

April 1997
Volume 17, Number 2

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FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

MATHFEST 97

World Class Mathematics at Work!

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Special Sessions

Contributed Paper Sessions

Minicourses

Tours

Student Activities

Mathfest 97 Atlanta • Aug 1-4

DETAILS START ON PAGE 3!



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A Sharper FOCUS

MAA Online is becoming the medium of choice for members to keep up to date on MAA activities. As a result, FOCUS will be leaner in the months to come. FOCUS will continue to provide you with essential information and interesting, informative articles, but the overall message as the MAA continues to move into the electronic age is *Get on line to MAA Online*.

—Keith Devlin, Editor

FOCUS

FOCUS is published by the Mathematical Association of America six times a year: February, April, June, August, October, and December.

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Editorial

The 5 Percent That Can Help the 60 Percent

Can three vectors in the Euclidean plane be linearly independent? The answer is yes, according to 48% of a group of 25 students questioned one to three semesters after they had completed a differential equations and linear algebra course followed by a linear algebra course. Of those same students, 36% were unable to give an example of three independent vectors in Euclidean three-space, 68% could not give a correct definition of linear independence, 58% could not define the span of a set of vectors, and 60% could not give an example of a subspace of a vector space. Incidentally, these were students who had *passed* both courses; indeed, their average grades in the two courses were 3.05 and 2.91, respectively ($A = 4$, $B = 3$, $C = 2$, $D = 1$).

This data was supplied by mathematics education expert Guershon Harel at the start of a presentation made at the Joint Mathematics Meetings in San Diego in January. Pretty discouraging, don't you agree?

Harel's point was not that we should give up trying to teach linear algebra to our students—though one can imagine that being a natural reaction to such depressing data. Rather, he said, we should reflect on what it takes to ensure that our students achieve genuine understanding. Although the students in Harel's sample had been able to pass the course, indeed to pass it with a solid grade, they had learned almost nothing of substance. Their success was based on learning how to manipulate symbols according to various rules, without any understanding of what those symbols referred to. To put it plainly, they had not understood the fundamental concepts of linear algebra.

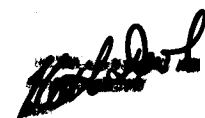
The blind use of symbolic manipulation was vividly illustrated by the response given by one of Harel's students, when faced with a matrix equation $AX = 0$, where A is a matrix and X a column vector. The student first rewrote the equation as $x_1A_1 + \dots + x_nA_n = 0$ (where the A_i are the columns of A) and then solved to give $x_1 = [x_2A_2 + \dots + x_nA_n]/A_1$.

When asked what dividing by A_1 meant, the student simply pointed to the expression he had written and said, "It's just this over this." Pure syntax. Of course, it would be easy for those of us in the business (of mathematics education) to shrug, smile, shake our heads, or wring our hands in despair at the sheer depth of misunderstanding displayed by this answer. If Harel's class was in any way unusual, such a response might be acceptable. But as we all know—or should know—it was not an unusual class in any way, except perhaps in being questioned on their knowledge after the ink on the final exam had dried. As Walter Cronkite used to say as he signed off on the CBS Evening News each night, that's the way it is.

Well, if that is indeed the way it is, then we need to do something about it. What on earth is the point of our putting weeks of effort into trying to teach some basic (and very useful) mathematics, if those efforts do not result in any real learning? Unless we are content to go through a meaningless ritual each semester, we have two choices. We either give up or we figure out how to do it right.

Figuring out how to do it right will require that those of us who earn our daily bread by teaching university mathematics and our summer airline ticket by publishing theorems (Coke) take a good hard look at what "the math ed crowd" down the corridor (Pepsi) have discovered about the way students learn. Yes, I know, 95% of the math ed literature is verbose junk and we Coke-folk don't have the time. But 95% of published mathematical research is symbolic junk, and we never let that get in our way, did we? In both cases, the good 5% is what counts. That 5% of good math ed stuff can help that 60% of college students whom our present methods measurably fail. For teaching linear algebra, start out by looking at some of Harel's own work. (Some of it is about to be published by the MAA.) In his San Diego talk, Harel stressed the importance of motivating mathematical concepts within the student's own frame of reference—of providing the student with an intellectual need for the concept.

Harel is on the faculty at Purdue University, by the way.



The above are the opinions of the FOCUS editor, and do not necessarily represent the official views of the MAA.

MATHFEST 97

World Class Mathematics at Work!

Discover the people, the theorems, the applications and the art of mathematics by attending Mathfest 97, August 1-4 in Atlanta, Georgia. Strengthen and energize your mathematical vocation by attending lectures, contributed paper sessions, minicourses, short courses, and special sessions. And, of course, you won't want to miss the opportunity to share and discuss ideas with colleagues at your national meeting.

Several special events are planned for Atlanta. Attend the lectures and special sessions that pay Tribute to Paul Erdős, the world-renowned mathematician whose itinerant life style and tremendous productivity won him legendary status. Leading this tribute are two lectures by Ronald L. Graham, who was a close-friend and colleague of Erdős for many years. Another special event is the Earle Raymond Hedrick Lecture Series with this year's lecturer, Elliott H. Lieb of Princeton University. He will begin with a presentation entitled "Why Is The Material World The Way It Is? A Mathematical View of the Stability of Matter." Back by popular demand is the theatrical performance of Colin C. Adams and Edward B. Burger, "Casting About: About Casting." If you missed it in Seattle, here's your second chance. Rounding out Mathfest 97 are many activities developed specifically for students.

Review the detailed descriptions of lectures, sessions, and other events in the following pages. Register by using the form on page 13. Information on Mathfest 97 also may be accessed via MAA Online at www.maa.org.



Tribute to Paul Erdős

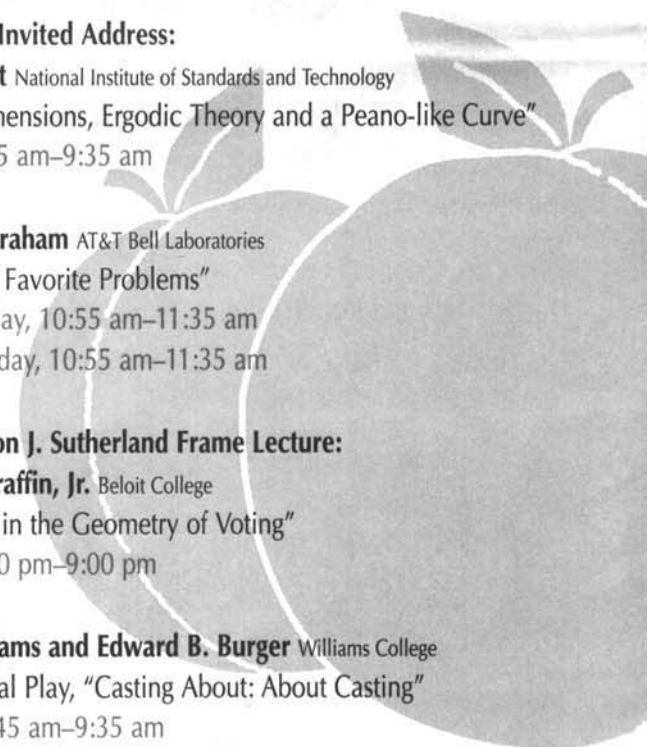
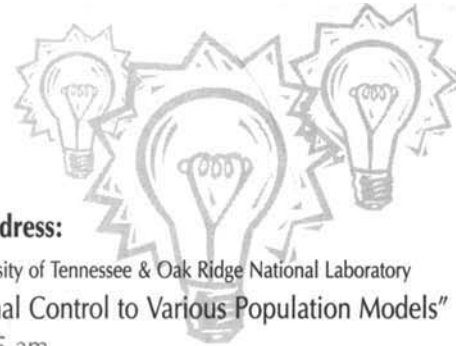
MAA will pay tribute to the master mathematician, Paul Erdős, with a collection of Invited Addresses and Special Sessions that reflect on his life, his mathematics, and the impact he had on individuals and the profession. Erdős died at age 83 in September of 1996, but will be remembered through the insights of his more than 1,500 papers, his almost 500 co-authors, his inspiring unsolved problems, and his unique character.

Join the MAA in honoring this influential mathematician by attending the lectures and sessions in his honor:

Ronald L. Graham will speak in a two-part series on Paul Erdős' Favorite Problems; Richard A. Duke and Renu Laskar will lead a session on Paul Erdős: A Mathematical Nomad; and Andrew Granville, Carl Pomerance, and other speakers will discuss Paul Erdős, Number Theorist Extraordinaire.

