am - 5:00 pm	Student Hospitality Center	Ballroom A
1:00 pm - 2:57 pm	MAA Session #5	Taos Room
1:00 pm - 2:15 pm	PME Session #5	Picuris Room
1:00 pm - 2:55 pm	MAA Session #6	Cochiti Room
1:00 pm - 2:15 pm	PME Session #6	Santa Ana Room
3:00 pm - 4:57 pm	MAA Session #7	Taos Room
3:00 pm - 4:57 pm	MAA Session #8	Cochiti Room
3:00 pm - 4:55 pm	MAA Session #9	Picturis Room
3:00 pm - 4:55 pm	MAA Session #10	Santa Ana Room
6:00 pm - 7:45 pm	PME Banquet	Grand Pavilion, Hyatt Hotel
8:00 pm - 9:00 pm	J. Sutherland Frame Lecture	Grand Pavilion, Hyatt Hotel

Saturday, August 6

9:00 am - 2:00 pm	Student Hospitality Center	Ballroom A
1:00 pm - 2:50 pm	MAA Student Workshop	Brazos Room
3:00 pm - 3:50 pm	MAA Student Lecture	Brazos Room
4:00 pm - 5:00 pm	Student Problem Solving Competition	Brazos Room
5:00 pm - 6:15 pm	MAA Modeling Contest Winners	Brazos Room

8:00 - 9:00 PM **Friday August 5, 2005** **Grand Pavilion, Hyatt Hotel**

J. Sutherland Frame Lecture

PROOFS THAT REALLY COUNT
THE ART OF COMBINATORIAL PROOF

Arthur T. Benjamin
Harvey Mudd College

Mathematics is the science of patterns, and mathematicians attempt to understand these patterns and discover new ones using various tools. In this talk, we demonstrate that many number patterns, even very complex ones, can be understood by simple counting arguments. You will enjoy the magic of Fibonacci numbers, Lucas numbers, continued fractions, and more. You can count on it! This talk is based on research with Professor Jennifer Quinn and many, many undergraduates.

The J. Sutherland Frame Lecture is named in honor of the ninth President of Pi Mu Epsilon, who served from 1957 to 1966 and passed away on February 27, 1997. In 1952, Sud Frame initiated the student paper sessions at the annual Pi Mu Epsilon meeting, which is held at the Summer Mathfests. He continually offered insight and inspiration to student mathematicians at these summer meetings.

MAA Student Lecture

LIGHTS, CAMERA, FREEZE!

Annalisa Crannell
Franklin & Marshall College
Marc Frantz
Indiana University

Director/Producer Stephen "Marc" Frantzberg teams up with the world-famous actress Annalisa Monalisa Cranberry to bring you the new blockbuster hit, Projection. Spanning the centuries between Renaissance perspective painting and modern cinematic special effects, Projection reveals the true secrets behind projecting a 3-dimensional world onto a 2-dimensional canvas (or movie screen). You'll laugh; you'll yawn; you'll cry; you'll reach the vanishing point. The movie includes a cast of thousands (or dozens, depending on how many people are in the audience).

MAA Student Speakers

Name	School	MAA Session
Asela Acosta	Texas A&M International University	1
Ashley Askew	Clayton State University	2
Kari Barkley	Lafayette College	6
Jessica Bauman	Tufts University	10
Lisa Bishop	Occidental College	4
Jenny Buontempo	St. Peter's College	9
Nicole Casacchia	Youngstown State University	5
John Chatlos	Williams College	7
Carlos Chiquete	University of Arizona	1
Anh Chu	University of Richmond	6
Kimberly Conner	Mercer University	9
Alan Covert	Arizona State University	1
Nicholas Croll	Sam Houston State University	8
Amber De More	Austin Peay State University	2
Elizabeth Eisemann	Augustana College	5
Carl Erickson	Stanford University	4
Sarah Fritsch	Sam Houston State University	9
Justin From	Central College	10
Go Fujita	University of Florida	8
Jesse Gell-Redman	Columbia University	10
John Gemmer	Millersville University of Pennsylvania	2
Ben Gibson	Wake Forest University	2
James Godzik	University of California, Berkeley	7
Sarah Goodpaster	Augustana College	8
Ryan Grady	Colorado School of Mines	6
Andrew Harrell	Texas A&M University	2
Nicholas Johnson	Augustana College	7
Nathan Kaplan	Princeton University	4
Thomas Kindred	Williams College	6
Joesph Kolenick	Youngstown State University	8
Samuel Kolins	Bowdoin College	7
Ross Kravitz	Williams College	1
Marion Kruse	University of Richmond	6

MAA Student Speakers (Continued)

Name	School	MAA Session
Sean Lee	Pepperdine University	4
Beverly Lytle	Allegheny College	3
Tim Major	Grand Valley State University	3
Melissa Mauck	Sam Houston State University	8
Neil Mendoza	Williams College	4
Benjamin Mitchell	Taos High School	9
Ludguier Montejo	Whitman College	3
Lorena Morales-Paredes	University of Alabama in Huntsville	1
Craig Nicholas	New Mexico Tech	8
Nicole O'Connell	St. Norbert College	5
Nnamdi Oparanozie	Sam Houston State University	8
Samuel Otten	Grand Valley State University	4
Azra Panjwani	University of California, Berkeley	3
Ammon Paquette	Augustana College	3
Mauricio Rivas	Sam Houston State University	9
Siva Sankrithi	University of Washington	5
Mary Servatius	Worcester Polytechnic Institute	3
Todd Shayler	Williams College	4
Brian Simanek	Williams College	7
Chris Smith	Grand Valley State University	9
Nicholas Stucky-Mack	Harvard College	2
Sean Sullivan	University of Texas at Austin	2
Nicholas Toombs	Montclair State University	5
Genevieve-Yvonne Toutain	Simon's Rock College of Bard	1
Timothy Trujillo	New Mexico Institute of Mining and Technology	10
Vladimir Ufimtsev	University of Nebraska at Omaha	3
Daniel Walton	Harvey Mudd College	5
Nathaniel Watson	Washington University in St. Louis	7
Lindsey Webster	Western Oregon University	10
Debbie Witczak	Benedictine University	6
Sherry Wu	Cornell University	7
Nicholas Yates	Williams College	10
Haiyun Zhao	Stevens Institute of Technology	1
Alexander Zupan	Gustavus Adolphus College	3

