



# MAA MATHFEST

Program

August 5–8, 2015 Washington, D.C.



**MAA100**

MATHEMATICAL ASSOCIATION OF AMERICA  
CELEBRATING A CENTURY OF ADVANCING MATHEMATICS

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# WELCOME

## TO THE CENTENNIAL MATHFEST! #MAA100

We are so glad you are joining in the fun... and it truly will be a memorable and mathemazing four days! The Centennial Planning Committee, led by Deanna Haunsperger and Stephen Kennedy, began its work over ten years ago and have produced an amazing program with a lot of mathematical heart. The days will be filled with enticing mathematics, and the evenings will showcase mathematical culture with performances by MAA members. Do browse the program, but I can point out a few highlights.

As you've noted, we expanded the program by an extra day to honor our centennial. There are six Centennial Lectures given by a slate of outstanding speakers (Erik Demaine, Jennifer Chayes, Ingrid Daubechies, Carlos Castillo-Chavez, Karen Parshall, and Manjul Bhargava) in a diversity of fields. And of course there are the named lectures to look forward to: Leitzel, Falconer, Frame, Blackwell Lectures and the AMS-MAA Joint Invited Address, as well as the Hedrick Lectures, which will be given by Karen Smith.

Sample the rich variety of invited paper sessions—many with a historical perspective of the last 100 years—including: “Gems of the Monthly”, “Presidential Reminiscences”, “Triangle Geometry” (by John Conway and Richard Guy), a session honoring Abdulalim A. Shabazz (who is credited for mentoring over half of all African-Americans with a Ph.D. in mathematics), and a session in which NSA mathematicians open up about what they do! And check out the awesome collection of mini-courses, including a reprise of some of our most popular mini-courses of the past.

Students will find a plethora of events to whet their mathematical appetites, including the newer competition *Estimathon!* and the Chan Stanek Lecture for Students, given by Joe Gallian. There will be a sneak peek of an upcoming movie *The Man Who Knew Infinity* about the life of Ramanujan. And graduate students who signed up in advance can get feedback on potential job talks and practice presenting them in a special workshop.

The entertainment each evening will surpass any other math conference you've attended in its variety and scope! Wednesday's Centennial Reception will feature a Mathematical Carnival, with performances by MAA members who are jugglers, magicians, and artists. This will be followed by Cirque de Mathematiques featuring drama, magic, mime and dance! On Thursday, the connection between mathematics and music will be explored in a concert by musical mathematicians. On Friday, the MAA Community Players led by Steve Abbott will perform *Albert's Bridge*, a mathematical tragicomedy by Tom Stoppard. And on Saturday, the Closing Banquet will feature the singing troupe of MAA Players led by Annalisa Crannell.

MathFest has always been known as a welcoming place where you can celebrate your love for mathematics, and passion for teaching and communicating it well, with a friendly and vibrant community in the more relaxed atmosphere of summer. So amid the fun, we also hope you'll take some time to make new friends here at MathFest! Introduce yourself to someone who looks like they might be here for the first time, and help them get connected to others with similar interests! On social media—share what you are learning or enjoying with others using the hashtag #MAA100.

Our community, inclusivity, and shared values is what makes MAA strong, and you are a big part of holding that banner high. Even amidst the fast-moving changes in our lives wrought by technology, the need for community and excellence in mathematical communication will not wane. As we celebrate the strengths that have brought us this far, I'm confident they will carry us with strength into the next 100 years.

Francis Edward Su  
MAA President



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EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF SCIENCE AND TECHNOLOGY POLICY  
WASHINGTON, D.C. 20502

July 1, 2015

To the Mathematical Association of America (MAA):

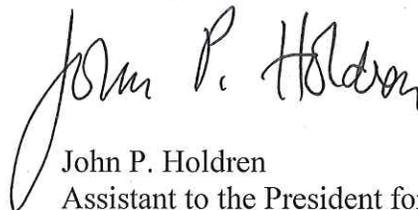
On behalf of the White House and the Office of Science and Technology Policy, I want to congratulate you on your centennial and recognize your dedication to advancing the mathematical sciences by providing students and educators alike with resources for professional development and scholarship.

America has flourished because of the determination and ingenuity of its people. As you know, supporting students and teachers in their study of mathematics is essential to ensure that Americans will have a promising future filled with groundbreaking discoveries. Your support for, research on, and publications about education in the mathematical sciences fosters the public appreciation necessary to further develop mathematical education.

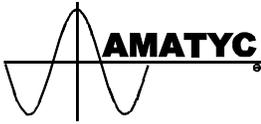
You stand out as a leader in strengthening mathematical education through your initiative to create effective curriculums and assessments at the collegiate level. Furthermore, your effort to recruit members of underrepresented groups, specifically women and students of lower income backgrounds, promotes inclusion in mathematics. For the past one hundred years your advocacy has contributed to making the mathematical sciences more accessible to a diverse pool of students. In doing so, you have also made the mathematical sciences a field in which all individuals can maximize their potential and develop their ideas in order to contribute to American society.

Congratulations on your achievements and thank you for your commitment to the mathematical sciences. I wish you all the best for continued success.

Sincerely,



John P. Holdren  
Assistant to the President for Science and  
Technology,  
Director of the White House Office of Science and  
Technology Policy



June 22, 2015

On behalf of the American Mathematical Association of Two-Year Colleges (AMATYC), congratulations to the Mathematical Association of America on your Centennial! For 100 years, MAA has been a leader in advancing the mathematical sciences, having a huge impact on both teachers and students. The national meetings that are held and the publications that have been created by the MAA have been key to keeping educators abreast with the latest research. The MAA's Committee on the Undergraduate Program in Mathematics (CUPM), has guided undergraduate curriculum in mathematics for many years. The association recognizes that curricular changes will occur and be impacted by the adoption of the Common Core State Standards by many U.S. states. The common core will significantly change the preparation of incoming college students and will necessitate changes in the preparation of pre-service teachers.

AMATYC and the MAA have partnered on numerous occasions, through both MAA's own Committee on Two-Year Colleges and its Committee on Curriculum Renewal Across the First Two Years (CRAFTY). These committees have provided guidance over the years on the mathematics of the first two years as well as on developmental courses in the mathematics.

AMATYC is pleased to offer its congratulations to the MAA for successfully reaching an important milestone.

Nancy J. Sattler, President  
AMATYC

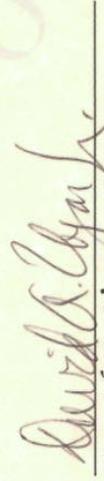
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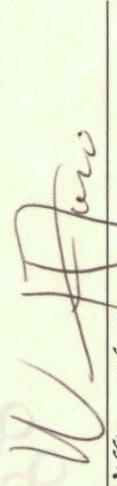
# American Mathematical Society

*The American Mathematical Society extends its warmest congratulations to the Mathematical Association of America on the occasion of its Centennial.*

*The inaugural meeting of the MAA in Columbus, Ohio, on December 30-31, 1915 was already large, well-organized, and active. Throughout its first century, the MAA's energetic and dedicated pursuit of its mission "to advance the mathematical sciences, especially at the collegiate level," has greatly contributed to the advancement of mathematics. There is a long history of fruitful cooperation between the MAA and the AMS. The AMS looks forward to even closer relations in the future as we work together toward our common goals of promoting mathematical scholarship and improving mathematical education in America and throughout the world.*

*November 2014*

  
\_\_\_\_\_  
David A. Vogan, Jr.  
President

  
\_\_\_\_\_  
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Chair, Board of Trustees



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June 25, 2015

Frances Su, President  
Mathematical Association of America  
1529 18th St. NW  
Washington D.C. 20036-1358

Dear Dr. Su,

On behalf of the Board of Directors and the membership of the American Statistical Association, I congratulate the Mathematical Association of America on its 100<sup>th</sup> anniversary. What is most praiseworthy about the MAA is not that it is 100 years old – and that is an excellent accomplishment – but that it is thriving and positioned to support the mathematical sciences community for the next century.

The MAA is renowned for improving the instruction of mathematics at all levels, fostering growth in mathematical professionals, developing the next generation of mathematicians, reaching out to the public to increase awareness of and appreciation for mathematics. Further, MathFest and the Joint Mathematics Meetings are the premier mathematics meetings in the world, and the association is an important publisher of books and articles that advance the field and make it more accessible.

The ASA is proud to be a partner with the MAA in the Joint Policy Board for Mathematics, collaborating on Math Awareness Month, the JPBM Communication Award, and other projects to support the mathematical sciences. We share with the MAA a committee of mathematicians and statisticians dedicated to improving undergraduate statistics. We have much common cause with the MAA, and the strength of the association and its bright future are important to the ASA and to the entire mathematical sciences community.

So we wish you a very happy anniversary! While you are enjoying your 100<sup>th</sup> anniversary celebration here in our nation's capital, we'll be on the west coast hosting the Joint Statistical Meetings. Nonetheless, we'll take a moment at our JSM meeting of the ASA Board to acknowledge the MAA anniversary and celebration.

Very best wishes for your next 100 years,

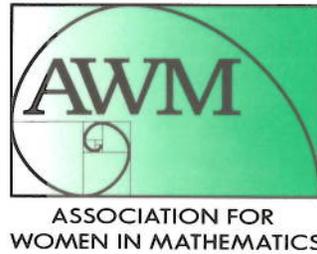
A handwritten signature in black ink that reads "David Morganstein". The signature is written in a cursive style with a prominent loop at the end of the last name.

David Morganstein. President

**Association for Women in Mathematics**

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June 8, 2015

Dear MAA Leadership,

The Association for Women in Mathematics (AWM) is pleased to congratulate the Mathematical Association of America (MAA) on the occasion of their Centennial Celebration.

The MAA has contributed to the advancement of the mathematical sciences in general, and mathematics education in particular, through meetings and conferences, professional development programs, advocacy and outreach to the broader community. The AWM has a long history of cooperation with the MAA through the Etta Z. Falconer Lecture Series, panel discussions, and other activities held annually at MathFest. We are proud to have participated in MAA events and we look forward to increased interaction between the two societies in the coming years.

It is with great pleasure that we acknowledge the valuable contributions of the MAA to the mathematical community over the past 100 years and wish them equal success in the next century.

Sincerely,

A handwritten signature in cursive script that reads 'Kristin Lauter'.

Kristin Lauter, President  
Association for Women in Mathematics



L. Robin Keller  
President, 2015  
Professor, Operations & Decision  
Technology  
University of California, Irvine

The Paul Merage School of Business  
University of California, Irvine  
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January 12, 2015

Dr. Bob Devaney, President  
Dr. Michael Pearson, Executive Director  
Mathematical Association of America  
1529 18 Street NW  
Washington, DC 20036

Dear Dr. Devaney and Dr. Pearson,

On behalf of my colleagues on the INFORMS Board of Directors and all our members, I'm writing to wish you a hearty congratulations on the 100<sup>th</sup> anniversary of the Mathematical Association of America.

For a century MAA members have been making an outstanding contribution to mathematical education on the undergraduate level and the recognition of mathematics' importance in the United States.

At the Institute for Operations Research and the Management Sciences (INFORMS), your sister society, we're delighted that we've been able to share goals and collaborate on your important work. Through the years we've enjoyed participating with you on the Conference Board of the Mathematical Sciences. Many academics and students have joined both INFORMS and MAA as they pursue careers in operations research and math modeling. Just as you recognize the importance of high school programs that prepare students for undergraduate and graduate work, the INFORMS K-12 Committee has conducted a series of high school teacher training sessions at our annual meetings and during special programs. Our Professional Awareness Committee reaches out to high school students and undergraduates to teach them about the value of a career in analytics, operations research, and math.

As you approach the crowning moment of your anniversary year, the MAA MathFest that will take place in Washington DC this coming August, we applaud you for your dedication and the leadership you have provided to all those who share your recognition that math plays such an important role in our society and that young people should share in this role.

Sincerely,

L. Robin Keller  
2015 INFORMS President  
Professor, Operations and Decision Technologies  
Former Editor-in-Chief, *Decision Analysis*

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NATIONAL COUNCIL OF  
TEACHERS OF MATHEMATICS

June 1, 2015

Dr. Michael Pearson  
Executive Director  
Mathematical Association of America  
1529 Eighteenth Street NW  
Washington, DC 20036

Dear Michael,

On behalf of the more than 70,000 members of the National Council of Teachers of Mathematics, we extend our sincere congratulations on the occasion of the 100<sup>th</sup> anniversary of the creation of the Mathematical Association of America.

We share with MAA a vision of the beauty and importance of mathematics and a mission of supporting teaching that will open worlds of opportunity for students by developing their mathematical skill and understanding. NCTM is a proud supporter of the MAA's United States of America Mathematical Olympiad, which has brought wide public attention to mathematics while generating enthusiasm among students. We are honored to be a longtime partner of the MAA, collaborating through the Conference Board of Mathematical Sciences and on other projects through the years.

Congratulations on reaching this milestone. You have our gratitude for MAA's 100 years of accomplishments and for what MAA continues to do for the field of mathematics and for mathematics education.

Sincerely,

A handwritten signature in black ink that reads "Diane J. Briars".

Diane J. Briars  
President

A handwritten signature in black ink that reads "Robert M. Doucette".

Robert M. Doucette  
Executive Director



Congratulates

**MATHEMATICAL ASSOCIATION OF AMERICA**

On the auspicious occasion of the 100<sup>th</sup> anniversary of the Mathematical Association of America (MAA), the Society for Industrial and Applied Mathematics (SIAM) wishes to offer its sincerest congratulations to a valued sister society. The MAA provides many important programs and services to vital segments of the math community. SIAM appreciates the cooperation and collaboration enjoyed with the MAA for many years and looks forward to another 100 years of service to our community.

A handwritten signature in black ink that reads "L. Pamela Cook". The signature is fluid and cursive.

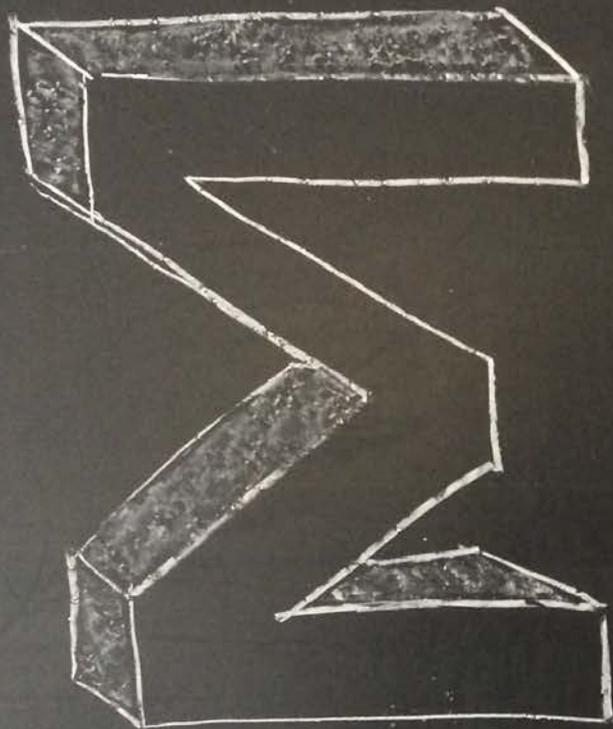
L. Pamela Cook  
President

A handwritten signature in black ink that reads "James M. Crowley". The signature is fluid and cursive.

James M. Crowley  
Executive Director

August 5, 2015

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## Invited Addresses

### EARLE RAYMOND HEDRICK LECTURE SERIES

#### Algebra Over Finite Fields



**Karen Smith**, *University of Michigan*

##### Hedrick Lecture 1

Wednesday, August 5, 9:30 AM – 10:20 AM  
Marriott Wardman Park, Salon 2/3

Starting with a little trick I learned in third grade to check my multiplication homework, I'll share my fascination with algebra as it grew through middle school, high school, college and eventually led to research in characteristic  $p$  rings. Along the way, I'll point out the importance of many mentors and teachers who led me to eventually pursue my career in mathematics.

##### Hedrick Lecture 2

Friday, August 7, 9:30 AM – 10:20 AM  
Marriott Wardman Park, Salon 2/3

In the second talk, I will explain how doing algebra over finite fields can deepen our understanding of geometry. Specifically, I'll discuss how understanding solutions to polynomials over finite fields can help understand the geometry of algebraic varieties defined by real or complex polynomials. Miraculously, rings of characteristic  $p$  have some very special properties that can be powerful tools in analyzing them, often replacing tools like integration for real manifolds.

##### Hedrick Lecture 3

Saturday, August 8, 9:30 AM – 10:20 AM  
Marriott Wardman Park, Salon 2/3

In the third talk, I will explain some of these recent tools in "characteristic  $p$ " algebra—specifically Frobenius splitting and related tools—which have made an impact on different areas of math, including the minimal model program for complex algebraic varieties and cluster algebras in combinatorics/representation theory. Some of this work is joint work with my PhD students and post-docs.

### MAA100 CENTENNIAL LECTURE 1

#### Replicators, Transformers, and Robot Swarms: Science Fiction through Geometric Algorithms

Wednesday, August 5, 8:20 AM – 9:20 AM  
Marriott Wardman Park, Salon 2/3



**Erik Demaine**, *Massachusetts Institute of Technology*

Science fiction is a great inspiration for science. How can we build reconfigurable robots like Transformers or Terminator 2? How can we build Star Trek-style replicators that duplicate or mass-produce a given shape at the nano scale? How can we orchestrate the motion of a large swarm of robots? Recently we've been exploring possible answers to these questions through computational geometry, in the settings of reconfigurable robots (both modular and folding robots that can become any possible shape), robot swarms (which may be so small and simple that they have no identity), and self-assembly (building computers and replicators out of DNA tiles).

### MAA100 CENTENNIAL LECTURE 2

#### Network Science: From the Online World to Cancer Genomics

Wednesday, August 5, 10:30 AM – 11:20 AM  
Marriott Wardman Park, Salon 2/3

**Jennifer Chayes**, *Microsoft Research*



Everywhere we turn these days, we find that networks can be used to describe relevant interactions. In the high tech world, we see the Internet, the World Wide Web, mobile phone networks, and a variety of online social networks. In economics, we are increasingly experiencing both the positive and negative effects of a global networked economy. In epidemiology, we find disease spreading over our ever-growing social networks, complicated by mutation of the disease agents. In biomedical research, we are beginning to understand the structure of gene regulatory networks, with the prospect of using this understanding to manage many human diseases. In this talk, I look quite generally at some of the models we are using to describe these networks, processes we are studying on the networks, algorithms we have devised for the networks, and finally, methods we are developing to indirectly infer network structure from measured data. I'll discuss in some detail particular applications to cancer genomics, applying network algorithms to suggest possible drug targets for certain kinds of cancer.

## Invited Addresses (continued)

### MAA100 CENTENNIAL LECTURE 3

#### Mathematics for Art Investigation

Thursday, August 6, 8:30 AM - 9:20 AM  
Marriott Wardman Park, Salon 2/3



**Ingrid Daubechies**, *Duke University*

Mathematical tools for image analysis increasingly play a role in helping art historians and art conservators assess the state of conservation of paintings, and probe into the secrets of their history. The talk will review several case studies, Van Gogh, Gauguin, Van Eyck among others.

### MAA100 CENTENNIAL LECTURE 4

#### The Role and Function of Mathematical Models in Interdisciplinary Mentorship through Research: Lessons from the World of Epidemics

Thursday, August 6, 10:30 AM - 11:20 AM  
Marriott Wardman Park, Salon 2/3



**Carlos Castillo-Chavez**, *Arizona State University*

We live in an interconnected world in which seeking solutions to societal problems no longer makes sense within the confines of single-discipline organized institutions. The nation's ability to train 21st century scientists depends on systems of learning and

thinking that are naturally embedded within interdisciplinary educational research/mentorship models. The use of multiple modes of doing science including the systematic use of computer experiments and data science (Big Data) must be at the heart of a modern 21st Century STEM education.

As Steve Strogatz observes "... cancer will not be cured by biologists working alone. Its solution will require a melding of both great discoveries of 1953 [Fermi-Pasta-Ulam introduction of the computer experiment and Watson & Crick discovery of the chemical structure of DNA]. Many cancers, perhaps most of them, involve the derangement of biochemical networks that choreograph the activity of thousands of genes and proteins. As Fermi and his colleagues taught us, a complex system like this can't be understood merely by cataloging its parts and the rules governing their interactions. The nonlinear logic of cancer will be fathomed only through the

collaborative efforts of molecular biologists — the heirs to Dr. Watson and Dr. Crick — and mathematicians who specialize in complex systems — the heirs to Fermi, Pasta and Ulam."

In this lecture, I will highlight (1) the role that interdisciplinary research challenges has played in shaping the training and mentorship of students from high school to the postdoctoral level and (2) the impact that has had on my own research program. The discussion will be centered on questions that arise in the study of disease dynamics (Ebola and Influenza) across levels of organization and over multiple spatiotemporal scales.

The examples used are the result of the research carried out with a myriad of collaborators (undergraduate, graduate, postdoctoral students and colleagues) over the past three decades.

### MAA100 CENTENNIAL LECTURE 5 CSHPM KENNETH O. MAY LECTURE

#### "We Are Evidently on the Verge of Important Steps Forward": The American Mathematical Community, 1915-1950

Friday, August 7, 10:30 AM - 11:20 AM  
Marriott Wardman Park, Salon 2/3

**Karen Parshall**, *University of Virginia*



The American mathematical community experienced remarkable changes over the course of the thirty-five years from the founding of the Mathematical Association of America (MAA) in 1915 to the establishment of the National Science Foundation in 1950. The first fifteen years witnessed not only the evolution of the MAA

with its emphasis on the promotion of mathematics teaching but also the "corporatization" and "capitalization" of the American Mathematical Society as mathematicians worked to raise money in support of research-level mathematics. The next decade, one characterized by the stock market crash and Depression, almost paradoxically saw the building of mathematics departments nationwide and the absorption into those departments of European mathematical refugees. Finally, the 1940s witnessed the mobilization of America's mathematicians in the war effort and their subsequent efforts to insure that mathematics was supported as the Federal government began to open its coffers in the war's immediate aftermath. This talk will explore this period of optimism in which the American mathematical community sensed, as Roland Richardson put it, "we are evidently on the verge of important steps forward."

## Invited Addresses

### MAA100 CENTENNIAL LECTURE 6

#### Recent Results Toward the Birch and Swinnerton-Dyer Conjecture

Saturday, August 8, 10:30 AM – 11:20 AM  
Marriott Wardman Park, Salon 2/3



**Manjul Bhargava**, Princeton University

Over the past half-century, the Birch and Swinnerton-Dyer Conjecture has become one of the most notoriously difficult unsolved problems in mathematics, and has been listed as one of the seven million-dollar “Millennium Prize Problems” of

the Clay Mathematics Institute. In this talk, we describe the problem in elementary terms, and the surprising and beautiful ways in which it is related to several well-known open problems in number theory. Despite the difficulties in solving it, there is actually quite a bit known now towards the conjecture. We will give a survey of what is known – including several recent advances – and, finally, what remains to be done!

### AMS-MAA JOINT INVITED ADDRESS

#### The Arithmetic of the Spheres

Thursday, August 6, 9:30 AM – 10:20 AM  
Marriott Wardman Park, Salon 2/3



**Jeffrey Lagarias**, University of Michigan

Beginning with historical remarks on the harmony of the spheres, this talk tours two topics at the interface of number theory and dynamical systems. The first concerns the Farey tree, Ford circles and the Minkowski question-mark function. The second concerns

Farey fractions, radix expansions and the Riemann zeta function.

### MAA JAMES R. C. LEITZEL LECTURE

#### Calculus at Crisis

Saturday, August 8, 8:30 AM – 9:20 AM  
Marriott Wardman Park, Salon 2/3



**David Bressoud**, Macalester College

The predominance of calculus in high school, recognition of the importance of modeling dynamical systems—especially in the biosciences, and existence of sophisticated online resources have changed what students need from college calculus. Despite

recent insights into what it means to understand calculus and how students achieve this knowledge, failure rates are unacceptably high, and passing is no guarantee of ability to use the ideas of calculus. Together, these forces confront departments with a series of decision points around what to teach and how to teach it.

### AWM-MAA ETTA Z. FALCONER LECTURE

#### “A Multiplicity All At Once”: Mathematics for Everyone, Everywhere

Friday, August 7, 8:30 AM – 9:20 AM  
Marriott Wardman Park, Salon 2/3



**Erica Walker**, Columbia University

What does it mean to learn mathematics? What does it mean to say that some people are “math people”? In this talk, I draw upon 20 years of research and teaching to describe multiple contexts for mathematics learning and socialization across the lifespan. I

share findings from studies with elementary students, high school youth, teachers, and mathematicians to describe how they engage in mathematical practice, develop mathematics identities, and craft meaningful spaces for rich mathematics learning. I discuss implications of this work for reframing teaching and learning, both within and outside of schools, to better foster people’s success, interest, and creativity in mathematics.

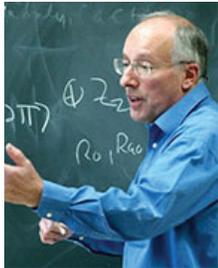
## Invited Addresses (continued)

### MAA CHAN STANEK LECTURE FOR STUDENTS

#### Seventy-Five Years of MAA Mathematics Competitions

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Wednesday, August 5, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2/3



**Joseph Gallian**, *University of Minnesota Duluth*

In this talk we provide facts, statistics, oddities, curiosities, videos, and trivia questions about the mathematics competitions that the MAA has sponsored for 75 years.

### PI MU EPSILON J. SUTHERLAND FRAME LECTURE

#### G-sharp, A-flat, and the Euclidean Algorithm

---

Friday, August 7, 8:00 PM – 8:50 PM  
Marriott Wardman Park, Salon 2/3



**Noam Elkies**, *Harvard University*

Why does Western music almost universally use the same repeating pattern of 7+5 notes seen in the piano's white and black keys, and why does each of these notes (especially the black ones, like G-sharp / A-flat) get more than one name? Using a piano, the audience's voices, and more

traditional lecture materials, I'll outline how music, physics, and mathematics converged to produce this structure, including an overlap between one thread of music history and the first few steps of the Euclidean algorithm applied to the logarithms of 2 and 3.

### NAM DAVID HAROLD BLACKWELL LECTURE

#### Mathematics, Mathematicians, Mathematics Education and Equity: Challenges and Opportunities

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Friday, August 7, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2/3



**Terrence Blackman**, *The University of Denver*

African Americans have a long and honorable tradition of doing Mathematics and Mathematics Education in the African American community. In this talk, from a perspective of excellence and equity, I will address the critical necessity of

engagement in Mathematics Education, by all mathematicians and in particular, African American mathematicians. In so doing, I will describe some of the challenges and opportunities for undergraduates considering careers in the mathematical sciences.

## Invited Sessions

### MAA100 INVITED PAPER SESSION

#### Generations of Monthly Gems

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Wednesday, August 5, 1:00 PM - 3:50 PM  
Marriott Wardman Park, Salon 1

The session is designed to help celebrate the MAA's Centennial. With thousands of papers to draw on, six speakers will give 25-minute talks on papers chosen from throughout the Monthly's history. Speakers will highlight the significance of these papers and remark on their impact on mathematics and science in general.

**Scott Chapman**, *Sam Houston State University*

**Dan Velleman**, *Amherst College*

**Bruce Palka**, *National Science Foundation*

**Roger Horn**, *University of Utah*

**John Ewing**, *Math for America*

#### Speakers

**1894 - 1919**

**Karen Parshall**, *University of Virginia*

**1920 - 1939**

**John Stillwell**, *University of San Francisco*

**1940 - 1959**

**Ron Graham**, *University of California at San Diego*

**1960 - 1979**

**Bob Devaney**, *Boston University*

**1980 - 1999**

**Paul Zorn**, *St. Olaf College*

**2000 - 2015**

**Rebecca Goldin**, *George Mason University*

### MAA INVITED PAPER SESSION

#### The Non-Traditional "Traditional NSA Mathematician"

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Wednesday, August 5, 1:00 PM - 3:45 PM  
Marriott Wardman Park, Delaware B

The National Security Agency's (NSA) mathematicians create breakthroughs in cryptography and communications security. It is common to associate number theory and discrete mathematics with cryptography. However, problems tackled by NSA mathematicians actually draw upon a much broader variety of fields including statistics, geometry, analysis, topology, graph theory, neuroscience, big data analytics, theoretical computer science, and computational linguistics. As a result, the research community at NSA includes experts in a wide range of mathematics and math-related subjects.

The purpose of this session is to highlight both usual and unusual problems applied to national security, with all talks being at the general non-expert level. NSA mathematicians have produced fascinating and significant results over the years, however much of the work is not published. This session is a great opportunity for the MAA community to be exposed to some of NSA's leading mathematicians and learn about the important role mathematics plays in a variety of problems.

**Carla D. Martin**, *National Security Agency*

#### Speakers

**David Perry**, *National Security Agency*

**Ben Benoy**, *National Security Agency*

**Steve Knox**, *National Security Agency*

**Christine Edwards**, *National Security Agency*

## Invited Sessions (continued)

### MAA INVITED PAPER SESSION

#### Improving Access to Mathematical Modeling Research

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Thursday, August 6, 1:00 PM – 4:20 PM  
Marriott Wardman Park, Delaware B

Recently with documents such as the Common Core State Standards, there has been an increasing push for mathematical modeling in every classroom. But the picture of mathematical modeling that applied mathematics researchers have is very different from the word problems provided in textbooks for teachers. This session is dedicated to closing the gap between applied mathematics research, mathematics education research, and what goes on in classrooms around the United States. With an eye to creating environment(s) that support students and teachers in mathematical modeling throughout the United States, at all mathematical and economic levels: How can we improve teacher's and students understanding of modeling research, and improve access to the experience of mathematical modeling research to populations that do not typically receive graduate training in the field?

**Carlos Castillo-Chavez**, *Arizona State University*

**Carlos Castillo-Garsow**, *Eastern Washington University*

#### Speakers

**Sara Del Valle**, *Los Alamos National Laboratory*

**Sherry Towers**, *Arizona State University*

**Patrick W. Thompson**, *Arizona State University*

**Kathleen R. Fowler**, *Clarkson University*

**Carlos Castillo-Garsow**, *Eastern Washington University*

**Richard Tapia**, *Rice University*

### MAA INVITED PAPER SESSION

#### Algebraic Structures Motivated by Knot Theory

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Friday, August 7, 9:00 AM – 11:20 AM and 1:00 PM – 5:00 PM  
Marriott Wardman Park, Delaware A

The area of knot theory has been developing rapidly in recent years. Most recent advances rely on the connections between algebra, homological algebra and knot theory. Examples include the Jones polynomial, topological quantum field theories, skein modules of links in 3-manifolds, Khovanov link and Heegard-Floer homologies, homology of distributive structures (i.e. quandles, racks, distributive lattices) and Yang-Baxter operators, as well as categorifications of knot polynomials and other appropriate combinatorial structures. These new developments relate knot theory to other branches of mathematics including number theory, Lie theory, statistical physics, etc, and employ tools far beyond the traditional ones from algebraic topology. These ideas mark the beginning of a new era in knot theory that includes relationships with four-dimensional problems and the creation of new forms of algebraic topology relevant to knot theory. Moreover, knot theory has numerous results and open problems requiring only knowledge of linear algebra, and are therefore accessible to undergraduates. We propose to bring together students and faculty active in these areas to share them with the broader mathematical community and encourage future collaboration and investigation.

**Alissa Crans**, *Loyola Marymount University*

#### Speakers

**Lou Kauffman**, *University of Illinois at Chicago*

**Heather Russell**, *Washington College*

**Erica Flapan**, *Pomona College*

**Alissa Crans**, *Loyola Marymount University*

**Sam Nelson**, *Claremont McKenna College*

**J. Scott Carter**, *University of South Alabama*

**Mikhail Khovanov**, *Columbia University*

**Radmila Sazdanovic**, *North Carolina State University*

## Invited Sessions

### MAA INVITED PAPER SESSION

#### Concrete Computations in Algebra and Algebraic Geometry

Friday, August 7, 1:00 PM – 3:20 PM  
Marriott Wardman Park, Delaware B

This session will bring together researchers in computational or combinatorial algebra and algebraic geometry whose research is concrete and accessible.

**Sarah Mayes-Tang**, *Quest University*

**Karen Smith**, *University of Michigan*

#### Speakers

**Robert Walker**, *University of Michigan*

**Courtney Gibbons**, *Hamilton College*

**Mike Janssen**, *Dordt College*

**Timothy Clark**, *Loyola University*

**Will Traves**, *United States Naval Academy*

### AMS-MAA INVITED PAPER SESSION

#### The Arithmetic of the Spheres

Thursday, August 6, 1:00 PM – 3:50 PM  
Marriott Wardman Park, Delaware A

This session deals with topics in number theory, geometry and dynamics related to Farey fractions, circle packings, and dynamical systems where mode locking appears.

**William Abram**, *Hillsdale College*

**Alex Kontorovich**, *Rutgers University*

**Jeffrey Lagarias**, *University of Michigan*

#### Speakers

**Katherine Stange**, *University of Colorado Boulder*

**Lionel Levine**, *Cornell University*

**Dan Romik**, *University of California Davis*

**Elena Fuchs**, *University of Illinois Urbana-Champaign*

**Steve Butler**, *Iowa State University*

**Kei Nakamura**, *University of California Davis*

### MAAT00 SPECIAL INVITED SESSION

#### The Geometry of Triangles

Saturday, August 8, 1:00 PM – 2:50 PM  
Marriott Wardman Park, Salon 1

Richard Guy and John Conway will share their latest ideas about the geometry of Euclidean triangles.

**A Triangle Has Eight Vertices (But Only One Center)**  
**Richard Guy**, *University of Calgary*

**New Ideas about the Geometry of Triangles**  
**John Conway**, *Princeton University*

### SPECIAL SESSION

#### “Notes of a Native Son”: The Legacy of Dr. Abdulalim A. Shabazz (1927-2014)

Saturday, August 8, 1:00 PM – 4:50 PM  
Marriott Wardman Park, Delaware B

Dr. Abdulalim A. Shabazz was a distinguished mathematician who is credited for mentoring over half of all African-Americans with a doctorate in Mathematics. “Notes of a Native Son” is a title of a collection of essays by James Baldwin. This title is fitting for a session honoring the life of Dr. Shabazz for three reasons. First, Dr. Shabazz is native to Washington, DC as he spent many years of his life there. Second, this session will feature various speakers whose careers were directly transformed by Dr. Shabazz’s mentorship. Third, this session will also include Dr. Shabazz’s peers who will discuss his active role in the mathematical community.

**Monica Jackson**, *American University*

**Talitha M. Washington**, *Howard University*

#### Speakers

**Monica Jackson**, *American University*

**Erica Walker**, *Teachers College, Columbia University*

**Ronald Mickens**, *Clark Atlanta University*

**Gwendolyn Irby**, *Lockheed Martin*

**Shree Taylor**, *Delta Decisions of DC*

**Brett Sims**, *Borough of Manhattan Community College*

**Gelonia Dent**, *Medgar Evers College*

**Talitha M. Washington**, *Howard University*

## Themed Contributed Paper Sessions

### TCPS#1: The History and Philosophy of Mathematics

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Wednesday, Thursday, Friday, and Saturday, mornings and afternoons

This session welcomes contributions from all areas related to history and philosophy of mathematics. This includes reports on research, survey talks, and issues related to the use of history and philosophy of mathematics in the classroom. The session will also include special sessions on mathematical communities and on the philosophy of mathematics. There will also be a group of talks in honor of Karen Parshall (one of the MAA Centennial lecturers) and also in memory of Jackie Stedall (a well known historian of mathematics who passed away in the early fall).

**Maria Zack**, *Point Loma Nazarene University*  
**Thomas Drucker**, *University of Wisconsin, Whitewater*  
**Robin Wilson**, *Open University and Oxford University*  
**June Barrow-Green**, *Open University*  
**Jean-Pierre Marquis**, *University of Montreal*  
**Sloan Despeaux**, *Western Carolina University*

**Sponsored by** HOM SIGMAA, POM SIGMAA, CSHPM, and BSHM

### TCPS#2: The Contributions of Women to Mathematics: 100 Years and Counting

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Friday and Saturday afternoons

In celebration of the 100th anniversary of the MAA, the AWM sponsors this session to acknowledge and recognize the contributions, achievements, and progress of women mathematicians over the past 100 years. This century has seen great mathematical achievements by women, the most recent and most public being Maryam Mirzakhani winning the Fields Medal. To honor this and other advances in mathematics by women, this session welcomes talks about mathematics done by women and historical or biographical presentations celebrating women in mathematics.

**Alissa S. Crans**, *Loyola Marymount University*  
**Jacqueline Jensen-Vallin**, *Lamar University*  
**Maura Mast**, *University of Massachusetts Boston*

**Sponsored by** The Association for Women in Mathematics (AWM)

### TCPS#3: Math Circle Problems in Honor of the MAA's 100th Anniversary

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Friday morning

A mathematics circle is an enrichment activity for K-12 students or their teachers, which brings them into direct contact with mathematics professionals, fostering a passion and excitement for deep mathematics in the participants. It is usually a weekly or monthly activity, but it can also be an intensive summer experience. Circles provide rich open-ended problems that enable students or their teachers to strengthen their problem-solving skills and deepen their appreciation for and excitement about mathematics. In honor of the MAA's 100th anniversary, we especially encourage talks that address a problem or topic involving the number 100 that was successful at your math circle.