Invited Addresses

- **AWM-MAA Invited Address:**
Suzanne Lenhart University of Tennessee & Oak Ridge National Laboratory
"Applications of Optimal Control to Various Population Models"
Saturday, 8:45 am–9:35 am
- **Hedrick Lecture Series:**
Elliott H. Lieb Princeton University
Lecture 1: "Why Is The Material World the Way It Is? A Mathematical View of the Stability of Matter"
Saturday, 9:50 am–10:40 am
Lecture 2: "The Origins of Entropy"
Sunday, 9:50 am–10:40 am
Lecture 3: "To the Edge of Quantum Mechanics"
Monday, 9:50 am–10:40 am
- **Denis Lawrence Weaire** Trinity College-Dublin
"The Simulation of Foam in 2 and 3 Dimensions"
Saturday, 3:00 pm–3:50 pm
- **NAM-MAA Invited Address:**
Fern Y. Hunt National Institute of Standards and Technology
"Fractal Dimensions, Ergodic Theory and a Peano-like Curve"
Sunday, 8:45 am–9:35 am
- **Ronald L. Graham** AT&T Bell Laboratories
"Paul Erdős' Favorite Problems"
Part 1: Sunday, 10:55 am–11:35 am
Part 2: Monday, 10:55 am–11:35 am
- **Pi Mu Epsilon J. Sutherland Frame Lecture:**
Philip D. Straffin, Jr. Beloit College
"Excursions in the Geometry of Voting"
Sunday, 8:00 pm–9:00 pm
- **Colin C. Adams and Edward B. Burger** Williams College
Mathematical Play, "Casting About: About Casting"
Monday, 8:45 am–9:35 am
- **MAA Student Lecture:**
Aparna W. Higgins University of Dayton
"Demonic Graphs and Undergraduate Research"
Monday, 3:00 pm–4:00 pm



Program at a Glance

GENERAL ACTIVITIES	INVITED ADDRESSES	SPECIAL SESSIONS	STUDENT ACTIVITIES	MINICOURSES	CONTRIBUTED PAPER SESSIONS
<p>Registration 12:00 noon–7:00 pm</p> <p>Board of Governors Breakfast 8:00 am–9:00 am</p> <p>Board of Governors Meeting 9:00 am–5:00 pm</p> <p>"Georgia on My Mind" Mathfestival 7:00 pm–10:00 pm</p>			<p>MAA-Pi Mu Epsilon Student Reception 5:30 pm–6:30 pm</p>		
<p>Registration 8:00 am–4:00 pm</p> <p>Exhibit Hall 9:00 am–5:00 pm</p> <p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>Pi Mu Epsilon Council Meeting 9:30 am–12:30 pm</p> <p>MAA Awards Session 10:55 am–11:25 am</p> <p>Investing for Retirement Seminar 4:00 pm–6:00 pm</p> <p>MAA Section Officers Meeting 4:00 pm–6:00 pm</p> <p>MAA 25-Year Member Reception & Banquet 6:00 pm–10:00 pm</p>	<p>Applications of Optimal Control to Various Population Models <i>Suzanne Lenhart</i> 8:45 am–9:35 am</p> <p>Hedrick Lecture 1: Why Is the Material World the Way It Is? <i>Elliott H. Lieb</i> 9:50 am–10:40 am</p> <p>The Simulation of Foam in 2 & 3 Dimensions <i>Denis Lawrence Weaire</i> 3:00 pm–3:50 pm</p>	<p>Undergraduate Research in Mathematics <i>Yewande Olubummo</i> 1:00 pm–2:50 pm</p> <p>NExT Trends in Research <i>Julianne Rainbolt, Frederick J. Wicklin</i> 1:00 pm–2:50 pm</p> <p>Standards in School Mathematics <i>Billy Rhoades</i> 4:00 pm–6:00 pm</p>	<p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>MAA & PME Student Paper Sessions 1:00 pm–5:00 pm</p>	<p>Developing the Ability in Beginning College Mathematics Majors to Write Proofs, Part A <i>Dan Fendel, Diane Resek</i> 1:00 pm–2:50 pm</p> <p>Knot Theory & Applications in the Sciences, Part A <i>Stefanos Gialamas</i> 1:00 pm–2:50 pm</p>	<p>History of Mathematics & Its Use in the Mathematics Classroom, Part 1 <i>Charles Pierre, Elinor Berger</i> 1:00 pm–2:50 pm</p> <p>Using Technology to Implement the Crossroad Standard in College Math Courses, Part 1 <i>Cheryl Stratton, Jean Bevis</i> 1:00 pm–2:50 pm</p> <p>The Incorporation of Statistics in Non-Statistics Mathematics Courses, Part 1 <i>Cathy A. Godbois, Eric Y. Leung</i> 4:00 pm–6:00 pm</p> <p>Innovative Teaching Ideas for Undergraduate Mathematics, Part 1 <i>Mohammad H. Ahmadi, Tingxiu Wang</i> 4:00 pm–6:00 pm</p>
<p>Registration 8:00 am–4:00 pm</p> <p>MAA Student Chapters/PME Advisor's Breakfast 8:00 am–9:15 am</p> <p>Exhibit Hall 9:00 am–5:00 pm</p> <p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>PME Banquet 6:00 pm–8:00 pm</p>	<p>Fractal Dimensions, Ergodic Theory & a Peano-like Curve <i>Fern Y. Hunt</i> 8:45 am–9:35 am</p> <p>Hedrick Lecture 2: The Origins of Entropy <i>Elliott H. Lieb</i> 9:50 am–10:40 am</p> <p>Paul Erdős' Favorite Problems, Part 1 <i>Ronald L. Graham</i> 10:55 am–11:35 am</p> <p>Invited Address To Be Announced 3:00 pm–3:50 pm</p>	<p>Paul Erdős: A Mathematical Nomad <i>Richard A. Duke, Renu Laskar</i> 1:00 pm–2:50 pm</p> <p>Mathematics Instruction & the World Wide Web <i>Earl D. Fife, Lawrence Husch, & Gene Klotz</i> 4:00 pm–6:00 pm</p> <p>Meeting the Challenges of Reform in Teacher Education at Minority Institutions Through Partnerships & Collaborations <i>Etta Falconer, John Kenelly, Genevieve Knight, William Hawkins</i> 4:00 pm–6:00 pm</p>	<p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>MAA & PME Student Paper Sessions 1:00 pm–5:00 pm</p> <p>PME Banquet 6:00 pm–8:00 pm</p> <p>PME Frame Lecture: Excursions in the Geometry of Voting <i>Philip D. Straffin, Jr.</i> 8:00 pm–9:00 pm</p>	<p>Developing the Ability in Beginning College Mathematics Majors to Write Proofs, Part B <i>Dan Fendel, Diane Resek</i> 1:00 pm–2:50 pm</p> <p>Knot Theory & Applications in the Sciences, Part B <i>Stefanos Gialamas</i> 1:00 pm–2:50 pm</p> <p>Music & Mathematics, Part A <i>Leon Harkleroad</i> 4:00 pm–6:00 pm</p> <p>Is Fuzziness a Mathematical Concept? Part A <i>Hua (Harry) Li, Luisamaria Nicosia McAllister</i> 4:00 pm–6:00 pm</p>	<p>Using Technology to Implement the Crossroad Standard in College Math Courses, Part 2 <i>Cheryl Stratton, Jean Bevis</i> 1:00 pm–2:50 pm</p> <p>Mathematics for Liberal Arts Students: New Goals, Methods, & Assessments, Part 1 <i>Janet Heine Barnett, Janet G. Nichols</i> 1:00 pm–2:50 pm</p> <p>Calculus Reform: What Works AND What Does Not Work <i>Lawrence Husch</i> 1:00 pm–2:50 pm</p> <p>Innovative Teaching Ideas for Undergraduate Mathematics, Part 2 <i>Mohammad H. Ahmadi, Tingxiu Wang</i> 4:00 pm–6:00 pm</p> <p>History of Mathematics & Its Use in the Mathematics Classroom, Part 2 <i>Charles Pierre, Elinor Berger</i> 4:00 pm–6:00 pm</p>
<p>Registration 8:00 am–4:00 pm</p> <p>Exhibit Hall 9:00 am–5:00 pm</p> <p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>MAA Business Meeting 11:45 am–12:15 pm</p>	<p>Casting About: About Casting <i>Colin C. Adams, Edward B. Burger</i> 8:45 am–9:35 am</p> <p>Hedrick Lecture 3: To The Edge of Quantum Mechanics <i>Elliott H. Lieb</i> 9:50 am–10:40 am</p> <p>Paul Erdős' Favorite Problems, Part 2 <i>Ronald L. Graham</i> 10:55 am–11:35 am</p>	<p>NSF-Funded Middle School Curriculum Projects: What Mathematical Background Will Be Needed by Teachers of These Materials? <i>James D. Gates</i> 1:00 pm–2:50 pm</p> <p>Paul Erdős: Number Theorist Extraordinaire <i>Andrew Granville, Carl Pomerance</i> 1:00 pm–2:50 pm</p> <p>Dynamical Systems & Modeling: Papers by Graduate Students <i>Jack Hale</i> 4:00 pm–6:00 pm</p>	<p>Student Hospitality Center 9:00 am–5:00 pm</p> <p>Workshop: Mathematical Modeling <i>Frank Giordano</i> 1:00 pm–2:50 pm</p> <p>MAA Student Lecture Demonic Graphs & Undergraduate Research <i>Aparna W. Higgins</i> 3:00 pm–4:00 pm</p>	<p>Music & Mathematics, Part B <i>Leon Harkleroad</i> 1:00 pm–2:50 pm</p> <p>Is Fuzziness a Mathematical Concept? Part B <i>Hua (Harry) Li, Luisamaria Nicosia McAllister</i> 1:00 pm–2:50 pm</p>	<p>The Incorporation of Statistics in Non-Statistics Mathematics Courses, Part 2 <i>Cathy A. Godbois, Eric Y. Leung</i> 1:00 pm–2:50 pm</p> <p>Mathematics for Liberal Arts Students: New Goals, Methods, & Assessments, Part 2 <i>Janet Heine Barnett, Janet G. Nichols</i> 1:00 pm–2:50 pm</p>

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Special Sessions

Special Sessions feature presentations or panel discussions. The speakers are invited by the organizers and selected because of their knowledge and accomplishments in the focal area of the session.

Undergraduate Research in Mathematics

Yewande Olubummo Spelman College

This session presents various aspects of research in mathematics at the undergraduate level. Topics include descriptions of programs, appropriate topics for research, ways to implement and support a research program, and the role of undergraduate research in mathematics.

Saturday, 1:00 pm–2:50 pm

NExT Trends in Research

Julianne Rainbolt Michigan State University
Frederick J. Wicklin The University of Minnesota

In this session, participants in MAA's Project NExT will share their current research interests and results.

Saturday, 1:00 pm–2:50 pm

Standards in School Mathematics

Billy Rhoades Indiana University

Panelists discuss the NCTM recommendations on professional, curriculum and evaluation standards for school mathematics. Pros and cons of implementation and implications for colleges and universities will be addressed, and questions will be taken from the audience. The panelists include: Gail Burrill, President of the NCTM; Joan Ferrini-Mundy Mathematical Sciences Education Board; Henry Alder, University of California, Davis; and James R. C. Leitzel, University of New Hampshire.

Saturday, 4:00 pm–6:00 pm

Paul Erdős: A Mathematical Nomad

Richard A. Duke Georgia Institute of Technology
Renu Laskar Clemson University

This session includes a discussion of Paul Erdős, the non-stop traveler, and his impact on those he met and worked with along the way. Speakers include the organizers.