Pi Mu Epsilon Delegates

Speakers

Name	School	Chapter	PME Session
Julian Apelete Allagan	Troy University	AL Eta	3
Chantel C. Blackburn	Andrews University	MI Gamma	3
Dakota Blair	Texas A&M University	TX Eta	1
Jason Brinker	St. Norbert College	WI Delta	1
Angela Brown	Sam Houston State University	TX Epsilon	6
Jennifer L. Carmichael	Western Oregon University	OR Delta	3
Christopher Cicotta	Clarkson University	NY Omicron	6
Tom Cochran	Youngstown State University	OH Xi	2
Stephanie Deacon	University of Texas at San Antonio	TX Omicron	5
Patrick Dixon	Occidental College	CA Theta	4
David Gohlke	Youngstown State University	OH Xi	2
Jeff Goldsmith	Dickinson College	PA Rho	3
Angela Hicks	Furman University	SC Delta	4
Amanda Hoffman	Sam Houston State University	TX Epsilon	4
Alaina Houmard	Mount Union College	OH Omicron	5
Colleen Hughes	Denison University	OH Iota	1
Aubrey Komorowski	Duquesne University	PA Upsilon	2
Mark Lane	Sam Houston State University	TX Epsilon	1
David Martin	Youngstown State University	OH Xi	2
Andrew Matteson	Texas A&M University	TX Eta	4
Tina Smith Mote	McNeese State University	LA Epsilon	3
Phuong Minh Thi Nguyen	Occidental College	CA Theta	6
Maria Salcedo	Youngstown State University	OH Xi	5
Ted Stadnik	Youngstown State University	OH Xi	5
Jennifer Swank	Denison University	OH Iota	2
Carrie Swauger	Duquesne University	PA Upsilon	4
Elizabeth Ann Tiedeman	Duquesne University	PA Upsilon	6
Jackie Van Ryzin	St. Norbert College	WI Delta	1

Additional Delegates

Name	School	Chapter
Michele J. Kneale	University of Akron	OH Nu
Doyle G. LaCroix, Jr.	Southeastern Louisiana University	LA Delta
Dillon McTernan	Southeastern Louisiana University	LA Delta
Darshit J. Patel	University of South Florida	FL Epsilon
William Paul	University of North Carolina at Charlotte	NC Theta
Margaret Smoot	Texas A&M University	TX Eta

Picuris Room **1:00 PM – 2:35 PM**

1:00–1:15

An Introduction to Franklin Squares

Mark Lane
Sam Houston State University, Texas Epsilon

This talk will give an introduction to Franklin Squares. We will determine algebraic relationships that exist among the properties that define a Franklin Square. Finally, we will describe all known symmetry operations on Franklin Squares.

1:20–1:35

Impossible Paths in Langton's Ant

Dakota Blair
Texas A&M University, Texas Eta

A new characterization of a path (as a word) provides insight into the study of paths produced by many ant-like automata. Impossible words and the construction of a possibility testing algorithm are presented. Additionally, for possible words, this algorithm provides the conditions required for the ant to produce this path.

1:40–1:55

A New Approach to Multiple Bubble Problems

Colleen Hughes
Denison University, Ohio Iota

It has long been known that a circular fence is the most efficient enclosure of a single quantity of area, and that a spherical bubble has the least surface area among all shapes of a given volume. In the early 1990's, proofs were developed for double or triple bubbles in the plane, three-space, and in other spaces. Here we present research from our REU group which extends this work on multiple bubble problems.

2:00–2:15

Let Me Do a Little Number

Jason Brinker
St. Norbert College, Wisconsin Delta

The interconnectedness of mathematics and music has long been discussed by professionals in both fields. In the analysis and composition of music, mathematics is used constantly. In fact, in the 20th century, musical set theory and the Twelve-Tone movement utilized mathematics as a foundation. We will examine these two movements as well as discuss a method of composition developed by the speaker himself.

2:20–2:35

Sumthing Special: The n Festivals of Whatever

Jackie Van Ryzin
St. Norbert College, Wisconsin Delta

We're all familiar with the song about the Twelve Days of Christmas. We will discuss some efficient ways of determining the total number of gifts given and then generalize to a much wider variety of festive occasions and levels of festivities.

Taos Room **1:00 PM – 2:57 PM**

1:00–1:15

Diophantine Approximation of Real Elements on the Number Line

Ross Kravitz
Williams College

We start with Dirichlet's Theorem from 1842, the cornerstone of classical Diophantine approximation. From there, we will use the notion of an irrational number's continued fraction expansion to discuss sequences of best approximates and badly approximated numbers. We conclude with new questions involving generalizations of Diophantine analysis to real curves in the plane.

1:17–1:32

An Epidemic Model of HSV-1 with Vaccination

Asela Acosta
Texas A&M International University

Recent developments of HSV-1 vaccination on mice motivate this study on the potential impact of a vaccine to control the disease in humans. Recent findings lead one to believe that such a vaccine may become available in the next couple of years. A deterministic epidemiological model of HSV-1 with vaccination will be discussed, along with the stability analysis of the equilibrium states, and the computation of the basic reproductive number.

1:34–1:49

The Dynamics of Poverty and Crime

Haiyun Zhao
Stevens Institute of Technology

Poverty and crime are two maladies that plague metropolitan areas. The economic theory of crime (Becker, 1968) demonstrates a direct correlation between poverty and crime. The model seeks to examine the dynamics of the poverty-crime system through stability analysis of a system of Ordinary Differential Equations in order to identify cost-effective strategies to combat crime in metropolises.

1:51–2:06

Immigration and Policy Change as a Dynamic Model

Genevieve-Yvonne Toutain
Simon's Rock College of Bard

For the past two centuries, people have emigrated from Mexico to the United States for various reasons. In recent years, changes in the United States immigration policy have drastically altered the flow of people over the border between the United States and Mexico. Modeling this phenomenon as an adapted epidemic model, we explore the dynamics of the Mexican demographic in the United States.

