MAA MATHFEST

MAA Prize Session

Friday, August 2, 2019
9:00 AM – 10:00 AM,
Duke Energy Convention Center, Grand Ballroom A
Cincinnati, OH

Awards and Prizes

A list of awards and prizes appears below. The full citation, winner responses and bios start on p. 7. Clicking on a winner's name will take you to the citation.

Inaugural MAA Award for Inclusivity

Sylvia Trimble Bozeman, *Spelman College*

Henry L. Alder Awards

PJ Couch, *Lamar University*

Pamela Harris, *Williams College*

Alicia Prieto Langarica, *Youngstown State University*

Carl B. Allendoerfer Awards

William Dunham

"The Early (and Peculiar) History of the Möbius Function," *Mathematics Magazine*, 91:2, 83–91, 10.1080/0025570X.2017.1413921.

Jordan Bell and Viktor Blåsjö

"Pietro Mengoli's 1650 Proof that the Harmonic Series Diverges," *Mathematics Magazine*, 91:5, 341–347, 10.1080/0025570X.2018.1506656.

Mary P. Dolciani Award

Joseph Gallian, *University of Minnesota Duluth*

Trevor Evans Award

Stan Wagon

"Resolving the Fuel Economy Singularity," *Math Horizons*, 26:1, 5–9, 10.1080/10724117.2018.1460120.

Paul R. Halmos - Lester R. Ford Awards

Adrian Rice

"Partnership, Partition, and Proof: The Path to the Hardy–Ramanujan Partition Formula," *The American Mathematical Monthly*, 125:1, 3–15, 10.1080/00029890.2017.1389178.

Jonathan M. Borwein and Robert M. Corless

"Gamma and Factorial in the Monthly," *The American Mathematical Monthly*, 125:5, 400–424, 10.1080/00029890.2018.1420983.

Andrew Granville

"Using Dynamical Systems to Construct Infinitely Many Primes," *The American Mathematical Monthly*, 125:6, 483–496, 10.1080/00029890.2018.1447732.

Kenneth S. Williams

"Everything You Wanted To Know About $ax^2+by^2+cz^2+dt^2$ But Were Afraid To Ask", *The American Mathematical Monthly*, 125:9, 797–810, 10.1080/00029890.2018.1503003.

Merton M. Hasse Prize

David Treeby

"Further Thoughts on a Paradoxical Tower," *The American Mathematical Monthly*, 125:1, 44–60, 10.1080/00029890.2018.1390375.

George Pólya Awards

Stanley R. Huddy and Michael A. Jones

"The Calculus Behind Generic Drug Equivalence," *College Mathematics Journal*, 49:1, 2–9, 10.1080/07468342.2017.1391502.

Peter McGrath

"Newton's Shell Theorem via Archimedes' Hat Box and Single Variable Calculus," *College Mathematics Journal*, 49:2, 109–113, 10.1080/07468342.2018.1411655.

Daniel Solow Award

Timothy Chartier, *Davidson College*

Meritorious Service Awards

John Thoo
Golden Section

Richard Alan (Rick) Gillman
Indiana Section

John Travis
Louisiana-Mississippi Section

Martha Abell
Southeastern Section

David and Muriel Skoug
Nebraska Southeast South Dakota Section

Christopher Swanson
Ohio Section

Competitions

The 79th William Lowell Putnam Mathematical Competition

December 1, 2018

The William Lowell Putnam Mathematical Competition is an annual contest of the Mathematical Association of America for college students established in 1938 in memory of its namesake. Each year on the first Saturday in December, over 4000 students spend six hours (in two sittings) trying to solve twelve problems.

The Five Highest Ranking Individuals (in alphabetical order)

1. Dongryul Kim, *Harvard University*
2. Shyam Narayanan, *Harvard University*
3. David Stoner, *Harvard University*
4. Yuan Yao, *Massachusetts Institute of Technology*
5. Shengtong Zhang, *Massachusetts Institute of Technology*

Team Winners

1. Harvard University
   Dongryul Kim, Shyam Narayanan, David Stoner
2. Massachusetts Institute of Technology
   Junyao Peng, Ashwin Sah, Yunkun Zhou
3. University of California, Los Angeles
   Ciprian Mircea Bonciocat, Xiaoyu Huang, Konstantin Miagkov
4. Columbia University
   Quang Dao, Myeonhu Kim, Matthew Lerner-Brecher
5. Stanford University
   David Kewei Lin, Hanzhi Zheng, Yifan Zhu

The Elizabeth Lowell Putnam Prize, established in 1992, is awarded periodically to a woman whose performance on the Putnam Exam is deemed particularly meritorious. The prize this year goes to:

Danielle Wang, *Massachusetts Institute of Technology*

The United States of America Mathematical Olympiad

The USAMO (United States of America Mathematics Olympiad) provides a means of identifying and encouraging the most creative secondary mathematics students in the country. It serves to indicate the talent of those who may become leaders in the mathematical sciences of the next generation. The USAMO is part of a worldwide system of national mathematics competitions, a movement in which both educators and research mathematicians are engaged in recognizing and celebrating the imagination and resourcefulness of our youth. The USAMO is a six-question, two-day, nine-hour essay/proof examination. This year it was held April 17–18.

Winners (in alphabetical order)

Vincent Bian, *Poolesville High School, MD*

Milan Haiman, *Stuyvesant High School, NY*

Vincent Huang, *Plano West Senior High School, TX**

Kevin Liu, *Carmel High School, IN*

Luke Robitaille, *Robitaille Home School, TX**

Victor Rong, *Marc Garneau Collegiate Institute, ON, Canada*

Carl Schildkraut, *Lakeside School, WA*

Colin Shanmo Tang, *Lakeside School, WA**

Edward Wan, *Saint John's School, PR**

Brandon Wang, *Saratoga High School, CA**

Guanpeng Xu, *Phillips Academy Andover, MA*

Daniel Zhu, *Montgomery Blair High School, MD**

*Member of the 2019 International Mathematics Olympiad USA Team

The European Girls' Mathematical Olympiad

The European Girls' Mathematical Olympiad (EGMO) is a mathematical olympiad for girls which started in 2012. The eighth EGMO was held in Kyiv, Ukraine, April 7–13, 2019. The United States was represented by a team of four who took first place with three individual gold medals and one individual silver medal.

Team Members (in alphabetical order)

Yuting Qin, *The Webb School, CA*

Ishika Shah, *Cupertino High School, CA*

Janabel Xia, *Lexington High School, MA*

Catherine Wu, *Saratoga High School, CA*

The Romanian Master of Mathematics

The Romanian Master of Mathematics is an annual competition for students in the pre-university level, held in Bucharest, Romania; the 11th RMM was held February 20–25, 2017. The United States was represented by a team of four who took first place with three individual gold medals and one individual silver medal.

Team Members (in alphabetical order)

Benjamin Qi, *Princeton High School, NJ*

Carl Schildkraut, *Lakeside School, WA*

Luke Robitaille, *Robitaille Home School, TX*

Daniel Zhu, *Montgomery Blair High School, MD*

Lectures

AWM-MAA Etta Zuber Falconer Lecture

Dance of the Astonished Topologist ... or How I Left Squares and Hexes for Math

Tara Holm, *Cornell University*

Earle Raymond Hedrick Lecture

Complex Dynamics and Elliptic Curves

Laura DeMarco, *Northwestern University*

MAA James R.C. Leitzel Lecture

What's at Stake in Rehumanizing Mathematics?

Rochelle Gutiérrez, *University of Illinois*

Awards and Prizes

Inaugural MAA Award for Inclusivity

Sylvia Trimble Bozeman

Spelman College

The MAA is pleased to honor Sylvia Trimble Bozeman with the inaugural Award for Inclusivity.

Dr. Bozeman served on the faculty at Spelman College beginning in 1974 until her retirement in 2013.

In her four decades as a Professor of Mathematics, Dr. Sylvia Trimble Bozeman has taught, supervised and mentored countless students, showing an unwavering commitment to bringing more African-Americans—as well as women and individuals from other under-represented groups—into the field of mathematics. She has taken on significant leadership roles in the mathematics community: in 1997, Sylvia Bozeman became the first African-American to be elected a Section Governor (Southeastern) in MAA's history, and she has been on the Executive Committees of the AWM and NAM.

Dr. Bozeman was, with Rhonda Hughes, the co-founder of the Enhancing Diversity in Graduate Education (EDGE) program, and continues to serve on the Board of the EDGE Foundation. She also currently serves as co-chair of the National Association of Mathematicians' Golden Anniversary Campaign Committee.

The purpose of the EDGE Program, a collaboration of Spelman and Bryn Mawr, is to increase the number of women and minority students who successfully complete graduate programs in the mathematical sciences. As of June 2018, more than 90 alumni of the EDGE program had obtained PhDs. The EDGE program was recognized in 2007 as a Mathematics Program that Makes a Difference by the American Mathematical Society, and in 2018 was awarded the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring by the White House Office of Science and Technology Policy. The EDGE program continues to provide mentoring at critical transition points through participants' careers, and alumni often return to give back to the program.