**Katherine Morrison**, *University of Northern Colorado*  
**Philip Yasskin**, *Texas A&M University*  
**Paul Zeitz**, *University of San Francisco*

**Sponsored by** SIGMAA MCST

### TCPS#4: Undergraduate Research Activities in Mathematical and Computational Biology

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Friday afternoon

This session is dedicated to aspects of undergraduate research in mathematical and computational biology. First and foremost, this session would like to highlight research results of projects that either were conducted by undergraduates or were collaborations between undergraduates and their faculty mentors. Of particular interest are those collaborations that involve students and faculty from both mathematics and biology. Secondly, as many institutions have started undergraduate research programs in this area, frequently with the help of initial external funding, the session is interested in the process and logistics of starting a program and maintaining a program even after the initial funding expires. Important issues include faculty development and interdisciplinary collaboration, student preparation and selection, the structure of research programs, the acquisition of resources to support the program, and the subsequent achievements of students who participate in undergraduate research in mathematical and computational biology.

**Timothy D. Comar**, *Benedictine University*

**Sponsored by** BIO SIGMAA

## Themed Contributed Paper Sessions

### TCPS#5: Recreational Mathematics: New Problems and New Solutions

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Friday and Saturday afternoons

As with all mathematics, recreational mathematics continues to expand through the solution of new problems and the development of novel solutions to old problems. For the purposes of this session, the definition of recreational mathematics will be a broad one. The primary guideline used to determine the suitability of a paper will be the understandability of the mathematics. Papers submitted to this session should be accessible to undergraduate students. Novel applications as well as new approaches to old problems are welcome. Examples of use of the material in the undergraduate classroom are encouraged.

**Paul R. Coe**, *Dominican University*  
**Sara Quinn**, *Dominican University*  
**Kristen Schemmerhorn**, *Concordia University Chicago*

### TCPS#6: Mathematics and Art

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Wednesday afternoon and Thursday morning

Mathematics and art have a long historical relationship throughout the centuries. Ancient Egyptians and Greeks incorporated several mathematical relationships into their lives and art. In this session we encourage talks and presentations that connect mathematics and art. We would like to see a broad range of art: visual art, decorative art and performing art. The emphasis will be on college level mathematics that connects math and art in problems and projects that can enrich mathematics teaching. Puzzles, games and other activities that relate math and art are also encouraged.

**Sandra Fital-Akelbek**, *Weber State University*  
**Mahmud Akelbek**, *Weber State University*

### TCPS#7: Financial Mathematics

---

Wednesday afternoon

Financial Mathematics encompasses all the mathematical and statistical tools, theories and techniques involved in the applied areas usually described as Quantitative Finance, Computational Finance, and Financial Engineering. Research in these areas of financial market modeling include derivatives pricing, risk-and-portfolio management and the theory of interest. Such works have resulted in Nobel Prizes in 1990 and 1997. This session welcomes presentations on any aspect of Financial Mathematics, including the history of this topic, the teaching of this topic, new applications or items of purely academic interest.

**Richard Stephens**, *Columbus State University*  
**Alin Stancu**, *Columbus State University*

### TCPS#8: Mathematics in Video Games

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Saturday afternoon

Video games are a part of popular culture and they show up everywhere and in different forms: computer or console, online or offline, on phones or other mobile devices. There are many applications of mathematics in the gameplay and creation of games that are popular today. This session seeks presentations that share some of the mathematical applications that appear in recent games. Presenters are encouraged to show college-level mathematics that might appear in a range of courses. This session will be of interest to gamers and instructors looking for innovative examples to use in their classes.

**Heidi Hulsizer**, *Hampden-Sydney College*

## Themed Contributed Paper Sessions (continued)

### TCPS#9: What Can a Mathematician Do with a 3D Printer?

Saturday afternoon

This session is dedicated to the intersection of 3D printing and mathematics: the creation of objects through the application of college-level mathematics or research-level mathematics, or the incorporation of 3D printing into the teaching of mathematics. In terms of the creation of objects on a 3D printer, of particular interest are those works that answer the question, "What can a mathematician do with a 3D printer?" This may include fractal images, knots, smooth manifolds, polyhedra, and demonstrations of theoretic or historical constructs. For teaching, of particular interest is the incorporation of 3D printing into college-level courses like geometry, topology, or multivariable calculus.

**Edward Aboufadel**, *Grand Valley State University*  
**Laura Taalman**, *James Madison University*

### TCPS#10: The Scholarship of Teaching and Learning in Collegiate Mathematics

Wednesday afternoon

In the Scholarship of Teaching and Learning (SoTL), faculty bring disciplinary knowledge to bear on questions of teaching and learning and systematically gather evidence to support their conclusions. Scholarly work in this area includes investigations of the effectiveness of pedagogical methods, assignments, or technology, as well as probes of student understanding. The goals of this session are to: (1) feature scholarly work focused on the teaching of postsecondary mathematics, (2) provide a venue for teaching mathematicians to make public their scholarly investigations into teaching/learning and (3) highlight evidence-based arguments for the value of teaching innovations or in support of new insights into student learning. Appropriate for this session are preliminary or final reports of post-secondary classroom-based investigations of teaching methods, student learning difficulties, curricular assessment, or insights into student (mis-) understandings. Abstract submissions should have a clearly stated question that was (or is) under investigation and should give some indication of the type of evidence that has been (or is being) gathered and will be presented. For example, papers might reference the following types of evidence: student work, participation or retention data, pre/post-tests, interviews, surveys, think-alouds, etc.

**Russell E. Goodman**, *Central College*  
**Jessie Hamm**, *Winthrop University*  
**Jackie Dewar**, *Loyola Marymount University*  
**Curt Bennett**, *Loyola Marymount University*

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## Themed Contributed Paper Sessions

### TCPS#11: Cultivating Critical Thinking through Active Learning in Mathematics

Thursday morning and afternoon

Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking. It entails effective communication and problem solving abilities. "We think critically when we have at least one problem to solve. One is not doing good critical thinking, therefore, if one is not solving any problems." (Richard Paul, Think Magazine, 1992). Mathematics is solving problems. The session will focus on the role of active learning in mathematics, and how a teacher can use it to cultivate critical thinking. We invite instructors to share their experiences and provide useful tips and tricks on implementing active learning strategies and overcoming obstacles to active learning in general. Examples and ideas can come from any type of course, from undergraduate non-major service courses and early-major mathematics courses to late-major and even graduate-level classes. Speakers are encouraged to include assessment data on the effectiveness of their active learning strategies or empirical feedback from students and/or faculty about their strategies.

David Taylor, *Roanoke College*  
 Robert Allen, *University of Wisconsin, La Crosse*  
 Lorena Bociu, *North Carolina State University*

### TCPS#12: Improving Undergraduate Math Writing

Wednesday afternoon

From the simplest modeling equations to the most complex proofs, students often lack the writing abilities to properly communicate their solutions. In order to help students achieve coherent arguments that are both logical and sequential, math-writing skills need to be developed. Students in introductory math classes must be able to find the solution to a problem by writing down all the necessary steps and reasons for each step leading up to the answer. Students in advanced math classes must be able to delineate hypothesis from conclusion in proving statements and be able to use the definitions, assumptions, and related results accurately in justifying their proofs. In this session, we invite participants to share useful approaches to teaching students not only how to reason critically, but also to communicate in writing in a way that fully demonstrates conceptual understanding. We encourage instructors that actively practice mathematical writing

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## Themed Contributed Paper Sessions

across all levels of the curriculum to share best practices for student writing objectives. We are interested in hearing about specific problems and/or projects, as well as the assessment tools for these projects, which have been used to address the issue of writing mathematics.

**Kerry M. Luse**, *Trinity Washington University*  
**Sita Ramamurti**, *Trinity Washington University*

### TCPS#13: Successful STEM Programs for Elementary Education Majors

Thursday afternoon

As President Obama stated regarding STEM, "We need to make this a priority to train an army of new teachers in these subject areas." In response to this need, many institutions have developed programs that provide STEM certification or other credentialing for pre-service elementary education majors. This session solicits presentations regarding programs that have been developed to provide this type of credentialing. As mathematics plays a significant role in these programs, the mathematical aspects of these programs should be highlighted. Presentations about programs under development are also encouraged.

**Timothy W. Flood**, *Pittsburg State University*  
**Karla Childs**, *Pittsburg State University*  
**Aaron Flood**, *Missouri University of Science and Technology*

### TCPS#14: Projects, Applications and Demonstrations to Enhance a Numerical Analysis or Computational Mathematics Course

Saturday afternoon

Computational mathematics is an important subject that is either an independent course or a component across multiple courses. This session seeks to gather ideas and further the scholarly discussion regarding the delivery of a course in: numerical analysis, numerical methods, modeling, and the use of Computer Algebra Systems to solve problems. All applicable ideas are welcome, but we would like to encourage presentations in areas like:

- New techniques for presenting numerical methods to an undergraduate audience
- New resources or tools that can be incorporated into a course
- Applications that illustrate the power of computational mathematics
- Contemporary research that is accessible to undergraduate students
- Assessment tools that could be used in this type of course

**Kyle Riley**, *South Dakota School of Mines & Technology*

### TCPS#15: Democratizing Access to Authentic Mathematical Activity

Friday afternoon

Essential to the learning of mathematics is that students engage in "authentic" mathematical activity, or what mathematicians would recognize as "doing math." However, too often deficit explanations (i.e., students' lack of background knowledge, lack of math ability, lack of motivation) have been used to deny students access to authentic experiences. This session is a vehicle to promote a more equitable orientation to the learning of mathematics for all students in a range of learning situations (not just the "top" kids in ideal situations). We invite talks illustrating viable, evidence-based strategies that promote access to authentic mathematical activity through inquiry that honors the diversity of students' mathematical knowledge. Topics may include 1) innovative, equity- and inquiry-oriented methods of teaching and learning in remedial, developmental, or introductory courses and courses for non-majors; 2) lessons that allow students to use mathematics to address important equity and social justice issues in their communities; and 3) programs that provide students with opportunities to engage in the kinds of authentic mathematical activities and research projects that embrace the knowledge and experiences they bring to school.

**Catherine Buell**, *Fitchburg State University*  
**Steven Greenstein**, *Montclair State University*  
**Zahava Wilstein**, *Berry College*

## Themed Contributed Paper Sessions (continued)

### TCPS#16: Curriculum Development to Support First Year General Education Mathematics Students

Wednesday afternoon

A common focus of university administration is student retention and graduation. First year mathematics courses—remedial and general education—have relatively high drop/fail/withdraw rates, which place them under scrutiny by administration. In this session, we would like to hear what you have been doing to improve pass rates and student persistence in first year courses with traditionally high DFW rates. We hope to focus on department efforts (rather than specific classroom approaches) to support students in these first year Mathematics courses. Presentations could include complete multi-section redesign, restructure of curriculum, efforts to standardize. We would like to hear about successful, in progress, and unsuccessful efforts. Presentations with a description of the initiative along with data supporting the success or failure are encouraged.

**Donna Flint**, *South Dakota State University*  
**Charles Bingen**, *University of Wisconsin Eau Claire*

### TCPS#17: Curriculum and Course Development to Support First Year STEM Students

Friday afternoon

Poor retention in the STEM fields is often tied to students' initial difficulties and/or lack of motivation in mathematics courses early in their academic career. In this session, we would like to hear about efforts to help struggling students in first year mathematics courses for STEM students or to help motivate students in these courses. We are particularly interested in departmental efforts, rather than specific classroom teaching activities. We would like to hear about successful, in progress, and unsuccessful efforts. Presentations with a description of the initiative along with data supporting the success or failure are encouraged.

**Donna Flint**, *South Dakota State University*  
**Dan Kemp**, *South Dakota State University*  
**Charles Bingen**, *University of Wisconsin Eau Claire*

### TCPS#18: Using Modeling for Teaching Differential Equations: Before, During, After

Saturday afternoon

Often modeling is associated with differential equations courses as a motivator for learning and as a way of showing how mathematics is applied in other disciplines such as physics, biology, and economics. Modeling can be used (1) as a way of leading up to the mathematics being taught, (2) during the instruction on the mathematics and techniques, and/or (3) after the mathematics has been taught. These three times—before, during, or after—for using modeling have the potential to support students and motivate their learning. We invite colleagues who use modeling, especially with real data, to share their experiences with special attention paid to the timing of the modeling activities with respect to associated differential equations concepts and techniques. This session is sponsored by SIMIODE - Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations and presenters will be invited to submit their modeling scenarios for peer-reviewed publication at [www.simiode.org](http://www.simiode.org).

**Brian Winkel**, *United States Military Academy*  
**Karen Bliss**, *Quinnipiac University*  
**Jessica Libertini**, *Virginia Military Institute*  
**Nakeya Williams**, *United States Military Academy*

### TCPS#19: Innovative Approaches in the Calculus Sequence

Friday and Saturday afternoons

There has been a significant amount of investigation into the flaws of traditional calculus courses and possible improvements, from the Calculus Reform movement beginning in the late 1980s to the recent MAA study finding significant attrition during the calculus sequence. This session shines a spotlight on recent efforts from instructors to make a productive change. In this session, we ask instructors to share creative ideas for instruction from the calculus sequence. We are interested in general approaches and/or specific activities that a) help students engage in the mathematics of calculus in innovative ways and/or b) promote group work and conversation about the mathematical content. Submitted abstracts should include a description of the approach/activity, how it meets these objectives, and observed strengths and weaknesses compared with the traditional approach. We encourage presentations in which the audience can experience the innovative teaching and learning.

**Aaron Wangberg**, *Winona State University*  
**Brian Fisher**, *Lubbock Christian University*  
**Jason Samuels**, *City University of New York*

## Themed Contributed Paper Sessions

### **TCPS#20: Evidence Based Approaches to the Mathematical Preparation of Secondary Teachers**

Wednesday afternoon

The mathematical preparation of secondary teachers has received substantial attention by mathematicians and mathematics teacher educators for many years, but how do university instructors and program coordinators know their efforts are making a difference? While the program evaluation process, which can include accreditation reports (e.g., CAEP) and teacher candidate surveys, encourages faculty to seriously consider this question, it is tempting to focus program evaluation on outcomes such as: graduation rates, teacher placement rates, and scores on teacher licensure exams or performance-based teacher assessments (e.g., edTPA). In this session, we invite mathematics content and methods instructors and program coordinators to share ways they gather and analyze data for the purpose of making decisions about their programs. Presentations should focus on one or two program goals directly linked to the mathematical preparation of secondary teachers. Examples include: How do you know that teachers can promote mathematical thinking and learning in ways consistent with the Common Core Standards for Mathematics (NGA Center & CCSSO, 2010)? How is your program addressing the recommendations in the Mathematical Education of Teachers II document (CBMS, 2012)? How does your program work with mentor teachers to develop candidates' use of formative assessment?

**Laurie O. Cavey**, *Boise State University*

**Scott A. Courtney**, *Kent State University*

### **TCPS#21: Show Me Geometry: Geometry Software and Tablet Demonstrations**

Wednesday afternoon

This session invites presenters to share demonstrations, using geometry software or tablet applications, which help students to understand aspects of undergraduate geometry. These demonstrations should be suitable for Euclidean and non-Euclidean geometry courses as well as for courses frequently referred to as "modern" or "higher" geometry but not those related to differential geometry or (low-level) graduate courses. Presenters must perform the full demonstration (or a key portion of it) and discuss the aspects of the demonstration that help students to understand an associated theorem. Information regarding prerequisite topics and related areas with which students have difficulty should be discussed as should problems, if any, experienced in using the software or tablet application. Presenters are invited to discuss how they have modified the demonstration over time as well as to share information about software or tablet explorations performed with students that have helped students understand the associated theorem. Abstracts should include the name of the software or application, the platform (computer or tablet), and the associated theorem as well as a brief description of the demonstration. Presenters must provide their own laptop or tablet.

**Sarah L. Mabrouk**, *Framingham State University*



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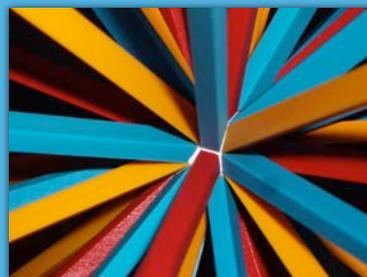
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- \* NAMC on Facebook: <http://www.facebook.com/MathCircles>
- \* SIGMAA-MCST: <http://sigmaa.maa.org/mcst>
- \* Math Teachers' Circle (MTC) Network: <http://mathteacherscircle.org>

# General Contributed Paper Sessions

Organized by: **Aliza Steurer**, *Dominican University*  
**Holly Zullo**, *Westminster College*

Wednesday, Thursday, Friday, and Saturday mornings and afternoons

The general sessions accept abstracts of papers in all areas of mathematics, pedagogy, and the undergraduate mathematics curriculum. Talks in the general sessions are organized in the following categories:

**Algebra and Linear Algebra**

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**Analysis and Other**

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**Applied Mathematics**

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**Geometry**

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**Graph Theory**

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**History or Philosophy of Mathematics**

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**Interdisciplinary Topics in Mathematics and Modeling or Applications**

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**Mathematics and Technology**

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**Mentoring and Outreach**

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**Number Theory and Logic or Foundations**

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**Probability or Statistics**

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**Teaching or Learning Advanced Mathematics**

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**Teaching or Learning Calculus**

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**Teaching or Learning Developmental Mathematics and Assessment**

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**Teaching or Learning Introductory Mathematics**

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**Other than the above**

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Eight book series. Three journals. Two magazines. One great brand.

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Friday, August 7  
2 p.m.

MAA Pavilion in the Exhibit Hall

Join us for a cake celebration and browse our new titles.

Don't miss this event!

## Panel Sessions

### Panel 1. A Common Vision for the Undergraduate Mathematics Program in 2025

Friday, August 7, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Salon 1

The Mathematical Association of America (MAA) is partnering with other professional associations in the mathematical sciences – AMATYC, AMS, ASA, and SIAM – to consider how we might modernize our programs to better prepare students for the demands of the 21st century workplace. We aim to catalyze widespread adoption of curricula and pedagogies that are (1) geared toward developing a broad base of intellectual skills and competencies to better prepare students for the workforce and (2) simultaneously endorsed by a broad cross-section of the mathematical sciences community. Funded by the NSF, “A Common Vision for the Undergraduate Mathematics Program in 2025” will take stock of the curricular guides endorsed by the various associations, identify and articulate common themes, and lay a foundation for future work. Panelists will update the community on the project.

**Organizers:**

**Karen Saxe**, *Macalester College*  
**Linda Braddy**, *MAA*

**Panelists:**

**Karen Saxe**, *Macalester College*  
**David Kung**, *St. Mary’s College of Maryland*

### Panel 2. Applying for and Obtaining Grants

Thursday, August 6, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Salon 1

Grants have always played a vital role in supporting faculty in a wide variety of activities. Now with decreased funding opportunities at many universities, there seems to be even more interest in procuring grants. In this session, panelists will provide suggestions on how to find and successfully apply for appropriate funding for projects involving undergraduate research, faculty scholarship, education reform, and the vast array of activities which faculty need financial resources to implement. Panelists have backgrounds in applying for a variety of federal grants as well as local grants. In addition, the panel has representation from funding agencies and can provide insight on what they look for when reviewing applications.

**Organizer:**

**Julie Barnes**, *Western Carolina University*

**Panelists:**

**Michael Dorff**, *Brigham Young University*  
**Jessica Libertini**, *Virginia Military Institute*  
**Jennifer Pearl**, *NSF Division of Mathematical Sciences*  
**Charles Toll**, *NSA Mathematical Sciences Program*  
**Lee Zia**, *NSF Division of Undergraduate Education*

**Sponsor:**

**Committee on Professional Development**

### Panel 3. Beyond the Post-Doc: Fellowship Opportunities for Mathematics Faculty

Friday, August 7, 4:10 PM – 5:30 PM  
Marriott Wardman Park, Salon 1

The availability of high-quality fellowship programs provides exciting opportunities for mathematics professionals at various stages of their careers. Panelists in this session will describe fellowships they recently participated in, including Fulbright and AAAS Science & Technology Policy fellowships. They will offer details and insights from the application process forward. After opening remarks, the session will become an open dialogue during which speakers enter into active dialogues with session attendees to provide additional details and information.

**Organizer:**

**Linda McGuire**, *Muhlenberg College*

**Panelists:**

**Beth Burroughs**, *Montana State University*  
**Karen Saxe**, *Macalester College*  
**Katherine Socha**, *The Park School of Baltimore*

### Panel 4. A Discussion of the MAA/NCTM Joint Position Statement on Calculus

Wednesday, August 5, 4:10 PM – 5:30 PM  
Marriott Wardman Park, Delaware A

In 2012, members of the MAA and NCTM released a joint position statement on calculus. The goal of the statement is to provide a clear vision of how calculus instruction should occur given that is the course most students planning to enter mathematically intensive careers take as they exit secondary school and/or again as they enter college. The increase in students taking calculus in secondary schools across the US has had several unwanted effects including students with an inadequate foundation in algebra, geometry and trigonometry and enrolling in calculus multiple times (secondary school and college), basically repeating the course. Although calculus can play an important role in secondary school, the ultimate goal of the K–12 mathematics curriculum should not be to get students into and through a course in calculus by twelfth grade but to have established the mathematical foundation that will enable students to pursue whatever course of study interests them when they get to college. The college curriculum should offer students an experience that is new and engaging, broadening their understanding of the world of mathematics while strengthening their mastery of tools that they will need if they choose to pursue a mathematically intensive discipline. Representatives from the MAA and NCTM will discuss the statement, the background for developing the statement and recommendations for the design of calculus programs at the post-secondary level recognizing the different backgrounds and goals of potential students.

**Organizer:**

**Jessica Deshler**, *West Virginia University*

**Panelists:**

**David Bressoud**, *Macalester College*  
**Michael Boardman**, *Pacific University*

## Panel Sessions

**Gail Burrill**, *Michigan State University*  
**Dan Teague**, *NC School of Science and Mathematics*

**Sponsor:**  
**Committee on Professional Development**

### Panel 5. Big Data in the Undergraduate Mathematics Curriculum

Saturday, August 8, 2:35 PM – 3:55 PM  
 Marriott Wardman Park, Delaware A

Big Data is a popular buzzword, but it is also a reality in many new jobs. How can we prepare students in data science, within existing courses and in new ones? How can faculty retrain to handle these courses? How does the material fit into the mathematics curriculum, rather than strictly computer science, statistics or other fields? What efforts are underway to answer these questions? On this panel, mathematics faculty with experience creating and delivering instruction in data science will share their experiences.

**Organizers:**  
**Rachel Levy**, *Harvey Mudd College, SIAM VP for Education*  
**Kathleen Fowler**, *Clarkson University*

**Panelists:**  
**Talithia Williams**, *Harvey Mudd College*  
**Chad Higdon-Topaz**, *Macalester College*  
**Sherry Towers**, *Arizona State University*  
**Peter Turner**, *Clarkson University*

**Sponsor:**  
**SIAM Education Committee**

### Panel 6. The Updated AP Calculus AB/BC courses: What Does This Mean For You?

Wednesday, August 5, 2:35 PM – 3:55 PM  
 Marriott Wardman Park, Delaware A

In November 2014, College Board announced that AP Calculus was the latest subject to go through the redesign process, and the updated courses will launch in the 2016-2017 academic year. This session will provide details on how the AP Calculus AB and AP Calculus BC courses have changed both in terms of course content and student expectations. The panel will include representatives from College Board and ETS, as well as some of the authors of the new AP Calculus Curriculum Framework. There will be time in the session for the panelists to answer questions from the audience.

**Organizer:**  
**Benjamin Hedrick**, *College Board*

**Panelists:**  
**Stephen Kokoska**, *Bloomsburg University*  
**Stephen Davis**, *Davidson College*  
**Gail Burrill**, *Michigan State University*  
**James Sellers**, *Penn State University*  
**Craig Wright**, *Educational Testing Service*  
**Benjamin Hedrick**, *College Board*

### Panel 7. Implementing the 2015 CUPM Curriculum Guide

Wednesday, August 5, 1:00 PM – 2:20 PM  
 Marriott Wardman Park, Delaware A

CUPM will present practical advice on how to succeed in curriculum assessment, renewal, and reform. Panelists will discuss necessary considerations and steps in the process of (re)designing a mathematical sciences major or major track. The resulting curriculum should implement the recommendations of the 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences.

**Organizer:**  
**Martha Siegel**, *Towson University*

**Panelists:**  
**Beth Burroughs**, *Montana State University*  
**Joel Cunningham**, *Sewanee, The University of the South*  
**Stephen deBacker**, *University of Michigan*  
**Jill Dietz**, *St. Olaf College*

### Panel 8. What Mathematics Do Engineering Students Need to Know in the First Two Years? (And What If It Doesn't Start with Calculus?)

Thursday, August 6, 2:35 PM – 3:55 PM  
 Marriott Wardman Park, Salon 1

Mathematics is an essential component of the education of future engineers, but what mathematics do engineers need to know, when should they learn it, how will they learn it best, and what role does mathematics play in attracting and retaining students in engineering? A recent longitudinal (10-year) study on the success of Wright State University's innovative engineering curriculum, which (gaspl) does not start with the standard calculus sequence, offers an innovative example of how we might re-imagine a modern mathematics/engineering curriculum partnership. Panelists will discuss the Wright State model and other trends in engineering education that might affect mathematics curricula and will highlight what we learned about the mathematical needs of engineering students from the MAA's Curriculum Foundations Project. Given the engineering community's influence on the calculus curriculum, we all have a vested interest in this conversation – whether or not we teach future engineers. Department chairs and academic leaders are especially encouraged to attend.

**Organizers:**  
**Wade Ellis**, *West Valley Community College*  
**Suzanne Dorée**, *Augsburg College*

**Panelists:**  
**Nathan Klingbeil**, *Wright State University*  
**Susan Ganter**, *East Carolina University*  
**Jenna Carpenter**, *Louisiana Tech University*

**Sponsors:**  
**Curriculum Renewal Across the First Two Years (CRAFTY) Committee**  
**Mathematics Across the Disciplines (MAD) Committee**

## Panel Sessions (continued)

### Panel 9. Quantitative Literacy and Democracy

Saturday, August 8, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Delaware A

For decades, mathematics educators such as Lynn Steen (ed., *Mathematics and Democracy*) and Robert Moses (*The Algebra Project*) have argued that quantitative literacy is necessary for a citizen's full participation in contemporary society. As we meet in our nation's capital, we invite panelists to reflect on how quantitative literacy supports and contributes to democracy. Questions may include: How does quantitative literacy enable participation in high quality debate over public issues? How can quantitative literacy support social advocacy? How do quantitative arguments affect legal proceedings? What should a citizen understand about the mathematics of voting, apportionment, gerrymandering, and other political issues?

**Organizers:**

**Gary Franchy**, *Southwestern Michigan College*  
**Gizem Karaali**, *Pomona College*  
**Andrew J Miller**, *Belmont University*  
**Aaron Montgomery**, *Central Washington University*  
**Victor Piercey**, *Ferris State University*

**Panelists:**

**Lily Khadjavi**, *Loyola Marymount University*  
**Maura Mast**, *Fordham University*  
**Rob Root**, *Lafayette College*

**Sponsor:**

**SIGMAA QL**

### Panel 10. Nonacademic Career Paths for Mathematicians

Friday, August 7, 2:35 PM – 3:55 PM  
Marriott Wardman Park, Salon 1

You're about to earn a degree in mathematics, now what? You may be surprised to know that teaching isn't your only option; in the "real world" mathematical knowledge is a valued commodity and there are many interesting job opportunities for mathematicians in nonacademic settings. So, whether you are a mathematics student looking for a job once you graduate or an advisor looking for advice to give to future job-seeking students, this session will help you gain new perspectives on nonacademic career experiences and what employers value in their employees. Panelists will share their paths to their current positions and offer advice to others looking for employment in similar venues.

**Organizers:**

**Ben Galluzzo**, *Shippensburg University*  
**Dora Ahmadi**, *Morehead State University*

**Sponsor:**

**MAA Committee on Undergraduate Student Activities and Chapters**

### Panel 11. Congratulations on Getting Tenure! Now What?

Wednesday, August 5, 4:10 PM – 5:30 PM  
Marriott Wardman Park, Washington 6

This session is designed for faculty who have recently received tenure and are thinking about what lies ahead. For those planning a sabbatical, transitioning to a new research area, taking on a major service obligation, or making a change in their academic priorities, our panelists will provide guidance and expertise for developing a new set of goals.

The discussion panel topics will be:

- Writing your first textbook or expository article
- Adapting a new area of research
- Taking on a new leadership role

**Organizers:**

**Allison Henrich**, *Seattle University*  
**Patrick X. Rault**, *SUNY Geneseo*

**Panelists:**

**Colin Adams**, *Williams College*  
**Shannon Overbay**, *Gonzaga University*  
**Inga Johnson**, *Willamette University*

**Sponsor:**

**Project NExT (Red 08 Dots)**

### Panel 12. Finding Your New Niche: Staying Fresh

Thursday, August 6, 4:10 PM – 5:30 PM  
Marriott Wardman Park, Washington 6

This panel of early Project NExT participants will explore the wide range of roles we have taken on in our careers, offering insight in how to stay engaged and enthusiastic in our work. Topics will include mentoring new faculty, authoring textbooks, serving as an academic administrator, working outside academia, and leadership in mathematics organizations.

**Organizers:**

**Gertrud L. Kraut**, *Southern Virginia University*  
**Emily Puckette**, *University of the South*

**Panelists:**

**Doug Ensley**, *Shippensburg University*  
**Jenny McNulty**, *University of Montana*  
**Tim Ray**, *NSA*  
**Elsa Schaefer**, *Marymount University*

**Sponsor:**

**Project NExT (Red dots)**

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## MAA Centennial T-shirt

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Complete and return the MAA Centennial Sudoku found in your registration bag by 7 p.m. on Wednesday for a chance to win an Apple iPad mini.

## Student Discount

Show us your student ID and receive 10% off book purchases.  
(cannot be combined with any other discount)

## MAA Bucks

Check your registration bag for your MAA Bucks. Use it towards your book purchases of \$50 or more.

## 3 Books. 3 Days.

Thursday at 2 p.m.: \$4 | Friday at 3:30 p.m.: \$5 | Saturday at 10:30 a.m.: \$6

## *I, Mathematician* Release Party

Thursday at 3 p.m.

Join us for wine and cheese and meet some of the contributors.

## MAA Press Launch

Friday at 2 p.m.

## Poster Sessions

### PosterFest 2015: A Poster Session of Scholarship by Early Career Mathematicians and Graduate Students

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Friday, August 7, 3:30 PM – 5:00 PM  
 Marriott Wardman Park, Exhibit Hall A

This poster session will allow early career mathematicians, including untenured faculty and graduate students, to present and discuss their scholarly activities with other attendees in an informal atmosphere. Examples of scholarly activities suitable for this poster session include expository work, preliminary reports, scholarship of teaching and learning, and research reports. Presenters should have their materials prepared in advance and will be provided with a self-standing, trifold tabletop poster approximately 48 in wide by 36 in high.

**Organizers:**

**Doug Ensley**, *Shippensburg University*  
**Jenny McNulty**, *University of Montana*

**Sponsors:**

**MAA Committee on Early Career Mathematicians**  
**Project NExT**  
**Young Mathematicians Network**

### Highlights from AWM Student Chapters

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Wednesday, August 5, 3:30 PM – 5:00 PM  
 Marriott Wardman Park, Marriott Foyer (outside Salon 1, upper level)

This poster session will highlight achievements by AWM Student Chapters in celebration of the 10th anniversary of the formation of the first chapters. This program has expanded to fifty chapters and has impacted thousands of undergraduate and graduate women across the country. AWM Student Chapters sponsor and host a range of activities including invited speakers, Pi Day Celebrations, field trips, outreach programs to local schools, Sonia Kovalesky Days, and career panels. In this poster session, AWM Student Chapters are invited to share their stories, ideas, and successes with other AWM Student Chapters and with the mathematical community.

**Organizers:**

**Alissa Crans**, *Loyola Marymount University*  
**Jacqueline Jensen-Vallin**, *Lamar University*  
**Maura Mast**, *University of Massachusetts, Boston*

**Sponsor:**

**Association for Women in Mathematics**

### Classroom Activities and Projects within the Context of Environmental Sustainability

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Thursday, August 6, 3:30 PM – 5:00 PM  
 Marriot Wardman Park, Exhibit Hall A

Humanity continually faces the task of how to balance human needs against the world's resources, while operating within the constraints imposed by the laws of nature. Mathematics helps us better understand these complex issues that span disciplines: from measuring energy and other resources, to understanding variability in air and water quality, to modeling climate change. Moreover, these and other real world driven sustainability topics have the potential for motivating students to pursue STEM courses and fields of study more deeply. This poster session will highlight sustainability-focused projects and activities that have been developed for use in mathematics courses; a number of which have been developed recently at NSF and MAA PREP supported Undergraduate Sustainability Experiences in Mathematics (USE Math) workshops. The format of the session will provide presenters and attendees the opportunity to discuss effective strategies for introducing sustainability themes in the classroom. Information about presenters and their projects will appear on the SIGMAA EM website.

**Organizers:**

**Ben Galluzzo**, *Shippensburg University*  
**Corrine Taylor**, *Wellesley College*

**Sponsor:**

**SIGMAA EM**

# Minicourses

All MAA MathFest Minicourses will take place at the Omni Shoreham Hotel, (2500 Calvert St, NW, one block up from the Marriott Wardman Park). **MAA Minicourses are partially supported by the William Lucas Fund.**

## 1. The Hitchhiker's Guide to Mathematics

### Part A:

Thursday, August 6, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Hampton Room

### Part B:

Saturday, August 8, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Hampton Room

A guided tour of some little known attractions of elementary mathematics, all closely related to and easily accessible from freshman-sophomore college mathematics. In the midst of these seemingly mundane surroundings lurk wonders to surprise, delight, and intrigue the mathematical eye. Some may make great enrichment topics for the participants' students, but the course's primary motivations are the edification and enjoyment of the participants themselves.

The Hitchhiker's Guide to Mathematics answers questions like these: What simple method reveals the sum of the reciprocals of a polynomial's roots? What does the quadratic formula have to do with the functions  $\max(x,y)$  and  $\min(x,y)$ ? What is the point of reversing a polynomial and its derivative, and then dividing one into the other? What are palindromic polynomials, and how can they be solved up to degree 9?

Participants are encouraged to bring a calculator (or mobile device/laptop with basic computing functionality).

**Dan Kalman**, *American University*  
**Bruce Torrence**, *Randolph-Macon College*

## 2. The Mathematics of Games and Gambling

### Part A:

Wednesday, August 5, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Hampton Room

### Part B:

Friday, August 7, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Hampton Room

In this course, you will learn about the mathematics that underlies many of the great games that people enjoy today. Learn the optimal basic strategy for playing blackjack, along with some simple card counting techniques. Learn the mathematics needed to play great poker and other games. Since you're a mathematician, most people assume that you're already good at these things. This course will teach you those skills and you'll learn some fun mathematics along the way.

The Game Plan:

Great Expectations and Winning Wagers Optimal Blackjack and Simple Card Counting

Scams and Hustles Zero Sum Games and Practical Poker Probabilities

All material in the course will be accessible to undergraduates. The instructor takes no responsibility for any get-rich-quick schemes that students learn from this class.

**Arthur Benjamin**, *Harvey Mudd College*

## 3. Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry

### Part A:

Wednesday, August 5, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Hampton Room

### Part B:

Friday, August 7, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Hampton Room

Trigonometry came into being at the birth of science itself, merging Greek geometric models of the motions of celestial bodies with the desire to predict where the planets will go. With the sky as the arena, spherical trigonometry was the "big brother" to the ordinary plane trigonometry our children learn in school. We shall explore the surprisingly elegant theory that emerges, as well as its appropriation into mathematical geography motivated by the needs of Muslim religious ritual. The beautiful modern theory of spherical trigonometry (including the pentagramma mirificum), developed by John Napier along with his logarithms, leads eventually to an astonishing alternate path to the subject using stereographic projection discovered only in the early 20th century. We conclude with a consideration of some of the ingenious techniques developed by navigators in the 19th century to find their locations, using as data only a couple of observations of stellar altitudes.

**Glen Van Brummelen**, *Quest University*  
**Joel Silverberg**, *Roger Williams University*

## Minicourses (continued)

### 4. Recruiting Students to Take More Mathematics Courses and to be Mathematics Majors

**Part A:**

Wednesday, August 5, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Calvert Room

**Part B:**

Friday, August 7, 1:00 PM – 3:00 PM,  
Omni Shoreham Hotel, Calvert Room

We will discuss some principles and specific activities we have used to increase the number of students taking mathematics courses and becoming math majors. Principles include creating a culture of “Math is cool!”, exposing students to careers and opportunities available to those who study mathematics, and being proactive in your efforts. Specific activities include a “Careers in Mathematics” seminar, a freshman/sophomore class titled “Intro to being a math major,” the creation of a student advisory council, a big screen HDTV display with a PowerPoint presentation about mathematics, a set of math t-shirts, and the “We Use Math” website.