2:08–2:23

Epidemiology and Evolution of the Influenza Virus

Lorena Morales-Paredes
University of Alabama in Huntsville

The decay of post infection immunity to influenza is known to include mutation of the virus and immune system memory loss, though little has been done to characterize this relationship. We examine dynamical systems at two scales: cellular level interactions between host immune pressures and viral mutations as well as the spread of the mutated strains among heterogeneous susceptible populations. This analysis facilitates understanding of viral evolution and proliferation.

2:25–2:40

Dispersal and Connectivity in a Stochastic Multi-City Epidemic Model

Alan Covert
Arizona State University

We consider the behavior of moderately infectious and lethal diseases such as SARS over a system of networked cities with SLIR dynamics. We include a disease-induced death rate and stochastic effects on intercity dispersal rates. We compute R0 for a theoretical system, and study system response to dispersal volumes and number of connections between cities.

2:42–2:57

Disease Spread as a Function of Population Density

Carlos Chiquete
University of Arizona

Spatial population distributions are key to the spread of many animal diseases. We present a study of human epidemic dynamics as a function of differing spatial population densities and variable contact rates. An epidemic outbreak is applied to both small and comparatively large populations such as New York City and its surrounding communities. Dynamical systems modeling the two scenarios are analyzed qualitatively through numerical methods and computer simulations.

Santa Ana Room **1:00 PM – 2:35 PM**

1:00–1:15

Math with Muscle

Tom Cochran
Youngstown State University, Ohio Xi

Smooth muscles are found throughout our bodies and are extremely important in regulating blood flow in arteries and veins. This talk will touch upon some of the mathematics dealing with the relaxation of smooth muscles. The data was collected during a bio-mathematics summer research program, sponsored by the National Science Foundation, at Youngstown State University.

1:20–1:35

Modeling Bacterial Growth in the Presence of Toxins

David Gohlke
Youngstown State University, Ohio Xi

Environmental factors such as the amount of available nutrients of the presence of toxins play a large role in bacterial growth. Some strains of bacteria have the ability to survive in environments in which other strains would not. This presentation will focus on modeling growth curves of bacteria in different situations, with the intent of finding accurate mathematical models. This research was undertaken in the NSF-SURE program at Youngstown State University.

1:40–1:55

An Alternate Demonstration of Euler's Formula

David Martin
Youngstown State University, Ohio Xi

Euler's formula, one of the most intriguing discoveries in the history of mathematics, shows that the exponential and the seemingly unrelated sine and cosine functions are indeed fundamentally linked. One popular method for proving the formula involves power series representations. Another involves differential equations. This presentation will include an alternate demonstration requiring only an understanding of calculus.

2:00–2:15

The Bus Driver's Sanity Problem

Jennifer Swank
Denison University, Ohio Iota

The Bus Driver's Sanity Problem, introduced by Will (1999), is to determine the best route for the drop off of kids so as to minimize exposure to the children, measured in kid-minutes. Will's solution approach, along with two possible heuristic approaches and continuing research will be presented.

2:20–2:35

Independence Models, Likelihood Ratio Tests, and a Side of Bacon

Aubrey Komorowski
Duquesne University, Pennsylvania Upsilon

The game PASS THE PIGS requires a player to roll a pair of pig-shaped dice. The configuration of the rolled pigs determines points earned. Data collected from thousands of such rolls from different heights are used in conjunction with multinomial independence models to examine height effect. Likelihood ratio tests are used to compare competing independence models and reveal the most plausible dependence relations.

Cochiti Room **1:00 PM – 2:57 PM**

1:00–1:15

Methods of Solutions for Second Order Equations on Time Scales

Ashley Askew
Clayton State University

In this research, we study different methods of solutions for the second order linear equations on a time scale, $\mathbb{T}$, which is a nonempty closed subset of $\mathbb{R}$. We compare some examples of the linear equations in the continuous system and in the time scale system, and we also discuss the generalization of methods of solutions in the time scale.

1:17–1:32

A Probabilistic Approach to the Derivative

Amber De More
Austin Peay State University

We show how various generalized derivatives arise as solutions to linear mean-square estimation problems involving continuous and discrete random variables. These derivatives and their higher-order analogs can be expressed completely in terms of the moment generating function of the corresponding random variable. Alternatively, they can be expressed in terms of orthogonal polynomials.

1:34–1:49

The General Brachistochrone Problem

John Gemmer
Millersville University of Pennsylvania

Consider a frictionless surface in a gravitational field that need not be uniform. Given two points, A and B, on the surface, what curve is traced out by a particle that starts at A and reaches B in the shortest time? This project studies this problem for simple surfaces such as surfaces of revolution. We solve this more general problem using the Euler-Lagrange equation and conservation of mechanical energy.

1:51–2:06

Bounds for Fourth-Order $[0, 1]$ Difference Equations

Ben Gibson
Wake Forest University

In this talk, we will present new results concerning growth rates for fourth-order difference equations with coefficients restricted to the interval $[0, 1]$. Optimality of the bounds will be discussed, as well as some conjectures and open questions.

2:08–2:23

Error Analysis in Moore-Penrose Interpolation Methods

Andrew Harrell
Texas A&M University

This presentation will demonstrate the power of the Moore-Penrose matrix pseudoinverse as a tool for interpolating data to a wide range of possible functions. Discussion will also include limitations on the method and possible errors in data analysis.

2:25–2:40

Model Structure Error in Parameter Identification Problems

Nicholas Stucky-Mack
Harvard College

For most parameter identification problems, the numerical model is not a complete description of the physical system. We investigate the impact of imperfect models on optimization by comparing objective functions generated with correct and incorrect models for a specific problem. We discuss how inadequate models can affect optimization outcomes.

2:42–2:57

Measurement Error in Parameter Identification Problems

Sean Sullivan
University of Texas at Austin

When optimization algorithms are applied to parameter identification problems, measurement error is unavoidable. We investigate the impact of noise in the matching data set by comparing objective functions generated with and without spurious noise for a specific problem. We discuss how changes in the objective function can affect optimization outcomes.