Alejandra Alvarado, who joined the program in 2002 and is now an associate professor at Eastern Illinois University said "I can state with certainty, if it wasn't for the EDGE family, I would not be where I am today. And so I will give EDGE everything I can for as long as I can, in hopes for brighter days ahead."

This sentiment is shared by many EDGE participants, and by many more in our community, who have witnessed and benefitted from Dr. Bozeman's personal attention and dedication to broadening participation in our discipline.

Response

What a great honor it is for me to have been chosen to receive the MAA Inaugural Award for Inclusivity! In accepting this award, I do so in honor and recognition of Dr. Lida Barrett, a past MAA President and an esteemed colleague, who took as a central mission of her presidency to make the MAA more diverse and inclusive. I am aware that the MAA leadership has continued that effort and has brought us now to the existence of an Award for Inclusivity.

I have felt some connection to the MAA since my high school years when I was awarded an MAA pin for performance on a comprehensive mathematics exam. In later years, my first public research talk was given at an MAA Southeastern Section Meeting, beginning a long history of work within the MAA and

support from the MAA. It has been an ongoing challenge for many who attended the segregated schools of the south (and beyond) to learn how to be inclusive. In the process I have benefitted significantly from colleagues, as we worked toward common goals, and from students whom I sought to mentor.

My connection to the EDGE Program and to the students there has had a tremendous effect on my understanding of diversity and the need for inclusive attitudes and actions. I thank the participants, faculty, and staff in the EDGE community, as well as those at Spelman College, for creating environments that encourage collaboration, mutual support, and other inclusive practices.

Kudos to the MAA for initiating an Award for Inclusivity that emphasizes this core value of the Association. I thank the nominator, the selection committee and the MAA Board of Directors for this honor.

Biographical Sketch

Sylvia Trimble Bozeman earned the BS degree at Alabama A&M University, the M.A. at Vanderbilt University and the PhD at Emory University. During more than 38 years on the faculty at Spelman College, her many roles included Chair of the Department of Mathematics for ten years, Associate Provost for Science and Mathematics, and, currently, Professor Emeritus.

Bozeman's early publications focused on Fredholm Operator Theory. Inspired by her colleagues at Spelman College, she began addressing the need for more inclusion of African Americans, women, and other underrepresented groups at the highest levels in the mathematical sciences. It was this interest that led Bozeman and Rhonda Hughes to the cofounding of the EDGE Program in 1998 and to publications on improving the graduate experiences of students in mathematics. Bozeman was the recipient of the Dr. Etta Z. Falconer Award for Mentoring and Commitment to Diversity at the 2007 Infinite Possibilities Conference and the recipient of a Mentor Award from the American Association for the Advancement of Science.

Henry L. Alder Awards

PJ Couch

Lamar University

As a first-generation college student, Dr. PJ Couch experienced first hand the uphill climb of higher education. He has made it his mission to ease this experience for all of his students. First and foremost, he is an excellent mathematics teacher. Through the use of active learning, Dr. Couch "designs his classes to motivate his students to work in ways that lead to success." He utilizes short enriching assignments that engage and challenge busy students. He is available to students, but he also mentors new faculty through the Center for Teaching and Learning Enhancement at Lamar. In this manner, Dr. Couch enhances the learning of all students at his institution. In addition, he is tireless with his contributions to the Math Club, the university retention committee, and the South Park neighborhood surrounding the university. His outstanding community service efforts netted him a community service award for his work establishing a tutoring program in local public schools. Dr. Couch's greatest achievement is the Mathematical Puzzle Programs (MaPP) challenge he established in Beaumont but has expanded globally. The MaPP challenge is a unique problem-solving program for middle school and high school students. Dr. Couch established MaPP in 2015 on his campus but has shared the program with colleagues at MathFest and the Joint Mathematics Meetings. There are now puzzle events in several states. As mentioned, he has taken the challenge globally with training events in Japan and Australia. Through all of these varied experiences, Dr. Couch remains committed to mentoring others as he remembers those who helped him on his journey. We believe this dedication to mathematics, mentoring, and community warrant full consideration for the Adler Award.

Response

I've had a great deal of help from a large number of people, and I've been very fortunate to have the opportunity and the support to help others. I appreciate your efforts, your guidance, your time, and, especially, your patience; thank you. As I continue to try to mature and improve, I'll keep these things in consideration and invest in others as you have invested in me.

Biographical Sketch

Dr. PJ Couch is an Assistant Professor and Distinguished Faculty Teaching Fellow at Lamar University. He received a BA in Mathematics from Lamar University in 2007 and an MS in Mathematics from LU in 2009, followed by a PhD from the Department of Mathematics and Statistics at Auburn University in 2012. His research is in Combinatorial Design Theory. PJ has directed several MS theses and McNair Scholar research projects. He has also served as a teaching mentor to graduate assistants, as well as a mentor to new faculty at Lamar.

PJ is the associate director and a founding member of Mathematical Puzzle Programs (MaPP), which designs events to help students have fun through learning and using mathematics. The program emphasizes collaboration and communication and rewards players' problem-solving ability over their previous mathematical background, pulling ideas from outside the usual arithmetic-to-calculus sequence based on modern mathematical research topics. The events take place on campuses across the country and abroad. Dr. Couch has also been an active member of the Lamar University led Greater South Park Neighborhoods Partnership since it was formed in 2015. The committee works to create a more prosperous future for the neighborhood by creating opportunity and meeting challenges. These efforts contributed to his receipt of the 2018 Julie and Ben Rogers Community Service Award.

Henry L. Alder Awards

Pamela Harris

Williams College

Dr. Pamela Harris of Williams College has achieved tremendous success as a teacher and undergraduate research mentor. Her teaching evaluation scores are consistently high, and her students describe her as passionate, masterful, and inspiring. One student writes, "Dr. Harris always pushed us towards the deeper questions… and pushed us to think and learn in ways that were not always within our comfort zone."

In the area of undergraduate research mentorship, Dr. Harris excels. Since arriving at Williams College in 2016, Dr. Harris has supervised 27 students, resulting in a staggering 16 joint publications with students. Williams College has already recognized her with the Davis Center Outstanding Mentor Award. Beyond campus, Dr. Harris has achieved a national impact on mentoring through her work as an editor of the AMS e-Mentoring Network. Additionally, she will soon begin serving as chair of the MAA Committee on Undergraduate Research.

Dr. Harris is a fierce advocate for a diverse and inclusive mathematics community. As co-founder of the Lathisms.org platform, she is internationally known for her impact on future generations through her efforts to highlight LatinX/Hispanic heritage in mathematics.

For all of these reasons and more, we recommend Dr. Pamela Harris for the Alder Award.

Response

To say that it is an honor to receive the 2019 Henry L. Alder award barely begins to express the sincere gratitude I feel. Since becoming an educator, I have had the fortune of being surrounded by colleagues who believe in making mathematics accessible and who share a passion for excellence in undergraduate education. Their support has been instrumental in my growth as an educator. In particular, I thank Drs. Alicia Prieto Langarica, Cindy Wyels, Chad Topaz, Erik Insko, and Mohamed Omar for their feedback and suggestions as I embarked on introducing inclusive pedagogical techniques in my classes.

Arriving at Williams, a beautiful place surrounded by mountains and where the setting sun turns the sky purple, I felt isolated and out of place. Yet I have seen my students succeed in the face of adversity, mathematical or otherwise, and they taught me the value of a community and the importance of belonging. They have also traveled with me on wild mathematical adventures—flipped classes, research based courses, and writing a book! Through these experiences, we discovered that mathematics is a vibrant and lively field to which we can all contribute meaningfully. Working with them has been the greatest joy in my professional career and I will do my best to continue to live up to the standards of this award.

I would also like to thank my family. Dear Jamual, thank you for supporting my dreams and being my rock. Akira thanks for being the reason I never settle—I know you are watching. Lastly, I thank my parents for inculcating in me the value of hard work and for their unending sacrifices giving me the opportunity to pursue an education.

Biographical Sketch

Dr. Pamela E. Harris is a Mexican-American assistant professor in the department of Mathematics and Statistics at Williams College. She received her BS from Marquette University, MS and PhD in mathematics from the University of Wisconsin-Milwaukee, and was a Davies Fellow of the National Research Council with an dual appointment at the United States Military Academy and the Army Research Lab. Her research interests are in algebraic combinatorics, with a particular focus on the representation theory of

Lie algebras. Dr. Harris is a prolific researcher. Since 2016, she has published thirty peer-reviewed research articles and received grants from the National Science Foundation and the Center for Undergraduate Research in Mathematics.

Dr. Harris is an advocate for diversity and inclusion in the mathematical sciences. She has led efforts to secure funding for mathematics sessions and for student travel scholarships for the national conference of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science. In 2016, she co-founded Lathisms.org, an online platform that prominently features the research and mentoring contributions of Latinxs and Hispanics in the Mathematical Sciences. She serves as an editor of the e-Mentoring Network Blog of the American Mathematical Society and was lead editor for the 2018 Special Issue on Motherhood and Mathematics of the *Journal of Humanistic Mathematics*. Dr. Harris has mentored over 30 undergraduate students on research projects and received the 2018 Outstanding Mentor of the Year by the Davies Center at Williams College. Dr. Harris has been featured in various publications, including being one of the fifty women featured in the book *Power in Numbers: The Rebel Women of Mathematics*.