Sunday, 1:00 pm–2:50 pm

Mathematics Instruction and the World Wide Web

Earl D. Fife Calvin College
Lawrence Husch University of Tennessee
Gene Klotz Swarthmore College

This session features invited presentations on how the World Wide Web is being used in mathematics education. Presenters demonstrate the use of, and discuss examples and strategies for using today's technology to enhance students' understanding of mathematics. (Sponsored by the MAA Committee on Computers in Mathematics Education.)

Sunday, 4:00 pm–6:00 pm

Meeting the Challenges of Reform in Teacher Education at Minority Institutions Through Partnerships and Collaborations

Etta Falconer Spelman College
John Kenelly Clemson University
Genevieve Knight Coppin State College
William Hawkins MAA's SUMMA Program

This session addresses efforts to align instructional activities with guidelines for the preparation of teachers of mathematics. In addition to the organizers, presenters include Stella Ashford, Southern University-Baton Rouge (for MainSTey); Karen Norwood, North Carolina State University; and Gilbert Casterlow, North Carolina A&T University (for CCRCA). The "MainSTey" and "CCRCA" projects are funded by NSF and based at minority institutions; SUMMA provides technical assistance.

Sunday, 4:00 pm–6:00 pm

NSF-Funded Middle School Curriculum Projects: What Mathematical Background Will Be Needed by Teachers of These Materials?

James D. Gates, Executive Director Emeritus
National Council of Teachers of Mathematics

New curriculum materials for middle school mathematics will require some changes in the traditional mathematical background provided for preservice and inservice teachers. This session deals with the necessary changes.

Monday, 1:00 pm–2:50 pm

Paul Erdős, Number Theorist Extraordinaire

Andrew Granville University of Georgia
Carl Pomerance University of Georgia

This session includes talks not only on the mathematics of Paul Erdős, but also developments from his mathematics and what he meant to the speakers personally. Other speakers include Krishna Alladi, University of Florida; and Neil Calkin, Georgia Tech.

Monday, 1:00 pm–2:50 pm

Dynamical Systems and Modeling: Papers by Graduate Students

Jack Hale Georgia Institute of Technology
Interesting research in dynamical systems and modeling will be presented by graduate students.

Monday, 4:00 pm–6:00 pm

Contributed Paper Sessions

Contributed paper sessions are organized around a pre-determined topic. Presenters are selected by the paper organizers after reviewing responses to a call for papers.

History of Mathematics and Its Use in the Mathematics Classroom

Charles Pierre Clark Atlanta University

Elinor Berger Columbus State University

These sessions feature papers describing innovative ways of using the history of mathematics in the classroom. Some of the topics to be covered: investigative approaches; descriptions of ways to teach history of mathematics courses using both original and non-original sources; uses of the history of mathematics in accord with current changes in curricula, pedagogy, the preparation of teachers of mathematics, and ideas inherent in the STANDARDS.

Part 1: Saturday, 1:00 pm–2:50 pm

Part 2: Sunday, 4:00 pm–6:00 pm

Using Technology to Implement the Crossroads Standards in College Mathematics Courses

Cheryl Stratton & Jean Bevis

Georgia State University

These sessions focus on innovative uses of technology in undergraduate mathematics courses, in particular, how changes in delivery can support AMATYC Standards, and how the classroom can become a learning laboratory.

Part 1: Saturday, 1:00 pm–2:50 pm

Part 2: Sunday, 1:00 pm–2:50 pm

The Incorporation of Statistics in Non-Statistics Mathematics Courses

Cathy A. Godbois & Eric Y. Leung

Harrisburg Community College–Lancaster

As the trend toward the incorporation of modeling real and student collected data into the undergraduate mathematics curriculum expands, issues regarding the amount of statistics required as a prerequisite and/or the statistics topics which should be included in the course must be resolved. How much or how little statistical background is required or should be included? Speakers will present differing viewpoints and current practices.

Part 1: Saturday, 4:00 pm–6:00 pm

Part 2: Monday, 1:00 pm–2:50 pm

Innovative Teaching Ideas for Undergraduate Mathematics

Mohammad H. Ahmadi

University of Wisconsin-Whitewater

Tingxiu Wang Oakton Community College

Throughout our teaching careers, we often find a new method in teaching standard topics in mathematics which is creative or interesting. This session highlights instructors' outstanding or innovative ideas, and their insights on teaching everyday material in undergraduate mathematics.

Part 1: Saturday, 4:00 pm–6:00 pm

Part 2: Sunday, 4:00 pm–6:00 pm

Mathematics for Liberal Arts Students: New Goals, Methods and Assessments

Janet Heine Barnett & Janet G. Nichols

University of Southern Colorado

Despite the reputation of liberal arts mathematics courses as "Math for Poets," such courses fulfill a standard graduation requirement and provide a final mathematical experience for numerous students who move into careers in non-technical fields. Recently, a variety of philosophies concerning the quantitative and mathematical needs of these students have developed, along with new and often innovative methods of instruction and assessment. This session addresses these philosophies, and instructional and assessment techniques being used to meet their goals.

Part 1: Sunday, 1:00 pm–2:50 pm

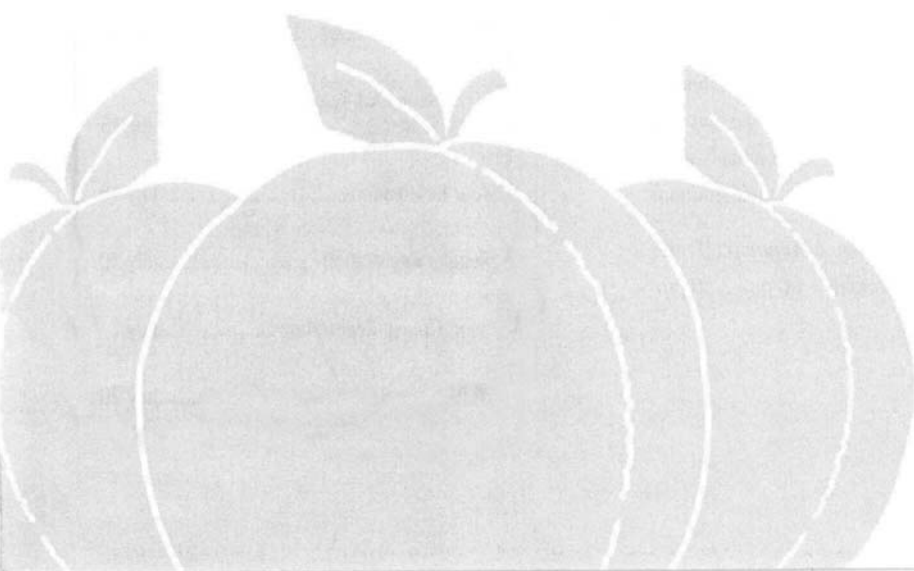
Part 2: Monday, 1:00 pm–2:50 pm

Calculus Reform—What Works AND What Does Not Work

Lawrence Husch University of Tennessee

This session features reports from departments which have implemented calculus reform in a significant manner for an extended period and have made a decision to continue or discontinue that teaching method.

Sunday, 1:00 pm–2:50 pm



Minicourses

Minicourses offer four hours of focused instruction. Enrollment is limited and a separate registration fee is required. Refer to Registration Information and the Registration Form for details.

#1 Developing the Ability in Beginning College Mathematics Majors to Write Proofs

Dan Fendel & Diane Resek
San Francisco State University
The focus of this minicourse is on ways to help beginning college mathematics majors develop the ability to write meaningful proofs. A key element of the approach is to have students work from their own conjectures, gradually attaining greater rigor. Participants work in groups with activities from the presenters' college and high school texts, see student work, and discuss the controversies that arise from this approach.

Part A: Saturday, 1:00 pm–2:50 pm
Part B: Sunday, 1:00 pm–2:50 pm

#2 Knot Theory and Applications in the Sciences

Stefanos Giamamas Illinois Institute of Art
Designed for participants who are unfamiliar with knot theory, this minicourse introduces such concepts as mathematical knots and links, knot equivalence, the Wirthe number, the linking number, Conway polynomial and Jones polynomial. Ribbon knots and their role in DNA research will also be presented. Participants will use strings to create fascinating knots and links and compute invariants and also will work on knot and link puzzles, present results, and then re-create knots using laser points and mirrors.

Part A: Saturday, 1:00 pm–2:50 pm
Part B: Sunday, 1:00 pm–2:50 pm

#3 Music and Mathematics

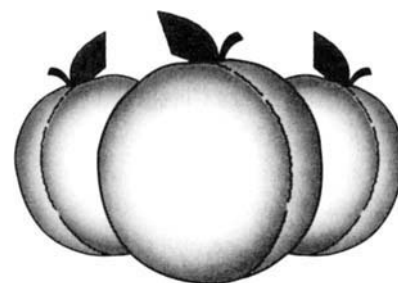
Leon Harkleroad Cornell University
Over the years, people have used mathematics in various ways to describe, analyze, and create music. This minicourse explores the application of mathematical areas such as number theory, probability, and group theory to musical topics like tuning systems, bell-ringing, and 20th century compositional technique. Emphasis will be placed on how participants can incorporate this material in their classes—or even design a service course on music and mathematics.

Part A: Sunday, 4:00 pm–6:00 pm
Part B: Monday, 1:00 pm–2:50 pm

#4 Is Fuzziness a Mathematical Concept?

Hua (Harry) Li West Texas University
Luisamaria Nicosia McAllister Moravian College
Fuzziness is a term introduced to denote a new mathematical methodology to handle uncertainties that cannot be determined by probabilistic and random assumptions. It is based on the theory proposed by Lotfi A. Zadeh in 1965. The theory of fuzzy sets eventually led to the discovery of fuzzy logic and its application to modern technology. During this hands-on course, participants will be introduced to the ideas underlying fuzzy sets, fuzzy numbers, fuzzy logic and fuzzy graphs. They will work collaboratively on assigned problems and discuss their solutions.