Picuris Room **3:00 PM – 4:35 PM**

3:00–3:15

Exploring Groups with Perfect Order Subsets (POS)

Tina Smith Mote
McNeese State University, Louisiana Epsilon

The order subset of an element x in a group G is defined to be the set of all elements in G with the same order as x. A finite group is said to have POS if the cardinality of each order subset divides the order of the group. Previously established results regarding groups with POS will be discussed and illustrated by examples. In addition, special classes of groups with POS will be characterized.

3:20–3:35

Finite and Infinite Configurations in the Hausdorff Metric Geometry

Chantel C. Blackburn
Andrews University, Michigan Gamma

The Hausdorff metric provides a way to measure distance between any two non-empty compact subsets of n-dimensional Euclidean space. A configuration in this space defines two compact sets and the number of sets at each location between the sets. We will focus on finite and infinite configurations and how a small change to a configuration can lead to a drastically different result in the number of sets at each location between sets.

3:40–3:55

Can You or Can't You Count Cantor?

Jennifer L. Carmichael
Western Oregon University, Oregon Delta

One of the most counterintuitive mathematical objects, the Cantor set, seems riddled with contradictions. This introduction to the Cantor set (a subset of the open interval from 0 to 1) will discuss some of these contradictions, including the ternary-expansion proof that answers whether or not we can count this elusive set.

4:00–4:15

Convergence Properties of the Riemann Integral

Jeff Goldsmith
Dickinson College, Pennsylvania Rho

We will begin by examining sequences of real numbers and look at what it means for a sequence to converge. This will lead us naturally to a discussion about sequences of functions, and two ways to define convergence for sequences of functions. Because no one can resist integrating a function, we will conclude with the Riemann Integral for the limit of sequences.

4:20–4:35

A Generalization of the Chromatic Polynomial of a Cycle

Julian Apelete Allagan
Troy University, Alabama Eta

We prove that if an edge of a cycle on n vertices is extended by adding k vertices, then the chromatic polynomial of such generalized cycle is:

$$P(H_k, \lambda) = (\lambda - 1)^n \sum_{i=0}^{k} \lambda^i + (-1)^n(\lambda - 1).$$

Taos Room **3:00 PM – 5:35 PM**

3:00–3:15

Wavelets and Art

Beverly Lytle
Allegheny College

A paper published recently by the National Academy of Sciences describes a wavelet-like analysis applied to European art to determine if works were done by masters or imitators. We present our study of the validity of their approach, along with our research in applying wavelets to the study of art. (The speakers are students in the REU program at Grand Valley State University.)

3:20–3:35

Tartini: Baroque Mathematics and Acoustics

Mary Servatius
Worcester Polytechnic Institute

The fundamentals of mathematic harmonies as outlined by Tartini are compared to the analyses of his contemporaries. Advantages of his methods are noted.

3:40–3:55

Bioinformatics Algorithms Using MATLAB

Tim Major
Grand Valley State University

The ever-growing interdisciplinary field of bioinformatics is the computational science of studying genomic data. This project involved adapting, analyzing, and comparing many bioinformatics algorithms using the Matlab programming environment. Many problems were considered both applicatively and demonstratively, from the partial digest problem to motif finding to dynamic alignment.

4:00–4:15

An Epidemiological Approach to the Spread of Minor Political Parties

Azra Panjwani
University of California, Berkeley

Minor political parties are influential in shaping American politics. This paper is a study of the diffusion of such third parties in the voting population. We apply methods of non linear dynamical systems of ordinary differential equations similar to those used in epidemiology and implement our general model towards studying the Green Party.

4:20–4:35

Modeling the Effects of Lifestyle Choices on Arterial Stenosis

Ludguier Montejo
Whitman College

Arterial stenosis, a cardiovascular disease (CVD), is a major cause of mortality. The two most common factors that increase the risk of CVD are genetic predispositions and lifestyle choices related to health. To show their relative degrees of importance in the development of arterial stenosis within a population, a mathematical model was created to illustrate how changes in lifestyle parameters affect the total number of incidences.

4:40–4:55

Generation of DNA Codes

Vladimir Ufimtsev
University of Nebraska at Omaha

Deoxyribonucleic acid (DNA) is an acid within the nucleus that is enriched with genetic codes used by living organisms for their physical development. We can use a branch of mathematics that was initiated around the same time as DNA research, known as Coding Theory, to study the similarity between different DNA strands. Codes built on spaces of DNA sequences can be implemented in biomolecular computing. A new metric based on the common block subsequence will be introduced.

5:00–5:15

Godel's Incompleteness Theorems and Human Intelligence

Ammon Paquette
Augustana College

Kurt Gdel showed, for formal systems capable of representing whole number arithmetic, that there are undecidable propositions. This also may suggest that human intelligence cannot be thought of as mechanistic. The context and basic principles of the theorems along with their role in the human intelligence discussion will be described.

5:20–5:35

Numbers and Patterns in Segments in the Hausdorff Metric Geometry

Alexander Zupan
Gustavus Adolphus College

The Hausdorff metric defines a geometry on the space of all non-empty compact subsets of n-dimensional Euclidean space. We will describe some Fibonacci-type patterns that are known in this geometry and elaborate on our search for new types of patterns. We will also discuss the surprising result that certain numbers do not appear at all in this geometry.

Santa Ana Room **3:00 PM – 4:35 PM**

3:00–3:15

An Analysis of Mathematical Models for Image Inpainting

Carrie Swauger
Duquesne University, Pennsylvania Upsilon

Modern technology has created a fundamental need to accurately and efficiently obtain, store, transmit, and recover data. However, these processes often result in the loss of critical information. Digital image inpainting is becoming an increasingly popular technique for automatically filling in lost information in images. In this talk we analyze and compare fundamental properties of several inpainting models based on partial differential equations.

3:20–3:35

It's More Than Nothing

Amanda Hoffman
Sam Houston State University, Texas Epsilon

It was many centuries after the development of natural numbers before any culture saw the need for zero and began to use it as a placeholder and as a number. We will look at the development and acceptance of zero throughout history.

3:40–3:55

Epidemiological Modeling of STDs Using Graph Theory

Patrick Dixon
Occidental College, California Theta

In recent years, increased attention has been given to the topic of obtaining exact solutions to disease models using the graph of contacts between people. This presentation will focus on using the known transmission and infection characteristics of certain STDs to predict transmission patterns within specified populations.