Henry L. Alder Awards

Alicia Prieto Langarica

Youngstown State University

Dr. Alicia Prieto Langarica of Youngstown State University has an impressive record of teaching, mentoring, and caring for her students. She incorporates research projects into many of her classes, emphasizing research that has the potential to benefit her community. Her students have helped to improve her campus library's staff scheduling paradigm; they have spurred the construction of a new parking structure; and they have helped the Youngstown City Council identify which buildings should be demolished, among other tangible impacts. In addition, Dr. Prieto Langarica never turns down students who want to gain research experience outside of class—she has even been known to mentor 25 students in research in a single semester!

Dr. Prieto Langarica is especially involved with mentoring students—both from her university and from across the country—from groups that have traditionally been underrepresented in the mathematical sciences community, including Latinx and Hispanic students. She strives to encourage mathematicians from minority groups, in part, by making more visible those mathematicians from similar backgrounds who have had successful careers. For instance, she co-founded Lathisms, "an accessible platform that features prominently the extent of the research and mentoring contributions of Latinxs and Hispanics in different areas of the Mathematical Sciences." She also regularly invites minority speakers to give talks on her campus and sets up meetings for her students to network with the visitors. In addition, she helped establish a page on the MAA website with resources for minority faculty and students.

Dr. Prieto Langarica recognizes that her students cannot succeed academically if they fail to thrive personally. To check in with her undergraduate researchers, she takes frequent one-on-one walks with each of them. She organized a group of undergraduate women in math to form a running group to train for a 5K. She has helped students who have become single mothers, who are challenged with homelessness, or who have faced significant medical issues. In short, Dr. Preito Langarica understands that her students are humans before they are mathematicians. This understanding is one of the reasons that she is profoundly successful at helping her students to achieve their potential. One of her former students, who became the first Rhodes Scholar from Youngstown State, observed that Dr. Prieto Langarica "is an effective and inspiring instructor of mathematics, STEM research, and of life."

For these reasons and many more, we enthusiastically recommend that Dr. Prieto Langarica receive the Alder Award.

Response

I am humbled and honored by the effort of students, colleagues and collaborators and their kind and encouraging words in nominating me. Your support and recognition means more than I can put in words and working with you makes every day a joy. I want to thank the MAA for finding me worthy of such a prestigious award. I am incredibly grateful to Youngstown State University faculty, students and staff, not a single day goes by that I do not feel lucky to have ended up in such a wonderful institution. I want to thank my mentors who always encourage me and push me to be better, especially, but not exclusively, Dr. Wyels and Dr. Cordero. Finally, I want to thank my dad, Carlos Prieto, for showing me every day by example the power of discipline and hard work and my partner, Chontele Coleman, for always supporting my work and filling our life with humor.

Biographical Sketch

Dr. Prieto Langarica is Associate Professor in the Department of Mathematics and Statistics at Youngstown State University. She received her Undergraduate degree in Applied Mathematics from the University of Texas at Dallas in 2008 and her PhD from the University of Texas at Arlington in 2012. Prieto Langarica's research is in the intersection of mathematics and biology, specifically problems related to the medical field. Recently she started conducting research in data science and public policy.

Carl B. Allendoerfer Awards

William Dunham

"The Early (and Peculiar) History of the Möbius Function," *Mathematics Magazine,* 91:2, 83–91, 10.1080/0025570X.2017.1413921.

Upon first encountering the Möbius function in a number theory course, a student might well find it "neither useful nor obvious," as the author writes in this lively story of the early appearances of the function. Seeking to perform a kind of inversion on infinite series, August Ferdinand Möbius was led in 1832 to introduce a certain function $\mu(x)$ on the positive integers—although as the author notes, the now-ubiquitous notation $\mu(x)$ only took hold after being introduced some 40 years later by Franz Mertens. In order to achieve his inversion, Möbius found that $\mu(x)$ must satisfy:

1. $\mu(1) = 1$
2. $\mu(n) = 0$ if n is divisible by the square of some prime
3. $\mu(n) = (-1)r$ if n is a product of r distinct primes

While it seems non-intuitive at first, Möbius' function gets at something fundamental about the integers – both the prime number theorem and the Riemann hypothesis can be recast as statements about $\mu(x)$. The author leads us on a tour of Möbius' construction from his 1832 paper, and illustrates the power of Möbius' method by showing how the complicated-looking sum

$$\sum_{k=1}^{\infty} \frac{\mu(k)x^k}{1-x^k}$$

equals, remarkably, x.

But the story doesn't end there, and those familiar with the author's previous work might have an inkling where it goes. Some 80 years earlier, Euler had already met the same function. In his typical fashion, Euler derived eye-popping formulas for sums such as $\sum_{k=1}^{\infty} \mu(k)/k$ and $\sum_{k=1}^{\infty} \mu(k)/k^2$ without ever explicitly defining $\mu(x)$. He considered the interplay between infinite products and infinite sums, and starting with the product

$$\left(1-\frac{1}{2^n}\right)\left(1-\frac{1}{3^n}\right)\left(1-\frac{1}{5^n}\right)\cdots$$

and its reciprocal. Niftily using the unique factorization of integers into products of prime powers, he showed that this product is given by $\sum_{k=1}^{\infty} \mu(k)/k$ and its reciprocal by the harmonic series. And presto: $\sum_{k=1}^{\infty} \mu(k)/k = 0$. With similar verve, Euler derived $\sum_{k=1}^{\infty} \mu(k)/k^2 = 6/\pi^2$. As the author writes, "These wonderful results are examples of Euler being Euler, manipulating symbols with a gusto that can take one's breath away. In so doing, he not only anticipated the Möbius function, but generated formulas more sophisticated than anything its namesake would discover eight decades later. Euler was, once again, far ahead of his time."

The article is written with its own gusto, guiding the reader with eloquence through the peculiar history of this foundational number-theoretic function. In a most entertaining way, "this tale reminds us—if we need reminding—that the history of mathematics can provide a host of unexpected rewards."

Response

It is a thrill to receive the Allendoerfer Award for my article on the origins of the Möbius function. Many thanks to the MAA and to those committee members who directed this honor my way.

Let me share a little story. When Penny and I retired from Muhlenberg College in 2014, we moved to Bryn Mawr on Philadelphia's Main Line. This put us near Bryn Mawr College, and we were pleased when their mathematics department gave us an affiliation that let us enjoy a new academic home a few blocks from our real one.

As a historian, I especially appreciated the College's excellent Science Library. There, one might find an old book that once belonged to Charlotte Angas Scott, Bryn Mawr's first math professor, or a volume bearing the signature of Emmy Noether, the illustrious mathematician who was welcomed by Bryn Mawr after fleeing Nazi Germany in 1933.

One day my browsing led me to the collected works of August Ferdinand Möbius. I figured I'd thumb through it to find the famous Möbius function from the theory of numbers. But nothing inside smacked of number theory. It took some time before I spotted a version of the function buried within an 1832 paper on analysis. This suggested that there was more to the topic than meets the eye, a thought reinforced when I found that Leonhard Euler had stumbled upon the same function in his famous *Introductio in analysin infinitorum* from 1748. My attempts to unravel the history of this idea became an article for *Mathematics Magazine*. And here we are.

The take-away from my little tale: grazing through a great library can have unexpected rewards.

Biographical Sketch

William Dunham is a historian of mathematics who has written/edited six books on the subject, including *Euler: The Master of Us All* (MAA, 1999) and *The Calculus Gallery* (Princeton, 2005). Since retiring from Muhlenberg College in 2014, he has held visiting positions at Princeton, Penn, Cornell, Harvard, and at Bryn Mawr College, where he is currently a Research Associate in Mathematics.

Carl B. Allendoerfer Awards

Jordan Bell and Viktor Blåsjö

"Pietro Mengoli's 1650 Proof that the Harmonic Series Diverges," *Mathematics Magazine*, 91:5, 341–347, 10.1080/0025570X.2018.1506656.

Everyone who's taken enough calculus has seen at least one proof that the harmonic series diverges. Fewer know that Pietro Mengoli gave the first published proof of this divergence, in 1650. The result had been known for centuries, but Mengoli's argument had a distinctive flavor that merits a new look—particularly because modern accounts have not always faithfully relayed his methods. The authors take the reader on a journey not only through Mengoli's arguments, but through his actual words, by providing a complete English translation of the proof.

Mengoli's proof proceeds by grouping terms into blocks of three and using the inequality

$$\frac{1}{n-1}+\frac{1}{n}+\frac{1}{n+1}>\frac{3}{n}.$$

At this point it is tempting from our modern perspective to argue that we obtain a lower bound for the sum of the harmonic series in terms of the sum itself, and no finite quantity can satisfy such a bound. Indeed, this is what several modern accounts claim Mengoli's proof does.

