

Mathfest 2003
Boulder, CO



MAA and Pi Mu Epsilon
Student Paper Sessions
July 31 – August 1, 2003

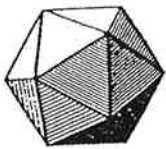


PI MU EPSILON

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 (MAA).



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.

J. Sutherland Frame Lecture

Friday, August 1, 2003
8:00 - 8:50 pm
Grand Ballroom, Millennium Hotel

CHAOS GAMES AND FRACTAL IMAGES

Robert L. Devaney

Boston University

In this lecture we will describe some of the beautiful images that arise from the "Chaos Game". We will show how the simple steps of this game, when iterated millions of times, produce the intricate images known as fractals. We will describe some of the applications of this technique used in data compression as well as in Hollywood. We will also challenge the students present to "Beat the Professor" at the chaos game and maybe win his computer!

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.

**Student Activities
Schedule of Events**

All Student Activities Events will be held in the Millennium Hotel

Wednesday, July 30

5:30 pm - 6:30 pm	MAA/PME Student Reception	Outdoor Pavilion
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Thursday, July 31

9:00 am - 5:00 pm	Student Hospitality Center	Hospitality Suite 331
1:00 pm - 3:00 pm	MAA Session #1	Flagstaff Room
1:00 pm - 3:00 pm	PME Session #1	Sugarloaf Room
1:00 pm - 3:00 pm	MAA Session #2	Canyon Room
1:00 pm - 3:00 pm	PME Session #2	Trail Ridge Room
3:15 pm - 5:15 pm	MAA Session #3	Flagstaff Room
3:15 pm - 5:15 pm	PME Session #3	Sugarloaf Room
3:15 pm - 5:15 pm	MAA Session #4	Canyon Room
3:15 pm - 5:15 pm	PME Session #4	Trail Ridge Room
5:20 pm - 6:30 pm	MAA Modeling Contest Winners	Flagstaff Room

Friday, August 1

9:00 am - 5:00 pm	Student Hospitality Center	Hospitality Suite 331
1:15 pm - 3:15 pm	MAA Session #5	Flagstaff Room
1:15 pm - 3:15 pm	PME Session #5	Sugarloaf Room
1:15 pm - 3:15 pm	MAA Session #6	Canyon Room
1:15 pm - 3:15 pm	PME Session #6	Trail Ridge Room
3:30 pm - 5:30 pm	MAA Session #7	Flagstaff Room
3:30 pm - 5:30 pm	MAA Session #8	Canyon Room
3:30 pm - 5:30 pm	MAA Session #9	Sugarloaf Room
6:00 pm - 7:45 pm	PME Banquet	Outdoor Pavilion
8:00 pm - 8:50 pm	J. Sutherland Frame Lecture Robert L. Devaney , Boston University <i>Chaos Games and Fractal Images</i>	Grand Ballroom

Saturday, August 2

9:00 am - 3:00 pm	Student Hospitality Center	Hospitality Suite 331
1:15 pm - 2:00 pm	MAA Special Session on <i>Math Horizons</i> Arthur T. Benjamin , Harvey Mudd College Jennifer J. Quinn , Occidental College	Flagstaff Room
2:10 pm - 3:50 pm	MAA Student Workshop Clayton Dodge , University of Maine <i>Problems, Problems, Problems!</i>	Flagstaff Room
4:00 pm - 4:50 pm	MAA Student Lecture Arthur T. Benjamin , Harvey Mudd College <i>The Art of Mental Calculation</i>	Flagstaff Room
5:00 pm - 6:00 pm	Student Problem Solving Competition	Hospitality Suite 331

MAA Session #1

Flagstaff Room (Millennium Hotel)

1:00 - 3:00 PM

1:00 - 1:15

A LINK BETWEEN FERMAT AND A CONJECTURE OF LANDAU

W. Andrew Pruet

Millsaps College

For any $a \in \mathbf{N}$, is there a $b < a$ such that $a^2 + b^2$ is prime? This reduces to the question of how many arithmetic progressions with prime generators less than $a\sqrt{2}$ are required to cover the interval $[1, a]$. This question arises when considering a conjecture of Landau which postulates the existence of a prime between n^2 and $(n+1)^2 \forall n \in \mathbf{N}$.

1:20 - 1:35

A TRAFFIC SIMULATION PROGRAM

Eric Bengtson

Augustana College

Computers can be used to simulate traffic. I will discuss the process of writing and revising a traffic simulation program, and will include my own examples. I will also describe the information that may become available from such a simulation.

1:40 - 1:55

ECONOMIC MODELS WITH RANDOM ELEMENTS

Andrew Boettcher

Augustana College

A widely used model for the value of an asset includes an underlying growth rate and a random change in value. I will discuss this model and show how a positive growth rate is needed to offset the random changes in the model.

2:00 - 2:15

KERMACK, MCKENDRICK, AND EPIDEMIOLOGY

Robin Douglas

Augustana College

I will present some of the history of the foundations of mathematical epidemiology, including information about Ross, Hudson, Kermack, and McKendrick. I will also compare the models of Kermack and McKendrick with models with slightly different underlying assumptions.