4:00–4:15

Applications of Lie Symmetry Groups to Minimal Surfaces

Angela Hicks
Furman University, South Carolina Delta

A system of differential equations can be represented as an n-dimensional Lie group which is a smooth n-manifold that is also an algebraic group. By computing the symmetries of this Lie group, we are able to find a continuous family of solutions to the original system of differential equations. We apply this method to the study of minimal surfaces which are surfaces whose mean curvature is zero and which can be represented by differential equations. This provides us with examples of families of surfaces that smoothly flow from one minimal surface to another.

4:20–4:35

Symmetry in a Modular Generalization of Schur's Problem

Andrew Matteson
Texas A&M University, Texas Eta

We consider Schur's well-known open problem of sum-free sets. Some relations to classical results, applications to Ramsey theory, backtrack programming, and generalizations of the problem are presented. Primarily, we focus on the ideas of symmetry and anti-symmetry and their applications to modular sum-free partitions.

Cochiti Room **3:00 PM – 5:15 PM**

3:00–3:15

Class Groups of Global Fields

Neil Mendoza
Williams College

We will provide an introduction to the theory of class groups and class numbers in number fields and discuss how these ideas can be generalized to function fields.

3:20–3:35

Prime Decomposition in Cubic Global Fields

Nathan Kaplan
Princeton University

It is possible to determine the decomposition of rational primes in a cubic number field K in terms of the coefficients of a defining polynomial of K. This is useful in computing class numbers and determining class number divisibility properties. We investigate prime decomposition and related questions in cubic global function fields.

3:40–3:55

Class Number Divisibility of Global Fields I

Todd Shayler
Williams College

Previous results have given sufficient conditions for the prime divisibility of the class number for quadratic number fields. In addition, necessary and sufficient conditions have been given for a quadratic number field's class number to be divisible by 3. We explore analogues of these results in the function field case.

4:00–4:15

Class Number Divisibility of Global Fields II

Carl Erickson
Stanford University

Previous results have given sufficient conditions for the prime divisibility of the class number for quadratic number fields. In addition, necessary and sufficient conditions have been given for a quadratic number field's class number to be divisible by 3. We explore analogues of these results in the function field case.

4:20–4:35

Differential Posets and k-ribbon Tableaux

Sean Lee
Pepperdine University

We examine examples of differential posets, which were first introduced by Richard Stanley in 1988. We prove directly for the $k = 2$ and $k = 3$ cases that k-ribbon tableaux are k-differential. We investigate variations on the k-ribbon tableaux such as building k-ribbon tableaux on k-cores and building k-ribbon tableaux with straight ribbons.

4:40–4:55

Differential Posets and k-ribbons

Lisa Bishop
Occidental College

We examine examples of differential posets, which were first introduced by Richard Stanley in 1988. We prove directly for the $k = 2$ and $k = 3$ case that k-ribbon tableaux are k-differential. We investigate variations on the k-ribbon tableaux such as building k-ribbon tableaux on k-cores and building k-ribbon tableaux with straight ribbons.

5:00–5:15

Exploring Dynamics of the Dual Billiard Map in the Hyperbolic Plane

Samuel Otten
Grand Valley State University

The theory of dual billiards is a fast-growing research area that is contained in the discipline of discrete dynamical systems. This research effort explored orbit behavior of the map within the hyperbolic plane and on the boundary at infinity.

Picuris Room **1:00 PM – 2:15 PM**

1:00–1:15

Key Generation of a Group-Oriented, Threshold Cryptosystem

Stephanie Deacon
University of Texas at San Antonio, Texas Omicron

In a (k, n)-threshold public key cryptosystem the group members choose their private key such that no member has knowledge of the private key. However, k members can recover this private key. This scheme is implemented in the field of integers modulo a prime, p, and generalized for any finite field.

1:20–1:35

An Introduction to Knot Theory

Maria Salcedo
Youngstown State University, Ohio Xi

This talk will be a concise introduction to general concepts in knot theory. A brief history of knot theory will be discussed. We will consider commonly studied knots as well as develop definitions of isotopies and isotopy invariants. Finally, results of mathematical research of knotted ribbons will be given. No prior knowledge of knot theory is required to understand this talk.

1:40–1:55

An Analytical Anomaly

Ted Stadnik
Youngstown State University, Ohio Xi

Continued fractions can be used to create sequences of continuous functions that converge pointwise to a function with a countably infinite number of discontinuities. Variations of this problem and open questions will be considered.

2:00–2:15

Selecting Small Groups in College Courses

Alaina Houmard
Mount Union College, Ohio Omicron

Conflicting schedules, ability, and interest among group members can affect the overall performance of a group. I will discuss how multidimensional scaling can be used to obtain optimal groups.

Taos Room **1:00 PM – 2:57 PM**

1:00–1:15

Statistical Analysis of Downed Trees in a Riparian Valley

Nicole Casacchia
Youngstown State University

It is hypothesized that downed trees in a protected river valley fall with a random orientation. Data collected for the downed course woody debris (CWD) in Zoar Valley, New York included volume, orientation from North, decay class, and tree species. Various tests, including the Kolmogorov-Smirnov Test, were conducted to evaluate orientation uniformity and to test the hypothesis.

1:17–1:32

The Rinsing Problem

Nicole O'Connell
St. Norbert College

What is the most efficient way to rinse out a bottle? Is it better to use more iterations with less water or fewer iterations with more water? How much water do you need to reach a desired level of purity? We will investigate these and other questions dealing with rinsing bottles.

1:34–1:49

Roots of a Quadratic Congruence Equation

Elizabeth Eisemann
Augustana College

Although a quadratic equation over the real numbers can have one, two, or no roots, there are other possibilities for the roots of a quadratic congruence equation. We will show some of these possibilities and exhibit equations with large numbers of roots.

2:08–2:23

The Construction and Multiplication of Octonions

Siva Sankrithi
University of Washington

This paper discusses topics presented in "The Octonions" by Dr. John Baez. It includes a discussion of the Fano Plane as it relates to octonionic multiplication, the non-associativity of octonions, and the Cayley-Dickson Construction. Also included is the construction of the octonions from the quaternions using the Cayley-Dickson Construction.