The authors emphasize that Mengoli's proof did not do this—he was as wary of infinity as the ancient Greeks, from whom he drew direct inspiration. He took care to phrase his proof in finite terms: he applied the above inequality to blocks of 3 terms, then 9 terms, then 27 terms, and argued that by adding enough of these blocks, he could find a partial sum of the harmonic series that must exceed any given number. This is very much in keeping with Archimedes' approach to determining the area of a segment of a parabola, in which he in effect evaluates a Riemann sum by ruling out every possible value for the area except for one.

This engaging article will draw in anyone who has thought about infinite series. One of its most appealing aspects is how it puts the reader in contact with Mengoli's original manuscript—the reader not only sees Mengoli's mathematics, but hears his voice. For instance, he begins with a meditation on Archimedes' determination of areas relating to parabolas. After summarizing Archimedes' argument, Mengoli interjects: "That wonderful theorem!" The reader comes away marveling at how mathematics can be a conversation across centuries.

Response

We are delighted with this honor. It is very encouraging to see others share our excitement about the history of mathematics and our conviction that reflective engagement with the past has a natural place in current mathematical thought. As mathematicians with esoteric interests in history and philosophy, we are very fortunate to have such readers. Some forces in academia would rather push historians to a humanities department and hire another algebraic geometer in their place, but, thanks to the MAA, a more inclusive point of view is alive and well in the mathematical community. In this way, the thriving MAA community makes work such as ours possible through its promotion of a diversity of scholarly approaches to mathematics. We are immensely grateful for this invaluable support.

Biographical Sketches

Jordan Bell is a mathematician and data scientist working in Toronto, Canada. His earlier work as a scholar in the history of mathematics includes a translation of Euler's paper finding the sum of reciprocals of the squares, and an exhaustive review paper on Euler's work on the pentagonal number theorem. He received his MSc in mathematics from the University of Toronto. For the history of mathematics, Jordan's next project is a paper showing that the focus of Book I of Euclid's *Elements* is application of areas (I.44)—not the Pythagorean theorem (I.47)—and to present different medieval Latin proofs that fix a gap in Euclid's proof that has been seldom commented on in modern writings. (Heath does not mention it in his translation, Vitrac does.)

Viktor Blåsjö is an assistant professor at the Mathematical Institute of Utrecht University. He is a historian of mathematics with a special interest in the interplay between technical mathematical content and foundational issues in the early modern period. You can follow him on Twitter @viktorblasjo and listen to his Opinionated History of Mathematics podcast.

Mary P. Dolciani Award

Joseph Gallian

University of Minnesota Duluth

Professor Joseph Gallian exemplifies the combination of excellence in both mathematical research and mathematics education that the Mary P. Dolciani Award honors. Dr. Gallian has published 35 research papers in pure mathematics, 40 papers related to teaching, 30 expository articles, 17 news articles, 7 books, led numerous workshops and conferences, and has given nearly 100 invited addresses at meetings. Dr. Gallian has been widely recognized for his contributions. He is an Inaugural Fellow of the American Mathematical Society; a recipient of the Franklin and Deborah Tepper Haimo Award for teaching excellence from the MAA; a recipient of every teaching award given by the University of Minnesota Duluth and the University of Minnesota System for which he is eligible, and a recipient of the most prestigious award given by the MAA recognizing contributions to our profession, the Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics.

Dr. Gallian has been a tireless contributor to the MAA serving on numerous committees spanning all aspects of MAA work, heading MAA grant funded projects, securing contributions for the MAA Carriage House programs, and notably served as MAA President. The MAA work for which he is best known is his 23-year leadership role in Project NExT.

Dr. Gallian is a great communicator of mathematics, inspiring mathematicians and students alike through his many presentations and expository papers and books. His talk on "Assigning Drivers License Numbers" has been heard and enjoyed by thousands. He led the effort to produce the film *Hard Problems*, about the U.S. team to the International Mathematical Olympiad, and to have the film *Julia Robinson and Hilbert's Tenth Problem* syndicated on public television.

In 1977, Professor Gallian helped to change undergraduate mathematics education across the country with his groundbreaking summer research program for undergraduate at the University of Minnesota Duluth. At that time, most mathematicians did not believe that undergraduate students could do significant original research in mathematics. Gallian showed that indeed talented undergraduates could and did produce publishable research results. In over 40 years of summer programs, Dr. Gallian taught and mentored over 250 REU students. One of those students states that the uniqueness of this program is that Professor Gallian treats undergraduate students as if they were working on a PhD thesis problem. The UMD program is recognized for the numbers of students who have gone to graduate school, received PhD's in mathematics, won mathematical prizes, and have gone onto stellar careers. A highlight of Dr. Gallian's remarkable career was an invitation from his student Manjul Bhargava to be his official guest at the ceremony in Seoul at which he received the Fields Medal. While his REU attracts highly talented students, Dr. Gallian excels in matching each one with a challenging published open problem. He spreads the word about undergraduate research through talks, papers, workshops, and conferences. Gallian and other REU directors in mathematics have made REUs a staple of summer enrichment offerings. Furthermore, because REUs showed it is a reasonable expectation for undergraduates to do original mathematics, research has been incorporated in the undergraduate curriculum across the country and throughout the spectrum of undergraduate institutions. Through his leadership of Project NExT, generations of new faculty have emulated Professor Gallian, combining research and excellent teaching and incorporating undergraduate research in their programs. Through the MAA, Dr. Gallian secured grants for undergraduate research conferences, workshops for faculty on undergraduate research, and for undergraduates' travel in order to present their work at national mathematics meetings and undergraduate research conferences. These efforts further

solidified the place of research in the undergraduate experience. It is for his profound impact on undergraduate mathematics education combined with an outstanding career as a research mathematician that Professor Joseph Gallian is awarded the 2019 Mary P. Dolciani Award.

Response

It is a great honor to receive the Dolciani award. I thought I was a long shot to win it, but I considered it an honor just to be nominated. I decided early on that rather than run summer research programs with faculty colleagues, the best people to assist me with the programs were alumni of the program. Over the years, I have had fantastic program alumni return to Duluth to live and work with wonderful undergraduates to accomplish significant research. Together, we have established a community of peers where interactions take place long after their initial participation in the program. The Dolciani award citation gives me credit for their efforts and the contributions of others who have helped to create a role for research in the undergraduate mathematics education. The NSF and the NSA provided crucial financial support and the MAA provided the necessary logistical support with minicourses, conferences, and Project NExT. There are too many people who contributed to this revolution to mention by name, but it is not a slight to the others to thank Aparna Higgins and Frank Morgan for their major contributions.

Biographical Sketch

Joe Gallian received a PhD from Notre Dame in 1971. He has been at the University of Minnesota Duluth since 1972. He is the author of the book *Contemporary Abstract Algebra* (9th edition) and coauthor of the book *For All Practical Purposes* (10th edition). His research interests include groups, graphs, and combinatorics. For pleasure, he enjoys spending time with his ten-year-old grandson Joey, reading nonfiction, and listening to National Public Radio.

Trevor Evans Award

Stan Wagon

"Resolving the Fuel Economy Singularity," *Math Horizons*, 26:1, 5–9, 10.1080/10724117.2018.1460120.

Combining the subtleties of an everyday phenomenon with a dash of exposé, the author makes a strong case for considering fuel economy in gallons per 100 miles (GPM) rather than the traditional miles per gallon (MPG). He begins with two counterintuitive results. First, a person considering trading in a car that gets 40 MPG for a car that gets better gas mileage could never save as much gas as would someone trading in a 10-MPG vehicle for a 14-MPG one. Second, a policy of the government's Corporate Average Fuel Economy (CAFE) program, intended to fine an automotive manufacturer for failing to meet minimum average fuel economy standards, may cause a manufacturer to incur an increased fine upon adding a new, fuel-efficient car to their fleet.

The discussion continues with the fuel efficiency of hybrid and electric vehicles, which can similarly be measured in kilowatt-hours per 100 miles (similar to GPM) or miles per kWh (similar to MPG). The first measure is displayed on the dashboards of Teslas, while the second is used by Chevrolet. As the article neatly explains, the use of miles per kWh has led to ugly hacks and bizarre results. These issues are subtle enough that they have made it into production, but significant enough that engineers from the Chevrolet Bolt team were willing to listen to the author's suggestions.

The article is illuminating and accessible. The author proposes a better display that fixes the issues he raises regarding fuel efficiency calculations and displays, without completely discarding the familiar MPG method. The subject is topical and draws attention to the need for revisiting common fuel economy measures, in addition to our collective need to change our understanding of them.