Part A: Sunday, 4:00 pm–6:00 pm
Part B: Monday, 1:00 pm–2:50 pm



Other Sessions

Investing for Retirement Seminar

Conducted by a certified financial planner, this seminar presents financial investment strategies for retirement. Areas of discussion include saving strategies, fighting inflation's effect now and in the future, ways to approach estate planning, and protecting assets from inheritance and estate taxes.

Saturday,
4:00 pm–6:00 pm.

Mathfest 97 Deadlines

Early Bird Registration	June 18
Dormitory Housing Reservations.....	June 18
Renaissance Atlanta Hotel-Downtown Reservations	June 30
50% Refund for Registration & Event Tickets	July 15
Tour Reservations	July 18
Regular Registration	July 20
Short Course Registration	July 20
Minicourse Registration	July 20



Exhibit Hall

Shop for new publications and products and revisit old favorites at the Mathfest 97 Exhibit Hall. This is your opportunity to review the latest books, play with innovative calculators and preview software programs. Meet company representatives and receive feedback that will assist you in making purchase decisions.

In the Exhibit Hall, you'll find the popular MAA Bookstore. There you can select from MAA's extensive collection of books on mathematics, mathematics education, and related topics. Schedule time to browse through the 12 new titles premiering at Mathfest 97. Purchase books at the meeting and you'll save money with a special discount!

Representatives from publishers, software firms, games and puzzle companies, educational foundations, and more will be on hand in the Atlanta Ballroom in the Renaissance Atlanta Hotel-Downtown.

The Exhibit Hall is open on Saturday, Sunday, and Monday 9:00 am–5:00 pm.

Call for Student Papers

Students who wish to present a paper at Mathfest 97 must be nominated by a faculty advisor familiar with the work to be presented. Students who make presentations at Mathfest 97, and who are also members of MAA Student Chapters are eligible for partial travel reimbursement through a grant from the Exxon Education Foundation.

To propose a paper for presentation, students must complete a form and obtain the signature of a faculty sponsor. Nomination forms are located on MAA Online at www.maa.org under STUDENTS, or can be obtained from Professor Charles Diminnie, 3306 Grandview Drive, San Angelo, TX 76904 E-mail: charles.diminnie@angelo.edu. *Deadline for receipt of papers is June 27, 1997.*

Student Activities

Students and faculty will be interested in presentations of student work in sessions sponsored by the MAA and PME, and in the Invited Lectures developed with students in mind. Starting with a student reception on Friday night, Mathfest 97 includes a rich array of activities for students. At the Student Hospitality Center—open Saturday through Monday—students and other Mathfest attendees can meet for informal conversation, refreshments, and mathematical diversions. The Hospitality Center also provides programs for the student paper sessions, packets for student presenters, and information on Mathfest activities of interest to students. Special information for students can be found on MAA Online at www.maa.org.

MAA/Pi Mu Epsilon Student Reception
Friday, 5:30 pm–6:30 pm

MAA and Pi Mu Epsilon Student Paper Sessions
Saturday, 1:00 pm–5:00 pm • Sunday, 1:00 pm–5:00 pm

Pi Mu Epsilon Banquet
See the Mathfest Registration Form for ticket information.
Sunday, 6:00 pm–8:00 pm

Pi Mu Epsilon J. Sutherland Frame Lecture
“Excursions in the Geometry of Voting”
Philip D. Straffin, Jr. Beloit College
Sunday, 8:00 pm–9:00 pm
Modern political theory uses geometric models to investigate how voters' ideological beliefs affect their voting power, the policy outcomes they will choose, the stability of those outcomes, and how the voters will form coalitions. This lecture looks at a selection of such models, using only ideas from plane geometry.

MAA Student Workshop
“Mathematical Modeling”
Frank R. Giordano COMAP
Monday, 1:00 pm–2:50 pm
In this presentation, problems from the Mathematical Contest in Modeling are examined and extended, and several models will be developed and refined. The discussion weaves through undergraduate mathematics to include discrete, continuous, stochastic and nonlinear considerations. To keep things lively there will be opportunities for audience participation, as well as some short film clips.

MAA Student Lecture
“Demonic Graphs and Undergraduate Research”
Aparna W. Higgins University of Dayton
Monday, 3:00 pm–4:00 pm
The results of student research can have depth, breadth, and beauty. This lecture highlights several student research studies: investigations into the effects of the line graph operator on properties of graphs; pioneering results in pebbling graphs; and, building on the other two studies, an exploration of pebbling numbers of line graphs.

Epidemiology Modeling

MAA Two-Day Short Course

Co-sponsored by the Centers for Disease Control (CDC)

July 31-August 1, 8:30 am to 5:00 pm

This short course precedes Mathfest 97 and requires a separate registration fee. For details, refer to the Mathfest 97 Registration Form or visit Short Course on MAA Online, www.maa.org.

Despite great strides in research and treatment, infectious diseases continue to be a major cause of mortality, particularly in developing countries. This course will present the basic mathematical models for the spread of infectious disease and provide participants with the foundations of model development and examples suitable for use in undergraduate mathematics courses. Applications to human diseases such as measles and HIV/AIDS and applications to wildlife diseases such as rinderpest and brucellosis will be presented. Participants do not need any previous knowledge of epidemiology modeling as all infectious disease models will be developed carefully from basic principles.

There will be four talks each day plus a lecture by an epidemiologist on "The Politics of Epidemiology Decision-Making" on Thursday and a panel discussion on "Current Problems in Epidemiology" with CDC panelists on Friday.

Speakers

The principal speaker, Herb Hethcote from the University of Iowa, has worked on epidemiology models and their applications for over 20 years. He will speak on several topics: "Three Basic Epidemiology Models," "Epidemiology Models with Variable Population Size," "Comparison of Vaccination Strategies for Rubella," and "Modeling Pertussis (whooping cough) Transmission and Immunization."

Andy Dobson of Princeton University will speak on "Diseases of Wildlife: Rinderpest in the Serengeti and Brucellosis in Yellowstone."

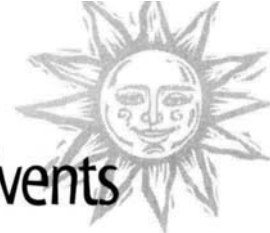
John Glasser from the Centers for Disease Control will talk on "Evaluation via Mathematical Modeling of Extraordinary Efforts to Control a Measles Outbreak in Dallas, Texas during 1990."

Linda Allen of Texas Tech University will talk on "Some Discrete-Time Epidemic Models, Applications to Chlamydia and Chickenpox."

Mac Hyman of the Los Alamos National Laboratory will speak on "Two Plausible Models for HIV Transmission Can Predict Qualitatively Different Epidemics."

Registration

To register for the MAA Two-Day Short Course refer to the Mathfest 97 Registration Form.



Social Events

Meet and share ideas with your peers at a variety of social events being held at Mathfest 97. You can **reserve your tickets by ordering through your advance registration** (see registration form). Banquet events will offer vegetarian meals if requested on the registration form. Cancellations must be received in writing by July 15 for a 50% refund. No refunds are available after this date.

"Georgia on My Mind" Mathfestival

Kick-off Mathfest 97 with this celebration of the food and fun of the South on Friday, August 1. All participants and guests are invited! This event will be held in the Georgia Ballroom of the Renaissance Atlanta Hotel-Downtown, 7:00 pm-10:00 pm. Come and mingle with old friends and make some new ones before the meeting even begins. Tickets are \$35.

PME Banquet

This annual event will be held on Sunday, 6:00 pm-8:00 pm. Tickets are \$12 and \$20. After the banquet, attend the popular PME J. Sutherland Frame lecture, given this year by Philip D. Straffin, Jr. of Beloit College.

MAA 25-Year Member Banquet

The 20th annual banquet for those individuals who have been members of the MAA for 25 years or more. This banquet will be held on Saturday, 7:00 pm-10:00 pm. There will be a reception prior to the banquet at 6:00 pm. Tickets are \$35.

Tours

To register for tours, please complete the form at the bottom of this page and return it, with payment, to Atlanta Arrangements by Friday, July 18. This form is separate from your Mathfest 97 registration. Confirmations will be mailed directly to you and tickets can be picked up at the Mathfest registration desk. Pre-registration is advised because decisions to cancel low-enrollment tours (less than 35) will be made by Friday, July 18, 1997. Cancelled tours will be fully refunded. No refunds or exchanges will be made after July 18. Payment must be in U.S. funds drawn on U.S. banks.

● Atlanta's Famous Firsts

Friday, August 1, 1:00 pm-5:00 pm

\$30.00

Today's tour will begin at CNN Center, home of the first cable television network, Cable News Network (CNN). Here you can catch a glimpse of the fast-paced excitement of a 24 hour news broadcast with an insider's studio tour. Then it's off to visit the fabulous new World of Coca-Cola Pavilion, Coke Mart and Underground Atlanta. Coca-Cola's International Headquarters are located in Atlanta and it is here where the secret formula was first perfected.

Church you will continue past Dr. King's birth home and tomb, and stop at the Martin Luther King, Jr. Center for Non-Violent Social Change. Next you will drive through the Atlanta University complex and visit the grand Herndon Home, former residence of Alonzo Herndon, founder of the Atlanta Life Insurance Company, the largest and most successful black-owned business in the world. The last stop will be the APEX Museum, where you will have the opportunity to view exhibits on local black history and art by national black artists.

Afterwards, enjoy a nature walk in the Fernbank Forest and take a trivia quiz as you look at native foliage. Then its off to SciTrek, one of the top ten physical science centers in the nation. Each exhibit here requires your participation to examine the laws of science.

● Atlanta's African-American Heritage

Saturday, August 2, 1:00 pm-5:00 pm

\$24.00

This tour will begin with a narrated ride down historic Auburn Avenue to visit Ebenezer Baptist Church where Dr. Martin Luther King preached. From the

● The Sights and Sounds of Science

Sunday, August 3. 1:00 pm-5:00 pm

\$29.00

The first stop will be Fernbank, the largest natural science museum south of The Smithsonian. Take "A Walk Through Time in Georgia" or view the intriguing "Spectrum of Senses."