2:25–2:40

A Three-Layered Model for Alzheimer's Disease

Nicholas Toombs
Montclair State University

We develop a three tiered model of Alzheimer's disease. The first component is to determine a risk function based on several known factors that trigger Alzheimer's disease. We model the progression of Alzheimer's by a differential equation measuring the decline of glucose metabolism in the neural tissue. The differential equation will be a function of many factors, one of which is the interaction oxidative stress and free radical scavengers.

2:42–2:57

Diophantine Approximations of Real Curves in the Plane

Daniel Walton
Harvey Mudd College

Here we will discuss generalizations of Diophantine approximation in the Cartesian plane. We move beyond approximating real numbers by rationals to approximating curves in the plane with points having rational coordinates. The objective is to classify curves into categories such as "badly approximative" in a manner analogous to the classification of real numbers.

Santa Ana Room **1:00 PM – 2:15 PM**

1:00–1:15

"The Kingdom Lost For A Smile" from a Theoretical Perspective

Phuong Minh Thi Nguyen
Occidental College, California Theta

This paper studies an intersection between game theory and history to illustrate the wide range of applications of game theory. Despite the tendency to take history for granted, this research illuminates one specific ancient Chinese historical event to emphasize the main factors leading to a turning point in early Chinese history. Moreover, it presents some elements that could turn the outcome of the event, and therefore Chinese history, and could be a useful lesson for leadership.

1:20–1:35

A Price Prediction Model for Building Blocks

Elizabeth Ann Tiedeman
Duquesne University, Pennsylvania Upsilon

Accompanying the prices of LEGO sets displayed in the online and paper catalogs are the number of corresponding pieces in each set. Using catalog data, we implement a least-squares regression model to predict the price of a LEGO set as a function of its piece count and estimate price-per-piece. Additional predictors, such as genre, are included to enhance predictive ability and better understand pricing strategy.

1:40–1:55

Which Mathematical Knots Are Celtic?

Angela Brown
Sam Houston State University, Texas Epsilon

Using a mathematical definition of a Celtic knot, we will attempt to show which knots are indeed Celtic. Celtic knots are obtained from an alternating rectangular grid pattern by changing crossings to vertical or horizontal uncrossings. The existence of identifying characteristics to distinguish Celtic and non-Celtic knots will be explored.

2:00–2:15

Intrinsically Linked, Outerplanar, and Outerflat Graphs

Christopher Cicotta
Clarkson University, New York Omicron

A graph G is outerflat if it can be embedded in a 3-ball, such that every vertex of G lies on the boundary of the 3-ball, and such that every cycle of G bounds a disk in the 3-ball disjoint from G. We will discuss the classification of all outerflat graphs.

Cochiti Room **1:00 PM – 2:55 PM**

1:00–1:15

One-relator Knot Groups

Kari Barkley
Lafayette College

We investigate whether or not all prime alternating knot groups are one-relator groups.

1:20–1:35

Surfaces Bounded by Alternating Knots

Thomas Kindred
Williams College

An alternating knot is a knot with a minimal crossing projection in which the crossings alternate between undercrossings and overcrossings. This talk will concern surfaces, orientable or not, bounded by alternating knots. By studying the surfaces a knot bounds, we can learn a great deal about the structure of a knot itself.

1:40–1:55

$\cos^{-1}(-1/3)$ Stick Number of the Connected Sum of n Trefoil Knots

Debbie Witczak
Benedictine University

We will show that the $\cos^{-1}(-1/3)$–regular stick number of the connected sum of two trefoil knots is 16, which realizes the lower bound for the $\cos^{-1}(-1/3)$–regular stick number for knots with bridge index 3. We then generalize this result to a connected sum of n trefoil knots.

2:00–2:15

Medial and Boundary Geometry I

Anh Chu
University of Richmond

Our research focuses on a medial description of shape in which the boundary of a solid object is represented as the envelope of spheres that are bi-tangent to the boundary. Given the locus of centers and the radii of the spheres, we investigate smoothness and curvature properties of the resulting object boundary.

2:20–2:35

Medial and Boundary Geometry II

Marion Kruse
University of Richmond

Our research focuses on a medial description of shape in which the boundary of a solid object is represented as the envelope of the spheres that are bi-tangent to the boundary. Given the locus of centers and the radii of the spheres, we investigate smoothness and curvature properties of the resulting object boundary.

2:40–2:55

Computing Conservation Laws Using Hodge Decomposition

Ryan Grady
Colorado School of Mines

Hodge decomposition is a powerful tool that arises in several different areas of mathematics. In this talk we will discuss an implementation of a Hodge decomposition for polynomial expressions on the jet space. This yields an alternate method for integration by parts which allows for computing conservation laws of nonlinear partial differential equations.

Taos Room **3:00 PM – 4:57 PM**

3:00–3:15

Review of Commutative Rings

John Chatlos
Williams College

In this talk we will review some basic concepts in commutative ring theory. Topics include Noetherian rings, maximal ideals, prime ideals, associated prime ideals, local rings, localization of rings, rings of power series, polynomial rings, and completion of rings.

3:17–3:32

Formal Fibers of Integral Domains

Sherry Wu
Cornell University

Given a complete local ring T, we construct an integral domain R whose completion is T and whose formal fibers satisfy specific properties. We then construct rings containing $R[x]$ with completion $T[[x]]$ whose formal fibers satisfy similar properties.

3:34–3:49

Formal Fibers and Power Series Rings

Nathaniel Watson
Washington University in St. Louis

Given a complete local ring T, we examine the formal fibers of local integral domains B with completion $T[[x]]$. In particular, we investigate which formal fibers can be realized by some domain B subject to certain restrictions on the relationship between B and T.

3:51–4:06

Semi-local Generic Formal Fibers

Brian Simanek
Williams College

We will give necessary and sufficient conditions for a local ring T and a collection C of nonmaximal prime ideals in T for there to exist a local domain R with completion T such that R has semi-local generic formal fiber with maximal elements the ideals of C.

4:08–4:23

Colorability of Paradromic Rings

James Godzik
University of California, Berkeley

In this talk, I begin by discussing the construction of paradromic rings and their relationship to torus links. James Bryan gave a criterion for the colorability of torus knots, which I hope to extend to the colorability of torus links and hence paradromic rings.