**Michael Dorff**, *Brigham Young University*

### 5. Using Videos of Students Developing Proofs to Guide Teaching and Learning

**Part A:**

Thursday, August 6, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Calvert Room

**Part B:**

Saturday, August 8, 3:30 PM – 5:30 PM,  
Omni Shoreham Hotel, Calvert Room

This minicourse will be of interest to anyone engaged in the teaching of proof-writing. Participants will develop a deeper understanding of students’ struggles as they view and discuss short videos of students constructing proofs for problems used in introduction-to-proof courses. The emphasis of the minicourse will be on identifying and implementing teaching strategies that help students overcome their difficulties and help them develop more effective proof-writing skills. Participants will be provided ongoing access to a library of edited student videos, developed by the organizers, which can be used as a classroom tool.

**James Sandefur**, *Georgetown University*  
**Connie Campbell**, *Millsaps College*  
**Kay Somers**, *Moravian College*

### 6. Creating Flipped Learning Experiences in the College Mathematics Classroom

**Part A:**

Thursday, August 6, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Calvert Room

**Part B:**

Saturday, August 8, 1:00 PM – 3:00 PM  
Omni Shoreham Hotel, Calvert Room

In the “flipped learning” approach to teaching, sometimes called the flipped classroom, direct instruction is moved outside the class meeting space, and the resulting freedup time in class is used for group explorations of the most challenging ideas. In this minicourse, participants will work together to learn about the core ideas of the flipped classroom and create materials for flipped learning in college mathematics. We will also discuss related issues such as formative and summative assessment, getting student buyin, technical questions about content creation, and making the flipped classroom a sustainable professional practice.

**Robert Talbert**, *Grand Valley State University*

### 7. Teaching Mathematics with Bead Crochet

**Part A:**

Wednesday, August 5, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Calvert Room

**Part B:**

Friday, August 7, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Calvert Room

We are all on the lookout for ways to entice people into mathematical discovery, especially those who might otherwise be intimidated by math. Bead crochet offers an entrée into many fields of mathematics, including geometry, topology, and abstract algebra. In this course, participants will learn ways to motivate deep ideas in math for their students through bead crochet models and the design and practice of bead crochet. In the first session, everyone will learn the basics of bead crochet needed to make their own mathematical models. In the second session, we will discuss how to use bead crochet models and puzzles in the classroom.

**Susan Goldstine**, *St. Mary’s College of Maryland*  
**Ellie Baker**, *Freelance*

## Minicourses (continued)

### 8. Getting Started in the Scholarship of Teaching and Learning

#### Part A:

Thursday, August 6, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Hampton Room

#### Part B:

Saturday, August 8, 3:30 PM – 5:30 PM  
Omni Shoreham Hotel, Hampton Room

This course will introduce participants to the scholarship of teaching and learning (SoTL) in mathematics and help them begin projects of their own. We describe a taxonomy of SoTL questions, provide examples of SoTL projects in mathematics, and discuss methods for investigation. Participants will learn about collecting and analyzing different types of evidence, dealing with human subjects requirements, and selecting venues for presenting or publishing their work. With the presenters' guidance, participants interactively select and transform a teaching problem of their own into a question for scholarly investigation and identify several types of evidence to gather.

**Jackie Dewar**, *Loyola Marymount University*

**Curtis Bennett**, *Loyola Marymount University*

### WILLIAM F. LUCAS

William F. Lucas (1933-2010), a native of Detroit, completed a PhD at the University of Michigan in 1963. His long career was spent primarily at Cornell University (1970-84) and the Claremont Graduate School (now Claremont Graduate University, 1984 until retirement), with a variety of visiting and short-term positions, including two years at Princeton University (1963-65) working with the Office of Naval Research and Mathematica, Inc., before spending a year as a Fulbright Professor at the Middle East Technical University in Ankara, Turkey. Prof. Lucas also held consulting or visiting positions at the Rand Corporation, the University of Wisconsin, Washington State University, and the Institute for Mathematics and its Applications at the University of Minnesota. Prof. Lucas wrote and spoke widely on topics in discrete mathematics, game theory, and operations research, including his own research as well as expository and educational materials that reflected his wish to develop interest and capacity in these fields.

Prof. Lucas served in a variety of editorial capacities on more than 15 journals, including a three-year term as Associate Editor of the *American Mathematical Monthly* (1974-77). He was instrumental in the early years of the Consortium for Mathematics and Its Applications (COMAP), where he served as Vice President and Clerk of the Board of Trustees (1981-1992). His long list of professional activities, to many organizations, demonstrated his commitment to advancing our profession.

As a long-time member of MAA, Prof. Lucas served on a variety of committees, including the Committee on the Undergraduate Program in Mathematics, which he chaired for two years (1976-78). He also served on the MAA Committee on Continuing Education from 1978-80, and over many years organized and led sessions at a variety of national and regional professional meetings, including minicourses at MAA meetings. To honor his long-standing interest in such programs, in 2005 friends, family, and colleagues joined together to establish the William F. Lucas Fund to provide ongoing support of MAA professional development programs. This fund now provides support for minicourses at MAA MathFest, and in particular allows MAA to offer reduced registration fees for students and high school teachers.

## Workshops

### What's the Story? A Graduate Student Workshop on Formulating a Research Presentation for a General Audience

Wednesday, August 5, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Maryland C

Presenting our research to undergraduate students can be both fun and rewarding. It can also be difficult, however, since the gory details of our results often require a great deal of specific jargon and background. Nonetheless, the big ideas can almost always be presented at a variety of levels, and this workshop is designed to interactively help participants develop the skills needed to formulate a presentation on their research that is appropriate for an audience of undergraduate students. Since many colleges and universities require giving such a talk as part of a job interview, almost any graduate student will have the opportunity to do so, and the ability to communicate complex mathematical ideas to students is a valued trait in a candidate. This workshop will consist of hands-on activities and audience interaction aimed toward developing and improving the necessary skills for creating an engaging and accessible presentation for undergraduates. Participants should be prepared to discuss in groups a potential presentation on their research or other related topic.

**Organizers:**

**Rachel Schwell**, *Central Connecticut State University*  
**May Mei**, *Denison University*

**Sponsors:**

**Committee on Graduate Students and Young Mathematicians Network**

### USE Math: Undergraduate Sustainability Experiences in the Mathematics Classroom

Thursday, August 6, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Maryland C

Undergraduate Sustainability Experiences in Mathematics (USE Math) projects are sustainability-focused, technology-enabled, single class-period projects, each offering students authentic experiences within the context of sustainability in applying various topics encountered in mathematics courses. For the past two years, with NSF and MAA PREP support, numerous USE Math projects have been developed and are now being used in classrooms at institutions across the country. This hands-on workshop will give participants the opportunity to work through a complete USE Math activity that has been successfully integrated into a general education mathematics course. Upon completion of the activity, workshop participants will discuss strategies for incorporating additional USE Math

projects into their classroom. Prior to MathFest, classroom-ready materials will be made available on the SIGMAA-EM Web site, and the Mathematics/QR Disciplinary page on the Sustainability Improves Student Learning (SISL) website ([http://serc.carleton.edu/sisl/sustain\\_in\\_math.html](http://serc.carleton.edu/sisl/sustain_in_math.html)).

**Organizers:**

**Ben Galluzzo**, *Shippensburg University*  
**Corrine Taylor**, *Wellesley College*

**Sponsor:**

**SIGMAA EM**

### MAA 100 Beauty of Three Dimensional Polyhedra Workshop (in Celebration of the MAA's Centennial)

Friday, August 7, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Maryland C

I have long been fascinated by the Platonic and Archimedean solids and their mathematical beauty. In this workshop I will demonstrate, and we will work with, a variety of materials I've come across over the years for building polyhedra. For example, we'll build with coffee stirrers (really cheap, less than 10¢ for the icosahedron), origami (about 25¢ for the Buckyball), and retail manipulatives (a few dollars for the truncated tetrahedron). We will also look at some online tools for exploring (and enjoying) the Platonic and Archimedean solids and their mathematical relationships and properties. These dynamic tools are useful in seeing how, for example, the snub icosidodecahedron is formed. (Attendees are encouraged to bring a laptop or device to the workshop.) Included will be how the icosahedron (this is the MAA!) can be built using three golden rectangles.

**Organizer:**

**James R. Olsen**, *Western Illinois University*

## Other Mathematical Sessions

### PROJECT NEXT LECTURE

#### Reducing Stereotype Threat in the Mathematics Classroom

Wednesday, August 5, 11:00 AM – 11:50 AM  
Marriott Wardman Park, Salon 1

Research has shown that stereotype threat can negatively affect student performance in the classroom. What exactly is it? What causes it? How can we mitigate its effects in the classroom? In this presentation, we will examine research on stereotype threat as well as interventions to reduce its effects on our students. This presentation is intended for all audiences.

**Catherine Good**, *Baruch College, City University of New York*

#### MAA Section Officers Meeting

Wednesday, August 5, 3:00 PM – 5:00 PM  
Marriott Wardman Park, Wilson A/B/C

This session is moderated by Elizabeth Mayfield, Hood College, Chair of the MAA Committee on Sections. It is open to all section officers and their guests. Our discussion will focus on outreach efforts in the Sections – to high school students and teachers, to community college faculty, and others.

#### Special Panel Session on Science Policy

Wednesday, August 5, 2:30 PM – 4:00 PM  
Marriott Wardman Park, Salon 2/3

Science and policy interact in many ways. Mathematical scientists – including mathematicians, applied mathematicians, statisticians, computer scientists, and mathematical sciences educators – can contribute to initiatives to advance national priorities that are in the best interests of all citizens. A key aspect of this interaction centers on education in the mathematical sciences, currently in the national spotlight due to the role it plays in economic mobility as well as its prominence in recent reports such as “Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics” (President’s Council of Advisors on Science and Technology, 2012) and “The Mathematical Sciences in 2025” (National Research Council, 2013).

This panel will focus on the role that mathematicians and mathematics educators can play in addressing national priorities such as increasing college completion rates and

improving the STEM skills of all graduates. Panelists will also discuss concrete ways to get involved in policy matters at the local, state, and national levels.

**Linda Braddy**, *MAA*  
**Karen Saxe**, *Macalester College*

#### Panelists:

**James Gates**, *University of Maryland*  
**David Manderscheid**, *Ohio State University*  
**Rush Holt**, *Chief Executive Officer, American Association for the Advancement of Science, and Executive Publisher, Science Family of Journals*

#### Sponsor:

Committee on Science Policy

#### MAA Prize Session

Thursday, August 6, 11:35 AM – 12:20 PM  
Marriott Wardman Park, Salon 2/3

The session is organized by Barbara Faires, Westminster College, MAA Secretary, and is moderated by Francis Su, Harvey Mudd College, MAA President.

#### MAA 100 *The Man Who Knew Infinity: Sneak Peek and Expert Panel*

Thursday, August 6, 5:00 PM – 6:00 PM  
Marriott Wardman Park, Salon 2/3

*The Man Who Knew Infinity* film will be released in late 2015. The film, which stars Jeremy Irons and Dev Patel, is based on the New York Times Best Selling biography of Srinivasa Ramanujan by Robert Kanigel. An expert panel will discuss Ramanujan, his life, and the film. The panel will include: Matthew Brown (Director of the film), Manjul Bhargava (Mathematician), Robert Kanigel (biographer), Ken Ono (Mathematician). A sneak peek of the film will be screened.

**Ken Ono**, *Emory University*

## Other Mathematical Sessions (continued)

### Alder Award Session

Friday, August 7, 2:00 PM – 3:20 PM  
Marriott Wardman Park, Salon 2/3

Presentations by the Alder Award recipients. The session will be moderated by Francis Su, Harvey Mudd College, MAA President.

#### Reality Shifting: Building Mathematical Confidence

2:00 PM – 2:20 PM

**Talithia Williams**, *Harvey Mudd College*

#### A Taste of Research

2:30 PM – 2:50 PM

**Patrick X. Rault**, *SUNY Geneseo*

#### Be Inspirable!

3:00 PM – 3:20 PM

**Allison K. Henrich**, *Seattle University*

### Estimathon!

Friday, August 7, 3:30 PM – 5:00 PM  
Marriott Wardman Park, Maryland C

They're called Fermi problems...

How many stop signs are in New York City?

How heavy is the Empire State Building?

How many primes have distinct digits?

If you're looking for a mindbending mixture of math and trivia, look no further! Jane Street Capital presents The Estimathon contest: attempt 13 Fermi problems in 30 minutes, ranging from totally trivial to positively Putnamesque. Work in teams to come up with the best set of confidence intervals. The top teams will receive prizes!

**Andy Niedermaier**, *Jane Street Capital*

### MAA 100 Presidential Reminiscences

Thursday, August 6, 3:00 PM – 4:45 PM  
Marriott Wardman Park, Salon 2/3

Past presidents of the MAA will share memories of their time in office and offer their thoughts on the future of the Association. Francis Su, current president of the MAA, will introduce the session.

**Victor Katz**, *University of the District of Columbia*  
**Jim Tattersall**, *Providence College*

#### Speakers:

**Henry O. Pollack**, *Teachers College, Columbia University*; MAA President 1975-1976

**Lida K. Barrett**, *West Point (retired)*; MAA President 1989-1990

**Kenneth Ross**, *University of Oregon (professor emeritus)*; MAA President 1995-1996

**Thomas F. Banchoff**, *Brown University*; MAA President 1999-2000

Friday, August 7, 3:45 PM – 6:00 PM  
Marriott Wardman Park, Salon 2/3

Past presidents of the MAA will share memories of their time in office and offer their thoughts on the future of the Association. Francis Su, current president of the MAA, will introduce the session.

**Victor Katz**, *University of the District of Columbia*  
**Jim Tattersall**, *Providence College*

#### Speakers:

**Ann E. Watkins**, *California State University Northridge*; MAA President 2001-2002

**Ronald L. Graham**, *University of California, San Diego*; MAA President 2003-2004

**Carl C. Cowen**, *Indiana University - Purdue*; MAA President 2005-2006

**Joseph A. Gallian**, *University of Minnesota Duluth*; MAA President 2007-2008

**David M. Bressoud**, *Macalester College*; MAA President 2009-2010

**Paul M. Zorn**, *St. Olaf College*; MAA President 2011-2012

**Robert L. Devaney**, *Boston University*; MAA President 2013-2014

## Other Mathematical Sessions (continued)

### Special Presentation for High School Students, Parents, and Teachers

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Saturday, August 8, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2

A Dozen Proofs that  $1=2$ : An Accessible and Quirky Overview of Mathematics for K-12 Teachers and Their Students

**James Tanton**, *The Saint Mark's Mathematics Institute and MAA*

Guidobaldo del Monte (1545-1647), a patron and friend of Galileo Galilei, believed he had witnessed the creation of something out of nothing when he established mathematically that zero equals one. He thereby thought he had proven the existence of God! James Tanton doesn't claim to be so bold, but he is willing to prove instead that one equals two. And, moreover, just to convince you that he is right, he will do so a dozen times over, drawing upon a wide spectrum of mathematical techniques: school algebra and arithmetic, probability and mechanics, pure thought and physical action! Will you be able to find fault with any of his "proofs?" This will be a math talk of the like you've never seen before. All are welcome!

**Sponsor:**  
**MAA Council on Outreach**

### Great Talks for a General Audience: Coached Presentations by Graduate Students

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Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Virginia C

Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Maryland C

Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Salon 1 Balcony A

Presenters in this session must be graduate students. While many graduate students will be asked to give a lecture to a general audience, which includes undergraduates and non-mathematicians as part of a job interview, most students do not have experience talking to a non-research audience. This session gives graduate students the opportunity to give a 20-minute talk aimed at an undergraduate audience, which has been exposed to calculus and some linear algebra. Both the talks and abstracts should be designed to excite a wide range of undergraduates about mathematics. All participants in this session will receive private feedback on their presentations from an established faculty member and an undergraduate student. Time permitting, a discussion of effective techniques for delivering great general-audience talks will occur at the end of the session.

**James Freeman**, *Cornell College*  
**Rachel Schwell**, *Central Connecticut State University*  
**Aliza Steurer**, *Dominican University*

**Sponsor:**  
**MAA Committee on Graduate Students**

### Math Circle Demonstration

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Saturday, August 8, 2:00 PM – 3:30 PM  
Marriott Wardman Park, Maryland A

A math circle is an enrichment experience that brings mathematics professionals in direct contact with pre-college students and/or their teachers. Circles foster passion and excitement for deep mathematics. This demonstration session offers the opportunity for conference attendees to observe and then discuss a math circle experience designed for local students. While students are engaged in a mathematical investigation, mathematicians will have a discussion focused on appreciating and better understanding the organic and creative process of learning that circles offer, and on the logistics and dynamics of running an effective circle.

**Katherine Morrison**, *University of Northern Colorado*  
**Japheth Wood**, *New York Math Circle*

**Sponsor:**  
**SIGMA MCST**

### Math Wrangle

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Saturday, August 8, 4:00 PM – 5:30 PM  
Marriott Wardman Park, Maryland A

Math Wrangle will pit teams of students against each other, the clock, and a slate of great math problems. The format of a Math Wrangle is designed to engage students in mathematical problem solving, promote effective teamwork, provide a venue for oral presentations, and develop critical listening skills. A Math Wrangle incorporates elements of team sports and debate, with a dose of strategy tossed in for good measure. The intention of the Math Wrangle demonstration at MathFest is to show how teachers, schools, circles, and clubs can get students started in this exciting combination of mathematical problem solving with careful argumentation via public speaking, strategy and rebuttal.

**Mark Saul**, *MAA American Mathematics Competitions*  
**Ed Keppelmann**, *University of Nevada*

**Sponsor:**  
**SIGMA MCST**

# Graduate Student Activities

## WORKSHOP

### What's the Story? A Graduate Student Workshop on Formulating a Research Presentation for a General Audience

Wednesday, August 5, 1:00 PM – 2:20 PM  
Marriott Wardman Park, Maryland C

Presenting our research to undergraduate students can be both fun and rewarding. It can also be difficult, however, since the gory details of our results often require a great deal of specific jargon and background. Nonetheless, the big ideas can almost always be presented at a variety of levels, and this workshop is designed to interactively help participants develop the skills needed to formulate a presentation on their research that is appropriate for an audience of undergraduate students. Since many colleges and universities require giving such a talk as part of a job interview, almost any graduate student will have the opportunity to do so, and the ability to communicate complex mathematical ideas to students is a valued trait in a candidate. This workshop will consist of hands-on activities and audience interaction aimed toward developing and improving the necessary skills for creating an engaging and accessible presentation for undergraduates. Participants should be prepared to discuss in groups a potential presentation on their research or other related topic.

#### Organizers:

**Rachel Schwell**, *Central Connecticut State University*  
**May Mei**, *Denison University*

#### Sponsor:

**Committee on Graduate Students and Young Mathematicians Network**

## Graduate Student Q&A

Thursday, August 6, 2:00 PM – 3:30 PM  
Marriott Wardman Park, Park Tower 8224

This session is only for graduate students intending to present in the session “Great Talks for a General Audience: Coached Presentations by Graduate Students” on Saturday, August 8th. This will be an informal Q&A session with the organizers of “Great Talks” and the workshop “What’s the Story? A Graduate Student Workshop on Formulating a Research Presentation for a General Audience,” where presenters can drop in at any time to get individual feedback on their presentations.

#### Organizer:

**Rachel Schwell**, *Central Connecticut State University*

## SOCIAL EVENT

### Graduate Student Reception

Thursday, August 6, 6:00 PM – 7:00 PM  
Marriott Wardman Park, The Chef’s Table at Stone’s Throw

Graduate students are invited for some refreshments and to meet several of the invited speakers.

#### Organizers:

**Estela A. Gavosto**, *University of Kansas*  
**James Freeman**, *Cornell College*

## Graduate Student Q&A

Friday, August 7, 9:30 AM – 11:00 AM  
Marriott Wardman Park, Park Tower 8224

## PANEL SESSION

### Nonacademic Career Paths for Mathematicians

Friday, August 7, 2:35 PM – 3:55 PM  
Marriott Wardman Park, Salon 1

You’re about to earn a degree in mathematics, now what? You may be surprised to know that teaching isn’t your only option; in the “real world” mathematical knowledge is a valued commodity and there are many interesting job opportunities for mathematicians in nonacademic settings. So, whether you are a mathematics student looking for a job once you graduate or an advisor looking for advice to give to future job-seeking students, this session will help you gain new perspectives on nonacademic career experiences and what employers value in their employees. Panelists will share their paths to their current positions and offer advice to others looking for employment in similar venues.

## POSTER SESSION

### PosterFest 2015: A Poster Session of Scholarship by Early Career Mathematicians and Graduate Students

Friday, August 7, 3:30 PM – 5:00 PM  
Marriott Wardman Park, Exhibit Hall A

This poster session will allow early career mathematicians, including untenured faculty and graduate students, to present and discuss their scholarly activities with other attendees in an informal atmosphere. Examples of scholarly activities suitable for this poster session include expository work, preliminary reports, scholarship of teaching and learning, and research reports. Presenters should have their materials prepared in advance and will be provided with a self-standing, trifold tabletop poster approximately 48 in wide by 36 in high.

## Graduate Student Activities (continued)

**Organizers:**

**Doug Ensley**, *Shippensburg College*  
**Jenny McNulty**, *University of Montana*

**Sponsors:**

**MAA Committee on Early Career Mathematicians**

**Project NExT**

**Young Mathematicians Network**

**Great Talks for a General Audience: Coached Presentations by Graduate Students**

**Sponsor:**

**MAA Committee on Graduate Students**

Part A - Saturday, August 8, 1:00 PM - 5:00 PM  
 Marriott Wardman Park, Virginia C

Part B - Saturday, August 8, 1:00 PM - 5:00 PM  
 Marriott Wardman Park, Maryland C

Part C - Saturday, August 8, 1:00 PM - 5:00 PM  
 Marriott Wardman Park, Salon 1 Balcony A

Presenters in this session must be graduate students. While many graduate students will be asked to give a lecture to a general audience, which includes undergraduates and non-mathematicians as part of a job interview, most students do not have experience talking to a non-research audience. This session gives graduate students the opportunity to give a 20-minute talk aimed at an undergraduate audience, which has been exposed to calculus and some linear algebra. Both the talks and abstracts should be designed to excite a wide range of undergraduates

about mathematics. All participants in this session will receive private feedback on their presentations from an established faculty member and an undergraduate student. Time permitting, a discussion of effective techniques for delivering great general-audience talks will occur at the end of the session.

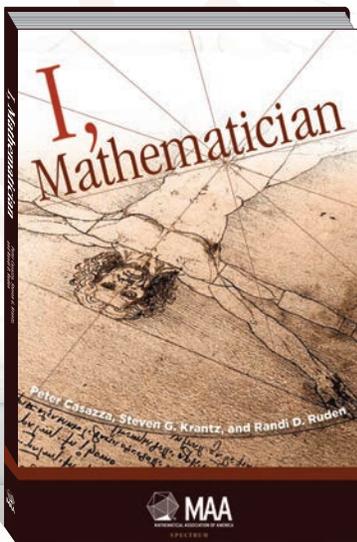
**Organizers:**

**James Freeman**, *Cornell College*  
**Rachel Schwell**, *Central Connecticut State University*  
**Aliza Steurer**, *Dominican University*

**Sponsor:**

**MAA Committee on Graduate Students**

## Join Us in Celebrating the Release of *I, Mathematician*



**Thursday, August 6**  
**3:00-4:00 p.m.**  
**MAA Pavilion in the Exhibit Hall**

Plan to join us and some of the contributors from *I, Mathematician* for a wine and cheese reception in the MAA Pavilion. You can meet and speak with the contributors of this volume. Some who plan to attend are: Hyman Bass, Roger Cook, Underwood Dudley, Sol Garfunkel, Steve Krantz, and Randi Ruden. Bring your copy of the book and have it signed.



Mathematical Association of America | [maa.org/press](http://maa.org/press)

# Undergraduate Student Activities

## INVITED ADDRESS

### MAA Chan Stanek Lecture for Students Seventy-Five Years of MAA Mathematics Competitions

Wednesday, August 5, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2/3

#### Organizer:

**Joseph Gallian**, *University of Minnesota Duluth*

In this talk we provide facts, statistics, oddities, curiosities, videos, and trivia questions about the mathematics competitions that the MAA has sponsored for 75 years.

### Radical Dash

Wednesday, August 5, 4:30 PM – 5:30 PM  
Marriott Wardman Park, Salon 1

The Radical Dash, a daily scavenger hunt filled with math challenges and creativity for teams of undergraduates. Every day up to five clues will be released via Instagram including a code to break, a mathematical brainteaser, a number of Instagram targets to find throughout the meeting, creative math artwork to fashion, and math to find in everyday objects. So, how quick are you on your feet at solving math problems? Can you picstitch? Would you like to create a sculpture with George Hart? How about your brain being puzzled by Joe Gallian? If any of this sounds like fun to you, join us at MAA MathFest 2015 for the Radical Dash. Individuals are welcome and encouraged to participate; they will be formed into teams on site.

#### Organizers:

**Jennifer Bergner**, *Salisbury University*  
**Lisa Marano**, *West Chester University*

#### Sponsor:

**MAA Committee on Undergraduate Student Activities and Chapters Maryland/DC/Virginia Section**

## Student Hospitality Center

Thursday, August 6, 9:00 AM – 5:00 PM  
Marriott Wardman Park, Exhibit Hall

Friday, August 7, 9:00 AM – 5:00 PM  
Marriott Wardman Park, Exhibit Hall

Saturday, August 8, 9:00 AM – 12:30 PM  
Marriott Wardman Park, Exhibit Hall

The Student Hospitality Center (SHC) provides a place for students and other MathFest attendees to meet for informal conversation, refreshments, and mathematical diversions. Programs for the MAA and Pi Mu Epsilon student paper sessions, packets for the MAA student presenters, and information on MathFest activities of interest to students are available in the SHC.

#### Organizers:

**Richard and Araceli Neal**, *American Society for the Communication of Mathematics*

#### Sponsor:

**Committee on Undergraduate Student Activities and Chapters (CUSAC) and Pearson**

## MAA Student Paper Sessions

**Theron J. Hitchman**, *University of Northern Iowa*

**Jiehua Zhu**, *Georgia Southern University*

### MAA Student Paper Session #1

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #2

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #3

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #4

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Wilson A

### MAA Student Paper Session #5

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Wilson B

### MAA Student Paper Session #6

Thursday, August 6, 8:30 AM – 10:25 AM  
Marriott Wardman Park, Wilson C

### MAA Student Paper Session #7

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #8

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #9

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #10

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson A

### MAA Student Paper Session #11

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #12

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #13

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #14

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson A

### MAA Student Paper Session #15

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #16

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #17

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #18

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Wilson A

## Undergraduate Student Activities (continued)

### MAA Student Paper Session #19

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #20

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #21

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #22

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson A

### MAA Student Paper Session #23

Friday, August 7, 4:00 PM – 5:00 PM  
Marriott Wardman Park, Virginia A

### MAA Student Paper Session #24

Friday, August 7, 4:00 PM – 5:00 PM  
Marriott Wardman Park, Virginia B

### MAA Student Paper Session #25

Friday, August 7, 4:00 PM – 5:00 PM  
Marriott Wardman Park, Virginia C

### MAA Student Paper Session #26

Friday, August 7, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson A

### Pi Mu Epsilon Student Paper Sessions

#### Organizer:

**Darci Kracht**, *Kent State University*

### PME Student Paper Session #1

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson B

### PME Student Paper Session #2

Thursday, August 6, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson C

### PME Student Paper Session #3

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson B

### PME Student Paper Session #4

Thursday, August 6, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson C

### PME Student Paper Session #5

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Wilson B

### PME Student Paper Session #6

Friday, August 7, 8:30 AM – 11:45 AM  
Marriott Wardman Park, Wilson C

### PME Student Paper Session #7

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson B

### PME Student Paper Session #8

Friday, August 7, 2:00 PM – 3:55 PM  
Marriott Wardman Park, Wilson C

### PME Student Paper Session #9

Friday, August 7, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson B

### PME Student Paper Session #10

Friday, August 7, 4:00 PM – 6:15 PM  
Marriott Wardman Park, Wilson C

### Secrets of Mental Math

Thursday, August 6, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2/3

#### Organizer:

**Arthur Benjamin**, *Harvey Mudd College*

Dr. Arthur Benjamin is a mathematician and a magician. In his entertaining and fast-paced performance, he will demonstrate and explain how to mentally add and multiply numbers faster than a calculator, how to figure out the day of the week of any date in history, and other amazing feats of mind. He has presented his mixture of math and magic to audiences all over the world.

### PANEL SESSION

#### Nonacademic Career Paths for Mathematicians

Friday, August 7, 2:35 PM – 3:55 PM  
Marriott Wardman Park, Salon 1

You're about to earn a degree in mathematics, now what? You may be surprised to know that teaching isn't your only option; in the "real world" mathematical knowledge is a valued commodity and there are many interesting job opportunities for mathematicians in nonacademic settings. So, whether you are a mathematics student looking for a job once you graduate or an advisor looking for advice to give to future job-seeking students, this session will help you gain new perspectives on nonacademic career experiences and what employers value in their employees. Panelists will share their paths to their current positions and offer advice to others looking for employment in similar venues.

#### Organizers:

**Ben Galluzzo**, *Shippensburg University*

**Dora Ahmadi**, *Morehead State University*

#### Sponsor:

**MAA Committee on Undergraduate Student Activities and Chapters**

### OTHER MATHEMATICAL SESSION

#### Estimathon!

Friday, August 7, 3:30 PM – 5:00 PM  
Marriott Wardman Park, Maryland C

They're called Fermi problems...

How many stop signs are in New York City?

How heavy is the Empire State Building?

How many primes have distinct digits?

## Undergraduate Student Activities (continued)

If you're looking for a mindbending mixture of math and trivia, look no further! Jane Street Capital presents The Estimation contest: attempt 13 Fermi problems in 30 minutes, ranging from totally trivial to positively Putnamesque. Work in teams to come up with the best set of confidence intervals. The top teams will receive prizes!

**Organizer:**

**Andy Niedermaier**, *Jane Street Capital*

**Pi Mu Epsilon Student Banquet**

Friday, August 7, 6:00 PM – 7:45 PM  
Marriott Wardman Park, Virginia A/B/C

All PME members and their supporters are welcome. See the registration desk for more information on this ticketed event.

**Pi Mu Epsilon J. Sutherland Frame Lecture**

**G-sharp, A-flat, and the Euclidean Algorithm**  
Friday, August 7, 8:00 PM – 8:50 PM  
Marriott Wardman Park, Salon 2/3

**Noam Elkies**, *Harvard University*

Description: see page 14

**MAA Mathematical Competition in Modeling (MCM) Winners**

Saturday, August 8, 9:00 AM – 10:15 AM  
Marriott Wardman Park, Salon 1

About 400 American teams, each consisting of three undergraduates, entered the 2014 Mathematical Contest in Modeling in February. Teams choose one of two real(istic) problems. The first problem requires a model for analyzing the performance of the Keep-Right-Except-To-Pass rule for drivers. The second requires a model for choosing the best 20th century coach for a sport such as football,

basketball, etc. Teams have four days to deal with the MCM challenge and may use or access any inanimate source – computers, libraries, the Web, etc. MAA judges choose a winner for each problem. The two MAA winning teams of students will present their results of the MCM four-day challenge.

**Organizer:**

**Ben Fusaro**, *Florida State University*

**MAA Ice Cream Social and Undergraduate Awards Ceremony**

Saturday, August 8, 12:30 PM – 2:00 PM  
Marriott Wardman Park, Salon 3

Students who gave the best talks in the MAA Student Paper Sessions will be recognized and awarded prizes. All undergraduate students are invited to attend.

**Student Problem Solving Competition**

Saturday, August 8, 10:30 AM – 11:45 AM  
Marriott Wardman Park, Maryland B

This event is the finals of the Problem Solving Competition. Universities and colleges that participate monthly on their own campuses by holding problem solving contests are invited to send a contestant. Each contestant will be required to solve a series of mathematical problems. Based on the outcome, a champion along with 2nd through 6th place winners will be named.

**Organizer:**

**Richard Neal**, *American Society for the Communication of Mathematics*

**Great Talks for a General Audience: Coached Presentations by Graduate Students**

**Part A** – Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Virginia C

**Part B** – Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Maryland C

**Part C** – Saturday, August 8, 1:00 PM – 5:00 PM  
Marriott Wardman Park, Salon 1 Balcony A

Presenters in this session must be graduate students. While many graduate students will be asked to give a lecture to a general audience, which includes undergraduates and non-mathematicians as part of a job interview, most students do not have experience talking to a non-research audience. This session gives graduate students the opportunity to give a 20-minute talk aimed at an undergraduate audience, which has been exposed to calculus and some linear algebra. Both the talks and abstracts should be designed to excite a wide range of undergraduates about mathematics. All participants in this session will receive private feedback on their presentations from an established faculty member and an undergraduate student. Time permitting, a discussion of effective techniques for delivering great general-audience talks will occur at the end of the session.

**Organizers:**

**James Freeman**, *Cornell College*  
**Rachel Schwell**, *Central Connecticut State University*

**Aliza Steurer**, *Dominican University*

**Sponsor:**

**MAA Committee on Graduate Students**

## K-12 Activities

### Industrial Math Research in the PIC Math Program

---

Saturday, August 8, 1:30 PM – 5:00 PM  
Marriott Wardman Park, Maryland B

During the spring 2015 semester, mathematics undergraduate students at 30 U.S. universities and colleges were enrolled in a PIC Math (Preparation for Industrial Careers in Mathematical Sciences) research course. Each student team worked on its own research problem, which came directly from industry, and submitted a written report and video solution to the problem. Several students with exemplary solutions will discuss their problem and solution during this session. In addition, other students will give poster presentations of their work. Finally, a few industrial mathematicians will make presentations about math in BIG (business, industry, and government).

PIC Math is a program of the MAA and SIAM supported by NSF funding (DMS-1345499). See [www.maa.org/picmath](http://www.maa.org/picmath).

#### Organizers:

**Linda Braddy**, MAA

**Michael Dorff**, Brigham Young University

**Suzanne Weekes**, Worcester Polytechnic Institute

**Reza Malek-Madani**, United States Naval Academy

The MAA strives to ensure that sessions at MathFest present mathematics in a way that is accessible to a broad audience. As a result, K-12 teachers will find all the expository sessions at MathFest to be informative and enriching. In addition, the following sessions are directed specifically at the professional interests of K-12 teachers.

Register for the AMC 8 or AMC 10/12 Contest(s), and you're automatically enrolled as a K-12 Teacher Member. Invite your students to attend MAA MathFest 2015. The High School Student rate is only \$49.

### Secrets of Mental Math

---

Thursday, August 6, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2/3

**Art Benjamin**, Harvey Mudd College

Dr. Arthur Benjamin is a mathematician and a magician. In his entertaining and fast-paced performance, he will demonstrate and explain how to mentally add and multiply numbers faster than a calculator, how to figure out the day of the week of any date in history, and other amazing feats of mind. He has presented his mixture of math and magic to audiences all over the world.

### Special Presentation for High School Students, Parents, and Teachers

#### A Dozen Proofs that $1=2$ : An Accessible and Quirky Overview of Mathematics for K-12 Teachers and Their Students

---

Saturday, August 8, 1:00 PM – 1:50 PM  
Marriott Wardman Park, Salon 2

**James Tanton**, The Saint Mark's Mathematics Institute and MAA

Guidobaldo del Monte (1545-1647), a patron and friend of Galileo Galilei, believed he had witnessed the creation of something out of nothing when he established mathematically that zero equals one. He thereby thought he had proven the existence of God! James Tanton doesn't claim to be so bold, but he is willing to prove instead that one equals two. And, moreover, just to convince you that he is right, he will do so a dozen times over, drawing upon a wide spectrum of mathematical techniques: school algebra and arithmetic, probability and mechanics, pure thought and physical action! Will you be able to find fault with any of his "proofs?" This will be a math talk of the like you've never seen before. All are welcome!

## K-12 Activities (continued)

### Math Circle Demonstration

---

Saturday, August 8, 2:00 PM – 3:30 PM  
Marriott Wardman Park, Maryland A

**Katherine Morrison**, *University of Northern Colorado*  
**Japheth Wood**, *New York Math Circle*

A math circle is an enrichment experience that brings mathematics professionals in direct contact with pre-college students and/or their teachers. Circles foster passion and excitement for deep mathematics. This demonstration session offers the opportunity for conference attendees to observe and then discuss a math circle experience designed for local students. While students are engaged in a mathematical investigation, mathematicians will have a discussion focused on appreciating and better understanding the organic and creative process of learning that circles offer, and on the logistics and dynamics of running an effective circle.

