

Mathfest 2002
Burlington, VT



MAA and Pi Mu Epsilon
Student Paper Sessions
August 1 - 2, 2002



PI MU EPSILON

Pi Mu Epsilon is a national mathematics honor society with over 275 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 2, 2002
8:00 - 8:50 pm
Emerald Grand Ballroom, Sheraton

SOAP BUBBLES: OPEN PROBLEMS

Frank Morgan

Williams College

Despite much recent progress by many mathematicians, including undergraduates, many simple open problems remain. This presentation will also include a little contest with demonstrations, explanations, and prizes. No prerequisites.

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**

Wednesday, July 31

5:30 pm - 6:30 pm MAA/PME Student Reception Courtyard, Sheraton

Thursday, August 1

9:00 am - 5:00 pm	Student Hospitality Center	Exhibit Hall, Sheraton
1:00 pm - 2:57 pm	MAA Session #1	Kingsland Room
1:00 pm - 2:55 pm	PME Session #1	Willsboro Room
1:00 pm - 2:57 pm	MAA Session #2	Shelburne Room
1:00 pm - 2:55 pm	PME Session #2	Meeting Room 12
3:00 pm - 4:57 pm	MAA Session #3	Kingsland Room
3:00 pm - 4:35 pm	PME Session #3	Willsboro Room
3:00 pm - 4:57 pm	MAA Session #4	Shelburne Room
3:00 pm - 4:35 pm	PME Session #4	Meeting Room 12
5:30 pm - 6:20 pm	MAA Modeling Contest Winners	Amphitheater, Sheraton

Friday, August 2

9:00 am - 5:00 pm	Student Hospitality Center	Exhibit Hall, Sheraton
1:00 pm - 2:57 pm	MAA Session #5	Kingsland Room
1:00 pm - 2:35 pm	PME Session #5	Willsboro Room
1:00 pm - 2:57 pm	MAA Session #6	Shelburne Room
1:00 pm - 2:35 pm	PME Session #6	Meeting Room 12
3:00 pm - 5:15 pm	MAA Session #7	Kingsland Room
3:00 pm - 4:35 pm	PME Session #7	Willsboro Room
3:00 pm - 5:15 pm	MAA Session #8	Shelburne Room
3:00 pm - 4:35 pm	PME Session #8	Meeting Room 12
6:15 pm - 7:45 pm	PME Banquet	Diamond Ballroom
8:00 pm - 8:50 pm	J. Sutherland Frame Lecture Frank Morgan , Williams College <i>Soap Bubbles: Open Problems</i>	Emerald Grand Ballroom

Saturday, August 3

9:00 am - 3:00 pm	Student Hospitality Center	Exhibit Hall, Sheraton
1:00 pm - 2:50 pm	MAA Student Workshop Patti Frazer Lock , St. Lawrence University <i>Topics in Graph Theory</i>	Emerald Ballroom I
3:00 pm - 3:50 pm	MAA Student Lecture Colin Adams , Williams College <i>"Blown Away: What Knot to do When Sailing"</i> by Sir Randolph "Skipper" Bacon	Emerald Ballroom III
4:00 pm - 4:50 pm	Student Problem Solving Competition	Shelburne Room

MAA Session #1

Kingsland Room (Burlington Sheraton Hotel)

1:00 P.M. – 2:57 P.M.

The first four speakers in this session are students of Professor Frank Morgan and the last three of Professor Cesar Silva in the REU Program at Williams College.

1:00-1:15

A HUNT FOR THE OCTAGON-SQUARE AND SOME OTHER NASTY COMPETITORS

Eric Schoenfeld
Williams College

The notorious octagon square tiling is the most efficient way to enclose and separate two areas on the two-dimensional torus. We hope to expose it for the fraud it truly is. Some other questionable characters arise already in \mathbf{R}^2 if bubbles are allowed to overlap themselves.

1:17-1:32

DOUBLE BUBBLES IN SPHERICAL AND HYPERBOLIC 3-SPACE

George Lee, Jr.
Harvard University

The double bubble problem seeks the least-area way to enclose two regions of prescribed volume. We suspect that the solution in spherical and hyperbolic three-space is similar to a familiar double soap bubble. One major difficulty in proving this is showing that no volume is split into multiple components.

1:34-1:49

BUBBLES ON CONES

Tracy Borawski
Williams College

The most efficient way to enclose a single area on the surface of a cone is a circle about the vertex. We seek the most efficient way to enclose and separate two areas. Numerous possibilities are reduced to two: a variation of the standard double bubble and something new.

1:51-2:06

SYMMETRIES AND COMPARISONS OF MINIMIZING DOUBLE BUBBLES

Robert Lopez
Williams College

The Double Bubble problem seeks to find the least-perimeter way to fence off two areas. On certain surfaces many types of minimizing double bubbles appear. This is a relatively new finding and can lead to some rather interesting solutions to the double bubble problem.

2:08-2:23

DYNAMICAL SYSTEMS AND THEIR EIGENFUNCTIONS

Brian Katz
Williams College

Here is a functional relationship between the study of dynamical systems and their eigenfunctions: Many of the seemingly purely dynamical questions have a precise rewording as eigenvalue questions. I will illuminate this relationship in the finite measure case and introduce some of the issues in the infinite measure case.

2:25-2:40

THE DYNAMICS OF \mathbf{R}^2 ACTIONS

Sarah Iams
Williams College

We will examine group actions in \mathbf{R}^2 on the measure space and define some dynamical properties of these systems. Our \mathbf{R}^2 examples will lead to an understanding of tilings as dynamical systems.

2:42-2:57

ON DYNAMICS OF \mathbf{R}^2 ACTIONS AND TILINGS

Kirsten Wicklegren
Harvard University

Given a finite set of tiles, the space of all tilings of the plane can be viewed as a dynamical system. We will investigate the dynamical properties of tiling spaces, a particular example of an \mathbf{R}^2 action.