4:25–4:40

The Dodecahedron and A5

Nicholas Johnson
Augustana College

It is well-known that $A5$ is the smallest non-abelian simple group. We show how the dodecahedron is useful in understanding the structure of $A5$ and its subgroups.

4:42–4:57

Spans of the Derivatives of Polynomials

Samuel Kolins
Bowdoin College

The span of a polynomial function with all real zeros is the difference between its least and greatest root. We will examine the relationship between the placement of the roots of a polynomial with fixed span and the spans of the derivatives of the polynomial. In particular, we will share results on which arrangements of zeros result in the extreme cases for the spans of the derivatives.

Cochiti Room **3:00 PM – 4:57 PM**

3:00–3:15

Generalizing the Sum Identities for Sine and Cosine

Nicholas Croll
Sam Houston State University

The sum identities for sine and cosine are used to find the sine or cosine of the sum of two angles. In this talk, we will investigate how these formulas may be generalized to find the sine or cosine of the sum of more than two angles.

3:17–3:32

Robots on Trees

Go Fujita
University of Florida

Discrete Morse theory gives rise to the homology groups of the braid groups of finite trees. We further develop this theory by looking at the cohomology rings. In particular, we investigate when these cohomology rings are isomorphic to exterior face algebras of flag complexes.

3:34–3:49

Controlling the Dimension of a Fractal

Sarah Goodpaster
Augustana College

We will show how to construct a fractal with a given dimension, provided the dimension is within certain bounds. A computer program implements the algorithm to give graphic representations.

3:51–4:06

American Mathematical Monthly Problem 11103

Joesph Kolenick
Youngstown State University

In this talk, a solution to Problem 11103 (Proposed by Gregory Galperin and Hillel Gauchman, Eastern Illinois University, Charleston, IL) from the American Mathematical Monthly will be presented. Only elementary methods will be used.

Problem: *Prove that for every positive integer* n,

$$\sum_{k=1}^{n} \frac{1}{k\binom{n}{k}} = \frac{1}{2^{n-1}} \sum_{\substack{k=1 \\ \text{with } k \text{ odd}}}^{n} \frac{\binom{n}{k}}{k}.$$

4:08–4:23

The Spiral of Roots

Melissa Mauck
Sam Houston State University

In this talk, we will investigate the Spiral of Roots. The Spiral of Roots is a geometric method of constructing the square root of every natural number. We will also explore consequences of this construction.

4:25–4:40

Koch and the Koch Snowflake

Nnamdi Oparanozie
Sam Houston State University

In this talk, we will discuss the life and work of Niels Fabian Helge von Koch and his work on the Koch Snowflake.

4:42–4:57

Fractional Iterates of Maps

Craig Nicholas
New Mexico Tech

Given a map $f : [a, b] \to [a, b]$ and an integer k, what can be said about the existence and properties of a map g such that k iterates of g equals f? We present several results concerning the restrictions placed on such a map g based on the periodic orbits of f.

Picturis Room **3:00 PM – 4:55 PM**

3:00–3:15

Does Distributed Method Help Student Retention of Calculus Techniques?

Kimberly Conner
Mercer University

We intend to determine if one of two styles of WebWork assignments is better at helping students retain basic techniques in Calculus. The results of the statistical analysis of final exam data normed via regrading with a rubric will be discussed.

3:20–3:35

The Life and Work of Georg Cantor

Sarah Fritsch
Sam Houston State University

In this talk, the life of Georg Cantor will be discussed. An overview of his ideas and research on infinite sets and the continuum hypothesis will be given.

3:40–3:55

Tableaux Cycling and Catalan Number Results

Jenny Buontempo
St. Peter's College

The Catalan numbers count, among many combinatorial objects, Young tableaux having two rows of the same length. An operation on tableaux called cycling is presented that leads to a direct derivation of the Catalan number formula from tableaux. Cycling is also used to prove a tableaux analog of the Chung-Feller theorem.

4:00–4:15

Properties of Hyper-logarithmic and Hyper-exponential Functions

Benjamin Mitchell
Taos High School

Functions $y^{y^{\cdot^{\cdot^{y^x}}}}$ and $\log y(\log y(\cdots \log y(x)))$ are analyzed for domain, range, jth order derivatives, integrals, power series and convergence properties. The discussion is generalized from $y = e$ to y being an arbitrary positive real number, and then to y being a complex number.

4:20–4:35

Hypergeometric Summations and the Wilf-Zeilberger (WZ) Algorithm

Chris Smith
Grand Valley State University

In this talk, we will describe hypergeometric summations and the Wilf-Zeilberger Algorithm. We will show how one can apply the WZ method to obtain quick and elegant proofs of hypergeometric summations.

4:40–4:55

Extending Means to n Variables

Mauricio Rivas
Sam Houston State University

Means of real numbers have been defined for two variables. In this talk, we will propose a definition of a mean of n real numbers. We will extend the harmonic, geometric, arithmetic, and contraharmonic means to n variables. We will show that they satisfy our definition and investigate their relationship to each other.

Santa Ana Room **3:00 PM – 4:55 PM**

3:00–3:15

Outer Space and Metric Graphs

Jessica Bauman
Tufts University

We investigate whether given any two distinct metrics, l_1 and l_2, on a graph with vertices of valence greater than or equal to 3, two curves, c_1 and c_2 exist such that $l_1(c_1) < l_2(c_2)$ but $l_1(c_2) > l_2(c_1)$, and then tie the results to a larger problem in Outer Space.

3:20–3:35

Irrational Numbers and the Notion of Equivalence

Nicholas Yates
Williams College

When are two irrational numbers equivalent? When is a quadratic irrational equivalent to its conjugate? In this talk, we examine some classical and recent results relating equivalence to numbers' continued fraction expansions. Then we begin a discussion of our work over the summer of 2005 toward extending those results.

3:40–3:55

Topological Analysis of J. C. Sprott's Simple Chaotic Flows

Timothy Trujillo
New Mexico Institute of Mining and Technology

Through an extensive computer aided search, J. C. Sprott has assembled a list of the 20 simplest distinct chaotic flows with at most two quadratic nonlinearities. We analyze these simple flows using the template theory of Birman and Williams, originally used for the analysis of the Lornez equations.