**Sponsor:**

**SIGMAA MCST**

### Math Wrangle

---

Saturday, August 8, 4:00 PM – 5:30 PM  
Marriott Wardman Park, Maryland A

**Mark Saul**, *MAA American Mathematics Competitions*  
**Ed Keppelmann**, *University of Nevada*

Math Wrangle will pit teams of students against each other, the clock, and a slate of great math problems. The format of a Math Wrangle is designed to engage students in mathematical problem solving, promote effective teamwork, provide a venue for oral presentations, and develop critical listening skills. A Math Wrangle incorporates elements of team sports and debate, with a dose of strategy tossed in for good measure. The intention of the Math Wrangle demonstration at the Math Fest is to show how teachers, schools, circles, and clubs can get students started in this exciting combination of mathematical problem solving with careful argumentation via public speaking, strategy and rebuttal.

**Sponsor:**

**SIGMAA MCST**

### Undergraduate Student Activities

---

There are also a number of activities planned for undergraduate students and many of them will be of interest to K-12 teachers. See page 42.

## Committee Meetings

### Wednesday, August 5

#### Committee on Sections Meeting

8:00 AM – 8:30 AM, Marriott Wardman Park, Park Tower 8222

#### Committee on Undergraduate Student Activities and Chapters (CUSAC) Meeting

11:45 AM – 12:45 PM, Marriott Wardman Park, Park Tower 8222

### Thursday, August 6

#### Task Force on Minority Participation in AMC Contests

9:00 AM – 10:00 AM, Marriott Wardman Park, Park Tower 8222

#### Committee on Minicourses

10:00 AM – 11:00 AM, Marriott Wardman Park, Park Tower 8223

#### Committee on the Undergraduate Program in Mathematics (CUPM) and CUPM Steering Committee Meeting

1:00 PM – 3:00 PM, Marriott Wardman Park, Park Tower 8222

### Friday, August 7

#### Council on Outreach Programs

8:00 AM – 9:00 AM, Marriott Wardman Park, Park Tower 8222

#### Council on the Profession

10:00 AM – 11:00 AM, Marriott Wardman Park, Park Tower 8222

#### MAA Committee on Departmental Liaisons Meeting

1:00 PM – 2:00 PM, Marriott Wardman Park, Park Tower 8222

#### Second Century Campaign Steering Committee Meeting

2:00 PM – 3:00 PM, Marriott Wardman Park, Park Tower 8223

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## SIGMAA Activities

The following is a list of activities at MathFest 2015 that are sponsored by SIGMAAs. Full descriptions of the sessions may be found elsewhere in the program or online at <http://www.maa.org/meetings/mathfest/program-details/2015/sigmaa-activities>

### BIO SIGMAA: the SIGMAA on Mathematical and Computational Biology

#### Contributed Paper Session on Undergraduate Research Activities in Mathematical and Computational Biology

Friday afternoon, August 7

### SIGMAA EM: the SIGMAA on Environmental Mathematics

#### Workshop on USE Math: Undergraduate Sustainability Experiences in the Mathematics Classroom

Thursday, August 6, 1:00 PM - 2:20 PM  
Marriott Wardman Park, Balcony A

#### Poster Session on Classroom Activities and Projects within the Context of Environmental Sustainability

Thursday, August 6, 3:30 PM - 5:00 PM

### HOM SIGMAA: the SIGMAA on the History of Mathematics

#### MAA 100 Contributed Paper Session on the History and Philosophy of Mathematics

Wednesday, Thursday, Friday, and Saturday, mornings and afternoons

### SIGMAA MCST: The SIGMAA on Math Circles for Students and Teachers

#### Contributed Paper Session on Math Circle Problems in Honor of the MAA's 100th Anniversary

Friday afternoon, August 7

#### Math Circle Demonstration

Saturday, August 8, 2:00 PM - 3:30 PM  
Marriott Wardman Park, Maryland A

#### Math Wrangle

Saturday, August 8, 4:00 PM - 5:30 PM  
Marriott Wardman Park, Maryland A

### POM SIGMAA: the SIGMAA on the Philosophy of Mathematics

POM SIGMAA GUEST LECTURE

#### What are Mathematical Objects, and Who Cares?

Thursday, August 6, 5:00 PM - 5:50 PM  
Marriott Wardman Park, Washington 4

#### Contributed Paper Session on the History and Philosophy of Mathematics

Wednesday, Thursday, Friday, and Saturday, mornings and afternoons

### SIGMAA QL: the SIGMAA on Quantitative Literacy

#### Panel Session on Quantitative Literacy and Democracy

Saturday, August 8, 1:00 PM - 2:20 PM  
Marriott Wardman Park, Delaware A

### Web SIGMAA: The SIGMAA on Mathematics Instruction Using the WEB

WEB SIGMAA GUEST LECTURE

#### MYMathApps: Lessons Learned and To-Be Learned

Friday, August 7, 5:00 PM - 5:50 PM  
Marriott Wardman Park, Washington 5

### Web SIGMAA Business Meeting

Friday, August 7, 6:00 PM - 6:30 PM  
Marriott Wardman Park, Washington 5

# Congratulations

to our MAA members celebrating 25 or more years of membership.  
Please stop by the MAA Pavilion to pick up your recognition sticker.

## 25 Years

Martha Abell  
Janet Beery  
Jennifer Beineke  
Philip Cobb  
Paul Coe  
Adam Coffman  
Sarah Greenwald  
George Heine  
Ockle Johnson  
Gertrud Kraut  
Ed Lamagna  
Glen Lobo  
Abraham Mantell  
Nancy Matthews  
Elizabeth Mauch  
Jennifer McNulty  
Nieves McNulty  
Michael Molinsky  
Bruce Palka  
Joan Reinthaler  
Richard Stephens  
Gary Towsley

## 26 Years

Julie Barnes  
Janet Barnett  
Manjul Bhargava  
Connie Campbell  
Timothy Comar  
Michael Dorff  
Chris Frenzen  
Sidney Graham  
David Manderscheid  
Phoebe McLaughlin  
Margaret Morrow

Olympia Nicodemi  
Harold Parks  
Jennifer Quinn  
Kyle Riley  
Dipa Sarkar-Dey  
Robert Vallin  
Virginia Watson

## 27 Years

Ronald Calinger  
Annalisa Crannell  
Pablo Echeverria  
Solomon Garfunkel  
Namyong Lee  
Colm Mulcahy  
James Olsen  
Tommy Ratliff  
James Sellers  
Hortensia Soto-Johnson  
Linda Van Niewaal  
Maria Zack

## 28 Years

Edward Aboufadel  
Jenna Carpenter  
Sharon Emerson-Stonnell  
Patrick Headley  
Cynthia Huffman  
Michael Jones  
Charles Lindsey  
Sarah Mabrouk  
Bhamini Nayar  
James Reid  
Margaret Robinson  
Steven Schlicker

Nora Strasser  
Uri Treisman

## 29 Years

William Abrams  
Paul Boisvert  
Dennis Collins  
Pam Crawford  
Ronald Czochoz  
Michael Eisenberg  
Frank Farris  
Erica Flapan  
Deanna Haunsperger  
Gary Raduns  
Sharon Robbert  
Mark Saul  
Leon Seitelman  
Daniel Teague  
Colleen Vachuska  
Bruce Wahl  
Susan Wildstrom  
Joe Yanik

## 30 Years

Colin Adams  
Michael Beals  
Linda Becerra  
Eileen Donoghue  
William Fenton  
Matthew Haines  
Russell Hendel  
Edward C. Keppelmann  
Suzanne Larson  
John Mayer  
Karen Saxe  
Robert Styer

## 31 Years

Arthur Benjamin  
Debra Borkovitz  
John Cade  
Benjamin Collins  
Rosalie Dance  
Aparna Higgins  
Michael Pearson  
Russell Petricka  
Theresa Rahikka  
Lynn Reed  
Therese Shelton  
T. Christine Stevens  
Daniel Ullman  
Glen Van Brummelen  
Elizabeth Yanik

## 32 Years

Christopher Baltus  
Douglas Ensley  
Alan Levine  
David Roberts  
Jay Schiffman  
Dirck Uptegrove  
Peter Vachuska  
John Wilson  
Roman Wong

## 33 Years

Richard Cleary  
Lawrence D'Antonio  
Stephen Davis  
Wade Ellis  
Richard Gillman

(continued)

Registered as of June 29

Fernando Gouvêa  
Leon Hall  
Allen Hibbard  
William Higgins  
George Jennings  
V. Lee Turner  
Kathryn Weld  
Michael Woltermann

**34 Years**

Suzanne Dorée  
Jim Freeman  
Michael Hvidsten  
Nan Jackson  
John Kavanagh  
Emelie Kenney  
Kathleen Lopez  
Joseph McDonough  
Michael Scanlon  
Carol Schumacher  
Robert Sefton Smith  
Barry Spieler  
Tina Straley

**35 Years**

Rotraut Cahill  
Dan Callon  
Robert Devaney  
Saeed Ghahramani  
Kenneth Gittelson  
Bonnie Gold  
David Hecker  
Thomas Hill  
Robert Megginson

**36 Years**

Gregory Call  
Douglas Dunham  
Ruth Favro  
Paul Flasch  
Joel Haack  
Stephen Kokoska  
Robert Rogers  
Edward Scheinerman

**37 Years**

Andrew Bennett  
Jeffrey Clark  
Susan Jane Colley  
William Emerson  
William Hackborn  
Luise-Charlotte Kappe  
Larry Penn  
Robert Root  
Lawrence Washington  
Ann Watkins

**38 Years**

James Carlson  
James Daniel  
Lucy Dechene  
Thomas Drucker  
Barbara Faires  
Dan Kalman  
Andy Matchett  
Walter Meyer  
Daniel Otero  
David Shannon  
Bette Warren

**39 Years**

John Best  
Sylvia Bozeman  
David Bressoud  
Carolyn Connell  
Richard Kaste  
Allan Kroopnick  
Philip Mahler  
Elizabeth Mayfield  
Frank Morgan  
James Sandefur  
Ronald Umble  
J. Paul Vicknair  
John Watkins

**40 Years**

Philip Benjamin  
Jimmy Buchanan  
Penelope Dunham  
William Dunham

Joseph Gallian  
James Henle  
James Langan  
Thomas Sibley  
Daniel Velleman  
Gerard Venema

**41 Years**

Dorothee Blum  
Ronald Brzenk  
David Carothers  
Daniel Curtin  
Jacqueline Dewar  
John Fink  
Douglas Girvan  
Judy Green  
Donald McClure  
Norman Richert  
Douglas Shier  
Kay Somers  
Alexia Sontag  
Michael Starbird  
William Velez  
Paul Zorn

**42 Years**

Stephen Andrilli  
William Barker  
Donna Beers  
Joanne Dombrowski  
Lloyd Douglas  
Susan Forman  
Herbert Kasube  
Joseph Straight  
Charles Toll

**43 Years**

Jean Bee Chan  
James Fagan  
William Feldman  
Sue Geller  
Dan Kennedy  
Bruce Murrie  
David Sklar

**44 Years**

William Adams  
Robert Blumenthal  
Raymond Boute  
Amy Cohen  
Milton Eisner  
Jonathan Kane  
William Lewis  
Rochelle Meyer  
Christine Shannon  
Edward White

**45 Years**

Thomas Banchoff  
Joel Cohen  
Francis Ford  
JoAnne Growney  
Roger Ray  
Peter Ross  
Doris Schattschneider  
Calvin Van Niewaal  
Philip Yasskin

**46 Years**

Joseph Auslander  
Nickolas Backscheider  
Joel Cunningham  
Robert Fontenot  
Samuel Graff  
Richard Guy  
Judith Meckley  
Harriet Pollatsek  
Jon Scott  
Martha Siegel  
Jonathan Sondow  
Philip Traffin  
Philippe Tondeur

**47 Years**

Curtis Herink  
Victor Katz  
Albert Lewis  
David Stone  
Roger Waggoner

(continued)

**48 Years**

Hyman Bass  
Theodore Eisenberg  
Michael Fisher  
Jennifer Galovich  
Jeffrey Lagarias  
David Manes  
Patrick McCray  
Eileen Poiani  
Karl Schaffer

**49 Years**

James Fey  
Frances Gulick  
Thomas Hern  
Virginia Jones  
Carl Leinbach

**50 Years**

Ethan Bolker  
Carl Cowen  
David Flesner  
Alexander Kleiner  
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**51 Years**

Donald Albers  
Morton Goldberg  
Jerrold Grossman  
Scott Harrod  
Daniel Kemp  
Steven Krantz  
Ronald Rosier  
Paul Stockmeyer  
Walter Stromquist  
James Tattersall

**52 Years**

Ron Barnes  
Donald Cohn  
Murray Eisenberg  
John Mack  
Daniel Maki  
Hugh Montgomery  
Donald Quiring  
David Smith  
Donovan Van Osdol

**53 Years**

Virginia Knight  
Warren Page

Joanne Peebles  
John Selden

**54 Years**

Lowell Beineke  
Afton Cayford  
Bert Fristedt  
Genevieve M. Knight  
Joan Leitzel  
Stephen Meskin  
Marvin Schaefer  
David Zitarelli

**55 Years**

Catherine Murphy  
Henry Ricardo

**56 Years**

Hudson Kronk  
Ellen Lehner  
Gerald Porter  
George Rosenstein

**57 Years**

Denny Gulick  
Barbara Osofsky  
Annie Selden

**58 Years**

Ronald Graham  
Henry Pollak

**59 Years**

Lida K Barrett  
Underwood Dudley

**60 Years**

Kenneth Ross

**61 Years**

Bernard Fusaro

Please join your colleagues at the Closing Banquet on Saturday, August 8 at 6pm. Members celebrating 25 or 50 years will receive a special pin. Stop by the Registration Desk for ticket information.

# Teaching Quantitative Learning

## An MAA Press Session

Ethan Bolker  
Author of *Common Sense Mathematics*

Friday, August 7  
3:00 p.m.–4:30 p.m.  
Room 8222 | Marriott Wardman Park Hotel

What do you want your Quantitative Learning students to remember ten years from now? Ethan Bolker and Maura Mast want theirs to approach numbers in life and in the news with confidence, common sense, common knowledge and appropriate mathematical tools. They've designed a course and co-authored *Common Sense Mathematics* hoping to change how QL is taught, learned and remembered.

Professor Bolker will lead a ninety-minute workshop on their common sense approach to QL with just-in-time mathematics. If you are wondering how to help your students achieve quantitative literacy, please come join the conversation.



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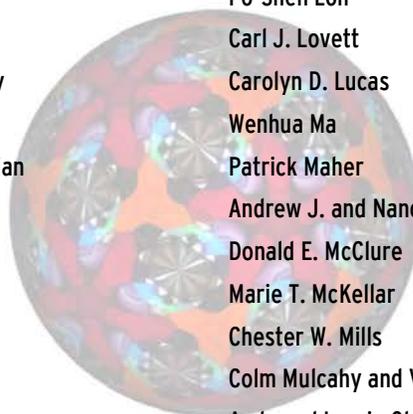
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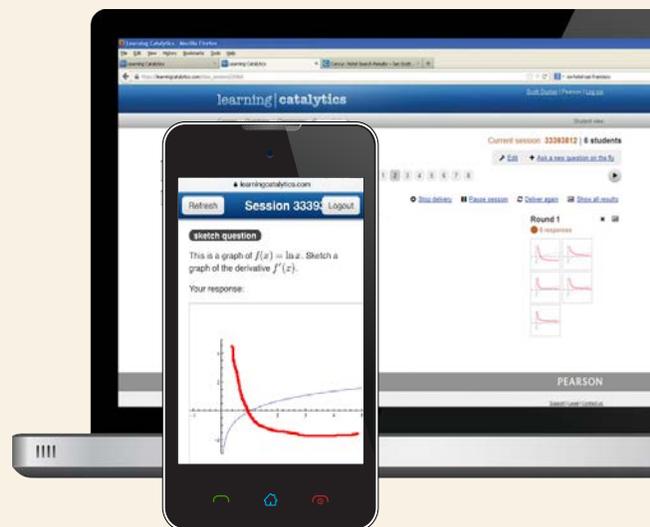
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## Social Events

### WEDNESDAY, AUGUST 5

#### MAA 100 Centennial Reception

5:00 PM – 7:00 PM  
Marriott Wardman Park, Exhibit Hall A

Join us for the MAA MathFest Centennial Reception to celebrate the beginning of the conference and the opening of the Exhibit Hall. Enjoy light hors d'oeuvres, a cash bar, and a chance to meet fellow attendees and all of our sponsors and exhibitors. This event is complimentary for all registered attendees and guests.

#### MAA 100 Mathematical Carnival at the Centennial Reception

5:00 PM – 7:00 PM  
Marriott Wardman Park, Exhibit Hall A

Mathematical presenters to include:

Dominic Klyve: *Juggling and Math*

Susan Goldstine: *Flexagons*

Colm Mulcahy: *Mathematical Card Tricks*

Jason Rosenhouse: *Monty Hall Interactive Game*

Karl Schaffer: *String Polyhedra*

**Tim Chartier**, Davidson College

#### MAA 100 Cirque de Mathematiques

7:00 PM – 9:00 PM  
Marriott Wardman Park, Salon 2/3

Come enjoy an evening of mathematical delights! Be amazed, tickled and touched by drama, magic, mime and dance. James Tanton will emcee an evening featuring performances by Colin Adams, Art Benjamin, Tanya and Tim Chartier, and Karl Schaffer.

**Tim Chartier**, Davidson College

### THURSDAY, AUGUST 6

#### Graduate Student Reception

6:00 PM – 7:00 PM  
Marriott Wardman Park  
Chef's Table at Stone's Throw

Graduate students are invited for some refreshments and to meet several of the invited speakers.

**Estela A. Gavosto**, University of Kansas

**James Freeman**, Cornell College

#### MAA 100 Mathematicians by Day, Musicians by Night

8:00 PM – 9:30 PM  
Marriott Wardman Park, Salon 2/3

The deep connection between mathematics and music comes to life as mathematicians take the stage as performers. Musicians will include pianist Noam Elkies (a three-time Putnam Fellow), tenor Frank Farris (former Mathematics Magazine editor), a trio playing Brahms, a quintet playing Mozart, and a choir of mathematician-singers. Expect to be delighted by wonderful music - and amazed at the versatility of the performers, all of whom work day jobs as mathematicians. Emceed by Paul Zorn, St. Olaf College, Past MAA President.

**Dave Kung**, St. Mary's College of Maryland, Project NEXt Director

### FRIDAY, AUGUST 7

#### Pi Mu Epsilon Student Banquet

6:00 PM – 7:45 PM  
Marriott Wardman Park, Virginia A/B/C

All PME members and their supporters are welcome. See the registration desk for more information on this ticketed event.

#### MAA 100 *Albert's Bridge: A Tragicomedy* by Tom Stoppard, Featuring the MAA Community Players

9:00 PM – 10:00 PM  
Marriott Wardman Park, Salon 2/3

A host of your favorite MAA personalities come together for a spirited performance of an early comedy written for radio by Tom Stoppard. Stoppard's richly mathematical play *Arcadia*, first produced in 1993, has been heralded as one of the best plays of the 20th century. *Albert's Bridge* was written 25 years before *Arcadia*, when Stoppard was a struggling journalist, but it still exhibits the playwright's propensity for running roughshod over the fabricated boundaries between mathematics and good storytelling. In the performance, elementary algebra, philosophy, and even some physics at the play's conclusion are weaved together into a comic commentary on the inevitable tragedy of life.

**Steve Abbott**, Middlebury College

### SATURDAY, AUGUST 8

#### MAA Ice Cream Social and Undergraduate Awards Ceremony

12:30 PM – 2:00 PM  
Marriott Wardman Park, Salon 3

Students who gave the best talks in the MAA Student Paper Sessions will be recognized and awarded prizes. All undergraduate students are invited to attend.

#### DC Math Walk

3:30 PM – 5:30 PM  
Departs from Marriott Wardman Park Lobby

There are ample places to find mathematics in Washington, DC with the Centennial MAA MathFest. Want to find math in the nation's capital itself? Come and enjoy a math trail designed by Ivars Peterson. From fire hydrants to friezes adorning buildings to various art work, find math as you enjoy the overall beauty throughout the city.

## Social Events (continued)

### Closing Banquet

6:00 PM – 9:00 PM  
Marriott Wardman Park, Salon 1

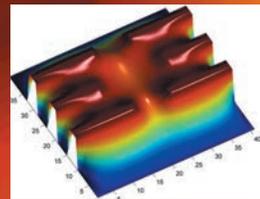
Celebrate the success of another MAA MathFest by joining us for the Closing Banquet. Back by popular demand, the MAA Players are proud to bring you *MAA: The Musical!* They'll tell the history of the MAA in song and dance with their award-winning cast. (Okay, so they didn't win awards for singing or dancing, but surely good mathematical exposition counts for something, right?) Come join in the fun with Art Benjamin, Bud Brown, Annalisa Crannell, Alissa Crans, Joyati Debnath, Frank Farris, Leigh Lunsford, Jenny Quinn, Dave Smith, Tina Straley, Francis Su, Talithia Williams, and more! All are welcome, and Silver and Gold members will be honored during the program. See the registration desk for more information on this ticketed event.

#### WELCOMING STATEMENT

The MAA encourages the free expression and exchange of ideas in an atmosphere of mutual respect and collegiality. The MAA strives to foster a welcoming environment for all, and specifically prohibits any conduct that is discriminatory, harassing, or threatening by any staff member or MAA member to any other person engaged in MAA operations or activities. As a professional society supporting open discussion of mathematics and mathematics education, the MAA requests that all individuals attending activities sponsored or co-sponsored by MAA, its Sections, or its Special Interest Groups, conduct themselves professionally and respectfully toward other participants. Violations may be reported directly to the Executive Director or the Compliance Officer (Associate Treasurer). For immediate concerns at a meeting, proceed to the registration area or hotel/convention center security office.

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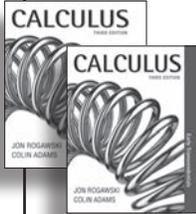
*Modeling electric potential in a quantum dot. Contributed by Kim Young-Sang at HYU.*

*This example available at [www.mathworks.com/ltc](http://www.mathworks.com/ltc)*

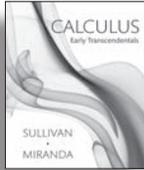
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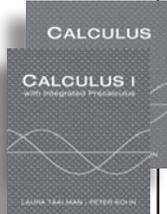
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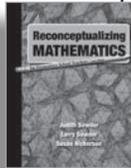


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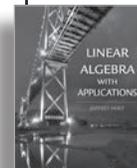
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## INTRODUCTORY STATISTICS



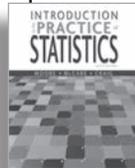
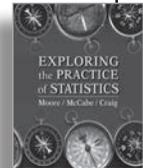
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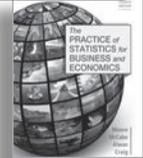
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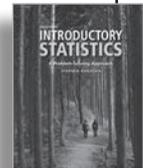


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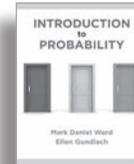
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## Tuesday, August 4

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### Registration

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3:00 PM – 7:00 PM, Marriott Wardman Park, Registration 1/2

## Wednesday, August 5

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### Registration

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7:00 AM – 7:00 PM, Marriott Wardman Park, Registration 1/2

INVITED ADDRESS

### MAA Centennial Lecture 1

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**Replicators, Transformers, and Robot Swarms: Science Fiction through Geometric Algorithms**

8:20 AM – 9:20 AM, Marriott Wardman Park, Salon 2/3

**Erik Demaine**, *Massachusetts Institute of Technology*

INVITED ADDRESS

### Earle Raymond Hedrick Lecture Series

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#### Hedrick Lecture 1

9:30 AM – 10:20 AM, Marriott Wardman Park, Salon 2/3

**Karen Smith**, *University of Michigan*

INVITED ADDRESS

### MAA Centennial Lecture 2

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**Network Science: From the Online World to Cancer Genomics**

10:30 AM – 11:20 AM, Marriott Wardman Park, Salon 2/3

**Jennifer Chayes**, *Microsoft Research*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#1: The History and Philosophy of Mathematics Part A – History of Mathematics

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10:30 AM – 11:55 AM, Marriott Wardman Park, Washington 4

**Ellipsographs: Drawing Ellipses and the Devices in the Smithsonian Collections**

10:30 AM – 10:55 AM

**Amy Shell-Gellasch**, *Montgomery College*

**Charter Members of the MAA and the Material Culture of American Mathematics**

11:00 AM – 11:25 AM

**Peggy A. Kidwell**, *Smithsonian Institution*

**History of Mathematics in Washington, DC**

11:30 AM – 11:55 AM

**Florence Fasanelli**, *MAA*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#1: The History and Philosophy of Mathematics Part B – History of Mathematics

---

10:30 AM – 11:55 AM, Marriott Wardman Park, Washington 5

**Eisenhower, the Binomial Theorem, and the \$64,000 Question**

10:30 AM – 10:55 AM

**Cathleen O'Neil**, *Johnson County Community College*

**John Horton Conway: Certainly a Piece of History**

11:00 AM – 11:25 AM

**Siobhan Roberts**, *Freelance Writer, Math & Science Journalist, Biographer*

**A Pair of Early MAA Presidents = A Pair of Mathematics Historians: Florian Cajori and David Eugene Smith**

11:30 AM – 11:55 AM

**Eileen Donoghue**, *City University of New York/CSI*

OTHER MATHEMATICAL SESSION

### Project NExT Lecture

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**Reducing Stereotype Threat in the Mathematics Classroom**

11:00 AM – 11:50 AM, Marriott Wardman Park, Salon 1

**Catherine Good**, *Baruch College, City University of New York*

INVITED ADDRESS

### MAA Chan Stanek Lecture for Students

---

**Seventy-Five Years of MAA Mathematics Competitions**

1:00 PM – 1:50 PM, Marriott Wardman Park, Salon 2/3

**Joseph Gallian**, *University of Minnesota Duluth*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#20: Evidence-Based Approaches to the Mathematical Preparation of Secondary Teachers

---

1:00 PM – 1:55 PM, Marriott Wardman Park, Washington 1

**Lesson Study: A Capstone Experience to Address the Recommendations of the MET II Document**

1:00 PM – 1:15 PM

**Connie Yarema**, *Abilene Christian University*  
**David Hendricks**, *Abilene Christian University*

**Wednesday, August 5** (continued)**Focusing on Mathematical Arguments**

1:20 PM - 1:35 PM

**AnnaMarie Conner**, *University of Georgia***Laura Singletary**, *Lee University***Investing the Preparation of Teachers of Mathematics: The Influence of Content Knowledge on Novice Teaching**

1:40 PM - 1:55 PM

**Allyson Hallman-Thrasher**, *Ohio University***Jeff Connor**, *Ohio University***Derek J. Sturgill**, *Ohio University*

## PANEL SESSION

**Panel 7. Implementing the 2015 CUPM Curriculum Guide**

1:00 PM - 2:20 PM, Marriott Wardman Park, Delaware A

## WORKSHOP

**What's the Story? A Graduate Student Workshop on Formulating a Research Presentation for a General Audience**

1:00 PM - 2:20 PM, Marriott Wardman Park, Maryland C

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#7: Financial Mathematics**

1:00 PM - 2:35 PM, Marriott Wardman Park, Washington 6

**Remaining Questions on Approximating The Rate of Interest For an Annuity**

1:00 PM - 1:15 PM

**Richard Stephens**, *Columbus State University***Insurance and Financial Investment Strategy under a Stochastic Process Model**

1:20 PM - 1:35 PM

**Wanwan Huang**, *Roosevelt University***Social Security Benefit: Now or Later?**

1:40 PM - 1:55 PM

**Amanda Mummert**, *Washington & Jefferson College***Katie Linthicum**, *Washington & Jefferson College***Kadie Clancy**, *Washington & Jefferson College***An Undergraduate Research Experience in Financial Mathematics**

2:00 PM - 2:15 PM

**Jeong-Mi Yoon**, *UH-Downtown***Actuarial Present Value: Calculations for Two Parametric Models**

2:20 PM - 2:35 PM

**Veera Holdai**, *Salisbury University***Barbara Wainwright**, *Salisbury University*

## GENERAL CONTRIBUTED PAPER SESSION

**Teaching or Learning Introductory Mathematics Part A**

1:00 PM - 2:55 PM, Marriott Wardman Park, Maryland B

**Exploring Probability Using The Settlers of Catan**

1:00 PM - 1:10 PM

**Jathan Austin**, *Salisbury University***Susanna Molitoris Miller**, *Kennesaw State University***Estimating the Number of Extraterrestrial Civilizations in a Statistics Class**

1:15 PM - 1:25 PM

**Alexander G. Atwood**, *Suffolk County Community College***Elementary Statistics using Facebook**

1:30 PM - 1:40 PM

**Krishna Kaphle**, *University of Maine at Fort Kent***Experiences and Experiments in Implementing a Flipped Classroom Design in an Introductory Statistics Course**

1:45 PM - 1:55 PM

**William J. Heuett**, *Marymount University***Integrating Worked Examples into a Flipped College Algebra Classroom**

2:00 PM - 2:10 PM

**Tyrone Washington**, *Millersville University***Collins Math Magic Number Blocks and the Wobble-Square Method of Multiplication**

2:15 PM - 2:25 PM

**Dennis G. Collins**, *UPR-Mayaguez***Glenn H. Collins****Promoting Student Understanding of Properties of Logarithms**

2:30 PM - 2:40 PM

**Erin R. Moss**, *Millersville University of Pennsylvania***Applications of R to Introductory and Intermediate Statistics**

2:45 PM - 2:55 PM

**Leon Kaganovskiy**, *Touro College Brooklyn Campus*

## Wednesday, August 5 (continued)

THEMED CONTRIBUTED PAPER SESSION

### **TCPS#1: The History and Philosophy of Mathematics Part C – History and Philosophy of Mathematics**

1:00 PM – 2:55 PM, Marriott Wardman Park, Washington 4

#### **Doing Arithmetic in Medieval Europe**

1:00 PM – 1:25 PM

**Chuck Lindsey**, *Florida Gulf Coast University*

#### **Imagination and Reading the Third Dimension in Early Modern Geometry**

1:30 PM – 1:55 PM

**Travis D. Williams**, *University of Rhode Island*

#### **The Arc Rampant in 1673: An Early Episode in the History of Projective Geometry**

2:00 PM – 2:25 PM

**Christopher Baltus**, *SUNY Oswego*

#### **William Brouncker's Rectification of the Semi-Cubical Parabola**

2:30 PM – 2:55 PM

**Andrew Leahy**, *Knox College*

THEMED CONTRIBUTED PAPER SESSION

### **TCPS#21: Show Me Geometry: Geometry Software and Tablet Demonstrations**

1:00 PM – 2:55 PM, Marriott Wardman Park, Virginia C

#### **Investigation of Geometric Theorems Using Geometer's Sketchpad**

1:00 PM – 1:15 PM

**Nora Strasser**, *Friends University*

#### **Active Exploration of Desargues' Theorem and Projective Geometry**

1:20 PM – 1:35 PM

**Michael Hvidsten**, *Gustavus Adolphus College*

#### **The Poincaré Disk Model in GeoGebra**

1:40 PM – 1:55 PM

**Martha Byrne**, *Earlham College*

#### **GeoGebra and Hyperbolic Geometry**

2:00 PM – 2:15 PM

**Violeta Vasilevska**, *Utah Valley University*

#### **Math on a Sphere: an Interactive Programming System for Spherical Geometry**

2:20 PM – 2:35 PM

**Michael Eisenberg**, *University of Colorado*  
**Hilary Peddicord**, *National Oceanic and Atmospheric Administration*  
**Sherry Hsi**, *Lawrence Hall of Science, Berkeley*

#### **Using A Dynamic Software Program to Develop Geometric Constructions**

2:40 PM – 2:55 PM

**Laura Singletary**, *Lee University*

MINICOURSE

### **2. The Mathematics of Games and Gambling (Part A)**

1:00 PM – 3:00 PM, Omni Shoreham Hotel, Hampton Room

MINICOURSE

### **4. Recruiting Students to Take More Mathematics Courses and to be Mathematics Majors (Part A)**

1:00 PM – 3:00 PM, Omni Shoreham Hotel, Calvert Room

THEMED CONTRIBUTED PAPER SESSION

### **TCPS#16: Curriculum Development to Support First Year General Education Mathematics Students**

1:00 PM – 3:35 PM, Marriott Wardman Park, Washington 3

#### **Redesigning a Liberal Arts Math Course for Student Performance**

1:00 PM – 1:15 PM

**Crystal Lorch**, *Ball State University*  
**John Lorch**, *Ball State University*

#### **Design and Implementation of a Quantitative Literacy Course at a Large Research Institution**

1:20 PM – 1:35 PM

**Vince Melfi**, *Michigan State University*  
**Dave Bramer**, *Michigan State University*  
**Jeff Craig**, *Michigan State University*  
**Richard A. Edwards**, *Michigan State University*  
**Andrew Krause**, *Michigan State University*  
**Amanda Lorenz**, *Michigan State University*

#### **Just Enough Algebra – Or How Teaching Interesting, Useful Algebra in Applied Contexts Incorporating Active Learning Led to Higher Student Engagement and Success**

1:40 PM – 1:55 PM

**Suzanne I. Dorée**, *Augsburg College*

#### **System-wide Co-requisite Pedagogical Approaches for Learning Support Mathematics Students**

2:00 PM – 2:15 PM

**Minsu Kim**, *University of North Georgia*

#### **Eliminating Pre-Foundational and Comprehensively Redesigning First Year General Education Mathematics Courses at Trinity Washington University**

2:20 PM – 2:35 PM

**Kent Kraft**, *Trinity Washington University*

**Wednesday, August 5** (continued)

**Reorganization and Innovation in First Year General Education Mathematics Courses**

2:40 PM - 2:55 PM

**Grace E. Cook**, Bloomfield College

**Michael Schiro**, Bloomfield College

**Kevin Kline**, Bloomfield College

**Alternative Pathway for General Education Mathematics Students**

3:00 PM - 3:15 PM

**Rachel M. Bates**, Redlands Community College

**Building Learning Communities for Students and Instructors in Introductory and Intermediate Algebra**

3:20 PM - 3:35 PM

**Janet Nichols**, Colorado State University - Pueblo

**Polynomials, Discriminants, and Root Counting in Number Fields**

2:45 PM - 2:55 PM

**Chad Awtrey**, Elon University

**Can this Polynomial be Factored?**

3:15 PM - 3:25 PM

**Gary Brookfield**, California State University, Los Angeles

**Valuation Derived from Graded Ring and Module and Krull Dimension Properties**

3:30 PM - 3:40 PM

**Mohammad Hassan Anjom Shoa**, University of Birjand

**Mohammad Hossein Hosseinie**, University of Birjand

INVITED SESSION

**MAA Invited Paper Session: The Non-Traditional "Traditional NSA Mathematician"**

1:00 PM - 3:45 PM, Marriott Wardman Park, Delaware B

GENERAL CONTRIBUTED PAPER SESSION

**Algebra and Linear Algebra**

1:00 PM - 3:40 PM, Marriott Wardman Park, Virginia B

**Linear Algebra and Forensics**

1:00 PM - 1:10 PM

**Donna Beers**, Simmons College

**Catherine Crawford**, Elmhurst College

**New Algorithms for Solving a System of Linear Equations**

1:15 PM - 1:25 PM

**Michael F. Zimmer**, Teradata, Inc

**New Canonical Forms for Matrices Over a Principal Ideal Domain**

1:30 PM - 1:40 PM

**Peter M. Joyce**, CCBC

**On the Structure of Generalized Symmetric Spaces of the Special Linear and General Linear Groups of Degree 2 Over Finite Fields**

1:45 PM - 1:55 PM

**Jennifer Schaefer**, Dickinson College

**The Index of a Numerical Semigroup in Four Generators**

2:00 PM - 2:10 PM

**Bernadette Boyle**, Sacred Heart University

**The Space of Biorders on Some Solvable Groups**

2:30 PM - 2:40 PM

**Kelli Karcher**, Virginia Polytechnic Institute and State University

**The Coming of Enigma**

1:00 PM - 1:30 PM

**David Perry**, National Security Agency

**Public Key Cryptography: From Abelian Groups to Yellow Padlocks in 30 Minutes Flat**

1:45 PM - 2:15 PM

**Ben Benoy**, National Security Agency

**Extending Pairwise Element Similarity to Set Similarity Efficiently**

2:30 PM - 3:00 PM

**Steve Knox**, National Security Agency

**Teaching Computers to See**

3:15 PM - 3:45 PM

**Christine Edwards**, National Security Agency

## Wednesday, August 5 (continued)

### INVITED SESSION

#### MAA Invited Paper Session: Generations of Monthly Gems

1:00 PM – 3:50 PM, Marriott Wardman Park, Salon 1

##### 1894 – 1919

1:00 PM – 1:20 PM

**Karen Parshall**, *University of Virginia*

##### 1920 – 1939

1:30 PM – 1:50 PM

**John Stillwell**, *University of San Francisco*

##### 1940 – 1959

2:00 PM – 2:20 PM

**Ron Graham**, *University of California at San Diego*

##### 1960 – 1979

2:30 PM – 2:50 PM

**Bob Devaney**, *Boston University*

##### 1980 – 1999

3:00 PM – 3:20 PM

**Paul Zorn**, *St. Olaf College*

##### 2000 – 2015

3:30 PM – 3:50 PM

**Rebecca Goldin**, *George Mason University*

### THEMED CONTRIBUTED PAPER SESSION

#### TCPS#1: The History and Philosophy of Mathematics Part D – History and Philosophy of Mathematics

1:00 PM – 3:55 PM, Marriott Wardman Park, Washington 5

##### A Mathematical Look at Mersenne's Water Jet Experiment

1:00 PM – 1:25 PM

**Charles Groetsch**, *The Citadel*

##### Inspiration for Elementary Mathematics Descriptions from a "Heritage" Reading (in the sense of Grattan-Guinness) of On the Nonexistent by Gorgias