2:20 - 2:35

SOME SUBGROUPS OF A SYMPLECTIC GROUP

Michael B. Henry

Augustana College

I will define the symplectic groups. I will show how to find many discrete subgroups, and will provide explicit formulas for the elements of some of these subgroups. Some properties of the subgroups will also be discussed.

2:40 - 2:55

LINEAR TRAJECTORIES ON A POOL TABLE

Rebecca Huberts

Augustana College

An idealized shot on a pool table may bank off a long side or a short side before going in a pocket. We show that for a shot which banks many times before going in, certain sequences of long-short banking are impossible. For example, long-short-long-short-short-short is an impossible sequence.

THURSDAY

JULY 31, 2003

Sugarloaf Room (Millennium Hotel)

PME Session #1

1:00 P.M. – 2:35 P.M.

1:00-1:15

HOW DOES IT DO THAT?!

Rebecca Jungman

South Dakota State University – South Dakota Gamma

Disappearing faces and pennies appearing from nowhere may be magic tricks, but they are also Mathematics! These are just two of the amazing properties of hexaflexagons. This presentation will look at the theory behind the hexaflexagon's unique properties. It will also feature instructions for making these delightful "flexing" puzzles.

1:20-1:35

GERBERT: THE MATHEMATICIAN WHO SOLD HIS SOUL TO THE DEVIL

Jennifer Webb

Hood College – Maryland Delta

This past May marked the 1000th anniversary of the death of Gerbert, the remarkable French mathematician and churchman who became Pope. I will report on the results of a summer research project, in which I tried to determine when and where Gerbert learned about Arabic mathematics.

1:40-1:55

THINKING THROUGH THE FOURTH DIMENSION

Delilah Whittington

Millsaps College – Mississippi Delta

Do you remember making cubes from paper in kindergarten? There is an analogous construction for a hypercube from eight cubes, but what are the rules for "folding" them together? Observations from our kindergarten problem can help answer this question.

2:00-2:15

HONEY, WHERE SHOULD WE SIT?

Brian Hahn

St. Norbert College – Wisconsin Delta

A classic calculus problem involves determining where to sit on a level floor in order to maximize the viewing angle for a picture on a wall. We will discuss interesting generalizations using calculus and geometry.

2:20-2:35

DOES YOUR VOTE COUNT?

Adam Christman

St. Norbert College – Wisconsin Delta

In closely contested elections, what are the chances that any one vote cast will affect the outcome of an election? We will extend the question to consider effects of various sized blocks of voters.

MAA Session #2

Canyon Room (Millennium Hotel)

1:00 - 3:00 PM

1:00 - 1:15

HOW IMPORTANT IS CONSTRUCTIVIST METHODOLOGY IN MATH EDUCATION?

Antoinette Border

Hood College

What methods denote one a constructivist teacher versus a traditional teacher? How do students learn mathematics so that they retain and can recall information? What are the implications of reform in math education? These are some of the questions I addressed in my research on constructivist teaching versus traditional teaching.

1:20 - 1:35

THE HISTORY OF AMERICAN MATHEMATICS PRIOR TO 1875

Dylan Burton

Hendrix College

European mathematics experienced tremendous growth during the 18th and 19th Centuries, but little is heard about mathematics or mathematicians in America during this time. Although little original research was produced, a few individuals were able to lay the foundation for Americans to excel in mathematics.

1:40 - 1:55

"WHICH CAME FIRST: e OR NATURAL LOG?"**Christy Sue Crouch**

Sam Houston State University

John Napier is credited with inventing logarithms in the early seventeenth century. However, evidence suggests that logarithms were in use as early as 6th century AD. We will discuss the development of natural logarithms and the number e apart from Napier's invention. Expect some history and oddities of mathematical development.

2:00 - 2:15

A VISUAL DEMONSTRATION OF THE FUNDAMENTAL THEOREM OF CALCULUS

Emanuel A. Lazar

Yeshiva University

The Fundamental Theorem of Calculus asserts that differentiation and integration are inverse operators (save a constant). Here we provide a visual demonstration of this fact by showing that doing differentiation "backwards" leads to the same formula as doing integration "forwards".

2:20 - 2:35

THREE HUNDRED FIFTY YEARS OF PROVING FERMAT'S LAST THEOREM

Lindsay Hardy

Sam Houston State University

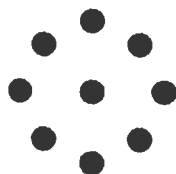
In this talk, we will discuss Fermat's Last Theorem. In particular, we will look at special cases proved between the mid 1600s, the time that Fermat proposed the Last Theorem, and the early 1990s when Andrew Wiles proved it. We will also discuss contributions that led to the proof of certain cases. This talk will focus more on the history of the proof of Fermat's Last Theorem than on the mathematics behind it.

2:40 - 2:55

CENTER OF ART

Natalie Puckett

Grand Junction (CO) Central High School/Mesa State College



A primitive society believed in geocentric astronomy. Their artwork was based on this belief, where all designs can be viewed as a graph on nine vertices. How many ways can we draw any number of lines using these nine vertices to create all the possible artwork designs?