● The Good Life in Historic Buckhead

Monday, August 4, 9:00 am-1:00 pm

\$25.00

Buckhead is known today as Atlanta's premiere residential and shopping district with a distinct historical identity. Here you will visit the Atlanta History Center with its regal Swan House, an architectural masterpiece built in 1929. Next you will stop at the Tullie Smith House, an Atlanta "plantation style" farmhouse of the 1840's. Finally, you can tour the Atlanta History Museum and follow Atlanta from its humble beginnings to today.

TOUR REGISTRATION FORM

Friday, August 1	1:00 pm-5:00 pm	Atlanta's Famous Firsts	\$30 x _____ = _____
Saturday, August 2	1:00 pm-5:00 pm	Atlanta's African-American Heritage	\$24 x _____ = _____
Sunday, August 3	1:00 pm-5:00 pm	The Sights and Sounds of Science	\$29 x _____ = _____
Monday, August 4	9:00 am-1:00 pm	The Good Life in Historic Buckhead	\$25 x _____ = _____

Total Amount Enclosed = _____

Name: _____

Address: _____

City, State, Zip: _____

Phone: (____) _____ Fax: (____) _____

Method of Payment: Check Visa Mastercard

Credit Card # _____ Expiration Date: _____

 Please check if you need additional assistance to fully participate in the tour program. You will be contacted by Atlanta Arrangements.

Make checks payable to Atlanta Arrangements and return this form to: Atlanta Arrangements, 2964 Peachtree Road, NW Suite 652, Atlanta, GA 30305 • phone (404) 262-7660. Credit card orders may be sent by fax to (404) 233-2426

Registration Information

How to Register for Mathfest

Early Bird Registration: Those who register by the early bird deadline of **June 18** can take advantage of the early bird fee savings and have their registration packets mailed directly to them prior to the meeting. The packets will be mailed July 9 and there will be no need to register once you arrive in Atlanta.

Regular Registration: Those who register after June 18 but before the final deadline of **July 20** must pay the regular registration fees. These registration packets will not be mailed and must be picked up at the Mathfest Registration Desk. You may also register on-site at the registration desk.

The Mathfest Registration Desk is located in the Georgia Ballroom Lobby at the Renaissance Atlanta Hotel-Downtown. Registration will be open noon–7:00 pm on Friday, and 8:00 am–4:00 pm, Saturday through Monday. You may also pick up or purchase event and tour tickets at this location.

The Windsor Company has been selected by MAA as the official Mathfest management firm (similar to the role AMS had in the past.) Windsor will coordinate arrangements and registration. **Send completed registration forms with full payment to:**

The Windsor Company
5600 General Washington Drive
Suite B-201
Alexandria, VA 22312
Phone: (703) 642-9385
Fax: (703) 642-9382
Email: mpalermo@windsor-inc.com

Make checks payable to The Windsor Company. Payments by check must be made in U.S. Funds and drawn on a U.S. bank.

Registration forms accompanied by insufficient payment will be returned or a \$5 charge will be assessed if an invoice must be prepared to collect the delinquent amount. For each invalid check or credit card, a \$25 processing fee will be assessed.

Refund Policy: Cancellations must be received in writing by July 15 for a 50% refund of registration fees and event tickets. There will be no refunds after this date.

Minicourses/Short Course Registration: Enrollment in Minicourses and the Short Course is limited. Advance registration must be received by **July 20**. You will be notified by July 26 if a course is full. Onsite registration will be accepted if enrollment permits. The MAA reserves the right to cancel a course due to low enrollment, and will provide a full refund of course registration fees.

Mathfest Housing

This year MAA will make dormitory housing arrangements but **will not make hotel reservations**. A special rate has been negotiated at the headquarters hotel, the Renaissance Atlanta Hotel-Downtown, but meeting participants must call and make their own reservations. **Call 1-800-468-3571 for reservations** and ask for the special Mathematical Association of America Mathfest meeting rate. The following rates are guaranteed **until June 30:**

- Single/Double \$99
- Triple/Quad \$119

The above rates are subject to applicable taxes at the time of the meeting.

A limited number of Georgia Tech dormitory rooms are reserved for Mathfest. Rooms will be assigned on a first come, first serve and student priority basis. If you would like to register for dormitory housing, please **complete the appropriate section on the registration form** and enclose proper payment. Dormitory housing reservations must be received by **June 18**.

If sharing a dorm room with another individual who is registering for Mathfest, only one person should submit housing registration. The additional person should only complete a registration form for the meeting. Confirmations for dormitory housing will be mailed on June 25. The rates for dorm rooms are:

- Single/\$35 per room per night
- Double/\$40 per room per night

Meal Information

Britan Dining Hall on Georgia Tech's campus will be open Monday through Friday, 7:30 am–8:00 pm and Saturday and Sunday, 11:00 am–7:00 pm. Meals at the dining hall must be paid on an individual basis. Meeting participants must make their own arrangements for an early breakfast on Saturday and Sunday. Meal prices are:

Breakfast—\$4.50
Lunch—\$5.50
Dinner—\$6.00

Travel Information

Air Travel: Delta Air Lines has been selected as the official airline for Mathfest 97 and offers special meeting fares. To take advantage of these savings, you must travel Delta round-trip from anywhere within the U.S. and Canada to Atlanta. For reservations call Uniglobe Travel Unlimited at 1-800-444-7176 or Delta at 1-800-214-6760. Refer to Mathfest file number XT529.

Travel from the Airport: The Renaissance Atlanta Hotel-Downtown is located at 590 West Peachtree, NW in Atlanta.

A taxi from the Hartsfield Atlanta International Airport costs approximately \$18.00 one way. The Airport Shuttle runs continuously from the airport to the major downtown hotels, including the Renaissance Atlanta Hotel-Downtown. Shuttle tickets can be purchased at the airport. You can also take the MARTA rapid rail system from the MARTA terminal in the airport to the North Avenue stop, located diagonally across the street from the hotel. The cost is \$1.50 per person one way.

By Car: The hotel is easily accessible by car from Interstate 85/75. Take Exit 100, Spring/W. Peachtree. Travel West on North Avenue to Peachtree Street. Take a right onto Peachtree, drive 2 blocks and make a right onto Prescott Street. At the next block, make a right onto West Peachtree Street. The hotel will be on your left.

To Dormitory Housing: Directions to the dormitory housing will be included with confirmations for dormitory housing.

DEADLINES: PLEASE NOTE THAT THESE ARE EARLIER THAN LAST YEAR

Early Bird Registration • June 18 Regular Registration • July 20 Dorm Reservations • July 18 50% Refund on Registration and Event Ticket Cancellation • July 15

Name _____ Name to appear on badge _____
 Address _____
 Telephone _____ Fax _____ Email _____
 Affiliation _____
 Guest badge _____ Guest badge _____

PLEASE NOTE CHARGE PER GUEST REGISTRATION BELOW

REGISTRATION FEES

MATHFEST	Early by 6/18	Regular by 7/20 & onsite	Amount	Subtotal
<input type="checkbox"/> Member <input type="checkbox"/> MAA <input type="checkbox"/> AMS <input type="checkbox"/> Both	\$140	\$183	_____	
<input type="checkbox"/> Nonmember	\$216	\$289	_____	
<input type="checkbox"/> Graduate Student & Others <small>Including Emeritus Members of MAA or AMS, unemployed or temporarily employed individuals, individuals from developing nations, K through 12 teachers and librarians</small>	\$ 39	\$ 49	_____	
<input type="checkbox"/> Undergraduate Student	\$ 22	\$ 27	_____	
<input type="checkbox"/> Guest	\$ 10	\$ 10	_____	
<input type="checkbox"/> One Day Registration		\$ 99	_____	

SHORT COURSE ON EPIDEMIOLOGY MODELING

You NEED NOT be registered for Mathfest to attend the Short Course.

<input type="checkbox"/> Student	\$ 50	\$60	_____	
<input type="checkbox"/> MAA Member and Mathfest Participant	\$125	\$140	_____	
<input type="checkbox"/> Nonmember or Mathfest nonparticipant	\$175	\$190	_____	

MINICOURSES

To register for a Minicourse, you MUST be registered for Mathfest.

<input type="checkbox"/> Developing the Ability in Beginning College Mathematics Majors to Write Proofs		\$ 45	_____	
<input type="checkbox"/> Knot Theory and Applications in the Sciences		\$ 45	_____	
<input type="checkbox"/> Music and Mathematics		\$ 45	_____	
<input type="checkbox"/> Is Fuzziness a Mathematical Concept?		\$ 45	_____	

SOCIAL EVENTS

	#Vegetarian Tickets	&/or	#Regular Tickets		
<input type="checkbox"/> "Georgia on My Mind" Mathfestival	_____	&/or	_____ x	\$ 35	_____
<input type="checkbox"/> 25-Year Banquet	_____	&/or	_____ x	\$ 35	_____
<input type="checkbox"/> PME Banquet: PME members & family, MAA Student Chapter members, MAA student paper presenters	_____	&/or	_____ x	\$ 12	_____
<input type="checkbox"/> PME Banquet: All others	_____	&/or	_____ x	\$ 20	_____

DORM HOUSING

A limited number of dorm rooms have been reserved for Mathfest & will be assigned on a first come first serve and student priority basis.


Arrival Date: _____ Departure Date: _____ If you are staying in a double, register for housing on only one registration form. Provide the name of the additional person here: _____ The additional person should register separately, but only for the meeting.

Room Type	#Nights		
<input type="checkbox"/> Single	_____ x	\$ 35	_____
<input type="checkbox"/> Double	_____ x	\$ 40	_____

GRAND TOTAL ENCLOSED

Indicate method of payment at right. →

The Renaissance Atlanta Hotel-Downtown
 Please call 1-800-468-3571 and ask for the Mathematical Association of America Mathfest 97 special meeting rate. **The rates per night for the meeting are: Single/Double \$99 & Triple/Quad \$119.** The above rates are subject to applicable taxes at the time of the meeting. Currently the tax rate is 13%.