1:30 PM – 1:55 PM

**Ann L. von Mehren**, *Arcadia University and University of Houston*

##### Going to the Source

2:00 PM – 2:25 PM

**Thomas Q. Sibley**, *St. John's University, College of St. Benedict*

##### Rope Geometry of Ancient India in the Classroom

2:30 PM – 2:55 PM

**Cynthia J. Huffman**, *Pittsburg State University*  
**Scott V. Thuong**, *Pittsburg State University*

##### Getting to the Root of the Problem

3:00 PM – 3:25 PM

**Steven J. Tedford**, *Misericordia University*

##### Reenactment of the Calculus Controversy: Newton vs Leibniz

3:30 PM – 3:55 PM

**Abraham Ayebo**, *North Dakota State University*

### THEMED CONTRIBUTED PAPER SESSION

#### TCPS#6: Mathematics and Art Part A

1:00 PM – 4:55 PM, Marriott Wardman Park, Maryland A

##### A Kaleidoscopic Journey

1:00 PM – 1:15 PM

**Jeff Johannes**, *SUNY Geneseo*

##### Artistic Patterns on Triply Periodic Polyhedra

1:20 PM – 1:35 PM

**Douglas Dunham**, *University of Minnesota - Duluth*

##### Maps of Strange Worlds: Beyond the Four-Color Theorem

1:40 PM – 1:55 PM

**Susan Goldstine**, *St. Mary's College of Maryland*

##### Virtual Bumblebees

2:00 PM – 2:15 PM

**James P. Howard**, *University of Maryland University College*

##### Surprises from Iterating Discontinuous Functions

2:20 PM – 2:35 PM

**Brian Heinold**, *Mount St. Mary's University*

##### The Many Lessons in Fractals

2:40 PM – 2:55 PM

**Lisa A. Oberbroeckling**, *Loyola University Maryland*

##### Parametric Equations at the Circus: Trochoids and Poi Flowers

3:00 PM – 3:15 PM

**Eleanor Farrington**, *Massachusetts Maritime Academy*

##### Modeling the Mathematical: Man Ray, Equational Mimesis, and Kinesthetic Learning

3:20 PM – 3:35 PM

**Steve Zides**, *Wofford College*

**Wednesday, August 5** (continued)**Pythagoras to Secor: Generalized Keyboards and the Miracle Temperament**

3:40 PM - 3:55 PM

Anil Venkatesh, Ferris State University

**Mathematics and Poetry: The Sweetest Noise**

4:00 PM - 4:15 PM

Randall E. Cone, Salisbury University

**Differential Equations in Music, Dance, and the Visual Arts**

4:20 PM - 4:35 PM

Lorelei Koss, Dickinson College

**Counting with Your Toes!**

4:40 PM - 4:55 PM

Julian Chan, Weber State

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#12: Improving Undergraduate Math Writing**

1:00 PM - 5:15 PM, Marriott Wardman Park, Virginia A

**Creating and Assessing Writing Prompts in Calculus and Below**

1:00 PM - 1:15 PM

Garry Johns, Saginaw Valley State University

**I Need Some Focus! Helping Calculus Students Navigate Mathematical Writing**

1:20 PM - 1:35 PM

David Clark, Grand Valley State University

**Student Engagement and Learning through Reading and Writing in Differential Equations**

1:40 PM - 1:55 PM

Michael C. Barg, Niagara University

**Using Writing in Introductory Statistics to Enhance Understanding**

2:00 PM - 2:15 PM

Tonya Adkins, Johnson &amp; Wales University

**Writing with Critical Thinking and Values for Effective Problem Solving**

2:20 PM - 2:35 PM

Jacci White, Saint Leo University

Monika Kiss, Saint Leo University

Brian Camp, Saint Leo University

**Definitions as Proof Blueprints**

2:40 PM - 2:55 PM

Andrew Cooper, North Carolina State University

**Product and Process: Writing Portfolios and Feedback in Introduction to Proof Techniques**

3:00 PM - 3:15 PM

May Mei, Denison University

**Revised Writing Across the Math Major**

3:20 PM - 3:35 PM

Jacqueline Anderson, Bridgewater State University

**Typesetting Homework in LaTeX: Best Practices that Support Teaching and Learning in Post-Calculus**

3:40 PM - 3:55 PM

James Quinlan, University of New England

**Revising for Clarity**

4:00 PM - 4:15 PM

Jeffrey Clark, Elon University

**Why Induction Is Like Ice Cream: Writing About Analogies in Discrete Mathematics Courses**

4:20 PM - 4:35 PM

Joshua Holden, Rose-Hulman Institute of Technology

**Emphasizing Mathematical Writing in On-line Courses**

4:40 PM - 4:55 PM

Byungik Kahng, University of North Texas at Dallas

**Teaching Mathematical Proof Writing Skills in a General Education Course: Graph Theory Algorithms and Color-Coding**

5:00 PM - 5:15 PM

Robin L. Blankenship, Morehead State University

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#10: The Scholarship of Teaching and Learning in Collegiate Mathematics**

1:00 PM - 5:35 PM, Marriott Wardman Park, Washington 2

**Comparing Oral and Traditional Assessments in Math Content Courses for Pre-Service Elementary Teachers**

1:00 PM - 1:15 PM

Daniel Visscher, University of Michigan

Nina White, University of Michigan

**Assessing the Effects of Interactive Technology on Concept Retention in Precalculus**

1:20 PM - 1:35 PM

Doug Ensley, Shippensburg University

Lea Adams, Shippensburg University

Barbara Kaskosz, University of Rhode Island

## Wednesday, August 5 (continued)

### Curing the High DFW Rate in First Year Calculus

1:40 PM - 1:55 PM

**Adam Childers**, Roanoke College

**Jan Minton**, Roanoke College

**Hannah Robbins**, Roanoke College

**Kristin Emrich**, Roanoke College

**David Taylor**, Roanoke College

### Increasing Student Success in the Calculus Sequence

2:00 PM - 2:15 PM

**Mary Shepherd**, Northwest Missouri State University

### Investigating Student Learning Gains from Content Videos in a Flipped Calculus I Course

2:20 PM - 2:35 PM

**John (Zig) Siegfried**, James Madison University

**Cassie Williams**, James Madison University

### Does Calculus Help with Algebra?

2:40 PM - 2:55 PM

**Cory Johnson**, California State University, San Bernardino

### Introducing Technology to a Vector Calculus Course

3:00 PM - 3:15 PM

**Tyler Kloefkorn**, University of Arizona

### Engaged Learning Through Writing: A Faculty Development Project

3:20 PM - 3:35 PM

**Mary E. Pilgrim**, Colorado State University

**Sue Doe**, Colorado State University

**Hilary Freeman**, Colorado State University

**Kate Kiefer**, Colorado State University

### From Scratch to Proof: Preliminary Report

3:40 PM - 3:55 PM

**Margaret L. Morrow**, SUNY Plattsburgh

### SoTLE: Assessing the Effectiveness of Moodle Glossaries

4:00 PM - 4:15 PM

**Jill E. Thomley**, Appalachian State University

**Sarah J. Greenwald**, Appalachian State University

### The Emporium Teaching Model and Its Effect on Students' Conceptions of Mathematics, Metacognitive Awareness and Course Performance

4:20 PM - 4:35 PM

**Yevgeniya Rivers**, University of New Haven

**Joshua Goss**, University of New Haven

### Student Beliefs on Math Ability and Sense of Belonging to a Math Community

4:40 PM - 4:55 PM

**Frank Hassebrock**, Denison University

**Lewis Ludwig**, Denison University

### Assessing the Cognitive Levels of Exam Problems in Mathematics: A Comparison Across Years

5:00 PM - 5:15 PM

**Sandra M. Merchant**, University of British Columbia

**Wesley Maciejewski**, University of Auckland

### Development of Students' Bayesian Reasoning Skill

5:20 PM - 5:35 PM

**Frank Wang**, LaGuardia Community College, CUNY

#### OTHER MATHEMATICAL SESSION

### Special Panel Session on Science Policy

2:30 PM - 4:00 PM, Marriott Wardman Park, Salon 2/3

#### PANEL SESSION

### Panel 6. The Updated AP Calculus AB/BC courses: What Does This Mean For You?

2:35 PM - 3:55 PM, Marriott Wardman Park, Delaware A

#### OTHER MATHEMATICAL SESSION

### MAA Section Officers Meeting

3:00 PM - 5:00 PM, Marriott Wardman Park, Wilson A/B/C

#### THEMED CONTRIBUTED PAPER SESSION

### TCPS#1: The History and Philosophy of Mathematics Part E - The Mathematics of Euler

3:00 PM - 5:55 PM, Marriott Wardman Park, Washington 4

#### Euler's Dissertation on Logic

3:00 PM - 3:25 PM

**Sylvio R. Bistafa**, University of São Paulo

#### Euler and Phonetics: The Untold Story of the Mathematics of Language

3:30 PM - 3:55 PM

**Dominic Klyve**, Central Washington University

**Olivia Hirschey**, Central Washington University

#### Leonhard Euler: The Final Decade 1773 to October 1783

4:00 PM - 4:25 PM

**Ronald S. Calinger**, Catholic University of America

#### Euler's Method for Computing the Movement of a Mortar Bomb

4:30 PM - 4:55 PM

**William W. Hackborn**, University of Alberta

**Wednesday, August 5** (continued)

**Euler on L'Hôpital's Analyse**

5:00 PM - 5:25 PM

Robert E. Bradley, *Adelphi University*

**Euler's OTHER Constant**

5:30 PM - 5:55 PM

Jonathan Martin, *Purdue University*  
 Andy Martin, *Kentucky State University*

POSTER SESSION

**Highlights from AWM Chapters**

3:30 PM - 5:00 PM, Marriott Wardman Park, Marriott Foyer

MINICOURSE

**3. Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry (Part A)**

3:30 PM - 5:30 PM, Omni Shoreham Hotel, Hampton Room

MINICOURSE

**7. Teaching Mathematics with Bead Crochet (Part A)**

3:30 PM - 5:30 PM, Omni Shoreham Hotel, Calvert Room

PANEL SESSION

**Panel 4. A Discussion of the MAA/NCTM Joint Position Statement on Calculus**

4:10 PM - 5:30 PM, Marriott Wardman Park, Delaware A

PANEL SESSION

**Panel 11. Congratulations on Getting Tenure! Now What?**

4:10 PM - 5:30 PM, Marriott Wardman Park, Washington 6

UNDERGRADUATE STUDENT ACTIVITY

**Radical Dash**

4:30 PM - 5:30 PM, Marriott Wardman Park, Salon 1

SOCIAL EVENT

**Centennial Reception**

5:00 PM - 7:00 PM, Marriott Wardman Park, Exhibit Hall A

SOCIAL EVENT

**Mathematical Carnival at the Centennial Reception**

5:00 PM - 7:00 PM, Marriott Wardman Park, Exhibit Hall A

SOCIAL EVENT

**Cirque de Mathematiques**

7:00 PM - 9:00 PM, Marriott Wardman Park, Salon 2/3

**Thursday, August 6**

**Registration**

8:00 AM - 5:00 PM, Marriott Wardman Park, Convention Registration

INVITED ADDRESS

**MAA Centennial Lecture 3**

**Mathematics for Art Investigation**

8:30 AM - 9:20 AM, Marriott Wardman Park, Salon 2/3

Ingrid Daubechies, *Duke University*

UNDERGRADUATE STUDENT ACTIVITY

**MAA Student Paper Session #1**

8:30 AM - 10:25 AM, Marriott Wardman Park, Virginia A

**MAA Student Paper Session #2**

8:30 AM - 10:25 AM, Marriott Wardman Park, Virginia B

**MAA Student Paper Session #3**

8:30 AM - 10:25 AM, Marriott Wardman Park, Virginia C

**MAA Paper Session #4**

8:30 AM - 10:25 AM, Marriott Wardman Park, Wilson A

**MAA Paper Session #5**

8:30 AM - 10:25 AM, Marriott Wardman Park, Wilson B

**MAA Paper Session #6**

8:30 AM - 10:25 AM, Marriott Wardman Park, Wilson C

THEMED CONTRIBUTED PAPER SESSION

**TCPS#1: The History and Philosophy of Mathematics Part F - Special Session in Memory of Jackie Stedall**

8:30 AM - 11:25 AM, Marriott Wardman Park, Washington 4

**Sylvester's Amphigenous Surface**

8:30 AM - 8:55 AM

June Barrow-Green, *The Open University*

## Thursday, August 6 (continued)

### Jackie Stedall and the Mathematics of Thomas Harriot

9:00 AM - 9:25 AM

Janet L. Beery, *University of Redlands*

### The Construction of Map Projections in the Works of Lambert and Euler

9:30 AM - 9:55 AM

Rosanna Cretney, *The Open University*

### Soviet Views of Early (English) Algebra

10:00 AM - 10:25 AM

Christopher Hollings, *University of Oxford*

### Bolzano's Measurable Numbers: Are They Real?

10:30 AM - 10:55 AM

Steve Russ, *University of Warwick*

Katerina Trlifajova, *Centre for Theoretical Studies, Prague*

### The BSHM, 1971-2015

11:00 AM - 11:25 AM

Robin J. Wilson, *Oxford University, UK*

### RAMScholars: Increasing Student Engagement in Learning Calculus Through PBL, Oral Assessments, and Writing

9:50 AM - 10:05 AM

Jessica Gehrtz, *Colorado State University*

Mary E. Pilgrim, *Colorado State University*

### Beginning an Emerging Scholar's Program in Calculus II

10:10 AM - 10:25 AM

Jacqueline Jensen-Vallin, *Lamar University*

### Wonders of 11 Stars: Mathematical Cultivations through Paper Folding

10:30 AM - 10:45 AM

Duk-Hyung Lee, *Asbury University*

### Teaching Validity and Soundness of Arguments Using the Board Game 'The Resistance'

10:50 AM - 11:05 AM

Derek Thompson, *Taylor University*

### Puzzles + Games = Mathematical Thinking

11:10 AM - 11:25 AM

Edmund A. Lamagna, *University of Rhode Island*

#### THEMED CONTRIBUTED PAPER SESSION

### TCPS#11: Cultivating Critical Thinking through Active Learning in Mathematics Part A

8:30 AM - 11:25 AM, Marriott Wardman Park, Washington 1

#### Teaching Elements of Effective Thinking Through Mathematics

8:30 AM - 8:45 AM

Michael Starbird, *The University of Texas at Austin*

#### Fostering Critical Thinking in a Liberal Arts Mathematics Course through Graph Theory

8:50 AM - 9:05 AM

Elizabeth S. Wolf, *Saint Mary's College*

#### Creative, Critical and Correct: Achieving Common Objectives in an Introductory Proofs Course

9:10 AM - 9:25 AM

Kayla B. Dwelle, *Ouachita Baptist University*

#### Active Learning in Linear Algebra Through Preview and In-class Activities

9:30 AM - 9:45 AM

Feryal Alayont, *Grand Valley State University*

Steven Schlicker, *Grand Valley State University*

#### GENERAL CONTRIBUTED PAPER SESSION

### Graph Theory

8:30 AM - 11:25 AM, Marriott Wardman Park, Washington 3

#### Social Implications of the Königsberg Bridge Problem

8:30 AM - 8:40 AM

Paul J. Janiczek, *Virginia Military Institute*

#### Coprime and Prime Labelings of Graphs

8:45 AM - 8:55 AM

Jonelle Hook, *Mount St. Mary's University*

#### Propagation Time on Directed Graphs

9:00 AM - 9:10 AM

Nathan Warnberg, *University of Wisconsin-La Crosse*

#### Counting Loops and Paths: The Monoid of a Directed Graph

9:15 AM - 9:25 AM

James Hamblin, *Shippensburg University*

Lance Bryant, *Shippensburg University*

#### The Isoperimetric Constant of a Paley Graph

9:30 AM - 9:40 AM

Anthony Shaheen, *CSU Los Angeles*

**Thursday, August 6** (continued)

**Two Intersection Sets and Paley Graphs**

9:45 AM - 9:55 AM

Liz Lane-Harvard, *University of Central Oklahoma*

**Generating Combinatorial Identities via Walk Counting**

10:00 AM - 10:10 AM

Nathan Moyer, *Whitworth University*

**Book Thickness of Zero-Divisor Graphs of Commutative Rings**

10:15 AM - 10:25 AM

Shannon Overbay, *Gonzaga University*

**DI-Pathological Conjectures and Results**

10:45 AM - 10:55 AM

John Asplund, *Dalton State College*

Joe Chaffee

James Hammer, *Ceder Crest College*

**On Decomposing Regular Graphs and Multigraphs into Forests**

11:00 AM - 11:10 AM

Saad El-Zanati, *Illinois State University*

Sabrina Allen, *Illinois State University*

Maggie Kopp, *Illinois State University*

Mike Plantholt, *Illinois State University*

Shailesh Tipnis, *Illinois State University*

**On the Number of Hills Among Generalized Dyck Paths**

11:15 AM - 11:25 AM

Jiillian McLeod, *U.S. Coast Guard Academy*

Naiomi Cameron, *Lewis & Clark College*

GENERAL CONTRIBUTED PAPER SESSION

**Mentoring and Outreach**

8:30 AM - 11:25 AM, Marriott Wardman Park, Maryland B

**Upper Elementary Outreach Mobius Bands and Polyhedra**

8:30 AM - 8:40 AM

Beth Schaubroeck, *United States Air Force Academy*

**"Energizing" Students**

8:45 AM - 8:55 AM

Elizabeth Yanik, *Emporia State University*

**Girls in Science: Over 15 Years of STEM Outreach for Middle School Girls**

9:00 AM - 9:10 AM

Susan Kelly, *University of Wisconsin - La Crosse*

**Expanding Your Horizons at James Madison University: Math and Science Outreach to Middle and High School Girls**

9:15 AM - 9:25 AM

Elizabeth Arnold, *James Madison University*

Katie S. Quertermous, *James Madison University*

**Rural STEM Model**

9:30 AM - 9:40 AM

Elizabeth Mauch, *Bloomsburg University*

**How to Hook Pre-Service Teachers on Professional Development**

9:45 AM - 9:55 AM

Pari Ford, *University of Nebraska at Kearney*

Amy Nebesniak, *University of Nebraska at Kearney*

**Impact of 2015 National Math Festival on Undergraduate Mathematics Students**

10:00 AM - 10:10 AM

Alice E. Petillo, *Marymount University*

Nicole Ferree, *Marymount University*

**Increasing Diversity in the Classrooms: A Path towards Inclusion in Mathematics**

10:15 AM - 10:25 AM

Li-Sheng Tseng, *University of California, Irvine*

Alessandra Pantano, *University of California, Irvine*

**Native American-based Mathematics Materials for Undergraduate Courses**

10:30 AM - 10:40 AM

Charles P. Funkhouser, *California State University Fullerton*

Miles R. Pfahl, *Turtle Mountain Community College*

Harriet Edwards, *California State University Fullerton*

**Creating a Meaningful Undergraduate Research Project**

10:45 AM - 10:55 AM

Brandon Samples, *Georgia College & State University*

**Supporting the Success of Women Faculty through an NSF ADVANCE Grant: Looking Back, Moving Forward**

11:00 AM - 11:10 AM

Jenna Carpenter, *Louisiana Tech University*

D. P. O'Neal, *Louisiana Tech University*

**What's It Like to Be Editor-in-Chief of the Notices of the American Mathematical Society?**

11:15 AM - 11:25 AM

Frank Morgan, *Williams College*

## Thursday, August 6 (continued)

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### THEMED CONTRIBUTED PAPER SESSION

#### **TCPS#6: Mathematics and Art Part B**

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8:50 AM - 11:25 AM, Marriott Wardman Park, Maryland A

**Geometry in Paintings: Where Two Dimensional Becomes Three Dimensional**

8:50 AM - 9:05 AM

**Blair Lewis**, *Weber State University*

**Geometric Islamic Star Patterns of Carved Mamluk Domes**

9:10 AM - 9:25 AM

**Lynn Bodner**, *Monmouth University*

**Geometry in 18th Century Japan: Exploring and Creating Sangaku**

9:30 AM - 9:45 AM

**David Clark**, *Randolph-Macon College*

**Randomness and Structure in Computer-generated Art and Design**

9:50 AM - 10:05 AM

**Vincent J. Matsko**, *University of San Francisco*

**"iFlakes": Interactive Line Designs for iOS**

10:10 AM - 10:25 AM

**James E. Mihalisin**, *JedMDesigns*

**Ten Years of Student Art in a Math Class**

10:30 AM - 10:45 AM

**Bryan Clair**, *Saint Louis University*

**Art of Teaching Mathematics**

10:50 AM - 11:05 AM

**Radmila Sazdanovic**, *North Carolina State University*  
**Andrew Cooper**, *North Carolina State University*

**Math = Art (or: How to Enhance Threaded Discussions)**

11:10 AM - 11:25 AM

**Debra M. Kean**, *DeVry University*

#### **MAA MathFest 2015 Exhibit Hall**

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9:00 AM - 5:00 PM, Marriott Wardman Park, Exhibit Hall

### UNDERGRADUATE STUDENT ACTIVITY

#### **Student Hospitality Center**

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9:00 AM - 5:00 PM, Marriott Wardman Park, Exhibit Hall

### GENERAL CONTRIBUTED PAPER SESSION

#### **History or Philosophy of Mathematics**

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9:15 AM - 11:25 AM, Marriott Wardman Park, Salon 1, Balcony A

**More of 1915: Why is Mathematics Continually Deemed So Essential to Science?**

9:15 AM - 9:25 AM

**G. Arthur Mihram**, *Princeton, NJ*  
**Danielle Mihram**, *University of Southern California*

**The Derivative Productions of Classical Heat Analyses**

9:30 AM - 9:40 AM

**Shigeru Masuda**, *Kyoto University*

**Romance in Many Dimensions**

9:45 AM - 9:55 AM

**Tereza Bartlova**, *Charles University in Prague*

**An Animation of the Maya Tzolkin Calendar**

10:00 AM - 10:10 AM

**Megan R. Rehm**, *Millersville University of Pennsylvania*  
**Cynthia E. Taylor**, *Millersville University of Pennsylvania*  
**Ximena Catepillan**, *Millersville University of Pennsylvania*

**On Mathematical Reasoning and the Decision Problem**

10:15 AM - 10:25 AM

**Linda Becerra**, *University of Houston-Downtown*  
**Ron Barnes**, *University of Houston-Downtown*

**The Sources Jeremiah Day Used in his 1823 Algebra Book**

10:30 AM - 10:40 AM

**Lokendra Paudel**, *New Mexico State University*

**History of Mathematics - The Illinois Connection**

10:45 AM - 10:55 AM

**Herbert Kasube**, *Bradley University*

**Mathematics, Baseball and Shakespeare: What Do They Have in Common?**

11:15 AM - 11:25 AM

**Charlie Smith**, *Park University*

**Thursday, August 6** (continued)

GENERAL CONTRIBUTED PAPER SESSION

**Teaching or Learning Calculus**

9:15 AM - 11:25 AM, Marriott Wardman Park, Salon 1, Balcony B

**Warmup Problems: How to Help Students Learn, Avoid Grading Homework, and Make All Your Dreams Come True**

9:15 AM - 9:25 AM

**Ryan Higginbottom**, *Washington & Jefferson College*

**The New Mathways Project's STEM Prep Curriculum: Learning Outcomes & Example Lessons**

9:30 AM - 9:40 AM

**Frank Savina**, *Charles A Dana Center, University of Texas, Austin*

**Stuart Boersma**, *Central Washington University*

**High Impact Practices at UHD: Calculus I Teaching Circle**

9:45 AM - 9:55 AM

**Sergiy Koshkin**, *UH-Downtown*

**Ronald Barnes**, *UH-Downtown*

**Jeong-Mi Yoon**, *UH-Downtown*

**Ryan Pepper**, *UH-Downtown*

**Plamen Simeonov**, *UH-Downtown*

**Timothy Redl**, *UH-Downtown*

**Volodymyr Hrynkiv**, *UH-Downtown*

**Arati Pati**, *UH-Downtown*

**A Surprisingly Simple Integral**

10:00 AM - 10:10 AM

**Alan Levine**, *Franklin and Marshall College*

**Integration By the Wrong Parts**

10:15 AM - 10:25 AM

**William Kronholm**, *Whittier College*

**Integrating Ideas: A Calculus II Project**

10:30 AM - 10:40 AM

**Jonathan Hulgan**, *Oxford College of Emory University*

**Reflections on Using Mastery-Based Testing in a Calculus II Course**

10:45 AM - 10:55 AM

**Alyssa Armstrong**, *Wittenberg University*

**The Effects of Assignment Timing on Student Learning**

11:00 AM - 11:10 AM

**Emma Smith Zbarsky**, *Wentworth Institute of Technology*

**Integrating First-year Physics and Mathematics through Project-based Learning**

11:15 AM - 11:25 AM

**Randall Crist**, *Creighton University*

**Gintaras Duda**, *Creighton University*

INVITED ADDRESS

**AMS-MAA Joint Invited Address**

**The Arithmetic of the Spheres**

9:30 AM - 10:20 AM, Marriott Wardman Park, Salon 2/3

**Jeffrey Lagarias**, *University of Michigan*

INVITED ADDRESS

**MAA Centennial Lecture 4**

**The Role and Function of Mathematical Models in Interdisciplinary Mentorship through Research: Lessons from the World of Epidemics**

10:30 AM - 11:20 AM, Marriott Wardman Park, Salon 2/3

**Carlos Castillo-Chavez**, *Arizona State University*

OTHER MATHEMATICAL SESSION

**MAA Prize Session**

11:35 AM - 12:20 PM, Marriott Wardman Park, Salon 2/3

UNDERGRADUATE STUDENT ACTIVITY

**Secrets of Mental Math**

1:00 PM - 1:50 PM, Marriott Wardman Park, Salon 2/3

**Arthur Benjamin**, *Harvey Mudd College*

PANEL SESSION

**Panel 2. Applying for and Obtaining Grants**

1:00 PM - 2:20 PM, Marriott Wardman Park, Salon 1

WORKSHOP

**USE Math: Undergraduate Sustainability Experiences in the Mathematics Classroom**

1:00 PM - 2:20 PM, Marriott Wardman Park, Maryland C

THEMED CONTRIBUTED PAPER SESSION

**TCPS#1: The History and Philosophy of Mathematics Part G - History and Philosophy of Mathematics**

1:00 PM - 2:25 PM, Marriott Wardman Park, Washington 4

**Robert Patterson: American 'Revolutionary' Mathematician**

1:00 PM - 1:25 PM

**Richard DeCesare**, *Southern Connecticut State University*

**Lisbon: Mathematics, Engineering and Planning in the Eighteenth Century**

1:30 PM - 1:55 PM

**Maria Zack**, *Point Loma Nazarene University*

**Vera on the Foundations of Mathematics**

2:00 PM - 2:25 PM

**Alejandro R. Garciadiego**, *UNAM*

## Thursday, August 6 (continued)

### TCPS#1: The History and Philosophy of Mathematics Part H – History and Philosophy of Mathematics

1:00 PM – 2:25 PM, Marriott Wardman Park, Washington 5

#### Yoshikatsu Sugiura: A Good Japanese Friend of Paul Dirac

1:00 PM – 1:25 PM

Michiyo Nakane, *Nihon University Research Institute of Science and Technology*

#### Ramanujan, Robin, Highly Composite Numbers, and the Riemann Hypothesis

1:30 PM – 1:55 PM

Jonathan Sondow, *Independent Scholar*

Jean-Louis Nicolas, *University of Lyon, France*

#### A Visit to the Vatican Library

2:00 PM – 2:25 PM

Matthew Haines, *Augsburg College*

MINICOURSE

### 1. The Hitchhiker's Guide to Mathematics (Part A)

1:00 PM – 3:00 PM, Omni Shoreham Hotel, Hampton Room

MINICOURSE

### 6. Creating Flipped Learning Experiences in the College Mathematics Classroom (Part A)

1:00 PM – 3:00 PM, Omni Shoreham Hotel, Calvert Room

THEMED CONTRIBUTED PAPER SESSION

### TCPS#13: Successful STEM Programs for Elementary Education Majors

1:00 PM – 3:15 PM, Marriott Wardman Park, Washington 2

#### Lecturing Left on the Cutting Room Floor: A Video Project for Pre-service Teachers

1:00 PM – 1:15 PM

Matthew D. Zawodniak, *University of Georgia*

#### Examining the Features and Outcomes of a STEM-Focused Elementary Teacher Preparation Program

1:20 PM – 1:35 PM

Temple A. Walkowiak, *North Carolina State University*

Valerie N. Faulkner, *North Carolina State University*

Paola Sztajn, *North Carolina State University*

#### Calculus for Pre-Service Elementary Teachers

1:40 PM – 1:55 PM

Alina N. Duca, *North Carolina State University*

Karen Keene, *North Carolina State University*

### Graduate Certificate in STEM Education

2:00 PM – 2:15 PM

Cynthia Orona, *University of Arkansas*

### An Overview of a Successful Mathematics Minor in Elementary Math Teaching at PUC

2:20 PM – 2:35 PM

Diana Underwood, *Purdue University Calumet*

Catherine Murphy, *Purdue University Calumet*

### The Pennsylvania Math Initiative: The First Three Years

2:40 PM – 2:55 PM

Andrew Baxter, *Penn State University, University Park*

Fran Arbaugh, *Penn State University, University Park*

George Andrews, *Penn State University, University Park*

### Reflections on Twenty Years of Wheelock College's Math/Science Majors for Prospective Elementary Teachers

3:00 PM – 3:15 PM

Debra K. Borkovitz, *Wheelock College*

INVITED SESSION

### AMS-MAA Invited Paper Session: The Arithmetic of the Spheres

1:00 PM – 3:50 PM, Marriott Wardman Park, Delaware A

#### The Apollonian Structure of Imaginary Quadratic Fields

1:00 PM – 1:20 PM

Katherine Stange, *University of Colorado Boulder*

#### Circles in the Sand

1:30 PM – 1:50 PM

Lionel Levine, *Cornell University*

#### Pythagoras Meets Euclid: A Euclidean Algorithm for Pythagorean Triples

2:00 PM – 2:20 PM

Dan Romik, *University of California Davis*

#### Dynamics of Apollonian Circle Packings

2:30 PM – 2:50 PM

Elena Fuchs, *University of Illinois Urbana-Champaign*

#### Variations on Apollonian Circle Packing Rules

3:00 PM – 3:20 PM

Steve Butler, *Iowa State University*

#### Geometry and Number Theory of Integral Sphere Packings

3:30 PM – 3:50 PM

Kei Nakamura, *University of California Davis*

## Thursday, August 6 (continued)

### INVITED SESSION

#### MAA Invited Paper Session: Improving Access to Mathematical Modeling Research

1:00 PM - 4:20 PM, Marriott Wardman Park, Delaware B

##### Global Disease Monitoring and Forecasting with Wikipedia

1:00 PM - 1:25 PM

Sara Del Valle, *Los Alamos National Laboratory*

##### Engaging students in applied mathematics via experiential learning through research

1:30 PM - 1:55 PM

Sherry Towers, *Arizona State University*

##### Overcoming Epistemic Obstacles to Teaching Mathematical Modeling in Calculus

2:00 PM - 2:25 PM

Patrick Thompson, *Arizona State University*

##### Mathematical Modeling Experiences in Secondary Schools

2:30 PM - 2:55 PM

Kathleen R. Fowler, *Clarkson University*

##### Mathematics Education Commentary: At the Interface Between Applied Mathematics and Mathematics Education

3:00 PM - 3:25 PM

Carlos Castillo-Garsow, *Eastern Washington University*

##### Applied Mathematics Commentary: Math at Top Speed: The Role of Mathematical Modeling in Science and in My Personal Life

3:30 PM - 4:20 PM

Richard Tapia, *Rice University*

### GENERAL CONTRIBUTED PAPER SESSION

#### Geometry

1:00 PM - 4:40 PM, Marriott Wardman Park, Salon 1, Balcony B

##### Exploring Mathematical Ideas through Origami

1:00 PM - 1:10 PM

Arsalan Wares, *Valdosta State University*

##### The Right Pascal's Triangle

1:15 PM - 1:25 PM

Yaping Liu, *Pittsburg State University*

##### Generalizing the Law of Cosines

1:30 PM - 1:40 PM

Lee N. Collins, *County College of Morris*

Tom Osler, *Rowan University*

##### Perfect Heptagons and 13-Sided Triskaidecagons

1:45 PM - 1:55 PM

Gengmun Eng

##### How to Add Guards to an Art Gallery

2:00 PM - 2:10 PM

T. S. Michael, *United States Naval Academy*

Val Pinciu, *United States Naval Academy*

##### New Perspectives on Polygonal Area

2:15 PM - 2:25 PM

Owen D. Byer, *Eastern Mennonite University*

##### Area Bounds of Covers of Unit Arcs

2:30 PM - 2:40 PM

Libin Mou, *Bradley University*

##### What Isn't an Ellipse?

2:45 PM - 2:55 PM

Alex Meadows, *St. Mary's College of Maryland*

Casey Douglas, *St. Mary's College of Maryland*

##### The Bounding Problem for Infra-Solvmanifolds

3:00 PM - 3:10 PM

Scott V. Thuong, *Pittsburg State University*

##### Nested Sequences of Triangles in Non-Euclidean Spaces

3:15 PM - 3:25 PM

Andrew Lazowski, *Sacred Heart University*

##### Excursions in Combinatorial Taxicab Geometry

3:30 PM - 3:40 PM

John Best, *Summit University of Pennsylvania*

##### Inequalities in Spherical Geometry: Ancient and Modern

3:45 PM - 3:55 PM

Marshall Whittlesey, *California State University San Marcos*

##### Angle-of-Parallelism Spectra in Non-Homogeneous Geometries

4:00 PM - 4:10 PM

J. Mealy, *Austin College*

Malin Pappas, *Austin College*

##### A New Theorem Concerning Isopivotal Cubics, Could it be the 'Swiss Army Knife' of Geometry?

4:15 PM - 4:25 PM

Ivan Zelich, *Anglican Church Grammar School*

## Thursday, August 6 (continued)

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### Plane Geometry Construction of Gravity Field Mechanical Energy Curves

4:30 PM - 4:40 PM

Alexander L. Garron, *Sand Box Geometry LLC*

GENERAL CONTRIBUTED PAPER SESSION

### Teaching or Learning Introductory Mathematics Part B

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1:00 PM - 4:40 PM, Marriott Wardman Park, Maryland B

### "Reverse Engineering" to Strengthen Critical Thinking for Pre-Service Teachers

1:00 PM - 1:10 PM

J. Lyn Miller, *Slippery Rock University*

### An Algebra Course for Pre-Service Middle Level Teachers

1:15 PM - 1:25 PM

Dorothee J. Blum, *Millersville University*

### Designing a General Education Mathematics Course in Linear Algebra

1:30 PM - 1:40 PM

David Hecker, *St. Joseph's University*  
Stephen Andrilli, *La Salle University*

### Fractals, Linear Algebra, Python, and Sage: A Linear Algebra Course for Computer Science Majors

1:45 PM - 1:55 PM

Vincent J. Matsko, *University of San Francisco*

### Project-Based Learning in First Year General Education Mathematics Courses

2:00 PM - 2:10 PM

Zeynep Teymuroglu, *Rollins College*

### Problem Exists Between Keyboard and Chair: Filling in the Gaps in Online Homework

2:15 PM - 2:25 PM

Sara Malec, *Hood College*

### Reflection Paper, Poster, and Presentation: A Unique Final Examination Experience for a Liberal Arts Mathematics Course

2:30 PM - 2:40 PM

Sarah L. Mabrouk, *Framingham State University*

### Math and Civil Rights: An Interdisciplinary Reading Course

2:45 PM - 2:55 PM

Rachel Weir, *Allegheny College*

### Teaching Strategies for Summer Math Courses

3:00 PM - 3:10 PM

Jeremiah Bartz, *Francis Marion University*

### A Collaborative Partnership to Teach Mathematical Reasoning Using Computer Programming (CPR2)

3:15 PM - 3:25 PM

Cynthia L. Stenger, *University of North Alabama*  
James A. Jerkins, *University of North Alabama*

### Critical Thinking and Mathematical Habits of Mind

3:30 PM - 3:40 PM

Marshall Gordon, *Park School of Baltimore*

### Developing Mathematical Authenticity, Maturity, and Aesthetic Experience in Pre-Calculus and Earlier Learners

3:45 PM - 3:55 PM

Deborah W. Devlin, *Frostburg State University*  
G. Gerard Wojnar, *Frostburg State University*