Response

Mathematically inclined runners quickly learn how to relate the harmonic mean to their sport. To get overall speed from the speeds on two halves of a route, one must use a harmonic mean. The same principle applies to the measurement of energy usage. What was shocking about my investigation into measures of economy in gasoline and electric vehicles is that serious errors can arise even when the developers (of vehicles, or government regulation) understand how the harmonic mean applies. An easy-to-grasp measure, such as miles-per-gallon, is deeply ingrained in American car culture and is obviously very useful. But it can lead to serious misunderstandings. For a mathematician, an electric car is a rich source of investigations into issues of measurement, both from a technical point of view, but also in terms of how language and common phrases can affect understanding by the general public. The use of mathematics in real-world problems is important at all levels and I am grateful to *Math Horizons* for its ongoing effort to publish realistic applications at an accessible level.

Biographical Sketch

Stan Wagon attended McGill University as an undergraduate, and then Dartmouth College, where he earned a PhD in set theory in 1975. He taught at Smith College for 15 years and then at Macalester College for 23 years. He is known for a certain inefficient method of transportation: a bike with square wheels. But he has always been interested in efficient transportation, having run many marathons and ultramarathons (up to 100 miles), both on foot and on skis. He is a founding editor of *Ultrarunning* magazine and the author of many books and papers, including most recently a second edition of *The Banach–Tarski Paradox*.

Paul R. Halmos - Lester R. Ford Awards

Adrian Rice

"Partnership, Partition, and Proof: The Path to the Hardy–Ramanujan Partition Formula," *The American Mathematical Monthly*, 125:1, 3–15, 10.1080/00029890.2017.1389178.

The Hardy-Ramanujan partition formula, which expresses the number of partitions of a natural number as a series involving π, e, and other unexpected quantities, remains one of the most stunning triumphs in the theory of numbers. It elegantly combines the uncanny intuition of Ramanujan with the analytical wizardry of Hardy and it marked the birth of the spectacularly successful circle method. This beautiful article celebrates the centennial of the partition formula, taking the reader on a tour through its historical development, including later contributions of Rademacher and criticism of Selberg. Adrian Rice chronicles the story in stages, portraying the famed result not as a singular event, but rather as the culmination of a sequence of refinements and improvements pioneered by the rigorous Hardy and the enigmatic Ramanujan.

Response

I am delighted and deeply honored to have been selected as a recipient of the Halmos-Ford Award for my article on the Hardy-Ramanujan partition formula. Working on it was a labor of love—which was fortunate, because the period of time from its conception to its eventual publication was about five years! Looking over the list of past recipients of this award is a fascinating and humbling experience, and I consider it a tremendous privilege to have my name included in such a distinguished group. My thanks go to Susan Colley, for her editorial help and attention to detail when preparing the piece for publication, to the members of the Halmos-Ford Award Committee, and of course to the Mathematical Association of America for this great honor.

Biographical Sketch

Adrian Rice received a BS in mathematics from University College London in 1992 and a PhD in the history of mathematics from Middlesex University in 1997 for a dissertation on Augustus De Morgan. He is currently chair of the Department of Mathematics at Randolph-Macon College in Ashland, Virginia. His research focuses on 19th- and early 20th-century mathematics, on which he has published research papers, articles and books, including *Mathematics Unbound: The Evolution of an International Mathematical Research Community, 1800–1945*, edited with Karen Hunger Parshall, *Mathematics in Victorian Britain*, edited with Raymond Flood and Robin Wilson, and *Ada Lovelace: The Making of a Computer Scientist*, written with Christopher Hollings and Ursula Martin. In his spare time, he enjoys reading, travel, and spending time with his wife and young son.

Paul R. Halmos - Lester R. Ford Awards

Jonathan M. Borwein and Robert M. Corless

"Gamma and Factorial in the Monthly," *The American Mathematical Monthly*, 125:5, 400–424, 10.1080/00029890.2018.1420983.

The Bernoulli-Euler-Legendre gamma function is the best known (and most useful!) solution to the following interpolation problem: "Find a smooth curve connecting the points (x, y) given by $y = (x - 1)!$ at the positive integer values for x." The authors give a survey of the many articles on the gamma function and Stirling's formula that have appeared in the *Monthly*. They show how the gamma function appears in different areas of mathematics, from geometry to analysis to number theory, and that the gamma function is "transcendentally transcendental." Part of the survey shines a light on some of the important aspects of the gamma function that haven't been covered in the *Monthly* (yet), including visualization of the gamma function and the inverse of the gamma function. The authors give some references so that anybody can go and follow their roadmap that they have given to the beauty of the gamma function.

Response

Jon would have been delighted with this award which, I believe, he never won in his lifetime, although his brother Peter did in 2001. To be sure, Jon was a Chauvenet prize winner: clear and engaging writing was second nature for him. I learned a lot working with Jon. His enthusiasm for this paper was as I described in the afternotes to it; it was hard for me to complete the paper without him, and I am very grateful for this award as a mark that his vision for the paper was not totally lost.

I am also personally grateful. Clear mathematical writing, as exemplified by the *Monthly*, is very important to me, both for research and for teaching. I have been (cumulatively) an MAA member for decades, since being awarded a membership on graduation from UBC in 1980 (thank you Professor George Bluman). The *Monthly* has had a profound effect on my mathematical tastes and standards. Having the chance to dive deep into *Monthly* archives was an intense pleasure, one I recommend to everyone; of course, anyone reading this response doesn't need a reminder from me about the value of the *Monthly*. My only advice is to read more, and don't overlook the older papers!

Biographical Sketches

Rob Corless did his BSc in Math and Computer Science at the University of British Columbia in 1980. After an M. Math (Applied Math) at Waterloo in 1982 he returned to UBC to do a PhD in Mechanical Engineering (really classical Applied Math, perturbation series and fluid mechanics, with a little computer algebra and dynamical systems thrown in) in 1987. He joined the Applied Math department at the University of Western Ontario immediately after and has been there ever since. Indeed I believe a major role of applied mathematics is to respond to the greater-than-human challenges of real applications and develop new pure mathematics. He was chair from 2002–2007, and is currently Scientific Director of ORCCA (The Ontario Research Center for Computer Algebra). His best *Monthly* paper (till now) made the cover of the March 1992 issue (Chaos and Continued Fractions) and his most nontraditional publication (that has any citations) is his 2004 poster "The Lambert W Function" (orcca.on.ca/LambertW). His current mathematical interests are computational special functions, computational dynamical systems, computational discovery and epistemology (www.springer.com/la/book/9781493990504), and computational algebra, especially linear algebra with matrix polynomials, and the newly named field "Bohemian Matrices and Applications" (see the website, especially the gallery at bohemicanmatrices.com, and the Characteristic Polynomial Database and its unsolved conjectures—he says, "come join the fun!"). His non-mathematical interests include scuba diving and Yoshinkan Aikido, in which he was awarded shodan in 2016.

For a bio of **Jon Borwein**, see the CMS obituary or www.tandfonline.com/doi/full/10.1080/00029890.2018.1420983.

Paul R. Halmos - Lester R. Ford Awards

Andrew Granville

"Using Dynamical Systems to Construct Infinitely Many Primes," *The American Mathematical Monthly*, 125:6, 483–496, 10.1080/00029890.2018.1447732.

One approach for showing that there are infinitely many primes is to construct a sequence of pairwise relatively prime integers, whose prime factors then provide an infinite collection of primes, provided the terms of the sequence are eventually greater in magnitude than 1. But how can we get our hands on such a sequence of pairwise relatively prime integers? This remarkable paper, assuming little more than a familiarity with elementary number theory, illustrates a dynamical approach, obtaining sequences by iterating maps given by polynomials with integer coefficients. The number-theoretic question (of showing that the resulting sequences are pairwise relatively prime, or at least have enough prime factors) leads directly to questions about dynamics, including the periodic orbits of polynomial maps and the rate of growth of terms in non-periodic orbits. The dynamic questions are in turn answered by number-theoretic methods, mostly elementary. By the end, we see how the *abc*-conjecture plays a natural role. This welcoming invitation to arithmetic dynamics will appeal to every reader's curiosity.

Response

I love the *Monthly*, both reading and learning from it, and greatly enjoy trying to explain mathematics, that has charmed me, to a wider audience. The *Monthly* is my favorite platform to share my joy in the distribution of prime numbers: be it races, patterns and now, dynamics, and how much beautiful and diverse mathematics can be involved in some simple-sounding questions.

Biographical Sketch

Andrew Granville is a professor at both the University of Montreal, and University College, London. He is the author of many research articles as well as a forthcoming graphic novel *Prime Suspects; The Anatomy of Permutations and Integers*, which can ordered from Princeton University Press. His first textbook, *Number Theory Revealed,* will also be published in the Fall in two versions, both as *An Introduction*, and as *A Masterclass.*

Paul R. Halmos - Lester R. Ford Awards

Kenneth S. Williams

"Everything You Wanted To Know About $ax^2+by^2+cz^2+dt^2$ But Were Afraid To Ask", *The American Mathematical Monthly*, 125:9, 797–810, 10.1080/00029890.2018.1503003.