 Please indicate if you need additional assistance to fully participate in Mathfest 97. You will be contacted by The Windsor Company.

Do you want your registration packet mailed in advance? Yes No
 If yes, please provide your mailing address if different from above:

Packets will be mailed July 9.

Please complete this form & return with payment to:

The Windsor Company
 5600 General Washington Drive, Suite B-201
 Alexandria, VA 22312
 Phone: (703)642-9385 • Fax: (703)642-9382
 Email: mpalermo@windsor-inc.com

METHOD OF PAYMENT

- CHECK**
 Make checks payable to The Windsor Company. Payment must be in U.S. Funds and drawn on a U.S. Bank.
- CREDIT CARD**
 Visa, Master Card, Discover, Novus
 Card Number _____
 Card Type _____
 Expiration Date _____
 Signature _____
 Name on Card _____

Please note that a \$25 processing fee will be applied for each returned check or invalid credit card.

- PURCHASE ORDER #** _____
 Please enclose copy.

Mathfest 97 Registration Form

Downtown Atlanta/Conference Vicinity



**The Renaissance Atlanta
Hotel-Downtown**

Teaching Math on the World Wide Web

Steven M. Hetzler and Robert M. Tardiff

The World Wide Web provides a revolutionary opportunity for teaching mathematics, communicating with students, and helping them construct their own learning. The same software that is used to create and browse web pages can create and execute interactive laboratory modules that make full use of multimedia. More importantly, this software can be used to orchestrate a computer algebra system (CAS) or other mathematical software in a natural way.

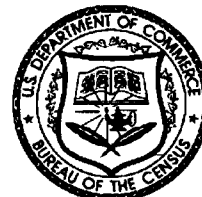
Much of the software is available at little or no cost to academics via the Internet and is reasonably easy to use in a Windows or Macintosh environment. This technology is not restricted to the Internet where speed of the connection is a real issue. The same programs can be run on your local machine or on a Local Area Network (LAN), where speed of connection is not as much of a problem.

A web page contains information that can be displayed (and instructions to the browser for displaying that information) just like a WordPerfect or LaTeX document. In all but the simplest pages, some of the information may be in other files; the web page contains pointers to those files (hypertext links). These pointers create opportunities to use multimedia, and mathematical and other software in an active learning environment. The reader can instruct the browser to load a helper, say *Mathematica*, to display the file. So, if the user has *Mathematica*, the browser can start *Mathematica*, download a notebook from the website into *Mathematica*, and then slip into the background. The result is an interactive learning environment! The user can toggle between *Mathematica* and the browser or even view the two simultaneously with a *Mathematica Notebook* designed to explore topics being discussed on the web page.

How does one get started writing these pages? It's no harder to construct one of these pages than it is to write a computer program. All you need are hardware, software, access to the Internet, time, and a lot of patience. Interested? Then check out our website at <http://henson2.ssu.edu/~rmtardiff/focus.htm> for details of how to get started.

Both Steven Hetzler and Robert Tardiff are in the Department of Mathematics and Computer Science at Salisbury State University in Maryland. Their e-mail addresses are smhetzler@ssu.edu and mtardiff@ssu.edu.

U.S. Department of Commerce BUREAU OF THE CENSUS



Mathematical Statisticians

The U.S. Bureau of the Census, an agency in the Department of Commerce, invites applications for several positions throughout the agency. As the primary factfinder for the Nation the Census Bureau's mathematical statisticians support a large number of ongoing surveys and censuses covering demographic and economic statistics. Besides the decennial census of population and housing and the quinquennial census of business the Census Bureau conducts a large number of establishment and household surveys. These efforts provide key data to quantify our Nation's economic and social health.

PPrimary areas of application include design, research, and evaluation in all areas of the Census Bureau's survey and census program. This includes design and analysis of surveys and censuses, evaluation of nonsampling errors occurring from nonresponse, coverage and measurement error, and research to reduce these errors..

These positions located in Suitland, Maryland, close to Washington, D.C., are appropriate for bachelors, masters

and doctoral level mathematical statisticians with a strong academic background and excellent communications and interpersonal skills. Successful candidates will have knowledge in a number of the following areas: sampling techniques, experimental design, time series analysis, regression analysis, linear models, exploratory data analysis, statistical inference, statistical analysis, statistical computing, and applied probability. U.S. CITIZENSHIP REQUIRED.

Salary range: \$28,208 - \$59,725 (GS 7 - 12 levels) commensurate with education and experience. The Federal Government provides an excellent benefit package. The Census Bureau is an Equal Opportunity Employer.

To apply send resumé, names of three references, and copy of transcripts to:

Cynthia Z.F. Clark
Associate Director for Methodology and Standards
U.S. Bureau of the Census
Washington, D.C. 20233

The Census Bureau is an Equal Opportunity Employer

The Third International Mathematics and Science Study

The Third International Mathematics and Science Study (TIMSS) represents the most extensive investigation of mathematics and science education ever conducted. The study is sponsored by the International Association for the Evaluation of Educational Achievement (IEA) and funded in the U.S. by the National Science Foundation (NSF) and the National Center for Education Statistics (NCES). Approximately fifty countries have participated in this comparative survey of education focusing upon nine-year-old students, thirteen-year-old students, and students in their last year of secondary schools. For the oldest students, TIMSS analyses considered three groups: a cross-section of all students completing their last year of secondary education, i.e., a "literacy" sample; mathematics specialists, i.e., those students studying or having studied calculus; and science specialists, those students studying or having studied physics. TIMSS went well beyond traditional comparative assessments by including a comprehensive analysis of textbooks and curriculum guides; investigations of instructional practices; students' classroom perceptions, interest, and motivation; and various influences on curricular organization and student learning. All curriculum analysis data are currently available. Questionnaire and assessment data for thirteen-year-old students is also currently available. Questionnaire and assessment data for nine-year-olds will be available in late spring 1997; questionnaire and assessment data for students in the last year of secondary school is anticipated to be available the beginning of 1998. Following are brief descriptions of the type of data available from the various aspects of TIMSS.

Curriculum Analysis

A content analysis of textbooks and state curriculum guides detailed the specific topics, student performance expectations, and perspectives encouraged. Curriculum guides from at least fifteen different states and multiple texts were examined for each of the three student age groups: four mathematics and three science textbooks for nine-year-olds; three general mathematics, one algebra, and three science textbooks for thirteen-year-olds; and two

calculus and two physics textbooks.

Student Assessments

Student assessments for both mathematics and science contained multiple choice, short answer, and extended response items. International scoring rubrics for short answer and extended response items defined multiple categories of correct and incorrect responses. All short answer and extended response items, as well as over half of the multiple choice items for both mathematics and science, have been released allowing detailed in-depth discussion and analyses. Release items are available for viewing at the TIMSS International Study Center web site, www.ed.gov/NCES/timss/brochure.html.

In addition, some countries, including the U.S., participated in the performance assessments which measured students' responses to hands-on, practical tasks. The TIMSS performance assessments were conducted with subsamples of the nine- and thirteen-year-old students participating in the main TIMSS survey. There were five tasks each for science and mathematics and two tasks that combined mathematics and science for a total of twelve tasks.

Student Questionnaires

Students responded to questions about the type and amount of homework assigned, typical classroom instructional practices, their interest in and motivations for doing

well in school subjects, as well as their home environment. In addition students in their last year of secondary school were asked a series of questions about their future career and education plans.

Teacher Questionnaires

Teachers responded to general questions about their academic background, official work schedule, familiarity and use of official documents and guides, their ideas about mathematics and science, and pedagogical approaches to two specific situations. With respect to the specific class from which students were tested for TIMSS, more specific questions were asked: specific topic coverage goals, typical lesson profile, assignment and use of homework, use of student work groups, types and purposes of classroom assessment, and characterizations of students' opportunities to learn specific TIMSS items. Teacher questionnaires were administered only to those teaching the two younger student age groups.

School Questionnaires

School administrators responded to questions about the school's staff, the locus of responsibility for various decisions, students' behavior, course offering and student tracking, instructional time, and course assignment/graduation criteria. School questionnaires were administered to those representing all three student age groups.

What's Happening at the MAA

- Former AMS President Ronald L. Graham of AT&T Research has been appointed Pólya Lecturer for 1997–98 and 1998–99. He will be visiting sections during those two years.
- The MAA Board of Governors has elected James R. C. Leitzel (University of New Hampshire) as governor-at-large representing Teacher Education and Jeffrey Lagarias (AT&T Research) as governor-at-large representing Mathematicians Outside Academia.
- Past-president Lynn Steen chairs the new joint advisory board for FOCUS and *MAA Online*.

The above are just three of the many items included in the latest report by MAA Secretary Martha J. Siegel. The full report is available on *MAA Online*.

PERSONAL OPINION

Question 13: How Do You Rate the Instructor?

Sandra Z. Keith and Pao-sheng Hsu

Most student evaluation forms culminate in a Question 13, typically:

Overall, how do you rate the instructor?

What's wrong here? The question is perhaps intended to guide students to summarize their responses to the previous questions on the survey, and in this respect the function of the question may be seen as exploratory, or formative. However, when this question appears on a survey, there is a danger that it will be regarded as the only significant item on the survey and interpreted with a particularly blind faith in the personnel process. To receive a score of 2.8 on a scale in which 1 is high and 5 low may be seen as a terminal failing grade for the instructor. In this situation, the question becomes inappropriately evaluative, or in the assessment jargon, summative.

It is fairly easy to persuade oneself as an evaluator that Question 13 carries its weight by reflecting on student comfort with the learning environment, or general student satisfaction. But there are serious validity problems here.

First, a substantial literature on these surveys suggests that on the most general or undefined questions, student ratings of female and minority instructors tend to be lower.* There are usually enough students in a class who feel free to exercise their biases on this question to skew the overall result.