4:00–4:15

A Problem Related to the Sendov Conjecture

Justin From
Central College

The critical numbers of any polynomial function are implicit functions of the polynomials zeros; thus the zeros provide information about the location of critical numbers. The Sendov Conjecture makes a claim about the distance from the set of zeros to the set of critical numbers of certain polynomial functions. We will share the results of recent investigations regarding a problem related to this conjecture for polynomials with all real zeros.

4:20–4:35

Extending the Notion of Equivalent Irrational Numbers

Jesse Gell-Redman
Columbia University

We explore and extend the notion of linear fractional transformations and their relationship with real quadratic irrationals and their conjugates. We uncover an interesting correspondence between such transformations and a modified continued fraction algorithm.

4:40–4:55

Pictionary and Markov Chains

Lindsey Webster
Western Oregon University

We will discuss how we used finite absorbing Markov Chains to model the game of Pictionary and to determine who was "better" at Pictionary, us or our classmates.

J. Sutherland Frame Lectures

2005	Arthur T. Benjamin	*Proofs that Really Count: The Art of Combinatorial Proof*
2004	Joan P. Hutchinson	*When Five Colors Suffice*
2003	Robert L. Devaney	*Chaos Games and Fractal Images*
2002	Frank Morgan	*Soap Bubbles: Open Problems*
2001	Thomas F. Banchoff	*Twice as Old, Again, and Other Found Problems*
2000	John H. Ewing	*The Mathematics of Computers*
1999	V. Frederick Rickey	*The Creation of the Calculus: Who, What, When, Where, Why*
1998	Joseph A. Gallian	*Breaking Drivers' License Codes*
1997	Philip D. Straffin, Jr.	*Excursions in the Geometry of Voting*
1996	J. Kevin Colligan	*Webs, Sieves, and Money*
1995	Marjorie Senechal	*Tilings as Differential Gratings*
1994	Colin Adams	*Cheating Your Way to the Knot Merit Badge*
1993	George Andrews	*Ramanujan for Students*
1992	Underwood Dudley	*Angle Trisectors*
1991	Henry Pollack	*Some Mathematics of Baseball*
1990	Ronald L. Graham	*Combinatorics and Computers*
1989	Jean Cronin Scanlon	*Entrainment of Frequency*
1988	Doris Schattschneider	*You Too Can Tile the Conway Way*
1987	Clayton W. Dodge	*Reflections of a Problems Editor*
1986	Paul Halmos	*Problems I Cannot Solve*
1985	Ernst Snapper	*The Philosophy of Mathematics*
1984	John L. Kelley	*The Concept of Plane Area*
1983	Henry Alder	*How to Discover and Prove Theorems*
1982	Israel Halperin	*The Changing Face of Mathematics*
1981	E. P. Miles, Jr.	*The Beauties of Mathematics*
1980	Richard P. Askey	*Ramanujan and Some Extensions of the Gamma and Beta Functions*
1979	H. Jerome Keisler	*Infinitesimals: Where They Come From and What They Can Do*
1978	Herbert E. Robbins	*The Statistics of Incidents and Accidents*
1977	Ivan Niven	*Techniques of Solving Extremal Problems*
1976	H. S. M. Coxeter	*The Pappus Configuration and Its Groups*
1975	J. Sutherland Frame	*Matrix Functions: A Powerful Tool*

Pi Mu Epsilon would like to express its appreciation to the American Mathematical Society and to the Committee for Undergraduate Research for the sponsorship of the Awards for Outstanding Presentations. It would additionally like to thank the National Security Agency for its continued support of the student program by providing subsistent grants to Pi Mu Epsilon speakers.

MAA Student Lectures

2005	Annalisa Crannell & Marc Frantz	*Lights, Camera, Freeze!*
2004	Mario Martelli	*The Secret of Brunelleschi's Cupola*
2004	Mark Meerschaert	*Fractional Calculus with Applications*
2003	Arthur T. Benjamin	*The Art of Mental Calculation*
2003	Donna L. Beers	*What Drives Mathematics and Where is Mathematics Driving Innovation?*
2002	Colin Adams	*"Blown Away: What Knot to do When Sailing" by Sir Randolph "Skipper" Bacon III*
2002	M. Elisabeth Pate-Cornell	*Finding and Fixing Systems' Weaknesses: The Art and Science of Engineering Risk Analysis*
2001	Rhonda Hatcher	*Ranking College Football Teams*
2001	Ralph Keeney	*Building and Using Mathematical Models to Guide Decision Making*
2000	Michael O'Fallon	*Attributable Risk Estimation: A Tale of Mathematical/Statistical Modeling*
2000	Thomas Banchoff	*Interactive Geometry on the Internet*
1999	Edward G. Dunne	*Pianos and Continued Fractions*
1999	Dan Kalman	*A Square Pie for the Simpsons and Other Mathematical Diversions*
1998	Ross Honsberger	*Some Mathematical Morsels*
1998	Roger Howe	*Some New and Old Results in Euclidean Geometry*
1997	Aparna Higgins	*Demonic Graphs and Undergraduate Research*
1997	Edward Schaefer	*When is an Integer the Product of Two and Three Consecutive Integers?*
1996	Kenneth Ross	*The Mathematics of Card Shuffling*
1996	Richard Tapia	*Mathematics Education and National Concerns*
1995	David Bressoud	*Cauchy, Abel, Dirichlet and the Birth of Real Analysis*
1995	William Dunham	*Newton's (Original) Method - or - Though This Be Method, Yet There is Madness*
1994	Gail Nelson	*What is Really in the Cantor Set?*
1994	Brent Morris	*Magic Tricks, Card Shuffling and Dynamic Computer Memories*
1993	Richard Guy	*The Unity of Combinatorics*
1993	Joseph Gallian	*Touring a Torus*
1992	Peter Hilton	*Another Look at Fibonacci and Lucas Numbers*
1992	Caroline Mahoney	*Contemporary Problems in Graph Theory*
1991	Lester Lange	*Desirable Scientific Habits of Mind Learned from George Polya*