The author leads us through explorations of the numbers that can be generated by $ax^2+by^2+cz^2+dt^2$ where x, y, z, t are any integers. Through a lively series of questions and answers we are taken from the very basic result of every integer being the sum of four squares up through the current state of the art in quadratic forms, a journey of over two hundred years, that leaves the reader with a satisfying overview of the mathematics of quadratic forms (and a few exercises to carry out to improve the understanding). The presentation of this paper has been thought out to make it friendly for a general audience. The flow of questions and answers follows one after another in a natural way, and so we are left with the feeling of having had a conversation with the author, and a quite enjoyable one at that.

Response

I am thrilled and honored to have been selected as a recipient of the Paul R. Halmos - Lester R. Ford Award for 2019. I received many valuable suggestions for improving the presentation of my article from the referees and the editor. I thank them again for their help. I hope that readers of my article will be further motivated to learn more about the fascinating world of quadratic forms. Finally I would like to thank my wife Carole for all her encouragement of my mathematical work over 56 years of married life together.

Biographical Sketch

As a point of interest the secondary school I attended in England was founded in 1541 by King Henry VIII and I had classes in what is believed to be the oldest classroom in continuous use in the UK. From there I went to the University of Birmingham and graduated with a B. Sc degree in mathematics in 1962. I received my PhD in mathematics from the University of Toronto in 1965 and from 1966 to 2002 I was a faculty member at Carleton University in Ottawa, Canada. I retired in 2002 as Professor Emeritus. After 56 years of marriage, my wife decided that in retirement I should learn to cook a few meals. Under her tutelage I am now proficient in making a good English cottage pie, tasty Italian spaghetti and meat balls, and spicy Mexican tacos! I also enjoy gardening, birding, and spending time with my 10-year-old granddaughter Isabelle.

Merton M. Hasse Award

David Treeby

"Further Thoughts on a Paradoxical Tower," *The American Mathematical Monthly*, 125:1, 44–60, 10.1080/00029890.2018.1390375.

David Treeby's article "Further Thoughts on a Paradoxical Tower" exemplifies the way a simple inquiry can prompt far-reaching mathematical exploration. The article begins with an appealing, tactile problem: how can one stack a set of blocks on a table so that the horizontal overhang extends as far as possible? If the blocks are of different widths, does the order matter? Should each block protrude further than the block below it, or should the uppermost blocks be used as a counterbalance? Treeby provides elegant, general answers to these questions. The discussion ranges from classical facts about sequences and series to open problems about complexity of computation. Throughout, the paper is illustrated with simple, informative, and compelling diagrams.

Response

That block stacking papers appear in MAA journals so frequently is notable; perhaps it reflects the fact that the mathematician is best served by retaining their playfulness; the tactile play of the child should simply be translated into more abstract forms of tinkering. My interest in this particular topic stemmed from an elegant solution to a classic block stacking problem written by my PhD supervisor, Burkard Polster, in his delightful little book titled *Q.E.D.: Beauty in Mathematical Proof*. Polster details how one can stack n blocks of width 2 in a one-on-one fashion to achieve an overhang equal to the nth harmonic number. Although the classic problem had already been extended in various directions, there was still a wealth of fascinating questions to be explored. My favorite discovery was that of infinite sets of blocks whose widths tend to zero that can nonetheless be stacked to achieve an arbitrarily large overhang. However, my article details many unsolved problems whose solutions were beyond the reach of my abilities. For instance, how should one maximally stack a set of blocks of whose widths are consecutive integers? My approach works for only small sets of such blocks. Readers are invited to pick up a conceptual set of blocks and add to my incomplete tower.

Biographical Sketch

David Treeby received his PhD from Monash University, Melbourne, in 2018, where he worked under Burkard Polster, Marty Ross and Heiko Dietrich. Each of these teachers imparted the lesson that mathematical ideas deserve to be beautifully presented, whether cast in words, equations or images. David completed his studies while teaching high school mathematics at Presbyterian Ladies' College. Here, he confuses his students by using words such as "elegant" and "mathematics" in close proximity.

George Pólya Awards

Stanley R. Huddy and Michael A. Jones

"The calculus behind generic drug equivalence," *College Mathematics Journal*, 49:1, 2–9, 10.1080/07468342.2017.1391502.

This paper starts with a question of obvious real-world significance: how can we tell whether a generic drug is "equivalent" to its brand-name counterpart? It is not enough just to check that they contain the same amount of the same active ingredient, since factors such as pill coatings or inactive ingredients could affect the rates at which the drug is absorbed and eliminated by a patient's body. These rates cannot be measured directly, so they must somehow be inferred from measurements over time of the drug concentration in the patient's blood. How should the concentration curves of the two drugs be compared? This leads us to the intriguing mathematical problem presented in the article.

The US Food and Drug Administration (FDA) has set equivalence criteria which involve comparing three quantities: the time of the maximal concentration peak, the maximal concentration at that time, and the area under the concentration curve. But why did they select these three quantities in particular? It seems clear that some calculus will be involved in answering the question, and the authors lead us gracefully along this path. Starting with a commonly used pharmacokinetic model for the shape of the concentration curve, they eventually demonstrate that any two of the FDA's three measured quantities are sufficient to determine the desired absorption and elimination rates for this model; thus, the FDA criteria are mathematically sound. The journey takes us through several calculus topics, including integration, optimization, and, surprisingly, the Lambert W function. The latter provides a good opportunity for readers to think about the notion of implicitly defined functions with multiple branches, an important concept that calculus students may not realize goes beyond the familiar inverse trigonometric functions. Not every equation can be solved by mere algebra, and not every useful function has a nice closed-form expression or a button on your calculator!

The authors skillfully illustrate the interplay between applied and theoretical mathematics: understanding the properties of a mathematical model may involve different tools than were required to formulate the model in the first place. This well-written and engaging article could form the basis of a very nice project for students in a calculus or modeling course, providing an opportunity to apply and explore concepts from coursework while demonstrating that calculus is useful—and used—beyond the classroom.

Response

We are honored to be awarded the George Pólya award. We were motivated to investigate bioequivalence after hearing Jeremy Greene describe his book on the history of generic drugs when he was interviewed on National Public Radio's *Science Friday*. Fittingly, determining how calculus applied to bioequivalence, we followed, not consciously, Pólya's steps from his book *How to Solve It*, from understanding and honing the problem statement to using a picture to prove an inequality. Working on the project was also rewarding because, fifteen years ago, our relationship was that of student and teacher, and since then we have become colleagues and coauthors.
We want to thank the anonymous referees and editor Brian Hopkins for their comments and suggestions that helped improve the presentation.

Biographical Sketches

Stanley R. Huddy is an assistant professor of mathematics at Fairleigh Dickinson University. He holds a PhD in dynamical systems from Clarkson University and his research interests include oscillator networks, game theory, and combinatorics. He was a National Science Foundation GK-12 Fellow and is a certified teacher of mathematics in the state of New Jersey. In his free time, he enjoys mountain biking, snowboarding, and playing the drums.

Michael A. Jones is an associate editor for the American Mathematical Society's *Mathematical Reviews* and is finishing his last year as editor of *Mathematics Magazine*. He was at Montclair State University (New Jersey) for 10 years where he recruited Stanley to work on a student research project. His PhD is in game theory from Northwestern University and his research interests often involve applications of mathematics to the social sciences. This year was his tenth time teaching The Mathematics of Decisions, Elections, and Games as part of the University of Michigan's Michigan Math and Science Scholars summer program for high school students. His free time is spent shuttling his kids to soccer, softball, and music lessons.

George Pólya Awards

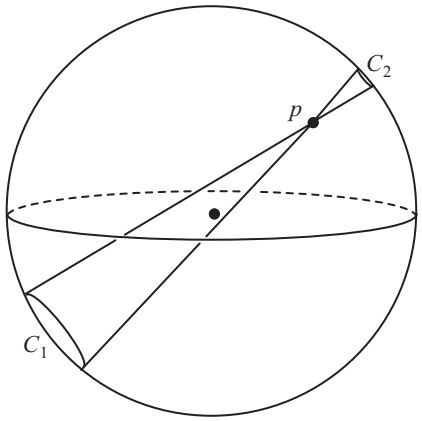
Peter McGrath

"Newton's shell theorem via Archimedes' hat box and single variable calculus," *College Mathematics Journal*, 49:2, 109–113, 10.1080/07468342.2018.1411655.

This lovely short paper revisits some classical theorems in a lively fashion. The first problem addressed is the following: if an orange is covered by chocolate and you are offered the chance to slice the orange with two parallel cuts at distance d apart (thus creating a spherical segment), which cuts should you choose so as to maximize the area of chocolate on your piece? Some readers will recognize the Archimedes "hat box" theorem, which proves that all spherical segments with the same distance d have exactly the same area.

The author recalls briefly the modern proof with integral calculus and then discusses the argument given by Archimedes nearly two millennia before, which establishes that the area of the spherical segment is that same as that of its horizontal projection onto a cylinder tangent to the sphere. This result of Archimedes was rediscovered by Johann Heinrich Lambert in 1772 and is used in cartography: horizontal projection onto a cylinder allows the drawing of maps which preserve ratios (now called Lambert equivalent projection).