Second, how are the statistics to be managed? A teacher's score on Question 13 is frequently compared with the department's average or with the average of others teaching a given course (since the level or type of course taught may influence the score on this question). If, for example, the departmental average is 2.3 and the teacher receives 2.8, the conclusion may be that the teacher is in the 3-range, and thus, well below average. In the situation of one of the authors, the departmental average on this question was indeed 2.3. Since the question is rated on a scale with 3 as a middle, the skewed mean not only suggests that we are in Lake Wobegon coun-

try (where all the children are above average) but raises the question of exactly what purpose is served by the low 5 on the scale. To see a 2.8 or 3.2 in this situation as signifying that the instructor failed should make an observer's skin crawl.

How does one even interpret a score of 2.8 when responses on this question are discrete and the class size is small? For example, a teacher with many high ratings has more to lose from a few angry scores than a teacher with middle ratings; a fact which shows up in the standard deviations. Noted assessment authority Clifford Adelman suggests that standard deviation units are at least as important as means in matters of assessment, that variation in the results alters the meaning of the mean.** Yet standard deviations are rarely referred to in this setting, and at any rate, it's unclear how they could be used wisely.

Third, semantics. Overall, how do you rate the instructor? How does one even interpret this vague question? Students may be influenced by the other survey questions related to instruction which may favor the lecture approach or devalue reform methods and interactive styles. Or the question may allow for rogue responses based on feelings not tapped by other questions. There is no way to tell how the student is using the question. Admittedly, students may provide follow-up comments, but even then, their brief explanations usually raise more questions than they answer. One of the authors received the comment: "The class was too abstract. I learned a lot more from one-on-one than class." How does one factor this response, or indeed, any other response into a score? The problem is that the ambiguity of the question makes it a magnet for students to remark on any differences which they happen to find unsettling. In the long run, an institution that uses a survey with a Question 13 may be vulnerable to charges of inherently discriminatory practices. At some institutions, the question is considered non-contractual, and is prohibited under collective bargaining.

Last and most important is the question of

what we are attempting to assess. Since the emergence of evaluation forms in the '70s, with their emphasis on teaching, good practice in assessment has shifted its focus to examine student learning. In pursuit of this goal, we have created a wide variety of assessment practices such as student self-evaluations, portfolios, focus groups, peer reviews, exit interviews, etc. These methods allow students to articulate their opinions in ways that can significantly improve the learning environment because they address learning experiences rather than fuzzy and emotion-skewed attitudes reported as a number. Mathematics departments have been slower than other departments on many campuses to adopt these open-ended methods, and a heavy reliance on Question 13 in faculty evaluation processes casts mathematics further into the Dark Ages. More dangerously, we imply to students that they may finish the term shifting the responsibility of their learning onto the teacher and away from themselves. Indeed, a significant problem with current student evaluations is that they fail to review with the student the ways in which the student has exerted his or her right to learn. In this sense, we are falling short of our mission to educate.

Well-worded student evaluation forms can have their uses when they trigger issues and questions that can be answered elsewhere in the evaluation process. However, Question 13 becomes too easily a substitute for meaningful assessment. When used in departmental, institutional, or system-wide surveys, it pressures faculty to emphasize student comfort or even complacency over student learning, thus subverting educational goals. It therefore has no place on departmental, institutional, and system-wide surveys.

*Basow, S. A. e.g., in "Student Evaluations of College Professors: When Gender Matters," *Journal of Experimental Psychology* 87, no. 4 (1995): 656-665.

**Adelman, C. *Lessons of a Generation, Education and Work in the Lives of the High School Class of 1972*, Jossey-Bass, (1994): 41.

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ICMI Study on History

The International Commission on Mathematical Instruction (ICMI) is conducting a study on the role of the history of mathematics in the teaching and learning of mathematics. This study is led by the International Program Committee (IPC) of ten members, of whom Florence Fasanelli of the MAA is the American representative. The IPC has prepared a discussion document in which key issues related to the study are identified, presented, and discussed in a preliminary manner. The document has identified the major questions the study will address. These include

1. How does the educational level of the learner bear upon the role of history of mathematics?
2. At what level does history of mathematics as a taught subject become relevant?
3. What are the particular functions of a history of mathematics course or component for teachers?
4. What is the relation between historians of mathematics and those whose main

concern is in using history of mathematics in mathematics education?

5. Do different parts of the curriculum utilize history of mathematics in a different way?
6. Does the experience of learning mathematics in different parts of the world, or cultural groups in local contexts, make different demands on the history of mathematics?
7. What role can history of mathematics play in supporting special educational needs?
8. What are the relations between the role or roles we attribute to history and the ways of introducing or using it in education?
9. Why would using history of mathematics be good for the learner?

These questions and others will be discussed in more detail at an invited study conference to be held in France in the spring of 1998. Individuals will also con-

duct related research activities during the next two years. It is planned that a book will be published in late 1999 in the *ICMI Study* series, based on contributions to and outcomes of the conference and research activities.

The IPC for the study invites members of the educational and historical communities to propose or submit contributions on specific questions, problems, or issues stimulated by the discussion document no later than June 1, 1997. These contributions will be regarded as input to the planning of the study conference. The entire Discussion Document is appearing in *L'Enseignement mathématique*, the official organ of ICMI, but because the IPC wants to make it accessible to as many people as possible, it will also be available electronically on *MAA Online*. If you cannot access the web, you may obtain a copy by contacting Florence Fasanelli at the MAA, 1529 18th St. NW, Washington, DC 20036-1385; fax: (202) 453-5450; e-mail: ffasanel@maa.org.

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WORKSHOPS

Multiwavelets and their Applications

Allegheny College, Meadville, PA, June 16–20, 1997

This short course focuses on the construction and properties of scaling vectors, the associated multiwavelets, and their application to image compression, signal processing, and differential equations. For information and/or an application, contact George Bradley, Math/CS Dept., Duquesne University, Pittsburgh, PA 15282; (412) 396-5115; e-mail: bradley@duq3.cc.duq.edu.

DIMACS Workshops

Economics, Game Theory, and the Internet
DIMACS Center, Rutgers University, Piscataway, NJ
April 18–19, 1997

The Internet poses many interesting challenges for theoretical economics and game theory. The highly asynchronous interactions and large degree of anonymity inherent in the Internet require that many traditional game theoretic notions of equilibrium, learning, and mechanism design, need to be reexamined in this context. Invited speakers include Herve' Moulin, William Sharkey, and Hal Varian. For further information, contact Eric Friedman, Department of Economics, Rutgers University; friedman@fas-econ.rutgers.edu. For local arrangements, contact Pat Pravato, DIMACS Center; (908) 445-5929; pravato@dimacs.rutgers.edu. WWW: <http://dimacs.rutgers.edu/Workshops/index.html>

Network Design: Connectivity and Facilities Location
Princeton University (Nassau Inn)
April 28–30, 1997

The workshop will focus on combinatorial, algorithmic, and applicational aspects of these problems. We will be especially interested in efficient approximation algorithms and their computational performance. The distinguished speaker will be Sanjeev Arora. For further information, contact organizers Ding-Zhu Du, dzd@cs.umn.edu or Panos Pardalos, pardalos@ufl.edu. For local arrangements, contact Sandy Barbu; (609) 258-4562; barb@cs.princeton.edu. WWW: <http://dimacs.rutgers.edu/Workshops/index.html>

Microsurveys in Discrete Probability
Institute for Advanced Study, Princeton
June 2–6, 1997

Probabilistic aspects of algorithms and discrete mathematics, and discrete aspects of theoretical probability form a broad and active field of contemporary research. The workshop is aimed at researchers seeking to broaden their familiarity with the field. The organizers are not soliciting contributed papers, but there will be a website set up in advance of the meeting featuring profiles of participants, abstracts of talks (both the main fifty-minute lectures and the twenty-minute presentations), and open problems; all registered participants are invited to contribute to the website. These contributions should be sent to Barbara Quigley; bquigley@dimacs.rutgers.edu. Invited speakers will include David Aldous, Persi Diaconis, Jim Fill Ravi Kannan, Harry Kesten, Robin Pemantle, Boris Pittel, Jim Propp, and Alistair Sinclair. Contact Jim Propp, propp@math.mit.edu. For local arrangements, contact Pat Pravato; (908) 445-5929; pravato@dimacs.rutgers.edu. WWW: <http://dimacs.rutgers.edu/Workshops/index.html>

Teaching and Learning on MAA Online

MAA Online, the newsletter of the MAA on the World Wide Web, has introduced a section titled "Teaching and Learning" which will feature columns, articles, and news related to the teaching of mathematics. The section includes two regular columns: "Research Sampler" and "Innovative Teaching Exchange." The Sampler, edited by Annie and John Selden, provides an overview of what is new in research on undergraduate mathematics education. The Teaching Exchange, edited by Bonnie Gold, is an opportunity for teachers to share the great ideas they have developed in their classrooms.

In addition to the two regular columns, "Teaching and Learning" contains short news stories related to mathematics education and pointers to other materials on the web, such as the Project NEXt website and a website dealing with the teaching of developmental mathematics. Longer feature articles are also planned for the near future. The URL for *MAA Online* is www.maa.org, from which one can click on "Teaching and Learning" to enter this section of the site.

Of course there's a lot more in *MAA Online* that's relevant to teaching, from news about professional development to book reviews which range from "popular" mathematics books to books about teaching mathematics. Contributions are welcome. Send e-mail to the editor, Fernando Gouvea, at fqgouvea@maa.org.

Math Ph.D.

Unemployment Rate Falls

The 1996 AMS-IMS-MAA Annual Survey of New Doctoral Recipients and Faculty Salaries (First Report) is now available. Highlights from the report are:

- Unemployment for new doctoral recipients declined to the lowest rate since fall 1990.
- Doctoral recipients employed by business and industry in the U.S. increased.

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NSF Undergraduate Faculty Enhancement Workshop

Teaching Undergraduate Geometry, Cornell University, June 9–14, 1997

This workshop is intended for college and university faculty who teach (or soon will teach) an undergraduate geometry course—such as the courses typically attended by future or inservice teachers. The leaders of the workshop will be Kelly Gaddis (Buffalo State College), David Henderson (Cornell University), Jane-Jane Lo (Cornell University), and Avery Solomon (Cornell University).