### Pedagogical Strategies for Quantitative Reasoning, Literacy, and Writing for Non-Science Majors

4:00 PM - 4:10 PM

Mike LeVan, *Transylvania University*

### Experiencing a 'GREAT' Project in a Liberal Arts Mathematics Course

4:15 PM - 4:25 PM

Mary B. Walkins, *The Community College of Baltimore County*

### Teaching Focused at a Research University: Temple University Mathematics

4:30 PM - 4:40 PM

Ellen Panofsky, *Temple University*  
Maria Lorenz, *Temple University*

GENERAL CONTRIBUTED PAPER SESSION

### Applied Mathematics

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1:00 PM - 4:55 PM, Marriott Wardman Park, Washington 3

### A New Directed Interval Arithmetic

1:00 PM - 1:10 PM

Sijie Liu, *University of Alabama*

### An Alternative Way of Calculating Area of Closed Regions in Parabolas

1:15 PM - 1:25 PM

Yavuz Sidal, *İşiklar Air Force High School*

**Thursday, August 6** (continued)**Iteratively Regularized Gauss–Newton Method for Applied Inverse Problems**

1:30 PM – 1:40 PM

Leslie Meadows, *GSU - Dept. of Mathematics and Statistics***On the Equilibrium Configurations of Flexible Fibers in a Flow**

1:45 PM – 1:55 PM

Bogdan Nita, *Montclair State University***Master Stability Functions for Synchronized Identical Systems with Linear Delay–Coupling**

2:00 PM – 2:10 PM

Stanley R. Huddy, *Fairleigh Dickinson University***Initial Condition and Stability of Differential Equations**

2:15 PM – 2:25 PM

Hassan K. Mansour, *El Centro College*Mike Panahi, *El Centro College*Dale Pearson, *El Centro College***A Seventh Order Block Integrator for Solving Stiff Systems**

2:30 PM – 2:40 PM

Blessing I. Akinnukawe, *University of Lagos, Lagos, Nigeria*Solomon A. Okunuga, *University of Lagos, Lagos, Nigeria***Mathematical Modeling of Continuous and Intermittent Androgen Deprivation Therapy for Advanced Prostate Cancer**

2:45 PM – 2:55 PM

Alacia M. Voth, *Sam Houston State University*John G. Alford, *Sam Houston State University*Edward W. Swim, *Sam Houston State University***Development and Implementation of a Pharmacokinetic Model as the Target Equation for a PID Control System**

3:00 PM – 3:10 PM

George W. Carpenter, *Louisiana Tech University*E. A. Sherer, *Louisiana Tech University*D. P. O'Neal, *Louisiana Tech University*I. B. Magana, *Louisiana Tech University*P. Adhikari, *Louisiana Tech University*Holly Grigsby, *Louisiana Tech University*Katie Evans, *Louisiana Tech University***A Numerical Solution to Boundary Value Problems and Volterra Integrals**

3:15 PM – 3:25 PM

Hamid Semiyari, *James Madison University***Identification Problem for Klein–Gordon Equation**

3:30 PM – 3:40 PM

Qinghua Luo, *Marian University***Reduced Basis Method for Solving the Hyperspectral Diffuse Optical Tomography Model**

3:45 PM – 3:55 PM

Rachel Grotheer, *Clemson University*Thilo Strauss, *Clemson University*Taufiqar Khan, *Clemson University***Where Is the Hypergeometric Distribution Used (Besides Card Games)?**

4:00 PM – 4:10 PM

Luis F. Moreno, *SUNY Broome Community College***Temporal Network Dynamics**

4:15 PM – 4:25 PM

Haley A. Yapple, *Carthage College***A New Way to Measure Competitive Balance Across Sports Leagues**

4:30 PM – 4:40 PM

Jake Lehman, *Cornell College*Brian Cristion, *Cornell College*Jordan Wolfe, *Cornell College*Tyler Skorczewski, *Cornell College***Counting Mutations and Anti-Chains in Binary Trees and Motzkin Trees**

4:45 PM – 4:55 PM

Lifoma Salaam, *Howard University*

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#11: Cultivating Critical Thinking through Active Learning in Mathematics Part B**

1:00 PM – 5:15 PM, Marriott Wardman Park, Washington 1

**Using Projects to Enrich and Expand in the Classroom**

1:00 PM – 1:15 PM

Meghan De Witt, *St Thomas Aquinas College***Using Learning Logs to Cultivate Critical Thinking Skills**

1:20 PM – 1:35 PM

Roger Wolbert, *University at Buffalo***Linked Math and English in an Active Learning Classroom**

1:40 PM – 1:55 PM

Victor Piercey, *Ferris State University***Active Learning through Formative Assessments**

2:00 PM – 2:15 PM

Maggie McHugh, *La Crosse School District*Jennifer Kosiak, *University of Wisconsin-La Crosse*

## Thursday, August 6 (continued)

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### **Making Problem ~Asking the Students to Make Up Problem~**

2:20 PM - 2:35 PM

**Noriko Tanaka**, *Toyota-nishi High School (Japan)*

### **Teaching with Your Mouth Shut - Inquiry Based Learning in Upper Level Mathematics Courses**

2:40 PM - 2:55 PM

**Shay Fuchs**, *University of Toronto Mississauga*

### **Student Centered Learning of Number Theory for Reluctant Mathematics Majors**

3:00 PM - 3:15 PM

**Daniel R. Shifflet**, *Clarion University of Pennsylvania*

### **Putting the "Real" Back in Real Analysis**

3:20 PM - 3:35 PM

**Justin Wright**, *Plymouth State University*

### **Discussing Mathematical Creativity at the Undergraduate Level**

3:40 PM - 3:55 PM

**Houssein El Turkey**, *University of New Haven*  
**Gulden Karakok**, *University of Northern Colorado*  
**Milos Savic**, *University of Oklahoma*  
**Gail Tang**, *University of La Verne*  
**Emilie Naccarato**, *University of Northern Colorado*

### **Mathematics Applied Through Programming, Modeling, and Games**

4:00 PM - 4:15 PM

**Leslie Jones**, *University of Tampa*  
**Britney Hopkins**, *University of Central Oklahoma*

### **Blended Delivery and Asynchronous Active-Learning Strategies in Developmental Math: a Case Study**

4:20 PM - 4:35 PM

**Filippo Posta**, *Grand Canyon University*

### **Achieving a Successful Active Learning Environment in an Online Math/Stat Undergraduate Course**

4:40 PM - 4:55 PM

**Christy S. Langley**, *University of Louisiana at Lafayette*  
**Julie Roy**, *University of Louisiana at Lafayette*

### **Synchronous Active Learning in Online and Hybrid Environments**

5:00 PM - 5:15 PM

**Carolyn Johns**, *The Ohio State University*

#### GRADUATE STUDENT ACTIVITY

### **Graduate Student Q&A**

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2:00 PM - 3:30 PM, Marriott Wardman Park, Park Tower 8224

#### UNDERGRADUATE STUDENT ACTIVITY

### **MAA Student Paper Session #7**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia A

### **MAA Student Paper Session #8**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia B

### **MAA Student Paper Session #9**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia C

### **MAA Student Paper Session #10**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson A

#### UNDERGRADUATE STUDENT ACTIVITY

### **PME Student Paper Session #1**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson B

### **PME Student Paper Session #2**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson C

#### THEMED CONTRIBUTED PAPER SESSION

### **TCPS#1: The History and Philosophy of Mathematics Part J - History and Philosophy of Mathematics**

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2:30 PM - 4:55 PM, Marriott Wardman Park, Washington 4

### **Mathematical Structuralism and Mathematical Applicability**

2:30 PM - 2:55 PM

**Elaine Landry**, *University of California, Davis*

### **Designing Mathematics: the Role of Axioms**

3:00 PM - 3:25 PM

**Jean-Pierre Marquis**, *Université de Montréal*

### **Does the Indispensability Argument Leave Open the Question of the Causal Nature of Mathematical Entities?**

3:30 PM - 3:55 PM

**Alexandru Manafu**, *IHPST Paris*

### **How Does the Mind Construct/Discover Mathematical Propositions?**

4:00 PM - 4:25 PM

**Carl Behrens**, *Alexandria, VA*

### **What is an Adequate Epistemology for Mathematics?**

4:30 PM - 4:55 PM

**Jeff Buechner**, *Rutgers University-Newark*

**Thursday, August 6** (continued)

PANEL SESSION

**Panel 8. What Mathematics Do Engineering Students Need to Know in the First Two Years? (And What If It Doesn't Start With Calculus?)**

2:35 PM - 3:55 PM, Marriott Wardman Park, Salon 1

SPECIAL MAA CENTENNIAL EVENT

**Presidential Reminiscences**

3:00 PM - 4:45 PM, Marriott Wardman Park, Salon 2/3

POSTER SESSION

**Classroom Activities and Projects within the Context of Environmental Sustainability**

3:30 PM - 5:00 PM, Marriott Wardman Park, Exhibit Hall A

MINICOURSE

**5. Using Videos of Students Developing Proofs to Guide Teaching and Learning (Part A)**

3:30 PM - 5:30 PM, Omni Shoreham Hotel, Calvert Room

MINICOURSE

**8. Getting Started in the Scholarship of Teaching and Learning (Part A)**

3:30 PM - 5:30 PM, Omni Shoreham Hotel, Hampton Room

UNDERGRADUATE STUDENT ACTIVITY

**MAA Student Paper Session #11**

4:00 PM - 6:15 PM, Marriott Wardman Park, Virginia A

**MAA Student Paper Session #12**

4:00 PM - 6:15 PM, Marriott Wardman Park, Virginia B

**MAA Student Paper Session #13**

4:00 PM - 6:15 PM, Marriott Wardman Park, Virginia C

**MAA Student Paper Session #14**

4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson A

UNDERGRADUATE STUDENT ACTIVITY

**PME Student Paper Session #3**

4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson B

**PME Student Paper Session #4**

4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson C

PANEL SESSION

**Panel 12. Finding Your New Niche: Staying Fresh**

4:10 PM - 5:30 PM, Marriott Wardman Park, Washington 6

SIGMAA ACTIVITY

**POM SIGMAA Guest Lecture**

**What are mathematical objects, and who cares?**

5:00 PM - 5:50 PM, Marriott Wardman Park, Washington 4

OTHER MATHEMATICAL SESSION

**The Man Who Knew Infinity: Sneak Peek and Expert Panel**

5:00 PM - 6:00 PM, Marriott Wardman Park, Salon 2/3

**Ken Ono, Emory University**

SOCIAL EVENT

**Graduate Student Reception**

6:00 PM - 7:00 PM, Marriott Wardman Park, Chef's Table at Stone's Throw

SOCIAL EVENT

**Mathematicians by Day, Musicians by Night**

8:00 PM - 9:30 PM, Marriott Wardman Park, Salon 2/3

**Friday, August 7**

**Registration**

8:00 AM - 5:00 PM, Marriott Wardman Park, Convention Registration

THEMED CONTRIBUTED PAPER SESSION

**TCPS#1: The History and Philosophy of Mathematics Part K - Special Session on Mathematical Communities**

8:00 AM - 10:25 AM, Marriott Wardman Park, Washington 4

**A Partial History of Math Circles**

8:00 AM - 8:25 AM

**Diana White, University of Colorado Denver**

**Brandy Wieggers, University of Central Washington**

**An American Postulate Theorist: Edward V. Huntington**

8:30 AM - 8:55 AM

**Janet H. Barnett, Colorado State University - Pueblo**

**Combatting the "Legion of Half-Wits": the Contentious Mathematicians of the Paris Academy of Sciences**

9:00 AM - 9:25 AM

**Lawrence D'Antonio, Ramapo College**

## Friday, August 7 (continued)

### The Mathematics in 'Mathematical Instruments': The Case of the Royal Geographical Society, London, in the Mid to Late Nineteenth Century

9:30 AM - 9:55 AM

Jane Wess, *Edinburgh University/Royal Geographical Society-IBG*

### Did American Professors Form a Mathematical Community in the Early 19th Century?

10:00 AM - 10:25 AM

Amy Ackerberg-Hastings, *University of Maryland University College*

#### INVITED ADDRESS

### AWM-MAA Etta Z. Falconer Lecture

#### "A Multiplicity All At Once": Mathematics for Everyone, Everywhere

8:30 AM - 9:20 AM, Marriott Wardman Park, Salon 2/3

Erica Walker, *Columbia University*

#### THEMED CONTRIBUTED PAPER SESSION

### TCPS#3: Math Circle Problems in Honor of the MAA's 100th Anniversary

8:30 AM - 11:05 AM, Marriott Wardman Park, Washington 6

#### Coordinating a State-Wide Math Contest

8:30 AM - 8:45 AM

Abraham S. Mantell, *Nassau Community College*

#### Abbot and Costello Numbers

8:50 AM - 9:05 AM

Mary Garner, *Gateway Community Math Center*  
Virginia Watson, *Gateway Community Math Center*

#### Exploring the 100 (and 1) Spaces of Prime Climb in a Math Teachers' Circle

9:10 AM - 9:25 AM

Jialing Dai, *University of the Pacific*  
Christopher Goff, *University of the Pacific*  
Sara Malec, *Hood College*  
Dennis Parker, *University of the Pacific*

#### Growing Math Circles for the Next 100 Years

9:30 AM - 9:45 AM

Brandy Wiegers, *Central Washington University/National Association of Math Circles*  
Diana White, *University of Colorado, Denver/National Association of Math Circles*

#### 100 Problems Involving the Number 100

9:50 AM - 10:05 AM

James Tanton, *MAA*

#### The Cell Phone Dropping Problem

10:10 AM - 10:25 AM

Japheth Wood, *Bard College*  
Philip B. Yasskin, *Texas A&M University*

#### From 100s in a Number to 100 Squares on a 10x10 Checker Board (Or Are There More?)

10:30 AM - 10:45 AM

Victoria Kofman, *Quality Engineering Education, Inc.*

#### Spinout, The Brain, Gray Code, and 100

10:50 AM - 11:05 AM

George McNulty, *University of South Carolina*  
Nieves McNulty, *Columbia College*  
Douglas B. Meade, *University of South Carolina*

#### GENERAL CONTRIBUTED PAPER SESSION

### Analysis and Other

8:30 AM - 11:10 AM, Marriott Wardman Park, Salon 1, Balcony B

#### Green's Functions for Right Focal Boundary Value Problems in Nabla Fractional Calculus

8:30 AM - 8:40 AM

Julia St. Goar, *University of Nebraska-Lincoln*

#### Periodic Behavior of Nonlinear 2nd Order Discrete Dynamical Systems

8:45 AM - 8:55 AM

Dan Maroncelli, *Concordia University St. Paul*  
Jesus Rodriguez, *North Carolina State University*

#### The Existence of Positive Solutions to an Even Order Differential Equation with Right Focal Boundary Conditions

9:00 AM - 9:10 AM

Britney Hopkins, *University of Central Oklahoma*  
Kristi Karber, *University of Central Oklahoma*

#### Algebra, Analysis, and Geometry in the Solution of the Basel Problem

9:15 AM - 9:25 AM

C. L. Frenzen, *Naval Postgraduate School*

#### Elementary Approach to End Compactifications

9:30 AM - 9:40 AM

Malgorzata A. Marciniak, *CUNY*

#### Composition of Formal Laurent Series

9:45 AM - 9:55 AM

Xiao-Xiong Gan, *Morgan State University*

**Friday, August 7** (continued)

**An Example for Green's Theorem with Discontinuous Partial Derivatives**

10:00 AM - 10:10 AM

**Adam Coffman**, *Indiana-Purdue Fort Wayne*  
**Yuan Zhang**, *Indiana-Purdue Fort Wayne*

**Equivalence of Some Picard-type Iterations for a General Class of Operators in Normed Linear Spaces**

10:15 AM - 10:25 AM

**Hudson Akewe**, *University of Lagos*

**Operator Diagonalizations of Multiplier Sequences**

10:30 AM - 10:40 AM

**Robert Bates**, *University of Hawaii at Manoa*

**Non-Linear Operators Satisfying Orthogonality Properties**

10:45 AM - 10:55 AM

**William Feldman**, *University of Arkansas*

**A Survey of Best Monotone Theorems in Graph Theory**

11:00 AM - 11:10 AM

**Douglas Bauer**, *Stevens Institute of Technology*  
**Hajo J. Broersma**, *University of Twente*  
**Nathan Kahl**, *Seton Hall University*  
**Aori Nevo**, *Stevens Institute of Technology*  
**Edward Schmeichel**, *San Jose State University*  
**Douglas R. Woodall**, *University of Nottingham*  
**Michael Yatauro**, *Penn State Brandywine*

UNDERGRADUATE STUDENT ACTIVITY

**MAA Student Paper Session #15**

8:30 AM - 11:45 AM, Marriott Wardman Park, Virginia A

**MAA Student Paper Session #16**

8:30 AM - 11:45 AM, Marriott Wardman Park, Virginia B

**MAA Student Paper Session #17**

8:30 AM - 11:45 AM, Marriott Wardman Park, Virginia C

**MAA Student Paper Session #18**

8:30 AM - 11:45 AM, Marriott Wardman Park, Wilson A

UNDERGRADUATE STUDENT ACTIVITY

**PME Student Paper Session #5**

8:30 AM - 11:45 AM, Marriott Wardman Park, Wilson B

**PME Student Paper Session #6**

8:30 AM - 11:45 AM, Marriott Wardman Park, Wilson C

INVITED SESSION

**MAA Invited Paper Session: Algebraic Structures Motivated by Knot Theory**

9:00 AM - 11:20 AM, Marriott Wardman Park, Delaware A

**Knots and Knot Theory**

9:00 AM - 9:40 AM

**Lou Kauffman**, *University of Illinois at Chicago*

**Knot Coloring: A Diagrammatic Approach to Algebraic Invariants**

9:50 AM - 10:30 AM

**Heather Russell**, *Washington College*

**Topological Symmetries of Molecules**

10:40 AM - 11:20 AM

**Erica Flapan**, *Pomona College*

**MAA MathFest 2015 Exhibit Hall**

9:00 AM - 5:00 PM, Marriott Wardman Park, Exhibit Hall

UNDERGRADUATE STUDENT ACTIVITY

**Student Hospitality Center**

9:00 AM - 5:00 PM, Marriott Wardman Park, Exhibit Hall

GENERAL CONTRIBUTED PAPER SESSION

**Probability or Statistics**

9:15 AM - 11:25 AM, Marriott Wardman Park, Maryland B

**An Exploration into Grouped Current Status Data**

9:15 AM - 9:25 AM

**Lucia C. Petito**, *UC Berkeley*  
**Nicholas P. Jewell**, *UC Berkeley*

**Using the Mathematical Sciences to Protect Data**

9:30 AM - 9:40 AM

**Paul Massell**, *U.S. Census Bureau*

**Stability - A New Way to Compare Statistical Measures: Theory and Applications for Assessing Learner Achievement and Teaching Effectiveness**

9:45 AM - 9:55 AM

**David DiMarco**, *Neumann University*  
**Ryan Savitz**, *Neumann University*  
**Fred Savitz**, *Neumann University*

**Lefty-Righty Experiment: A Group Project for An Individual Grade**

10:00 AM - 10:10 AM

**Tuyetdong Phan-Yamada**, *Glendale Community College*  
**Walter M. Yamada, III**, *Children's Hospital Los Angeles*

## Friday, August 7 (continued)

### Statistics and Japan: Bringing Themes into Elementary Statistics Courses

10:15 AM - 10:25 AM

Pat Kiihne, *Illinois College*

### Analyzing Distributions by Visualization in a Probability and Statistics Class

10:30 AM - 10:40 AM

Jason Moliterno, *Sacred Heart University*

### Inverting an Introductory Statistics Course

10:45 AM - 10:55 AM

Gertrud L. Kraut, *Southern Virginia University*

### Probability and Possibilities: A Promising Pedagogy

11:00 AM - 11:10 AM

Deborah J. Gougeon, *University of Scranton*

### Using Conway's Napkin Problem in an Introductory Probability Class

11:15 AM - 11:25 AM

Shenglan Yuan, *LaGuardia Community College, CUNY*

#### GENERAL CONTRIBUTED PAPER SESSION

### Teaching or Learning Developmental Mathematics and Assessment

9:15 AM - 11:25 AM, Marriott Wardman Park, Salon 1, Balcony A

#### Conceptual Learning in Mathematics Upper Secondary Education: The International Baccalaureate

9:15 AM - 9:25 AM

Neil Hendry, *International Baccalaureate*

#### Developmental Mathematics Remediation through an Online Summer Bridge Program

9:30 AM - 9:40 AM

James Sobota, *University of Wisconsin-La Crosse*

Jennifer Kosiak, *University of Wisconsin-La Crosse*

Maggie McHugh, *La Crosse School District*

Robert Hoar, *University of Wisconsin-La Crosse*

Robert Allen, *University of Wisconsin-La Crosse*

#### For Developmental Students, a Different Way of Working with Fractions, Solving Linear Equations, Obtaining the Equation of a Straight Line and Rigorously Defining Real Numbers

9:45 AM - 9:55 AM

Maria T. Alzugaray, *Suffolk County Community College*

#### Dividing Process in Base-10 Number System: Reversed Dividing Process for $1/X$

10:00 AM - 10:10 AM

Nick H. Huang, *Howard Consulting*

#### What Should be the Content of a Developmental Algebra Class?

10:15 AM - 10:25 AM

Carlos Nicolas, *Ferrum College*

#### A Critical Reflection on the Development and Promotion of Constructivist-Learning Environment in Mathematics at the Intermediate Phase in South Africa

10:30 AM - 10:40 AM

Lateef N. Najeem, *University of South Africa*

#### One Student's Journey on the Road to Sense-Making in Algebra

10:45 AM - 10:55 AM

Janet St. Clair, *Alabama State University*

#### The University of Illinois Math Placement Program: A Retrospection on 8 Years and 75,000+ Students

11:00 AM - 11:10 AM

Alison Reddy, *University of Illinois*

#### An Assessment of Student-Centered Learning Across Multi-Sections of 'Large' College Algebra Classrooms: An On-Going Study

11:15 AM - 11:25 AM

Perry Y.C. Lee, *Kutztown University of Pennsylvania*

Padraig McLoughlin, *Kutztown University of Pennsylvania*

#### INVITED ADDRESS

### Earl Raymond Hedrick Lecture Series

#### Hedrick Lecture 2

9:30 AM - 10:20 AM, Marriott Wardman Park, Salon 2/3

Karen Smith, *University of Michigan*

#### GRADUATE STUDENT ACTIVITY

### Graduate Student Q&A

9:30 AM - 11:00 AM, Marriott Wardman Park, Park Tower 8224

#### INVITED ADDRESS

### MAA Centennial Lecture 5

#### CSHPM Kenneth O. May Lecture

#### "We Are Evidently on the Verge of Important Steps Forward": The American Mathematical Community, 1915-1950

10:30 AM - 11:20 AM, Marriott Wardman Park, Salon 2/3

Karen Parshall, *University of Virginia*

#### INVITED ADDRESS

### NAM David Harold Blackwell Lecture

#### Mathematics, Mathematicians, Mathematics Education and Equity: Challenges and Opportunities

1:00 PM - 1:50 PM, Marriott Wardman Park, Salon 2/3

Terrence Blackman, *The University of Denver*

**Friday, August 7** (continued)

PANEL SESSION

**Panel 1. A Common Vision for the Undergraduate Mathematics Program in 2025**

1:00 PM - 2:20 PM, Marriott Wardman Park, Salon 1

WORKSHOP

**Beauty of Three Dimensional Polyhedra Workshop (in Celebration of the MAA's Centennial)**

1:00 PM - 2:20 PM, Marriott Wardman Park, Maryland C

THEMED CONTRIBUTED PAPER SESSION

**TCPS#17: Curriculum and Course Development to Support First Year STEM Students**

1:00 PM - 2:55 PM, Marriott Wardman Park, Washington 3

**Supporting Students in Health Sciences**

1:00 PM - 1:15 PM

*Magdalena Luca, MCPHS University*

**A Watershed Year in STEM Education at Sonoma State University**

1:20 PM - 1:35 PM

*Martha Shott, Sonoma State University*

**FastTrack: A Collaborative Effort to Support STEM Students**

1:40 PM - 1:55 PM

*Jennifer Kosiak, University of Wisconsin-La Crosse*

*James Sobota, University of Wisconsin-La Crosse*

*Robert Hoar, University of Wisconsin-La Crosse*

*Maggie McHugh, La Crosse School District*

**Summer Curriculum for Selected Incoming Freshmen and Transfer STEM Students**

2:00 PM - 2:15 PM

*Amanda L. Hattaway, Wentworth Institute of Technology*

*Kathleen Grace Kennedy, Wentworth Institute of Technology*

*Emma Smith Zbarsky, Wentworth Institute of Technology*

**Implementing Learning Labs as Instructional Support for Freshman Calculus**

2:20 PM - 2:35 PM

*K. Grace Kennedy, Wentworth Institute of Technology*

*Emma Smith Zbarsky, Wentworth Institute of Technology*

*Amanda Hattaway, Wentworth Institute of Technology*

*Joan Giblin, Wentworth Institute of Technology*

**Thinking On Your Feet Does No Harm**

2:40 PM - 2:55 PM

*Paul N. Runnion, Missouri S&T*

MINICOURSE

**2. The Mathematics of Games and Gambling (Part B)**

1:00 PM - 3:00 PM, Omni Shoreham Hotel, Hampton Room

MINICOURSE

**4. Recruiting Students to Take More Mathematics Courses and to be Mathematics Majors (Part B)**

1:00 PM - 3:00 PM, Omni Shoreham Hotel, Calvert Room

GENERAL CONTRIBUTED PAPER SESSION

**Teaching or Learning Advanced Mathematics**

1:00 PM - 3:10, Marriott Wardman Park, Salon 1, Balcony B

**Teaching Quantifiers via Map Coloring**

1:00 PM - 1:10 PM

*John McSweeney, Rose-Hulman Institute of Technology*

**Teaching Linear Independence with Process Oriented Guided Inquiry Learning (POGIL)**

1:15 PM - 1:25 PM

*Kseniya Fuhrman, Milwaukee School of Engineering*

*Cynthia Farthing, University of Iowa*

**Four Stages in Teaching Linear Algebra: From Diagnosis, Connection, Deepening to Application**

1:30 PM - 1:40 PM

*Wen-Haw Chen, Department of Applied Mathematics, Tunghai University*

**Visualizing the Actions of Abelian Groups**

1:45 PM - 1:55 PM

*Jennifer F. Vasquez, The University of Scranton*

**Where Can We Use Abstract Algebra?**

2:00 PM - 2:10 PM

*Fariba Nowrouzi-Kashan, Kentucky Sytate University*

**Exterior Algebra in the Undergraduate Curriculum**

2:15 PM - 2:25 PM

*Boyd Coan, Norfolk State University*

**Writing Projects in Combinatorics and Graph Theory**

2:30 PM - 2:40 PM

*Mahmud Akelbek, Weber State University*

**Empowering Undergraduate Students through Project-Oriented Independent Studies**

2:45 PM - 2:55 PM

*Zhewei Dai, Alma College*

**Rekindling Critical Thinking: Heeding Major Errors in Typical "Transition to Proof" Textbooks**

3:00 PM - 3:10 PM

*Raymond T. Boute, Ghent University*

## Friday, August 7 (continued)

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### INVITED SESSION

#### **MAA Invited Paper Session: Concrete Computations in Algebra and Algebraic Geometry**

1:00 PM - 3:20 PM, Marriott Wardman Park, Delaware B

##### **Continued Fractions Can Resolve Singularities?!**

1:00 PM - 1:20 PM

**Robert Walker**, *University of Michigan*

##### **The Search for Indecomposable Modules**

1:30 PM - 1:50 PM

**Courtney Gibbons**, *Hamilton College*

##### **The Importance of $\alpha$**

2:00 PM - 2:20 PM

**Mike Janssen**, *Dordt College*

##### **Pictures of Syzygies**

2:30 PM - 2:50 PM

**Timothy Clark**, *Loyola University*

##### **When Do 10 Points Lie on a Cubic Curve?**

3:00 PM - 3:20 PM

**Will Traves**, *United States Naval Academy*

### THEMED CONTRIBUTED PAPER SESSION

#### **TCPS#19: Innovative Approaches in the Calculus Sequence Part A**

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1:00 PM - 3:35 PM, Marriott Wardman Park, Washington 6

##### **Calculus for Life Sciences: A Two-Semester Calculus Sequence for Biology and Health Science Majors**

1:00 PM - 1:15 PM

**Anthony DeLegge**, *Benedictine University*

##### **Resequencing Calculus I & II**

1:20 PM - 1:35 PM

**Charlotte Knotts-Zides**, *Wofford College*

##### **Rethinking the Sequence of the Content of Calculus I for Deeper Conceptual Understanding**

1:40 PM - 1:55 PM

**Jose A. Jimenez**, *Penn State Hazleton*

##### **Multivariable Calculus Reordered and Rethought**

2:00 PM - 2:15 PM

**Robert Sachs**, *George Mason University*

##### **An Innovative, Three-Dimensional Approach to Multivariable Calculus Instruction**

2:20 PM - 2:35 PM

**Jason Samuels**, *City University of New York*

**Aaron Wangberg**, *Winona State University*

**Brian Fisher**, *Lubbock Christian University*

##### **Exploring Multivariable Calculus Concepts in Context through Physical Surfaces**

2:40 PM - 2:55 PM

**Dale Buske**, *St. Cloud State University*

##### **Inquiry Based Instructional Supplement (IBIS) for Calculus Sequence**

3:00 PM - 3:15 PM

**Karmen T. Yu**, *Montclair State University*

**Justin Seventko**, *Montclair State University*

**Trina Wooten**, *Montclair State University*

##### **An Instructor's Perspective of Flipping Calculus: The Pros and Cons**

3:20 PM - 3:35 PM

**Caleb Adams**, *Radford University*

### THEMED CONTRIBUTED PAPER SESSION

#### **TCPS#2: The Contributions of Women to Mathematics: 100 Years and Counting Part A**

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1:00 PM - 3:55 PM, Marriott Wardman Park, Washington 2

##### **One of the Most Significant Woman in Matrix Theory - Olga Taussky-Todd**

1:00 PM - 1:15 PM

**Sandra Fital-Akelbek**, *Weber State University*

##### **Pie Charts, Pearson, and the Prussian Army: Celebrating Florence Nightingale and FN David**

1:20 PM - 1:35 PM

**Samuel Luke Tunstall**, *Appalachian State University*

##### **American Women Mathematics PhDs of the 1940s and 1950s**

1:40 PM - 1:55 PM

**Margaret Murray**, *University of Iowa*

##### **African American Women Mathematicians**

2:00 PM - 2:15 PM

**Darlene Butler**, *Arkansas State University-Beebe*

##### **Making Her Mark on a Century of Turmoil and Triumph: A Tribute to Polish and Polish-American Women in Mathematics**

2:20 PM - 2:35 PM

**Emelie Kenney**, *Siena College*

##### **A Well-Kept Secret: Women in Mathematics Education**

2:40 PM - 2:55 PM

**Jacqueline Dewar**, *Loyola Marymount University*

##### **Interesting Women in the Missouri MAA Section**

3:00 PM - 3:15 PM

**Leon Hall**, *Missouri S&T*

**Friday, August 7** (continued)

**Life and Research of Vasanti Bhat-Nayak**

3:20 PM - 3:35 PM

**Pallavi Jayawant**, *Bates College*

**Iran and Women in Mathematics**

3:40 PM - 3:55 PM

**Sahar M. Kashan**, *DuPont Manual High School*  
**Fariba Nowrozi-Kashan**, *Kentucky State University*

GENERAL CONTRIBUTED PAPER SESSION

**Interdisciplinary Topics in Mathematics and Modeling or Applications**

1:00 PM - 4:25 PM, Marriott Wardman Park, Maryland B

**Experiences Teaching an Honors Seminar on Sports Analytics**

1:00 PM - 1:10 PM

**Russell E. Goodman**, *Central College*

**Tapestries In the Teaching Of Mathematics**

1:15 PM - 1:25 PM

**Hari N. Upadhyaya**, *Scholars Home Academy*

**The Importance of "Navigating Ambiguity through Context" for Students in Quantitative Sciences**

1:30 PM - 1:40 PM

**Aminul Huq**, *University of Minnesota Rochester*  
**Marcia D. Nichols**, *University of Minnesota Rochester*  
**Bijaya Aryal**, *University of Minnesota Rochester*

**Unique Algebraic Structure to Connect Nanoscale Instance from Mesoscale Material Behavior**

1:45 PM - 1:55 PM

**Vikash Mishra**, *University of Arkansas*  
**Craig Mclean**, *University of Arkansas*

**Counting Melodies with Fibonacci Polynomials**

2:00 PM - 2:10 PM

**Kurt Ludwick**, *Salisbury University*

**Roots of Polynomials with Generalized Fibonacci Coefficients**

2:15 PM - 2:25 PM

**Ron Taylor**, *Berry College*  
**Eric McDowell**, *Berry College*  
**Jill Cochran**, *Berry College*

**The Use of Mathematics in Ecology, Evolution and Behavior**

2:30 PM - 2:40 PM

**Pablo Duran**, *The University of Texas at Austin*

**A Model for Soil-Plant-Surface Water Relationships in Arid Flat Environments**

2:45 PM - 2:55 PM

**Bonni Dichone**, *Gonzaga University*  
**David Wollkind**, *Washington State University*  
**Richard Cangelosi**, *Gonzaga University*

**Pattern Formation in the Developing Visual Cortex - The Joint Development of CO Blobs and Ocular Dominance Stripes**

3:00 PM - 3:10 PM

**Andrew M. Oster**, *Eastern Washington University*  
**Paul C. Bressloff**, *University of Utah*

**A Mathematical Model with Asymptomatic Individuals for Malaria in the Amazon Region**

3:15 PM - 3:25 PM

**Ana L. Vivas-Barber**, *Norfolk State University, VA, USA*  
**Eun Chang**, *Norfolk State University, VA, USA*  
**Sunmi Lee**, *Kyung Hee University, Yongin, Korea*

**Bifurcations, Chaos and Fractal Dimensions in Population Models**

3:30 PM - 3:40 PM

**Tarini K. Dutta**, *Gauhati University*

**Tomographic Image Processing**

3:45 PM - 3:55 PM

**Shylee Ezroni**, *Wentworth Institute Of Technology*  
**Ely Biggs**, *Wentworth Institute Of Technology*  
**Jack Reff**, *Wentworth Institute Of Technology*

**Understanding the Role of Voltage Dependent Electrical Coupling in a Neuronal Network**

4:00 PM - 4:10 PM

**Christina L. Mouser**, *William Paterson University*  
**Amitabha Bose**, *New Jersey Institute of Technology*  
**Farzan Nadim**, *New Jersey Institute of Technology*

**Timing of Action Potential in Auditory Neuron System**

4:15 PM - 4:25 PM

**Anh T. Vo**, *Creighton University*

THEMED CONTRIBUTED PAPER SESSION

**TCPS#5: Recreational Mathematics: New Problems and New Solutions Part A**

1:00 PM - 4:55 PM, Marriott Wardman Park, Washington 1

## Friday, August 7 (continued)

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### Elvis Lives: An Exploration of Greedy and Global Path Optimization in a Game of Fetch

1:00 PM - 1:15 PM

**Steve J. Bacinski**, *Davenport University*  
**Mark J. Panaggio**, *Rose-Hulman Institute of Technology*  
**Timothy J. Pennings**, *Davenport University*

### Logarithms are Hot Stuff and a New Rating Scale for Chili Peppers

1:20 PM - 1:35 PM

**Eric Landquist**, *Kutztown University*

### Turning Infinity Inside Out: A Seamstress's Conundrum

1:40 PM - 1:55 PM

**Ellie Baker**, *Freelance*

### Geometric Modeling of Hexagonal Joints: Carving Mathematics Out of Wood

2:00 PM - 2:15 PM

**James S. Sochacki**, *James Madison University*  
**Anthony Tongen**, *James Madison University*

### A Trouble-some Simulation

2:20 PM - 2:35 PM

**Geoffrey Dietz**, *Gannon University*

### An Analyzable (Though Seldom Winnable) Card Solitaire

2:40 PM - 2:55 PM

**Leon Harkleroad**, *Bates College*

### Penney's Game and Roulette

3:00 PM - 3:15 PM

**Robert W. Vallin**, *Lamar University*

### Multi-Opponent James Functions

3:20 PM - 3:35 PM

**Christopher N. B. Hammond**, *Connecticut College*  
**Warren P. Johnson**, *Connecticut College*

### Sylver Coinage - An Algebraist's Investigation

3:40 PM - 3:55 PM

**Jeremy Thompson**, *USAF Academy*

### Winning Moves in Fibonacci Nim

4:00 PM - 4:15 PM

**Cody Allen**, *San Diego State University*  
**Vadim Ponomarenko**, *San Diego State University*

### The n-Queens Problem with Forbidden Placements

4:20 PM - 4:35 PM

**Doug Chatham**, *Morehead State University*

### A New Approach to Chinese Chess Knight's Tour Using Gauss' Area Formula

4:40 PM - 4:55 PM

**Matthew Mak**, *ACS Independent*  
**Suling Lee**, *ACS Independent*

#### INVITED SESSION

### MAA Invited Paper Session: Algebraic Structures Motivated by Knot Theory

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1:00 PM - 5:00 PM, Marriott Wardman Park, Delaware A