The author then moves to Newton's shell theorem. Consider a thin spherical shell of uniform mass density and total mass M. The net gravitational force exerted by the shell is zero at any point p inside the shell. As for a point p outside the shell, the gravitational force is the same as that exerted by a single mass point of mass M located at the center O of the spherical shell. Again, the author proposes a clever proof. First, consider the case where p is inside the shell, and consider a cone with vertex at p. This cone cuts two spherical shells. The squares of the distances from these shells to p are proportional to their areas, and hence to their masses. Thus their joint contribution exerts a zero gravitational force at p. The case where p is outside the sphere requires some computation, which the author elegantly carries out in the spirit of the hat box theorem. By a symmetry argument the force is directed along the line Op. Then this force is computed as the sum of the forces exerted by infinitely thin spherical segments perpendicular to Op, by means of a single variable elementary integral.



This paper is a gem, exhibiting the beauty of mathematical proof while at the same time revealing the mystery behind some deep classical results. It deserves to be used in calculus classes.

Response

I am delighted to receive the George Pólya Award. For many years, I have admired writings of several of the prior winners of this award, and it is a privilege to join their ranks. I would like to thank an anonymous referee, whose feedback and suggestions greatly improved the quality of the final article, as well as the editors of the *College Mathematics Journal*, for their support and dedication.

Biographical Sketch

Peter McGrath is currently a Hans Rademacher Instructor of Mathematics at the University of Pennsylvania and received his PhD in mathematics at Brown University in 2017. His research is in geometric analysis and primarily focuses on minimal surfaces.

Daniel Solow Award

Timothy Chartier

Davidson College

The Mathematical Association of America is pleased to present its 2019 Daniel Solow Award to Dr. Timothy Chartier for his works: *Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms, Math Bytes: Google Bombs, Chocolate-Covered Pi, and Other Cool Bits in Computing, When Life is Linear: From Computer Graphics to Bracketology*, and his *Princeton University Press Mathematics Blog.*

Dr. Chartier engages his readers through his enthusiasm for mathematics, and his writings illustrate his extraordinary ability to reach a wide range of audience. He can communicate with the most celebrated mathematicians hoping to expand their circle of knowledge, as well as the "math haters" who are working to fulfill a math requirement. Through strong exposition and playfulness, he illuminates both the nature of mathematics itself, as well as the interesting ways in which math is used in other disciplines. Simply stated, Dr. Chartier's materials make his readers want to learn more.

As one nominator describes it, "[Tim's writing] accomplishes the difficult task of being mathematically challenging while also being interesting and relevant to today's students. Students working with his materials learn mathematics, often at a higher level than the course they are enrolled in. They not only learn techniques, they learn to think about mathematical options and helpful (or dangerous) ways to use technology. They do so because Tim's work has a 'cool' factor that gets them excited about the material and wanting to create their own cool mathematics. Thus, the students learn skills that are often impressively sophisticated. More importantly, they get excited about mathematics and want to do more; in some cases, this represents a 180-degree reversal of attitude."

Another nominator states, "I look forward to finding ways to incorporate more of his writing into my courses in the future, as his texts have an approachability and a focus on applications and real-life motivation for mathematical topics that inspire and resonate with undergraduates."

Certainly, one of Dr. Chartier's greatest strengths is in connecting with undergraduates, whether they be at his own institution or elsewhere. He is known for effectively incorporating applications within his educational materials, thereby illustrating the usefulness of a mathematical notion or theory. His publications have had a major impact on numerous undergraduates within mathematics and throughout the mathematical sciences.

Additionally, Dr. Chartier's work has been positively reviewed in *MAA Focus*, *Science*, *New York Journal of Books*, *SIAM News*, and *GrrlScientist, The Guardian*. These reviews speak to Dr. Chartier's emphasis on applications and their relevance to students. The MAA applauds Dr. Chartier for his excellence in expository writing and for his tireless quest to bring mathematics to as many people as possible.

Response

Einstein remarked, "Have the courage to take your own thoughts seriously." Effective teaching creates a space for someone to embrace the unknown and learn to stand in uncertainty, waiting for knowledge and intuition's guidance. Education is a collaborative journey between teacher and student where both guide and learn. For these reasons, receiving the Daniel Solow Author's Award overwhelms me with gratitude to students who engaged in concepts and shared their discoveries, teachers who inspired me to create content, and friends and family who support my quest to teach and write in ways that reflect the whimsical artist ever active within me.

I want to thank my family as each of the commitments noted in the citation is one we made as a unit.

One of my greatest joys is sharing life's journey with my wife Tanya. She inspires me as a teacher and challenges me to be the educator I want and hope to be. I thank my children, Noah and Mikayla, who share their joy of learning. I also thank my parents for the hours we've shared discussing learning, communicating, and creating affirming and safe environments.

I want to specifically thank Vickie Kearn. Meeting Vickie was a springboard moment in my career. She helped me dream and find my mathematical voice. Through it all, Vickie is and has been a friend to me and my family.

I also thank Amy Langville, who enthusiastically collaborates as a colleague, mentor, and friend.

I want to thank Davidson College. I am grateful to teach at a place where I am surrounded by faculty and staff who focus intently on quality, long-lasting educational experiences.

Finally, I want to thank the MAA, which has helped me see that I have a voice, and my less-trodden path has a place.

For those who've read and used my writing, I ever look forward to seeing what you've done and being inspired by your work.

Biographical Sketch

Tim Chartier is a Professor of Mathematics and Computer Science at Davidson College. He specializes in numerical linear algebra, with his recent work focusing on data analytics. He frequently consults for businesses on data analytics questions, which have included consultation on problems for ESPN, the New York Times, the US Olympic Committee and teams in the NBA, NFL and NASCAR. He oversees a group of 70 student researchers in supplying analytics to Davidson College sports teams. Tim serves Section Representative to the MAA Congress for the MAA's Southeastern Section and has served as Vice President of the MAA. Tim is a recipient of the Henry L. Alder Award. His research and scholarship were recognized with an Alfred P. Sloan Research Fellowship. Published by Princeton University Press, Tim wrote *Math Bytes: Google Bombs, Chocolate-Covered Pi, and Other Cool Bits in Computing* and coauthored the textbook *Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms*. He also authored the book *When Life is Linear: From Computer Graphics to Bracketology* which won the MAA's Beckenbach Book. Through the Teaching Company, Dr. Chartier completed a 24-lecture series entitled *Big Data: How Data Analytics Is Transforming the World*. In K–12 education, Tim has also worked with Google and Pixar on their educational initiatives.

Meritorious Service Awards

John Thoo

Yuba College

The Golden Section of the Mathematical Association of America proudly nominates Dr. John Thoo of the Yuba College Department of Mathematics for its service award. John's Haimo nomination citation from 2008 states "*What is extraordinary about Dr. Thoo's nominating documents for the award is the uniformity of the comments made by his students, departmental colleagues, college administrators, and off campus professional colleagues. Strongly favorable comments are not unusual coming from one or two of these groups...But it is unusual to see praise for someone from all categories...*"

Soon after winning the section's teaching award in 2008, John began serving on and revolutionizing the work of the section's teaching committee—he revamped our time line, took an active role in recruiting members to the committee and did a great deal to find great teachers and extol their virtues. While some MAA sections are no longer able to find nominees for the Haimo and/or the Alder award (John works on both), we have been so fortunate to always have absolutely fantastic nominees and winners. One committee member remarked: "*In the 5 years or so that I served on the teaching award committee, I have quickly learned just how much I appreciate John's ansatz to our profession, to teaching, and to collegiality. Working with John is simply a joy. He has seemingly endless enthusiasm, works extremely effectively, and is professional in the best sense of the word: he has clear expectations, is generous with praise (if there is reason for it) and gentle but firm with criticism (if there is reason for it).*"

While John's work for the section is so empowering and valuable to our mission, it is clear that John's service to mathematics in general is nothing short of incredible. Since it is the goal of the MAA to promote and support mathematics for students, teachers, and the public, this doesn't always have to be done in the name of the MAA. With such champions of mathematics like John, we all win BIG: In addition to serving the MAA, Dr. Thoo has been involved in *CMC*3 (California Mathematics Council, Community Colleges) for over 20 years. He has edited the newsletter and served on the board. He wrote a math history column for the newsletter for about 11 years. Even more significantly, is that he, almost single-handedly, organized and continues to keep running the Sacramento Valley Community College Mathematics conferences. These have been free annual conferences provided for community college mathematics teachers for the last 15 years.

Response

I am deeply honored to be recognized by the Golden Section, especially because I see many more-deserving individuals around me. If I have done any good at all for the Section, my students, and the profession at large, it is because of all the wonderful role models and mentors who have influenced me over the years until now and the grace of God. Although I would like to name every person in this capacity, space permits me to recognize only a few: Edward Keppelmann, David Viglienzoni, Beresford Parlett, Robert Lipton, Evelyn Silvia, Don Chakerian, Kurt Kreith, John Hunter, and Brian Winkel. I encourage everyone to be such a person to someone: share your wisdom with them, encourage them, and recognize them both personally and publicly, perhaps by nominating them for an award like your Section teaching award.