In the mornings the participants will experience a learning and teaching environment that is innovative both in terms of content and in terms of teaching methods. The content will be the integration of geometries on plane, sphere, and other surfaces—presented through problems which emphasize experiencing the meanings in the geometry. Student investigations, small group learning, and writing assignments will be explored.

In the afternoons there will be seminars and presentations on topics related to the workshop theme, including “How to Write Good Exploratory Problems,” “Using Writing in Mathematics,” “Curriculum Developments in School Geometry,” “Using Computer Technology in Geometry,” “Formal versus Intuitive Knowing in Geometry,” “What is in the 8 Undergraduate Geometry Courses at Cornell,” “Non-test-based Assessments,” “Student Affects and Beliefs Toward Innovative Program,” and “Including All Students by Encouraging Diverse Ideas.” In addition there will be ample free time for informal discussions and enjoyment of the geometry of nature in and around Ithaca.

Much of the housing and food expenses will be covered for all participants by the NSF. There may also be very limited NSF funds available to support travel costs for participating faculty from institutions with limited resources. The NSF will also support follow-up activities by the participants after the workshop including local workshops, exchange of related classroom materials, and communication of experiences and ideas.

Enrollment is limited. Applications will be reviewed beginning April 1. For more information and application procedures, contact the UFE Geometry Workshop, Dept. of Math, Cornell University, Ithaca, NY 14853-7901; fax: (607) 255-7149; e-mail: dwh@math.cornell.edu; WWW: <http://math.cornell.edu/~dwh>.

Undergraduate

Posters Awarded

The Undergraduate Student Poster Session sponsored by the MAA and CUR at the January meetings in San Diego was very successful and visitors were truly impressed with the quality of the projects presented. A panel of three judges, Joe Gallian, Judyth Palagallo, and Phil Straffin, carefully evaluated all posters and recognized five of them with a \$100 prize each, with money provided by the MAA and CUR. The students selected for recognition were Pilar Mata (California State University, Fullerton), Andy Miller (Wartburg College), Dmitry Ostrovski (Macalester College), Jessica Sidman (Scripps College), and



Front row: Sarah Spence, Jessica Sidman, Pilar Mata;
Second row: Dmitry Ostrovsky, Andy Miller

Sarah Spence (University of Richmond). Each was also given a book kindly offered by the exhibitors present at the meeting. Mario Martelli (California State University, Fullerton) organized the session.

In Memoriam: J. Sutherland Frame

J. Sutherland Frame, professor of mathematics emeritus, Michigan State University, died at his home in East Lansing, Michigan, on February 27, 1997. He was 89 years old.



Dr. Sutherland, “Sud” to all who knew him, was highly active in both the MAA and the mathematics honor society Pi Mu Epsilon. He personally installed more than fifty chapters of Pi Mu Epsilon, and in 1952 he created and developed the highly successful Pi Mu Epsilon Summer Student Paper Conferences in conjunction with the MAA and the AMS. He was president of Pi Mu Epsilon from 1957 to 1966. He was an MAA governor for a period, and at the Association’s request, he organized the first MAA–AMS Employment Register, which he chaired from 1953 to 1958.

At the Joint Mathematics Meetings in January 1994, Sud was awarded the Yueh-gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics, the Association’s most prestigious award.

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The two instructor positions require a masters degree in mathematics. Candidates will teach introductory courses, work with lower-level stu-

dents, recruit and tutor students, and write technology grants for introductory courses.

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VIRGINIA

University of Richmond

The Mathematics and Computer Science Department invites applications for a one-year position as Visiting Assistant Professor of Mathematics beginning in August of 1997 and ending in May of 1998. The teaching load is 12 hours (normally four courses) per semester. Candidates with Ph.D. in hand are preferred. The University is an equal opportunity employer.

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MEETINGS

National MAA Meetings

- August 1–4, 1997 MathFest, Atlanta, GA
 January 7–10, 1998 Eighty–first Annual Meeting, Baltimore, MD. Board of Governors Meeting January 6, 1998
 January 13–16, 1999 Eighty–second Annual Meeting, San Antonio, TX. Board of Governors Meeting, January 12, 1999.
 January 19–22, 2000, Eighty–third Annual Meeting, Washington, DC. Board of Governors Meeting, January 18, 2000.
 January 10–13, 2001 Eighty–fourth Annual Meeting, New Orleans, LA. Board of Governors Meeting, January 9, 2001

Section Meetings

- ALLEGHENY MOUNTAIN – April 4–5, 1997, Westminster College, New Wilmington, PA
 – April 1998, Clarion University of PA, Clarion, PA
 EASTERN PA & DELAWARE – April 17, 1997, Ursinus College, Collegeville, PA
 – November 1, 1997, University of Pennsylvania, Philadelphia, PA
 INDIANA – October 18, 1997, Wabash College, Crawfordsville, IN
 – March 20–21, 1998, Ball State University, Muncie, IN
 INTERMOUNTAIN – April 10–12, 1997, Utah State University, Logan, UT
 IOWA – April 11–12, 1997, Iowa State University, Ames, IA
 KANSAS – March 14–15, 1997, Pittsburg State University, Pittsburg, KS
 LOUISIANA–MISSISSIPPI – March 6–7, 1998, University of New Orleans, LA
 MD–DC–VA – April 18–19, 1997, William & Mary, Williamsburg, VA
 METRO. NEW YORK – May 3, 1997, Mercy

- College, Dobbs Ferry, NY
 MICHIGAN – May 2–3, 1997, Wayne State University, Detroit, MI
 – May 1–2, 1998, Western Michigan University, Kalamazoo, MI
 MISSOURI – April 11–12, 1997, Missouri Western State College, St. Joseph, MO
 – Spring 1998, Southwest Missouri State University, Springfield, MO
 NEBRASKA–SOUTHEAST
 SOUTH DAKOTA – April 11–12, 1997, Wayne State College, Wayne, NE
 NEW JERSEY – April 12, 1997, Middlesex County College, Edison, NJ
 NORTH CENTRAL – April 25–26, 1997, Mankato State University, Mankato, MN
 NORTHEASTERN – June 6–7, 1997, Merrimack College, N. Andover, MA
 – Nov 21–22, 1997, Western New England College, Springfield, MA
 OHIO – April 11–12, 1997, Youngstown State University, Youngstown, OH
 OKLAHOMA–ARKANSAS – April 4–5, 1997, University of Central Oklahoma, Edmond, OK
 – March 27–28, 1998, University of Arkansas–Little Rock, AR
 – Spring 1999, Southern Nazarene University, Bethany OK
 PACIFIC NORTHWEST – June 19–21, 1997, Western Washington University, Bellingham, WA
 ROCKY MOUNTAIN – April 11–12, 1997, Metro State College and Univ of Colorado–Denver, CO
 SOUTHEASTERN – March 13–14, 1998, College of Charleston, SC
 SOUTHERN CALIFORNIA – October 4, 1997, Claremont McKenna College, Claremont, CA
 SOUTHWESTERN – April 4–5, 1997, New Mexico State University, Grants, NM

- Spring 1998, Pima Community College, Tucson, AZ
 SEAWAY – April 18–19, 1997, Broome Community College, Binghamton, NY
 – November 7–8, 1997, Siena College, Loudonville, NY
 – April 1998, York University, No. York, Ontario, Canada
 TEXAS – April 3–5, 1997, Texas Lutheran College, Sequin, TX
 – Spring 1998, Southern Methodist University, Dallas, TX
 – Spring 1999, Southwest Texas State University, San Marcos, TX
 WISCONSIN – April 11–12, 1997, University of Wisconsin–River Falls, River Falls, WI
 – April 17–18, 1998, University of Wisconsin–Stevens Point, Stevens Point, WI

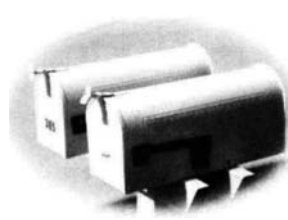
Other Meetings

June 6–8, 1997 Annual Meeting of the Canadian Society for History and Philosophy of Mathematics, Memorial University, St. John's, Newfoundland. Featured speaker: Ruediger Thiele (Leipzig). Contact Glen Van Brummelen, Secretary/Treasurer; (403) 465-3500; fax: (403) 465-3534; e-mail: gvanbrum@kingsu.ab.ca

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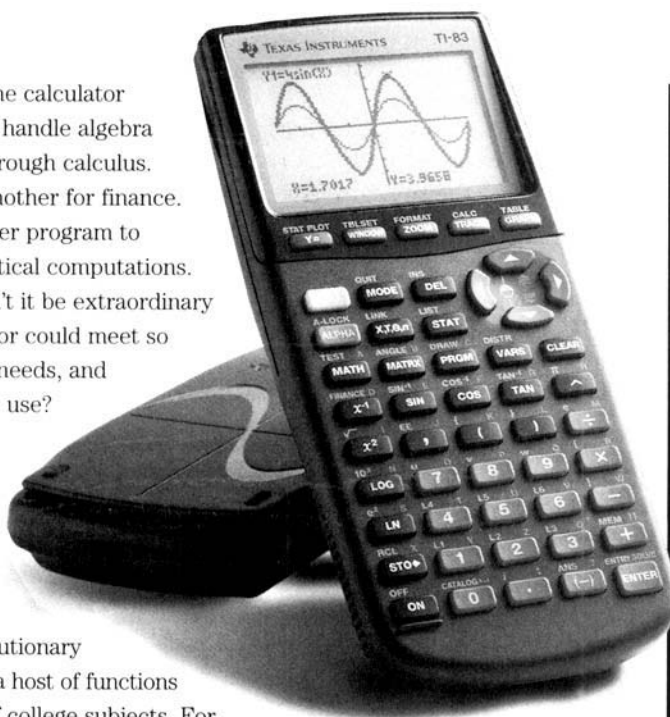
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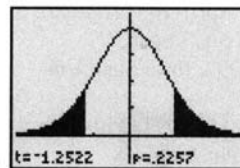
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