### An Introduction to Quandles

1:00 PM - 1:40 PM

**Alissa Crans**, *Loyola Marymount University*

### Enhancements of Counting Invariants

1:50 PM - 2:30 PM

**Sam Nelson**, *Claremont McKenna College*

### An Introduction to Quandle Cohomology

2:40 PM - 3:20 PM

**J. Scott Carter**, *University of South Alabama*

### What is Categorification?

3:30 PM - 4:10 PM

**Mikhail Khovanov**, *Columbia University*

### From Jones to Chebyshev: Adventures in Categorification

4:20 PM - 5:00 PM

**Radmila Sazdanovic**, *North Carolina State University*

#### THEMED CONTRIBUTED PAPER SESSION

### TCPS#15: Democratizing Access to Authentic Mathematical Activity

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1:20 PM - 3:35 PM, Marriott Wardman Park, Maryland A

### Mathematics and Social Justice: Perspectives and Resources for the College Classroom

1:20 PM - 1:35 PM

**Gizem Karaali**, *Pomona College*  
**Lily Khadjavi**, *Loyola Marymount University Los Angeles*

### Opening a Gateway to Mathematical Inquiry

1:40 PM - 1:55 PM

**Brian Katz**, *Augustana College*

### Seeding Mathematical Interest in Inner-City Latino Students

2:00 PM - 2:15 PM

**Alessandra Pantano**, *University of California, Irvine*  
**Li-Sheng Tseng**, *University of California, Irvine*  
**Andres Forero**, *University of California, Irvine*

**Friday, August 7** (continued)

**Documenting Instantaneous and Cumulative Change**

2:20 PM - 2:35 PM

**Monelle Joline Gomez**, *The Ohio State University*

**Azita Manouchehri**, *The Ohio State University*

**Xiangquan Yao**, *The Ohio State University*

**What Evidence Do You Have? Data-Based Investigations into Contemporary Race Relations in a General Education Math Class**

2:40 PM - 2:55 PM

**Victor Piercey**, *Ferris State University*

**Mathematical Modeling for Elementary Mathematics Teachers**

3:00 PM - 3:15 PM

**Elizabeth A. Burroughs**, *Montana State University*

**Undergraduate Research, Outreach and Student Activities for a "Fair" Mathematical Experience**

3:20 PM - 3:35 PM

**Emek Kose**, *St. Mary's College of Maryland*

**Leaf Hydraulic Conductance: Modeling Geometry**

3:00 PM - 3:15 PM

**Frank Lynch**, *EWU*

**Cancer Classification of Gene Expression Data by Top Scoring Pairs, Consensus Clustering and Support Vector Machines**

3:20 PM - 3:35 PM

**Andrea E. Ekey**, *Howard University*

**Louise A. Raphael**, *Howard University*

**Ahmed Tadde**, *Howard University*  
**Integrating Mathematics and Biology Through Mathematical Modeling**

3:40 PM - 3:55 PM

**Debra Mimbs**, *Lee University*

**Classification: A Fundamental Tool in Biology and Mathematics**

4:00 PM - 4:15 PM

**Atabong T. Agendia**, *Madonna University Nigeria*

THEMED CONTRIBUTED PAPER SESSION

**TCPS#4: Undergraduate Research Activities in Mathematical and Computational Biology**

1:20 PM - 4:15 PM, Marriott Wardman Park, Washington 5

**Building a Math-Bio Research Program at a Primarily Undergraduate Institution**

1:20 PM - 1:35 PM

**Zachary Abernathy**, *Winthrop University*

**Ten Years of Math/Bio Research Collaboration with Undergraduates**

1:40 PM - 1:55 PM

**Jeffrey L. Poet**, *Missouri Western State University*

**Laurie J. Heyer**, *Davidson College*

**Todd T. Eckdahl**, *Missouri Western State University*

**A. M. Campbell**, *Davidson College*

**Modeling Delay in Axon Circuit**

2:00 PM - 2:15 PM

**Mikhail Shvartsman**, *University of St Thomas*

**Pavel Bêlik**, *Augsburg College*

**The Dynamics of Pulse Vaccination Models**

2:20 PM - 2:35 PM

**Timothy D. Comar**, *Benedictine University*

**Simulating and Animating the Spatial Dynamics of Interacting Species Living on a Torus-shaped Universe**

2:40 PM - 2:55 PM

**Boyan Kostadinov**, *City Tech, CUNY*

OTHER MATHEMATICAL SESSION

**Alder Award Session**

2:00 PM - 3:20 PM, Marriott Wardman Park, Salon 2/3

**Reality Shifting: Building Mathematical Confidence**

2:00 PM - 2:20 PM

**Talithia Williams**, *Harvey Mudd College*

**A Taste of Research**

2:30 PM - 2:50 PM

**Patrick X. Rault**, *SUNY Geneseo*

**Be Inspirable!**

3:00 PM - 3:20 PM

**Allison K. Henrich**, *Seattle University*

UNDERGRADUATE STUDENT ACTIVITY

**MAA Student Paper Session #19**

2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia A

**MAA Student Paper Session #20**

2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia B

**MAA Student Paper Session #21**

2:00 PM - 3:55 PM, Marriott Wardman Park, Virginia C

**MAA Student Paper Session #22**

2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson A

## Friday, August 7 (continued)

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### UNDERGRADUATE STUDENT ACTIVITY

#### **PME Student Paper Session #7**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson B

#### **PME Student Paper Session #8**

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2:00 PM - 3:55 PM, Marriott Wardman Park, Wilson C

### THEMED CONTRIBUTED PAPER SESSION

#### **TCPS#1: The History and Philosophy of Mathematics Part M – Special Session in Honor of Karen Parshall**

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2:00 PM - 4:55 PM, Marriott Wardman Park, Washington 4

##### **Leonard Dickson's Other Doctoral Student from 1928**

2:00 PM - 2:25 PM

*Della Dumbaugh, University of Richmond*

##### **Spreading the Wealth: The Ford Foundation and Eugene Northrop's Advancement of Mathematics and Science at Home and Abroad**

2:30 PM - 2:55 PM

*Patti W. Hunter, Westmont College*

##### **The Annals of Mathematics: From the Fringes of Civilization to the University of Virginia, 1873-1883**

3:00 PM - 3:25 PM

*Deborah Kent, Drake University*

##### **Karen Parshall and a Course on the History of Mathematics in America**

3:30 PM - 3:55 PM

*David Zitarelli, Temple University*

##### **Fuzzy Logic and Contemporary American Mathematics: A Cautionary Tale**

4:00 PM - 4:25 PM

*Joseph W. Dauben, City University of New York*

##### **American Mathematicians Beyond the Iron Curtain: The US-Soviet Interacademy Exchange Program**

4:30 PM - 4:55 PM

*Brittany Shields, University of Pennsylvania*

### PANEL SESSION

#### **Panel 10. Nonacademic Career Paths for Mathematicians**

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2:35 PM - 3:55 PM, Marriott Wardman Park, Salon 1

### POSTER SESSION

#### **PosterFest 2015: A Poster Session of Scholarship by Early Career Mathematicians and Graduate Students**

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3:30 PM - 5:00 PM, Marriott Wardman Park, Exhibit Hall A

### OTHER MATHEMATICAL SESSION

#### **Estimathon!**

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3:30 PM - 5:00 PM, Marriott Wardman Park, Maryland C

### MINICOURSE

#### **7. Teaching Mathematics with Bead Crochet (Part B)**

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3:30 PM - 5:30 PM, Omni Shoreham Hotel, Calvert Room

### MINICOURSE

#### **3. Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry (Part B)**

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3:30 PM - 5:30 PM, Omni Shoreham Hotel, Hampton Room

### SPECIAL MAA CENTENNIAL EVENT

#### **Presidential Reminiscences**

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3:45 PM - 6:00 PM, Marriott Wardman Park, Salon 2/3

### UNDERGRADUATE STUDENT ACTIVITY

#### **MAA Student Paper Session #23**

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4:00 PM - 5:00 PM, Marriott Wardman Park, Virginia A

#### **MAA Student Paper Session #24**

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4:00 PM - 5:00 PM, Marriott Wardman Park, Virginia B

#### **MAA Student Paper Session #25**

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4:00 PM - 5:00 PM, Marriott Wardman Park, Virginia C

#### **MAA Student Paper Session #26**

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4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson A

### UNDERGRADUATE STUDENT ACTIVITY

#### **PME Student Paper Session #9**

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4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson B

#### **PME Student Paper Session #10**

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4:00 PM - 6:15 PM, Marriott Wardman Park, Wilson C

### PANEL SESSION

#### **Panel 3. Beyond the Post-Doc: Fellowship Opportunities for Mathematics Faculty**

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4:10 PM - 5:30 PM, Marriott Wardman Park, Salon 1

**Friday, August 7** (continued)

SIGMAA ACTIVITY

**Web SIGMAA Guest Lecture**

**MYMathApps: Lessons Learned and To-Be Learned**

5:00 PM - 5:50 PM, Marriott Wardman Park, Washington 5

SIGMAA ACTIVITY

**Web SIGMAA Business Meeting**

6:00 PM - 6:30 PM, Marriott Wardman Park, Washington 5

SOCIAL ACTIVITY

**Pi Mu Epsilon Banquet**

6:00 PM - 7:45 PM, Marriott Wardman Park, Virginia A/B/C

INVITED ADDRESS

**Pi Mu Epsilon J. Sutherland Frame Lecture**

**G-sharp, A-flat, and the Euclidean Algorithm**

8:00 PM - 8:50 PM, Marriott Wardman Park, Salon 2/3

Noam Elkies, *Harvard University*

SOCIAL EVENT

**Albert's Bridge: A Tragicomedy by Tom Stoppard, Featuring the MAA Community Players**

9:00 PM - 10:00 PM, Marriott Wardman Park, Salon 2/3

**Saturday, August 8**

**Registration**

8:00 AM - 12:30 PM, Marriott Wardman Park, Registration 1/2

INVITED ADDRESS

**MAA James R. C. Leitzel Lecture**

**Calculus at Crisis**

8:30 AM - 9:20 AM, Marriott Wardman Park, Salon 2/3

David Bressoud, *Macalester College*

THEMED CONTRIBUTED PAPER SESSION

**TCPS#1: The History and Philosophy of Mathematics Part N – History and Philosophy of Mathematics**

8:30 AM - 11:55 AM, Marriott Wardman Park, Washington 4

**Some Original Sources for Modern Tales of Thales**

8:30 AM - 8:55 AM

Michael Molinsky, *University of Maine at Farmington*

**A Prehistory of Arithmetic**

9:00 AM - 9:25 AM

Patricia Baggett, *New Mexico State University*  
Andrzej Ehrenfeucht, *University of Colorado*

**Adelard's Euclid and the Arabic Transmission Attributed to al-Hajjāj**

9:30 AM - 9:55 AM

Gregg De Young, *The American University in Cairo*

**Al-Khwarizmi, Anselm, and the Algebra of Atonement**

10:00 AM - 10:25 AM

Valerie J. Allen, *John Jay College, CUNY*

**Approaches to Computation in Third Millennium Mesopotamia**

10:30 AM - 10:55 AM

Duncan J. Melville, *St. Lawrence University*

**Famous Mathematicians from Iran but Whom You May Not Know**

11:00 AM - 11:25 AM

Samaneh Gholizadeh Hamidi, *Brigham Young University*

**The Quest for Digital Preservation: Will Part of Math History Be Gone Forever?**

11:30 AM - 11:55 AM

Steve DiDomenico, *Northwestern University Library*  
Linda Newman, *University of Cincinnati Libraries*

THEMED CONTRIBUTED PAPER SESSION

**TCPS#1: The History and Philosophy of Mathematics Part P – History and Philosophy of Mathematics**

8:30 AM - 11:55 AM, Marriott Wardman Park, Washington 5

**Finding the Roots of a Non-Linear Equation: History and Reliability**

8:30 AM - 8:55 AM

Roger Godard, *RMC*

**J. D. Forbes and the Development of Curve Plotting**

9:00 AM - 9:25 AM

Isobel Falconer, *University of St Andrews*

**"Remarkable Similarities": A Dialogue Between De Morgan & Boole**

9:30 AM - 9:55 AM

Gavin Hitchcock, *University of Stellenbosch*

## Saturday, August 8 (continued)

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### Clifford and Sylvester on the Development of Peirce's Matrix Formulation of the Algebra of Relations 1870-1882

10:00 AM - 10:25 AM

Francine F. Abeles, *Kean University*

### Polygonal Numbers from Fermat to Cauchy

10:30 AM - 10:55 AM

Susan Martin, *Kentucky Employers' Mutual Insurance*

### Orson Pratt: A Self Taught Mathematician on the American Western Frontier

11:00 AM - 11:25 AM

Troy Goodsell, *Brigham Young University-Idaho*

### Five Families Around a Well: A New Look at an Ancient Problem

11:30 AM - 11:55 AM

Ezra Brown, *Virginia Tech*

#### GENERAL CONTRIBUTED PAPER SESSION

#### **Mathematics and Technology**

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8:45 AM - 11:25 AM, Marriott Wardman Park, Salon 1, Balcony A

### Introducing the Pi-Base: An Interactive Encyclopedia of Topological Spaces

8:45 AM - 8:55 AM

Austin Mohr, *Nebraska Wesleyan University*

### Cutting Edge Information Technology Applied to the NIST Digital Library of Mathematical Functions

9:00 AM - 9:10 AM

### Bonita V. Saunders, *National Institute of Standards and Technology*

### Audio, Documents, and Screens, Oh My! Free and Easy Online Collaboration

9:15 AM - 9:25 AM

Tamara Eyster, *Kaplan University*

Lea Rosenberry, *Kaplan University*

### Exploration of Best "Flipped" Practices

9:30 AM - 9:40 AM

Emilie Naccarato, *University of Northern Colorado*

Gulden Karakok, *University of Northern Colorado*

Spencer Bagley, *University of Northern Colorado*

### Increase Student Engagement by Using Clickers and Smart Phones

10:00 AM - 10:10 AM

Myungchul Kim, *Suffolk County Community College*

### Maplets for Calculus, Rating, Grading and Evaluation

10:15 AM - 10:25 AM

Philip B. Yasskin, *Texas A&M University*

Douglas B. Meade, *University of South Carolina*

### Enhancing Student Learning Experience through Maple

10:30 AM - 10:40 AM

Marcela Chiorescu, *Georgia College*

Darin Mohr, *Georgia College*

Brandon Samples, *Georgia College*

### Updating the WeBWork Open Problem Library

10:45 AM - 10:55 AM

John W. Jones, *Arizona State University*

Jeff Holt, *University of Virginia*

### Online Homework Can Provide Desirable Difficulties for Learning Mathematics

11:00 AM - 11:10 AM

Dick Lane, *University of Montana*

### Improving Students' Learning by Integrating Effective Learning and Teaching Strategies and Instructional Learning Management Systems

11:15 AM - 11:25 AM

Jack Narayan, *SUNY Oswego and WebAssign*

#### UNDERGRADUATE STUDENT ACTIVITY

#### **MAA Mathematical Competition in Modeling (MCM) Winners**

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9:00 AM - 10:15 AM, Marriott Wardman Park, Salon 1

#### **MAA MathFest 2015 Exhibit Hall**

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9:00 AM - 12:30 PM, Marriott Wardman Park, Exhibit Hall

#### UNDERGRADUATE STUDENT ACTIVITY

#### **Student Hospitality Center**

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9:00 AM - 12:30 PM, Marriott Wardman Park, Exhibit Hall

#### INVITED ADDRESS

#### **Earle Raymond Hedrick Lecture Series**

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#### **Hedrick Lecture 3**

9:30 AM - 10:20 AM, Marriott Wardman Park, Salon 2/3

Karen Smith, *University of Michigan*

#### INVITED ADDRESS

#### **MAA Centennial Lecture 6**

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#### **Recent Results Toward the Birch and Swinnerton-Dyer Conjecture**

10:30 AM - 11:20 AM, Marriott Wardman Park, Salon 2/3

Manjul Bhargava, *Princeton University*

**Saturday, August 8** (continued)

## UNDERGRADUATE STUDENT ACTIVITY

**Student Problem Solving Competition**

10:30 AM - 11:45 AM, Marriott Wardman Park, Maryland B

## UNDERGRADUATE STUDENT ACTIVITY

**MAA Ice Cream Social and Undergraduate Awards Ceremony**

12:30 PM - 2:00 PM, Marriott Wardman Park, Salon 3

## OTHER MATHEMATICAL SESSION

**Special Presentation for High School Students, Parents, and Teachers****A Dozen Proofs that  $1=2$ : An Accessible and Quirky Overview of Mathematics for K-12 Teachers and Their Students**

1:00 PM - 1:50 PM, Marriott Wardman Park, Salon 2

**James Tanton**, *The Saint Mark's Mathematics Institute and MAA*

## PANEL SESSION

**Panel 9. Quantitative Literacy and Democracy**

1:00 PM - 2:20 PM, Marriott Wardman Park, Delaware A

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#14: Projects, Applications and Demonstrations to Enhance a Numerical Analysis or Computational Mathematics Course**

1:00 PM - 2:35 PM, Marriott Wardman Park, Washington 3

**The Everyday Examples in Engineering (E3) Program in a Scientific Computing Course**

1:00 PM - 1:15 PM

**Mike Nicholas**, *Colorado School of Mines***Project-Based Numerical Mathematics and Computation Course at Augsburg College**

1:20 PM - 1:35 PM

**Pavel Bêlik**, *Augsburg College***A Project-Based Numerical Analysis Course**

1:40 PM - 1:55 PM

**G. Daniel Callon**, *Franklin College***A Novel Newton's Method Project**

2:00 PM - 2:15 PM

**James Sochacki**, *James Madison University***Assessing Student Motivation in a Numerical Methods Class**

2:20 PM - 2:35 PM

**Kyle Riley**, *South Dakota School of Mines & Technology*

## INVITED SESSION

**Special Invited Session: The Geometry of Triangles**

1:00 PM - 2:50 PM, Marriott Wardman Park, Salon 1

**A Triangle Has Eight Vertices (But Only One Center)**

1:00 PM - 1:50 PM

**Richard Guy**, *University of Calgary***New Ideas about the Geometry of Triangles**

2:00 PM - 2:50 PM

**John Conway**, *Princeton University*

## MINICOURSE

**1. The Hitchhiker's Guide to Mathematics Part B**

1:00 PM - 3:00 PM, Omni Shoreham Hotel, Hampton Room

## MINICOURSE

**6. Creating Flipped Learning Experiences in the College Mathematics Classroom Part B**

1:00 PM - 3:00 PM, Omni Shoreham Hotel, Calvert Room

## THEMED CONTRIBUTED PAPER SESSION

**TCPS#2: The Contributions of Women to Mathematics: 100 Years and Counting Part B**

1:00 PM - 3:15 PM, Marriott Wardman Park, Washington 2

**Teaching Students about Women and Mathematics: A Dialogue between Two Course Designers**

1:00 PM - 1:15 PM

**Sarah J. Greenwald**, *Appalachian State University*  
**Jacqueline Dewar**, *Loyola Marymount University***Gender and the Pursuit of Mathematics: An Examination of the Participation Gap in Math Careers**

1:20 PM - 1:35 PM

**Kevin T. Maritato**, *Suffolk County Community College***Positive Female Role Models in Mathematics: The Importance, Influence, and Impact of Their Contributions in Attracting Females to Mathematics**

1:40 PM - 1:55 PM

**Joan E. DeBello**, *St. John's University***The Daughters of Hypatia: A Mathematical Dance Concert Celebrating Women Mathematicians**

2:00 PM - 2:15 PM

**Karl Schaffer**, *De Anza College*

## Saturday, August 8 (continued)

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### Application of Knot Theory: Using Knots to Unravel Biochemistry Mysteries

2:20 PM - 2:35 PM

**Candice Renee Price**, *United States Military Academy, West Point*

### Dessin D'Enfants and Shabat Polynomials

2:40 PM - 2:55 PM

**Alejandra Alvarado**, *Eastern Illinois University*

### An Introduction to Interval Exchange Transformations

3:00 PM - 3:15 PM

**Kelly B. Yancey**, *University of Maryland*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#5: Recreational Mathematics: New Problems and New Solutions Part B

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1:00 PM - 3:15 PM, Marriott Wardman Park, Washington 1

### Cracking the SafeCracker 40 Puzzle

1:00 PM - 1:15 PM

**Brittany Shelton**, *Albright College*  
**Tyler VanBlargan**, *Albright College*

### Nonclassical Logic Puzzles

1:20 PM - 1:35 PM

**Jason Rosenhouse**, *James Madison University*

### The Mathematics of Tripos, A World without Subtraction

1:40 PM - 1:55 PM

**Brian Hollenbeck**, *Emporia State University*

### Counting with Fractals and the Mysterious Triangles of Behrends and Humble

2:00 PM - 2:15 PM

**Michael A. Jones**, *Mathematical Reviews*  
**Lon Mitchell**, *Mathematical Reviews*  
**Brittany Shelton**, *Albright College*

### 'Cover the Spot' and Homothetic Covering of Convex Bodies

2:20 PM - 2:35 PM

**Muhammad A. Khan**, *University of Calgary*

### Dissecting and Coloring Polygons Using Power Series

2:40 PM - 2:55 PM

**Alison G. Schuetz**, *Hood College*  
**Gwyneth R. Whieldon**, *Hood College*

### Exploring Two Fascinating Integer Sequences

3:00 PM - 3:15 PM

**Jay L. Schiffman**, *Rowan University*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#1: The History and Philosophy of Mathematics Part Q – Special Session in Memory of Ivor Grattan-Guinness

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1:00 PM - 3:25 PM, Marriott Wardman Park, Washington 4

### Ivor Grattan-Guinness (1941–2014) and his Contributions to the History of Analysis, Set Theory, and Applied Mathematics

1:00 PM - 1:25 PM

**Joseph W. Dauben**, *City University of New York*

### Grattan-Guinness's Work on Classical Mechanics

1:30 PM - 1:55 PM

**Roger Cooke**, *University of Vermont*

### Ivor Grattan-Guinness's Legacy to History and Philosophy of Logic

2:00 PM - 2:25 PM

**John W. Dawson**, *Penn State York*

### "Another Big Book": Ivor Grattan-Guinness as Editor and Organizer

2:30 PM - 2:55 PM

**Albert C. Lewis**, *Educational Advancement Foundation*

### "Same Time Next Week?": Ivor Grattan-Guinness as a Ph.D. Advisor

3:00 PM - 3:25 PM

**Adrian Rice**, *Randolph-Macon College*

THEMED CONTRIBUTED PAPER SESSION

### TCPS#19: Innovative Approaches in the Calculus Sequence Part B

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1:00 PM - 3:55 PM, Marriott Wardman Park, Washington 6

### Teaching Calculus Using Movies and Television Shows

1:00 PM - 1:15 PM

**Elana Reiser**, *St. Joseph's College*

### Beyond Computation: A Team-Based Learning Approach to the Limit Definition of the Derivative

1:20 PM - 1:35 PM

**Carly J. A. Briggs**, *University at Albany*

## Saturday, August 8 (continued)

### Elements of the Successful Calculus Computer Lab Assignment

1:40 PM - 1:55 PM

Stepan Paul, *California Polytechnic State University*

### Creating Online Problems that Develop Mathematical Strategies and Reduce Student Frustration

2:00 PM - 2:15 PM

Geoffrey Cox, *Virginia Military Institute*

### Where is the Differential in Differential Calculus?

2:20 PM - 2:35 PM

Eugene Boman, *Penn State, Harrisburg Campus*  
Robert Rogers, *SUNY, Fredonia*

### Five Things The Calculus Texts Leave Out and What We Can Do About It

2:40 PM - 2:55 PM

Meighan Dillon, *Kennesaw State University*

### A Small Adjustment to the Definition of the Limit of a Function

3:00 PM - 3:15 PM

Andy Martin, *Kentucky State University*

### Finite Topological Spaces as a Pedagogical Tool for Teaching Concepts in Calculus

3:20 PM - 3:35 PM

Daniel C. Cheshire, *Texas State University*

### Students' Perceptions of and Expectations for Videos in a Flipped Calculus Course

3:40 PM - 3:55 PM

Fei Xue, *University of Hartford*  
Larissa Schroeder, *University of Hartford*  
Jean McGivney-Burelle, *University of Hartford*

#### THEMED CONTRIBUTED PAPER SESSION

### TCPS#18: Using Modeling for Teaching Differential Equations: Before, During, After

1:00 PM - 4:35 PM, Marriott Wardman Park, Virginia A

#### Modeling from Calculus to Numerical Analysis (and Everything in Between)

1:00 PM - 1:15 PM

Meagan C. Herald, *Virginia Military Institute*

#### Coloring Inside the Lines: My Experiences Adding Modeling to an Existing DE Curriculum Without Sacrificing Content

1:20 PM - 1:35 PM

Jessica M. Libertini, *Virginia Military Institute*

### Using Real Data to Study the Heat Equation

1:40 PM - 1:55 PM

Kimberly Spayd, *Gettysburg College*

### Using Differential Equations to Analyze the Energy Future

2:00 PM - 2:15 PM

James Case, *SIAM*

### Validating Groundwater Flow Models

2:20 PM - 2:35 PM

Michael A. Karls, *Ball State University*

### Predator-Prey Modeling

2:40 PM - 2:55 PM

Hubert Noussi Kamdem, *Roger Williams University*

### Modeling Duck-Gull-Human Interactions in California

3:00 PM - 3:15 PM

Christopher Brown, *California Lutheran University*

### Two Differential Equations Projects to Help Students Apply and Synthesize Mathematics

3:20 PM - 3:35 PM

Michelle Ghrist, *United States Air Force Academy*

### Inquiry-Based Learning in ODE Classes: Stable or Unstable?

3:40 PM - 3:55 PM

Randall E. Cone, *Salisbury University*

### Modeling in an Inquiry-Oriented Differential Equations Course

4:00 PM - 4:15 PM

Karen A. Keene, *North Carolina State University*  
William H. Hall, *North Carolina State University*

### Day One Modeling Discussions

4:20 PM - 4:35 PM

Benjamin Galluzzo, *Shippensburg University*

#### INVITED SESSION

### Special Session: "Notes of a Native Son": The Legacy of Dr. Abdulalim A. Shabazz (1927-2014)

1:00 PM - 4:50 PM, Marriott Wardman Park, Delaware B

#### Dr. Abdulalim A. Shabazz—Statistically Significant!

1:00 PM - 1:20 PM

Monica Jackson, *American University*

## Saturday, August 8 (continued)

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### **"In a Beautiful Way": Lessons for Mathematics Education from Dr. Abdulalim Shabazz**

1:30 PM - 1:50 PM

**Erica Walker**, *Teachers College, Columbia University*

### **"The Teacher and the Mentor: A Combination that Instills Mathematical Greatness"**

2:00 PM - 2:20 PM

**Ronald Mickens**, *Clark Atlanta University*

### **More than Equations**

2:30 PM - 2:50 PM

**Gwendolyn Irby**, *Lockheed Martin*

### **The Impact of Dr. Abdulalim Shabazz on the Business Community**

3:00 PM - 3:20 PM

**Shree Taylor**, *Delta Decisions of DC*

### **Dr. Abdulalim A. Shabazz: An Example of a Living Topological Isomorphism**

3:30 PM - 3:50 PM

**Brett Sims**, *Borough of Manhattan Community College*

### **To STEM or Not STEM**

4:00 PM - 4:20 PM

**Gelonia Dent**, *Medgar Evers College*

### **Sharing the Impacts of Dr. Abdulalim Shabazz**

4:30 PM - 4:50 PM

**Talitha M. Washington**, *Howard University*

#### THEMED CONTRIBUTED PAPER SESSION

### **TCPs#9: What Can a Mathematician Do with a 3D Printer?**

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1:00 PM - 4:55 PM, Marriott Wardman Park, Virginia B

### **3D Printed Catalan Wireframes: Designing with Mathematica, MeshLab, and TopMod**

1:00 PM - 1:15 PM

**Laura Taalman**, *James Madison University*  
**I Can Touch the Math!**

1:20 PM - 1:35 PM

**Lila F. Roberts**, *Clayton State University*

### **3-D Printing and Triply-Periodic Minimal Surfaces**

1:40 PM - 1:55 PM

**Rebekah Durig**, *Southern Illinois University*  
**Oneal Summers**, *Southern Illinois University*  
**Gregory Budzban**, *Southern Illinois University*

### **Printing Fractals: Experiences with Julia Sets and Diffusion-Limited Aggregates**

2:00 PM - 2:15 PM

**Mark J. Stock**, *Independent Artist*

### **Teaching Mathematical Art: Coordinating Design and 3D Printing**

2:20 PM - 2:35 PM

**Christopher R. H. Hanusa**, *Queens College, CUNY*

### **Exploring Visualizations: An Overview of a Seminar in 3D Modeling and Printing**

2:40 PM - 2:55 PM

**Nicholas J. Owad**, *University of Nebraska - Lincoln*

### **How You Too Can Join the 3D Printing Craze!**

3:00 PM - 3:15 PM

**Lewis Ludwig**, *Denison University*

### **Cy: A 3D-Printed Robot for Calculus Teaching**

3:20 PM - 3:35 PM

**Jason H. Cantarella**, *University of Georgia*

### **A Voluminous Vessel**

3:40 PM - 3:55 PM

**Brenda Edmonds**, *Johnson County Community College*  
**Cathleen O'Neil**, *Johnson County Community College*  
**Rob Grondahl**, *Johnson County Community College*

### **Goblet Design in Calculus II**

4:00 PM - 4:15 PM

**Scott Dunn**, *University of South Carolina*  
**Douglas B. Meade**, *University of South Carolina*  
**Philip B. Yasskin**, *Texas A&M University*

### **Topology, Calculus and 3D Visualization**

4:20 PM - 4:35 PM

**Elizabeth Denne**, *Washington & Lee University*

### **3D Printing Projects for Multivariate Calculus and College Geometry**

4:40 PM - 4:55 PM

**Edward Aboufadel**, *Grand Valley State University*

#### GENERAL CONTRIBUTED PAPER SESSION

### **Number Theory and Logic or Foundations**

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1:00 PM - 4:55 PM, Marriott Wardman Park, Balcony B

### **Bijections between Hyper $m$ -ary Partitions**

1:00 PM - 1:10 PM

**Timothy B. Flowers**, *Indiana University of Pennsylvania*  
**Shannon R. Lockard**, *Bridgewater State University*

### **The Graphic Nature of Gaussian Periods**

1:15 PM - 1:25 PM

**Stephan R. Garcia**, *Pomona College*

**Saturday, August 8** (continued)

**The Composite Two-Step**

1:30 PM - 1:40 PM

Ryan Stuffelbeam, *Transylvania University*

**The Periods of Fibonacci Sequences mod m**

1:45 PM - 1:55 PM

Marc Renault, *Shippensburg University*

**10,000 Ways to Count a Truncated Tetrahedron**

2:00 PM - 2:10 PM

Jeremy Newton, *Lee University*

Debra Mimbs, *Lee University*

**Jacobsthal Sequence in Ternary Represented Modified Collatz Sequences**

2:15 PM - 2:25 PM

Ji Young Choi, *Shippensburg University of PA*

**Schinzel's Hypothesis H**

2:30 PM - 2:40 PM

Elijah M. Allen

**Infinitude of Primes**

2:45 PM - 2:55 PM

Sam Northshield, *SUNY Plattsburgh*

**Using Binomial Coefficients to Prove Oppermann's Conjecture**

3:00 PM - 3:10 PM

William R. Oscarson, *Cornell*

**Topics in tau (n) -Number Theory**

3:15 PM - 3:25 PM

Reyes M. Ortiz-Albino, *University of Puerto Rico-Mayaguez*

**The Digital Binomial Theorem**

3:30 PM - 3:40 PM

Hieu D. Nguyen, *Rowan University*

**A Bad But Fruitful Way To Count N Choose K**

3:45 PM - 3:55 PM

Steven Edwards, *Kennesaw State University*

William Griffiths, *Kennesaw State University*

**Number of solutions to  $a^x + b^y = c^z$**

4:00 PM - 4:10 PM

Reese Scott Robert Styer, *Villanova University*

**Beal's Conjecture vs. "Positive Zero", Fight**

4:15 PM - 4:25 PM

Angela Moore, *Yale University*

**Near-Isosceles Pythagorean Triples**

4:30 PM - 4:40 PM

Frederick Chichester

**Using Strong Notions of Reducibility to Distinguish Complete Sets**

4:45 PM - 4:55 PM

Brooke Andersen, *Assumption College*

GRADUATE STUDENT ACTIVITY

**Great Talks for a General Audience: Coached Presentations by Graduate Students Part A**

1:00 PM - 5:00 PM, Marriott Wardman Park, Virginia C

GRADUATE STUDENT ACTIVITY

**Great Talks for a General Audience: Coached Presentations by Graduate Students Part B**

1:00 PM - 5:00 PM, Marriott Wardman Park, Maryland C

GRADUATE STUDENT ACTIVITY

**Great Talks for a General Audience: Coached Presentations by Graduate Students Part C**

1:00 PM - 5:00 PM, Marriott Wardman Park, Salon 1, Balcony A

UNDERGRADUATE STUDENT ACTIVITY

**Industrial Research in the PIC Math Program**

1:30 PM - 5:00 PM, Marriott Wardman Park, Maryland B

OTHER MATHEMATICAL SESSION

**Math Circle Demonstration**

2:00 PM - 3:30 PM, Marriott Wardman Park, Maryland A

PANEL SESSION

**Panel 5. Big Data in the Undergraduate Mathematics Curriculum**

2:35 PM - 3:55 PM, Marriott Wardman Park, Delaware A

THEMED CONTRIBUTED PAPER SESSION

**TCPS#8: Mathematics in Video Games**

3:00 PM - 4:55 PM, Marriott Wardman Park, Washington 3

**Using Turn Based Games to Introduce Modeling and Optimization**

3:00 PM - 3:15 PM

Glenn Berman, *Dakota State University*

**Mathematics of Ingress**

3:20 PM - 3:35 PM

Kimberly Anne Roth, *Juniata College*

Erika Ward, *Jacksonville University*

## Saturday, August 8 (continued)

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### Quaternions in Action

3:40 PM - 3:55 PM

Susan H. Marshall, *Monmouth University*

### Mathematics of Fez

4:00 PM - 4:15 PM

Raena King, *Christian Brothers University*

### A Math Course for Game Programming Majors

4:20 PM - 4:35 PM

Scott Stevens, *Champlain College*

### Extracting Mathematical Pedagogy from Video Games

4:40 PM - 4:55 PM

Aaron M. Montgomery, *Baldwin Wallace University*

### THEMED CONTRIBUTED PAPER SESSION

#### **TCPS#1: The History and Philosophy of Mathematics Part R – History of Mathematics**

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3:30 PM to 5:25 PM, Marriott Wardman Park, Washington 4

### Humanistic Reflections on Mathematics Magazine Problem 1951 and a Solution

3:30 PM - 3:55 PM

Joel Haack, *University of Northern Iowa*

Timothy Hall, *PGI Consulting*

### The Interplay of "Hard" and "Soft" Analysis in the History of Summability Theory: Preliminary Report

4:00 PM - 4:25 PM

Alexander F. Kleiner, *Drake University*

### The Life and Letters of William Burnside

4:30 PM - 4:55 PM

Howard Emmens, *BSHM*

### Prehistory of the Outer Automorphism of $S_6$

5:00 PM - 5:25 PM

James Parson, *Hood College*

### MINICOURSE

#### **5. Using Videos of Students Developing Proofs to Guide Teaching and Learning (Part B)**

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3:30 PM - 5:30 PM, Omni Shoreham Hotel, Calvert Room

### MINICOURSE

#### **8. Getting Started in the Scholarship of Teaching and Learning (Part B)**

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3:30 PM - 5:30 PM, Omni Shoreham Hotel, Hampton Room

### SOCIAL EVENT

#### **DC Math Walk**

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3:30 PM - 5:30 PM, Departs from Marriott Wardman Park Lobby

### OTHER MATHEMATICAL SESSION

#### **Math Wrangle**

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4:00 PM - 5:30 PM, Marriott Wardman Park, Maryland A

### SOCIAL EVENT

#### **Closing Banquet**

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6:00 PM - 9:00 PM, Marriott Wardman Park, Salon 1



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## Sponsors & Exhibitors

### Sponsors:

#### Center of Math

(BOOTH 19)

The Worldwide Center of Mathematics (WCoM) is an academic resource provider producing free and affordable math textbooks, videos, research, and more. The Center of Math was founded to further mathematical knowledge and to serve as a community for mathematicians at all levels. To learn more about the Center of Math please visit our website at [www.centerofmath.org](http://www.centerofmath.org) or email us at [info@centerofmath.org](mailto:info@centerofmath.org). Located in Cambridge, Massachusetts, the Center of Math was founded in 2008 by David B. Massey, Ph.D.

#### National Association of Math Circles

(BOOTHS 13-14)

The National Association of Math Circles provides a community for Math Circles and similar programs via a website <http://mathcircles.org>. This fun and interactive website includes a database of Math Circles worldwide, a wiki started by Sam Vandervelde's Circle in a Box Math Circle book, a Math Circle Problem and Lesson Collection, as well as a developing forum for discussion of Math Circle related ideas. Visit our booth to learn more or attend one of the SIGMAA-MCST sessions to learn more about Math Circles.

#### Pearson

(BOOTHS 37-38)

A leader in mathematics and statistics educational solutions, Pearson provides course content from respected authors. Pearson's online courses within MyMathLab and MyStatLab have helped millions of students succeed since 2001. See us online at [www.pearsonhighered.com](http://www.pearsonhighered.com).

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(BOOTH 34)

WebAssign is a flexible and fully customizable online instructional system that puts powerful tools in the hands of teachers, enabling them to deploy assignments, instantly assess individual student performance, and realize their teaching goals. Adopted by all major academic publishers, integrated with more than 900 science and math textbooks, and enhanced with a robust selection of independently developed original content, WebAssign makes it easy for faculty to enrich the teaching and learning experience.

#### Woodrow Wilson National Fellowship Foundation

(BOOTH 28)

The Woodrow Wilson National Fellowship Foundation identifies and develops leaders to meet the nation's most critical challenges. In 1945, the Foundation was created to meet the challenge of preparing a new generation of college professors. Today Woodrow Wilson offers a suite of fellowships to address national needs, including the education of teachers and school leaders. The Woodrow Wilson National Fellowship Foundation has created and administered highly competitive fellowships for more than 60 years. Its more than 22,000 Fellows have won 14 Nobel Prizes, 35 MacArthur "genius grants," and most other major awards.

### Exhibitors

#### American Institute of Mathematics

(BOOTH 31)

#### American Mathematical Association of Two Year Colleges

(BOOTH 30)

#### American Mathematical Society

(BOOTHS 16-18)

#### Art of Problem Solving

(BOOTH 12)

#### Association for Women in Mathematics

(BOOTH 20)

#### Basic Books

(BOOTH 42)

#### Be An Actuary

(BOOTH 49)

#### Budapest Semesters in Mathematics Education (BSME)

(BOOTH 40)

#### California University of Pennsylvania

(BOOTH 39)

#### Cambridge University Press

(BOOTH 11)

#### CRC Press / Taylor & Francis

(BOOTHS 21-22)

#### Enovative Technologies

(BOOTH 43)

#### GEICO

(BOOTH 27)

#### Hawkes Learning

(BOOTHS 35-36)

#### Maplesoft

(BOOTH 46)

#### National Science Foundation

(BOOTH 15)

#### National Security Agency

(BOOTHS 44-45)

#### OpenStax College

(BOOTH 23)

#### Oxford University Press

(BOOTH 32)

#### Princeton University Press

(BOOTH 33)

#### Resequencing Calculus

(BOOTH 29)

#### Richmond Teacher Residency – Richmond, VA

(BOOTH 41)

#### SIMIODE

(BOOTH 26)

#### Springer

(BOOTH 24)

#### W.H. Freeman & Company

(BOOTH 47)

#### Wiley

(BOOTH 48)

#### Zim Mathematics

(BOOTH 25)

## Commercial Presentation

### Hawkes Learning: Revolutionizing Math Courseware

Thursday, August 6, 10:00 AM – 11:30 AM  
Marriott Wardman Park, Maryland C

Hawkes Learning has enhanced its courseware, building new functionality for customization with the feedback of instructors from across the country! Exciting innovations are now available with our tablet-friendly learning platform. Check out the new customization tools to individualize your curriculum and tailor the student experience in the learning path, including single sign-on from Blackboard, Canvas, and D2L. Even learn about our brand-new courses available for review. All attendees will be entered to win a \$200 Amazon gift card!

## Sponsors & Exhibitors (continued)

### Other Exhibits

The following exhibits will be located in the Exhibit Hall.

#### MAA Centennial History Display

The Mathematical Association of America, a substantial organization from its founding in 1915, is today the largest professional society devoted to undergraduate mathematics as well as a publisher of expository mathematics, host of student competitions, and provider of professional development programs. The MAA comprises 29 sections, an Executive Council and 7 area councils, and dozens of committees. Many stories - some big, some small; some enduring, some temporary - lie behind the MAA's first 100 years of growth. This exhibit samples those stories by presenting a few of the items, housed in the American Archives of Mathematics and elsewhere, that document the organization's development.

#### MAA Pavilion

- Books
- Membership
- Competitions
- WeBWoRK - Online Homework Source
- Merchandise

### SIGMAA Fair

The following Special Interests Groups of the MAA will be represented:

- ARTS
- BIG
- BIO
- HOM
- MCST
- POM
- QL
- STAT-ED
- TAHSM
- WEB

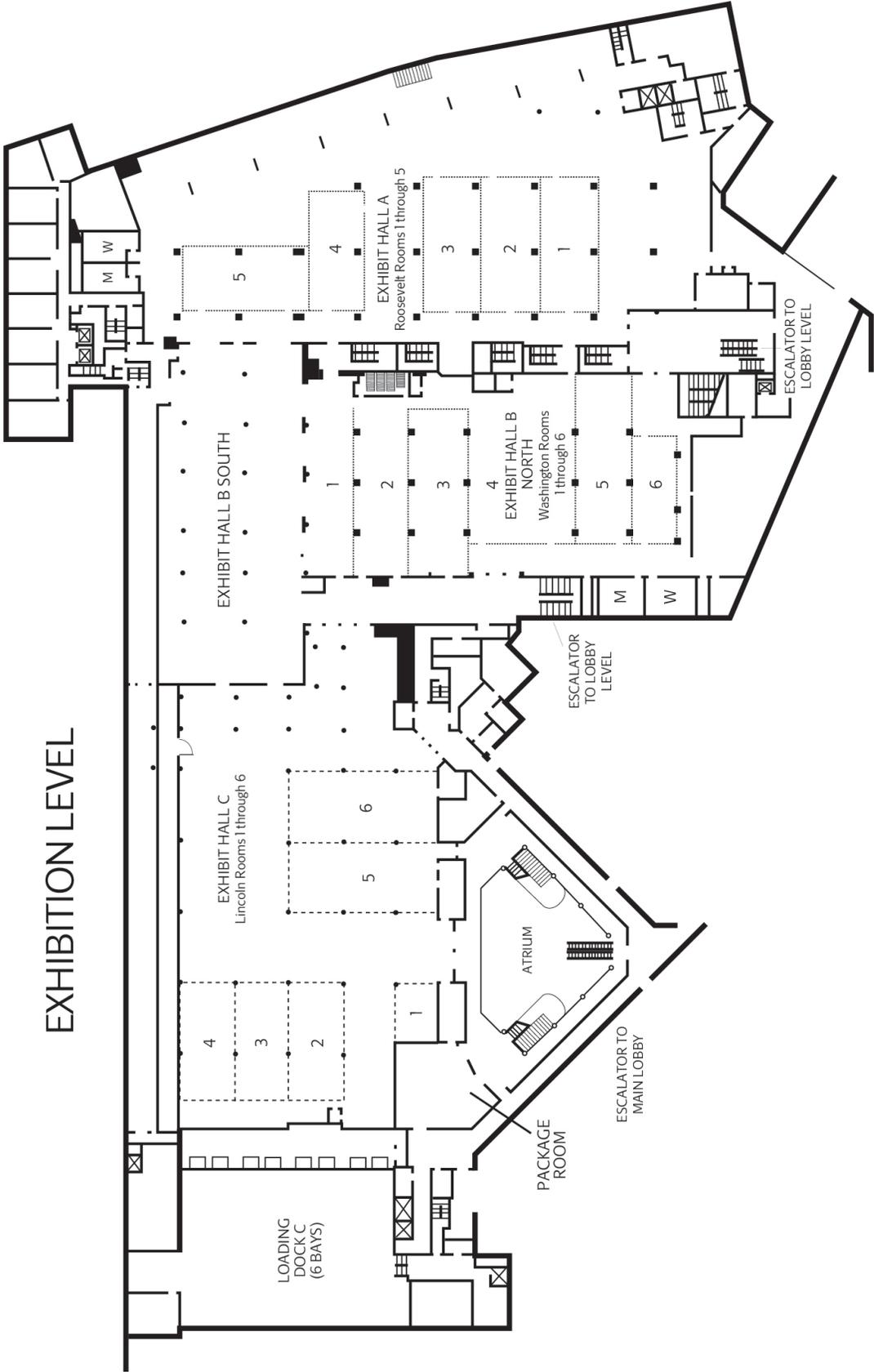
### Tessellations

The Bridges Exhibition of Mathematical Art will be on display in the exhibit hall. Drawn from the 2015 Bridges Conference, the exhibition will feature over 100 artworks by artists and mathematicians around the world and across the U.S. A wide variety of artistic media are included in the exhibition, including 2D and 3D digital prints, painting, beadwork, ceramics, wood, metal, and paper folding. The artists drew inspiration from the mathematics of fractals, polyhedra, non-Euclidean and four-dimensional geometry, tiling, knot theory, number theory, and more.

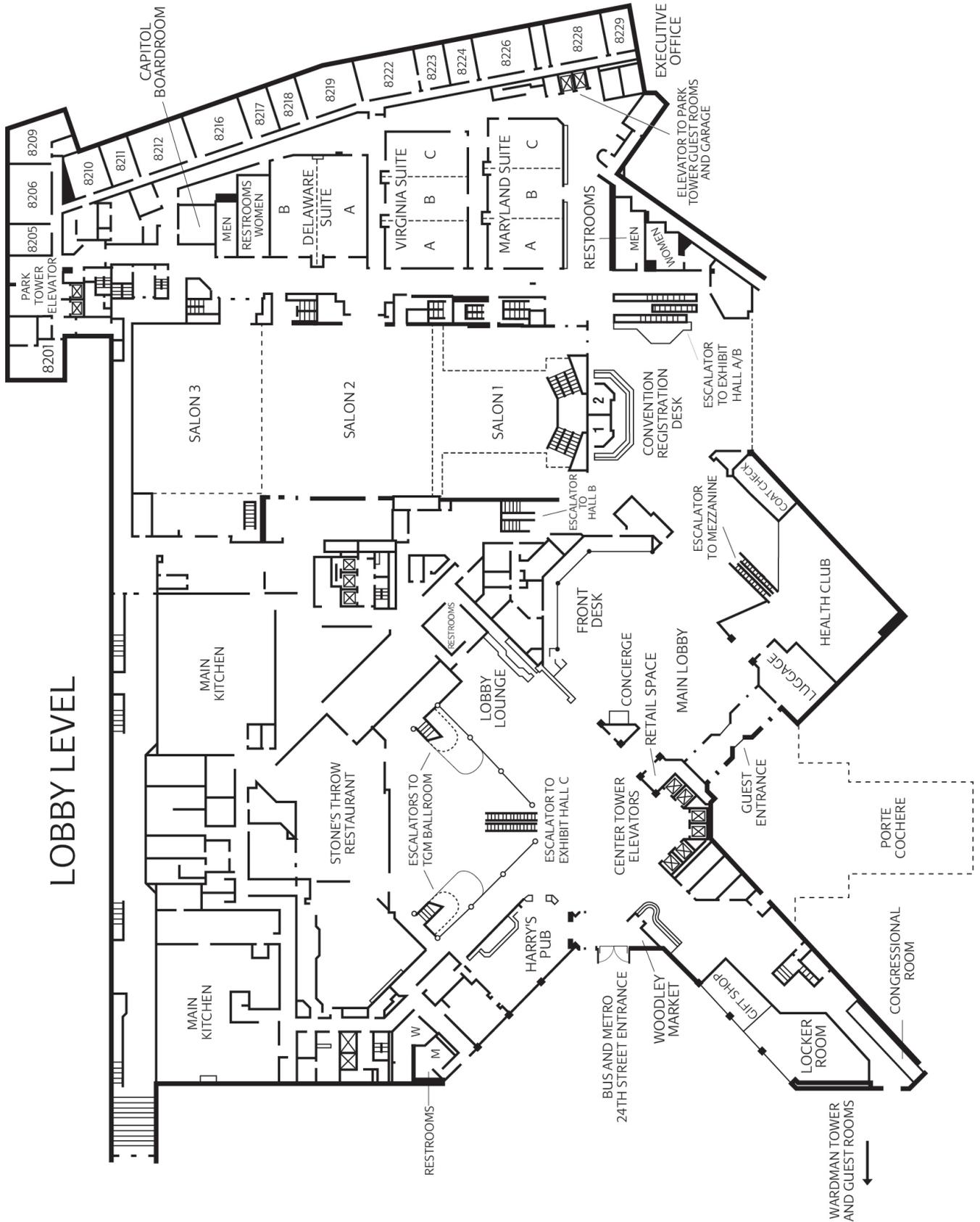
**EXHIBIT HALL  
HOURS:**

Wednesday, August 5: 5:00 PM – 7:00 PM  
 Thursday, August 6: 9:00 AM – 5:00 PM  
 Friday, August 7: 9:00 AM – 5:00 PM  
 Saturday, August 8: 9:00 AM – 12:30 PM

# Marriott Floor Plan



# Marriott Floor Plan





# Notes:

Wednesday, August 5														
	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM
<b>Salon 2/3</b> Marriott Wardman Park	Centennial Lecture 1 (Demaine) 8:20 AM - 9:20 AM	Earle Raymond Hedrick Lecture 1 (Smith) 9:30 AM - 10:20 AM	Centennial Lecture 2 (Chayes) 10:30 AM - 11:20 AM			Chan-Stanek Lecture for Students (Gallian) 1:00 PM - 1:50 PM		Special Panel Session on Science Policy 2:30 PM - 4:00 PM					Cirque de Mathematiques (Chartier) 7:00 PM - 9:00 PM	
<b>Wilson A/B/C</b> Marriott Wardman Park								MAA Section Officers Meeting 3:00 PM - 5:00 PM						
<b>Delaware A</b> Marriott Wardman Park						Panel 7 - Implementing the 2015 CUPM Curriculum Guide 1:00 PM - 2:20 PM	Panel 6 - The Updated AP Calculus AB/BC Courses: What Does This Mean For You? 2:35 PM - 3:55 PM		Panel 4 - A Discussion of the MAA/NCTM Joint Position Statement on Calculus 4:10 PM - 5:30 PM					
<b>Delaware B</b> Marriott Wardman Park						IPS - The Non-Traditional "Traditional NSA Mathematician" 1:00 PM - 3:45 PM								
<b>Washington 1</b> Marriott Wardman Park						TCPS 20 - Evidence-Based Approaches to the Mathematical Preparation of Secondary Teachers 1:00 PM - 1:55 PM								
<b>Washington 2</b> Marriott Wardman Park						TCPS 10 - The Scholarship of Teaching and Learning in Collegiate Mathematics 1:00 PM - 5:35 PM								
<b>Washington 3</b> Marriott Wardman Park						TCPS 16 - Curriculum Development to Support First Year General Education Mathematics Students 1:00 PM - 3:35 PM								
<b>Washington 4</b> Marriott Wardman Park			TCPS 1A - History of Mathematics 10:30 AM - 11:55 AM			TCPS 1C - History and Philosophy of Mathematics 1:00 PM - 2:55 PM	TCPS 1E - The Mathematics of Euler 3:00 PM - 5:55 PM							
<b>Washington 5</b> Marriott Wardman Park			TCPS 1B - History of Mathematics 10:30 AM - 11:55 AM			TCPS 1D - History and Philosophy of Mathematics 1:30 PM - 3:55 PM								
<b>Washington 6</b> Marriott Wardman Park						TCPS 7 - Financial Mathematics 1:00 PM - 2:35 PM			Panel 11 - Congratulations on Getting Tenure! Now What? 4:10 PM - 5:30 PM					
<b>Salon 1</b> Marriott Wardman Park			Project NEXt Lecture 11:00 AM - 11:50 AM			IPS - Generations of Monthly Gems 1:00 PM - 3:50 PM			Radical Dash 4:30 PM - 5:30 PM					
<b>Convention Registration</b> Marriott Wardman Park	Registration 7:00 AM - 7:00 PM													
<b>Exhibit Hall</b> Marriott Wardman Park												Centennial Reception / Mathematical Carnival / Exhibit and Student Hospitality Opening 5:00 PM - 7:00 PM		
<b>Maryland A</b> Marriott Wardman Park						TCPS 6A - Mathematics and Art 1:00 PM - 4:55 PM								
<b>Maryland B</b> Marriott Wardman Park						GCPS - Teaching or Learning Introductory Mathematics, Part A 1:00 PM - 2:55 PM								
<b>Maryland C</b> Marriott Wardman Park						Workshop - What's the Story? A Graduate Student Workshop on Formulating a Research Presentation for a General Audience 1:00 PM - 2:20 PM								
<b>Virginia A</b> Marriott Wardman Park						TCPS 12 - Improving Undergraduate Math Writing 1:00 PM - 5:15 PM								
<b>Virginia B</b> Marriott Wardman Park						GCPS - Algebra and Linear Algebra 1:00 PM - 3:40 PM								
<b>Virginia C</b> Marriott Wardman Park						TCPS 21 - Show Me Geometry: Geometry Software and Tablet Demonstrations 1:00 PM - 2:55 PM								
<b>Marriott Foyer</b> Marriott Wardman Park									Poster Session - Highlights from AWM Student Chapters Poster Session Alissa Crans/Jacqueline Jensen-Vallin/Maura Mast 3:30 PM - 5:00 PM					
<b>Calvert</b> Omni Shoreham						Minicourse 4A - Recruiting Students to Take More Mathematics Courses and to Be Mathematics Majors 1:00 PM - 3:00 PM			Minicourse 7A - Teaching Mathematics with Bead Crochet 3:30 PM - 5:30 PM					
<b>Hampton</b> Omni Shoreham						Minicourse 2A - The Mathematics of Games and Gambling 1:00 PM - 3:00 PM			Minicourse 3A - Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry 3:30 PM - 5:30 PM					

# Schedule At A Glance

# Thursday, August 6

Thursday, August 6														
	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM
<b>Salon 2/3</b> Marriott Wardman Park	Centennial Lecture 3 (Daubechies) 8:30 AM - 9:20 AM	AMS-MAA Joint Invited Address (Lagarias) 9:30 AM - 10:20 AM	Centennial Lecture 4 (Castillo-Chavez) 10:30 AM - 11:20 AM	MAA Prize Session 11:35 PM - 12:20 PM		MAA Undergraduate Student Activity (Benjamin) 1:00 PM - 1:50 PM		Presidential Reminiscences (Su/Pollak, Barrett, Ross, Banchoff) 3:00 PM - 4:45 PM		The Man Who Knew Infinity: Sneak Peek and Expert Panel (Ono) 5:00 PM - 6:00 PM			Mathematicians by Day, Musicians by Night (Kung) 8:00 PM - 9:30 PM	
<b>Delaware A</b> Marriott Wardman Park						IPS - The Arithmetic of the Spheres (Abram, Kontorovich, Lagarias) 1:00 PM - 3:50 PM								
<b>Delaware B</b> Marriott Wardman Park		PME SPS #11 8:30 AM - 10:25 AM				IPS - Improving Access to Mathematical Modeling Research (Castillo-Chavez, Castillo-Garsow) 1:00 PM - 3:55 PM								
<b>Washington 1</b> Marriott Wardman Park		TCPS 11A - Cultivating Critical Thinking through Active Learning in Mathematics 8:30 AM - 11:25 AM				TCPS 11B - Cultivating Critical Thinking through Active Learning in Mathematics 1:00 PM - 5:15 PM								
<b>Washington 2</b> Marriott Wardman Park						TCPS 13 - Successful STEM Programs for Elementary Education Majors 1:00 PM - 3:15 PM								
<b>Washington 3</b> Marriott Wardman Park		GCPS - Graph Theory 8:30 AM - 11:25 AM				GCPS - Applied Mathematics 1:00 PM - 4:55 PM								
<b>Washington 4</b> Marriott Wardman Park		TCPS 1F - Special Session in Memory of Jackie Stedall 8:30 AM - 11:25 AM				TCPS 1G - History and Philosophy of Mathematics 1:00 PM - 2:25 PM		TCPS 1J - History and Philosophy of Mathematics 2:30 PM - 4:55 PM						
<b>Washington 5</b> Marriott Wardman Park						TCPS 1H - History and Philosophy of Mathematics 1:00 PM - 2:25 PM								
<b>Washington 6</b> Marriott Wardman Park									Panel 12 - Finding Your New Niche: Staying Fresh 4:10 PM - 5:30 PM					
<b>Salon 1 Balcony A</b> Marriott Wardman Park		GCPS - History or Philosophy of Mathematics 9:15 AM - 11:25 AM												
<b>Salon 1 Balcony B</b> Marriott Wardman Park		GCPS - Teaching or Learning Calculus 9:15 AM - 11:25 AM				GCPS - Geometry 1:00 PM - 4:40 PM								
<b>Salon 1</b> Marriott Wardman Park						Panel 2 - Applying for and Obtaining Grants 1:00 PM - 2:20 PM	Panel 8 - What Mathematics do Engineering Students Need to Know in the First Two Years? (And What if it Doesn't Start with Calculus?) 2:35 PM - 3:55 PM							
<b>Convention Registration</b> Marriott Wardman Park	Registration 8:00 AM - 5:00 PM													
<b>Exhibit Hall</b> Marriott Wardman Park	Exhibit Hall and Student Hospitality Center 9:00 AM - 5:00 PM													
<b>Exhibit Hall</b> Marriott Wardman Park								Poster Session - Classroom Activities and Projects within the Context of Environmental Sustainability Poster Session (Galluzzo/Taylor) 3:30 PM - 5:00 PM						
<b>Maryland A</b> Marriott Wardman Park		TCPS 6B - Mathematics and Art 8:50 AM - 11:25 AM												
<b>Maryland B</b> Marriott Wardman Park		GCPS - Mentoring and Outreach 8:15 AM - 11:10 AM				GCPS - Teaching or Learning Introductory Mathematics, Part B 1:00 PM - 4:40 PM								
<b>Maryland C</b> Marriott Wardman Park						Workshop - USE Math: Undergraduate Sustainability Experiences in the Mathematics Classroom (Galluzzo/Taylor) 1:00 PM - 2:20 PM								
<b>Virginia A</b> Marriott Wardman Park		MAA SPS #1 8:30 AM - 10:25 AM						MAA SPS #7 2:00 PM - 3:55 PM		MAA SPS #11 4:00 PM - 6:15 PM				
<b>Virginia B</b> Marriott Wardman Park		MAA SPS #2 8:30 AM - 10:25 AM						MAA SPS #8 2:00 PM - 3:55 PM		MAA SPS #12 4:00 PM - 6:15 PM				
<b>Virginia C</b> Marriott Wardman Park		MAA SPS #3 8:30 AM - 10:25 AM						MAA SPS #9 2:00 PM - 3:55 PM		MAA SPS #13 4:00 PM - 6:15 PM				
<b>Wilson A</b> Marriott Wardman Park		MAA SPS #4 8:30 AM - 10:25 AM						MAA SPS #10 2:00 PM - 3:55 PM		MAA SPS #14 4:00 PM - 6:15 PM				
<b>Wilson B</b> Marriott Wardman Park		MAA SPS #5 8:30 AM - 10:25 AM						PME SPS #1 2:00 PM - 3:55 PM		PME SPS #3 4:00 PM - 6:15 PM				
<b>Wilson C</b> Marriott Wardman Park		MAA SPS #6 8:30 AM - 10:25 AM						PME SPS #2 2:00 PM - 3:55 PM		PME SPS #4 4:00 PM - 6:15 PM				
<b>Calvert</b> Omni Shoreham						Minicourse 6A - Creating Flipped Learning Experiences in the College Mathematics Classroom 1:00 PM - 3:00 PM			Minicourse 5A - Using Videos of Students Developing Proofs to Guide Teaching and Learning 3:30 PM - 5:30 PM					
<b>Hampton</b> Omni Shoreham						Minicourse 1A - The Hitchhiker's Guide to Mathematics 1:00 PM - 3:00 PM			Minicourse 8A - Getting Started in the Scholarship of Teaching and Learning 3:30 PM - 5:30 PM					

# Schedule At A Glance

# Friday, August 7

Friday, August 7														
	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM
<b>Salon 2/3</b> Marriott Wardman Park	AWM-MAA Etta Z. Falconer Lecture (Walker) 8:30 AM - 9:20 AM	Earle Raymond Hedrick Lecture 2 (Smith) 9:30 AM - 10:20 AM	Centennial Lecture 5/CSHPM Kenneth May Lecture (Parshall) 10:30 AM - 11:20 AM			NAM David Harold Blackwell Lecture (Blackman) 1:00 PM - 1:50 PM	Alder Award Session 2:00 PM - 3:20 PM		Presidential Reminiscences (Watkins, Graham, Cowen, Gallian, Bressoud, Zorn, Devaney) 3:45 PM - 6:00 PM					Albert's Bridge: A Tragicomedy by Tom Stoppard, Featuring the MAA Community Players (Abbott) 9:00 PM - 10:00 PM
<b>Delaware A</b> Marriott Wardman Park	IPS - Algebraic Structures Motivated by Knot Theory Part I 9:00 AM - 11:20 AM					IPS - Algebraic Structures Motivated by Knot Theory Part II 1:00 PM - 5:00 PM							Pi Mu Epsilon J. Sutherland Frame Lecture (Elkies) 8:00 PM - 8:50 PM	
<b>Delaware B</b> Marriott Wardman Park	PME SPS #12 8:30 AM - 11:45 AM					IPS - Concrete Computations in Algebra and Algebraic Geometry 1:00 PM - 3:30 PM								
<b>Washington 1</b> Marriott Wardman Park						TCPS 5A - Recreational Mathematics: New Problems and New Solutions 1:00 PM - 4:55 PM								
<b>Washington 2</b> Marriott Wardman Park						TCPS 2A - The Contributions of Women to Mathematics: 100 Years and Counting 1:00 PM - 3:55 PM								
<b>Washington 3</b> Marriott Wardman Park						TCPS 17 - Curriculum and Course Development to Support First Year STEM Students 1:00 PM - 2:55 PM								
<b>Washington 4</b> Marriott Wardman Park	TCPS 1K - Special Session on Mathematical Communities 8:00 AM - 10:25 AM						TCPS 1M - Special Session in Honor of Karen Parshall 2:00 PM - 4:55 PM							
<b>Washington 5</b> Marriott Wardman Park						TCPS 4 - Undergraduate Research Activities in Mathematical and Computational Biology 1:20 PM - 4:15 PM								
<b>Washington 6</b> Marriott Wardman Park	TCPS 3 - Math Circle Problems Involving the Number 100 in Honor of the MAA's 100th Anniversary 8:30 AM - 11:05 AM					TCPS 19A - Innovative Approaches in the Calculus Sequence 1:00 PM - 3:35 PM								
<b>Salon 1 Balcony A</b> Marriott Wardman Park		GCPS - Teaching or Learning Developmental Mathematics and Assessment 9:15 AM - 11:25 AM												
<b>Salon 1 Balcony B</b> Marriott Wardman Park	GCPS - Analysis and Other 8:30 AM - 11:10 AM					GCPS - Teaching or Learning Advanced Mathematics 1:00 PM - 3:10 PM								
<b>Salon 1</b> Marriott Wardman Park						Panel 1 - A Common Vision for the Undergraduate Mathematics Program in 2025 (Saxe/Braddy) 1:00 PM - 2:20 PM	Panel 10 - Nonacademic Career Paths for Mathematicians (Galluzzo/Ahmadi) 2:35 PM - 3:55 PM		Panel 3 - Beyond the Post-Doc: Fellowship Opportunities for Mathematics Faculty (McGuire) 4:10 PM - 5:30 PM					
<b>Convention Registration</b> Marriott Wardman Park	Registration 8:00 AM - 5:00 PM													
<b>Exhibit Hall</b> Marriott Wardman Park	Exhibit Hall and Student Hospitality Center 9:00 AM - 5:00 PM													
<b>Exhibit Hall</b> Marriott Wardman Park									PosterFest 2015 - A Poster Session of Scholarship by Early Career Mathematicians and Graduate Students (Ensley/McNulty) 3:30 PM - 5:00 PM					
<b>Maryland A</b> Marriott Wardman Park						TCPS 15 - Democratizing Access to Authentic Mathematical Activity 1:20 PM - 3:35 PM								
<b>Maryland B</b> Marriott Wardman Park		GCPS - Probability or Statistics 9:15 AM - 11:25 AM				GCPS - Interdisciplinary Topics in Mathematics & Modeling or Applications 1:00 PM - 4:25 AM								
<b>Maryland C</b> Marriott Wardman Park						Workshop - Beauty of Three Dimensional Polyhedra Workshop (in Celebration of the MAA's Centennial) (Olsen) 1:00 PM - 2:20 PM			Estimation! 3:30 PM - 5:00 PM					
<b>Virginia A</b> Marriott Wardman Park	MAA SPS #15 8:30 AM - 11:45 AM						MAA SPS #19 2:00 PM - 3:55 PM		MAA SPS #23 4:00 PM - 5:00 PM					
<b>Virginia B</b> Marriott Wardman Park	MAA SPS #16 8:30 AM - 11:45 AM						MAA SPS #20 2:00 PM - 3:55 PM		MAA SPS #24 4:00 PM - 5:00 PM				Pi Mu Epsilon Banquet 6:00 PM - 7:45 PM	
<b>Virginia C</b> Marriott Wardman Park	MAA SPS #17 8:30 AM - 11:45 AM						MAA SPS #21 2:00 PM - 3:55 PM		MAA SPS #25 4:00 PM - 5:00 PM					
<b>Wilson A</b> Marriott Wardman Park	MAA SPS #18 8:30 AM - 11:45 AM						MAA SPS #22 2:00 PM - 3:55 PM		MAA SPS #26 4:00 PM - 6:15 PM					
<b>Wilson B</b> Marriott Wardman Park	PME SPS #5 8:30 AM - 11:45 AM						PME SPS #7 2:00 PM - 3:55 PM		PME SPS #9 4:00 PM - 6:15 PM					
<b>Wilson C</b> Marriott Wardman Park	PME SPS #6 8:30 AM - 11:45 AM						PME SPS #8 2:00 PM - 3:55 PM		PME SPS #10 4:00 PM - 6:15 PM					
<b>Calvert</b> Omni Shoreham						Minicourse 4B - Recruiting Students to Take More Mathematics Courses and to Be Mathematics Majors 1:00 PM - 3:00 PM			Minicourse 7B - Teaching Mathematics with Bead Crochet 3:30 PM - 5:30 PM					
<b>Hampton</b> Omni Shoreham						Minicourse 2B - The Mathematics of Games and Gambling 1:00 PM - 3:00 PM			Minicourse 3B - Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry 3:30 PM - 5:30 PM					

	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM
<b>Salon 2/3</b> Marriott Wardman Park	MAA James C. Leitzel Lecture (Bressoud) 8:30 AM - 9:20 AM	Earle Raymond Hedrick Lecture 3 (Smith) 9:30 AM - 10:20 AM	Centennial Lecture 6 (Bhargava) 10:30 AM - 11:20 AM											
<b>Salon 2</b> Marriott Wardman Park						A Dozen Proofs that 1=2: An Accessible and Quirky Overview of Mathematics for K-12 Teachers and Their Students (Tanton) 1:00 PM - 1:50 PM								
<b>Salon 3</b> Marriott Wardman Park					MAA Undergraduate Ice Cream Social 12:30 PM - 2:00 PM									
<b>Delaware A</b> Marriott Wardman Park						Panel 9 - Quantitative Literacy and Democracy (Franchy/Miller) 1:00 PM - 2:20 PM		Panel 5 - Big Data in the Undergraduate Mathematics Curriculum (Levy) 2:35 PM - 3:55 PM						
<b>Delaware B</b> Marriott Wardman Park						Special Session: "Notes of a Native Son": The Legacy of Dr. Abdulim A. Shabazz (1927-2014) (Jackson, Washington) 1:00 PM - 4:50 PM								
<b>Washington 1</b> Marriott Wardman Park						TCPS 5B - Recreational Mathematics: New Problems and New Solutions 1:00 PM - 3:15 PM								
<b>Washington 2</b> Marriott Wardman Park						TCPS 2B - The Contributions of Women to Mathematics: 100 Years and Counting 1:00 PM - 3:15 PM								
<b>Washington 3</b> Marriott Wardman Park						TCPS 14 - Projects, Applications and Demonstrations to Enhance a Numerical Analysis or Computational Mathematics Course 1:00 PM - 2:35 PM		TCPS 8 - Mathematics in Video Games 3:00 PM - 4:55 PM						
<b>Washington 4</b> Marriott Wardman Park	TCPS 1N - History and Philosophy of Mathematics 8:30 AM - 11:55 AM					TCPS 1Q - Special Session in Memory of Ivor Grattan-Guinness 1:00 PM - 3:25 PM		TCPS 1R - History of Mathematics 3:30 PM - 5:25 PM						
<b>Washington 5</b> Marriott Wardman Park	TCPS 1P - History and Philosophy of Mathematics 8:30 AM - 11:55 AM													
<b>Washington 6</b> Marriott Wardman Park						TCPS 19B - Innovative Approaches in the Calculus Sequence 1:20 PM - 3:55 PM								
<b>Salon 1 Balcony A</b> Marriott Wardman Park	GCPS - Mathematics and Technology 8:45 AM - 11:25 AM							Great Talks for a General Audience: Coached Presentations by Graduate Students, Part C 1:00 PM - 5:00 PM						
<b>Salon 1 Balcony B</b> Marriott Wardman Park						GCPS - Number Theory and Logic or Foundations 1:00 PM - 4:55 PM								
<b>Salon 1</b> Marriott Wardman Park		MAA Mathematical Competition in Modeling (MCM) Winners 9:00 AM - 10:15 AM				Special Session: The Geometry of Triangles (Guy, Conway) 1:00 PM - 2:50 PM					Closing Banquet featuring the Centennial Players 6:00 PM - 9:00 PM			
<b>Convention Registration</b> Marriott Wardman Park	Registration 8:00 AM - 12:30 PM													
<b>Exhibit Hall</b> Marriott Wardman Park	Exhibit Hall and Student Hospitality Center 9:00 AM - 12:30 PM													
<b>Maryland A</b> Marriott Wardman Park							Math Circle Demonstration 2:00 PM - 3:30 PM		Math Wrangle 4:00 PM - 5:30 PM					
<b>Maryland B</b> Marriott Wardman Park			Student Problem Solving Competition 10:30 AM - 11:45 AM				Industrial Math Research in the PIC Math Program 1:30 PM - 5:00 PM							
<b>Maryland C</b> Marriott Wardman Park							Great Talks for a General Audience: Coached Presentations by Graduate Students, Part B 1:00 PM - 5:00 PM							
<b>Virginia A</b> Marriott Wardman Park						TCPS 18 - Using Modeling for Teaching Differential Equations: Before, During, After 1:00 PM - 4:35 PM								
<b>Virginia B</b> Marriott Wardman Park						TCPS 9 - What Can a Mathematician Do with a 3D Printer? 1:00 PM - 4:55 PM								
<b>Virginia C</b> Marriott Wardman Park						Great Talks for a General Audience: Coached Presentations by Graduate Students, Part A 1:00 PM - 5:00 PM								
<b>Calvert</b> Omni Shoreham						Minicourse 6B - Creating Flipped Learning Experiences in the College Mathematics Classroom 1:00 PM - 3:00 PM		Minicourse 5B - Using Videos of Students Developing Proofs to Guide Teaching and Learning 3:30 PM - 5:30 PM						
<b>Hampton</b> Omni Shoreham						Minicourse 1B - The Hitchhiker's Guide to Mathematics 1:00 PM - 3:00 PM		Minicourse 8B - Getting Started in the Scholarship of Teaching and Learning 3:30 PM - 5:30 PM						



# MAA American Mathematics Competitions

## Middle School and High School Levels

### The MAA American Mathematics Competitions provides:

- ▶ Great math problems that engage your students and connect with the Common Core State Standards
- ▶ Print and video teaching resources found in Curriculum Inspirations by award-winning mathematics teacher and scholar James Tanton
- ▶ MAA K-12 teacher membership – electronic subscriptions to *Math Horizons* and *MAA FOCUS* magazines, *AMC Math Messenger* and *MAA Math Alert* monthly electronic newsletters plus discounts on national meetings, books and videos

Students use words like “fun,” “challenging,” “great math,” and “bringing math to life” when describing the MAA American Mathematics Competitions.

### Register

for the MAA American Mathematics Competitions (AMC), the oldest, largest, and most prestigious mathematics competition in the United States.

#### AMC 8 Contest Date

Tuesday, November 17, 2015

#### AMC 10 and AMC 12 Contest Dates

Tuesday, February 2, 2016

Wednesday, February 17, 2016

To register and for more information visit [amc.maa.org](http://amc.maa.org).

Questions: Email [amcinfo@maa.org](mailto:amcinfo@maa.org) or call 800 527-3690.





# MAA MATHFEST

August 3-6, 2016

Columbus, Ohio

## Save the Date