Biographical Sketch

John Thoo is a mathematics instructor at Yuba College, a community college in Marysville, California, where he has been since 1995. His journey there brought him through Cabrillo College in Aptos, Califor-

nia; Cal Berkeley in, well, Berkeley; and UC Davis. He is a father of three (ages 27, 23, and 10) and a husband of one (age x). He enjoys riding his motorcycle and would like to ride it as much as possible before he shrinks in height too much to reach the ground anymore. John is very interested in the mathematical theory of waves, which is a deep and rich area of mathematics of which he has barely scratched the surface. In fact, he knows just enough to be dangerous to himself. John also has an interest in the history of mathematics and has come to admire the wealth of knowledge that historians of mathematics possess. John encourages everyone to explore the history of mathematics, not only because it is our history, but because there are gems for the classroom to be found among the rubble.

Meritorious Service Awards

Richard Alan (Rick) Gillman

Valparaiso University

The Mathematical Association of America, especially the Indiana section, wishes to recognize the extensive and praiseworthy contributions of Richard Alan (Rick) Gillman by awarding him the Certificate of Meritorious Service.

Rick's service to Valparaiso University, located in northwest Indiana, goes back to the 1980s when he was first hired as an assistant professor. His positive influence on the mathematics community quickly extended beyond the university to the region, state, and national levels. In the 1990s, Rick worked on projects aimed at high school students, high school teachers, underrepresented minorities in the mathematical sciences, and women in mathematics (to name a few). These projects ranged from external workshops and minicamps to new internal general education courses on conceptual calculus and game theory.

By the new millennium, Rick had also made a name for himself as an expert in Quantitative Literacy. He shared his knowledge of this subject through presentations, organizing numerous contributed paper sessions, and running mini-courses on "A Game Theory Path to Quantitative Literacy." Rick edited an MAA Notes volume on the topic in 2006 describing then current best practices in the field.

Rick also edited the MAA publication *A Friendly Competition: 35 Years of Teamwork in Indiana*, which is about the undergraduate problem-solving competition held at the spring Indiana section meeting. Rick also initiated the annual Mathcounts competition at Valparaiso University, which serves middle school students in the area. His involvement in mathematics problem solving extended beyond the state as he became a member and chair of the MAA *Problem Book Series* editorial board.

Rick has held many positions in the MAA committee and goverance structure. At the section level, he was the Secretary-Treasurer from 1995–2000, Chair from 2002–2003, and Governor from 2005–2008. At the Association level, he has served as a member of the MAA Membership Committee (1999–2005), a member of the CUPM Subcommittee on Quantitative Literacy Requirements (1993–2004), chair of the MAA Committee on Sections (2009–2015), and since 2015 as chair of the MAA Committee on Program Review . This list is not exhaustive, but demonstrates the commitment Rick has had to serving the MAA throughout his career. Anecdotally, if you mention Rick's name at Mathfest or the JMM, it is likely that the person you are talking to knows him.

Finally, it would be a disservice to Rick to discuss his accomplishments without mentioning undergraduate research. Not only has he personally supervised many projects, but he continues to do so even after leaving a teaching position and becoming Associate Provost at Valparaiso University. Often, those projects led to joint publications with undergraduate students in prestigious journals like *Involve*. At Valparaiso University, Rick established the Celebration of Undergraduate Scholarship, an annual conference for students to showcase their research. He led the Valpo Department of Mathematics and Computer Science effort to develop and run an NSF-supported summer research experiences for undergraduates. While the REU recruits students not from Valpo, Rick has also worked to increase the faculty and student participation in collaborative research at Valpo. He has shared his knowledge of engaging students in research through several publications and presentations as well as through serving as a Councilor for the Mathematics Division of the Council on Undergraduate Research (1998–2001).

This description of Rick Gillman highlights some of his work in the mathematics community. As can be seen here, he is well deserving of the Certificate of Meritorious Service, and it is the pleasure of the Indiana Section of the MAA to nominate him for that award.

Response

When I reviewed the names of the previous Indiana recipients of the Certificate of Meritorious Service, I was humbled that my friends and colleagues felt that I deserved to be in their company. The Mathematical Association of America has been my professional home for 35 years—the same age as this award, as it turns out—and I have found the Association to be a wonderfully supportive community. Over the years, I have had many mentors in the organization including Duane Deal, Steve Carlson, and Martha Siegel. Along with others, these mentors have taught me how to serve and lead in our community. I hope that in return I have been able to mentor others to do the same in turn. The citation attributes many achievements to me, but very few would have been possible without collaborators and I would like to extend a thank you to all of them. Finally, my nominators exaggerate the number of people that I know at the Joint Mathematics Meetings and Mathfest, but I am impressed that they believe that it is so.

Biographical Sketch

I am a Hoosier; I grew up in southern Indiana, I went to college at Ball State University, and I have spent my entire professional career at Valparaiso University. My only time away was the four years that I spent in Idaho earning my Doctorate of Arts and meeting my wife, Michele. She was not happy to be taken away from the mountains, but has come to love Indiana nearly as much as I. She will also tell you that I see the world through a very mathematical lens; all the way down to the 'dishwasher packing problem' that I discovered while our sons were young.

Meritorious Service Awards

John Travis

Mississippi College

The Louisiana/Mississippi Section of the MAA has selected Professor John Travis for the Meritorious Service Award. Dr. Travis is a Professor of Mathematics and Chair of the Department of Mathematics at Mississippi College in Clinton, Mississippi. He has served the section with distinction for over 30 years. In 1995 Dr. Travis became the first ever webmaster for the section, a position he still holds. He also serves as the Technical Editor and Publisher of the Section's Annual Meeting Proceedings, a position he has held since 1999. He held the position of Newsletter Editor from 1998-2001, Section Chair from 2002 to 2003 and served as the Section Governor from 2006 to 2009. Throughout his time on the Section's Executive Committee Dr. Travis has provided support to both the Section and to members of the Section. He was instrumental in the development of the Section NExT program as well as the Anderson Lecture Series. Both of these initiatives provide ongoing support to the Section's members and institutional partners through meeting activities and professional development opportunities.

Dr. Travis also has a strong track record of service to the MAA beyond the Louisiana/Mississippi Section. He has been a consultant for Project NExT as well as for the PREP program on multiple occasions and has led several very successful MAA minicourses and PREP workshops. John has served on a number of MAA strategic planning groups and several committees. He has also promoted WeBWorK extensively and has supported the associated MAA initiative at national meetings for many years. He currently serves as President of The WebWork Project. One of John's main areas of interest is the use of open source resources for teaching mathematics, such as WeBWorK, Sage and PreTeXT. He has done extensive work creating and sharing innovative WeBWorK exercises and Sage modules, both locally and nationally, and has presented on using WeBWorK for teaching the Introduction to Proofs Course at national meetings and on using Sage and WeBWorK for teaching multivariable calculus at Sage Education Days. These and many of his other contributions to the teaching and learning of mathematics were recognized in 2013 when he was awarded the Sections' Distinguished Teaching Award.

Dr. Travis has provided unprecedented service to the Section and is a leader in pedagogy through his contributions to various open source resources. His dedication to and leadership in the Section is outstanding and he is very deserving of this award.

Response

It would not be a stretch to say that the Louisiana/Mississippi Section of the MAA is filled with interesting people. They are often boisterous and opinionated as well as generous and thoughtful. To be honored by such a group of deserving people is a special privilege. I have never felt like my service to the LA/MS Section was so much work but more like an opportunity to be able to support and serve such a great group. Indeed, the MAA is a great organization that has provided me with ways to serve the profession hopefully in ways that ultimately matter. The friends that I have been able to cultivate through my work with the LA/MS Section in particular and the MAA in general have made my life all the richer.

Biographical Sketch

John Travis is Professor of Mathematics at Mississippi College where he has served as Chair of Mathematics since 2004. He earned a BA in mathematics from Mississippi College, a MS in mathematics from

the University of Tennessee and a PhD in mathematical sciences from Mississippi State University. He has been teaching at his alma mater for the past 31 years. During that time he concurrently served one year as Senior Research Mathematician for the Army Corps of Engineers at the Engineering Research and Development Center in Vicksburg Mississippi.

John's primary professional interests include Numerical Linear Algebra and Scientific Computing and he is also very involved in the use of technology in the teaching of Mathematics. He is the author of two open source textbooks: *Essentials of Mathematical Probability and Statistics* and *Mathematics of Finance*, each of which incorporates interactive elements utilizing WeBWorK, Sage, and R.

You can find him often playing guitar and racquetball but not necessarily at the same time but mostly enjoying having students drop by to sit in his recliner. He and his wife Ruth have three double-named daughters: Anna Kate, Sarah Grace, and Laura Joy.

Meritorious Service Awards

Martha Abell

Georgia Southern University

The Southeastern Section of the Mathematical Association of America nominates Martha Abell of Georgia Southern University for the Meritorious Service Award.

Martha first became involved with the Southeastern Section of the Mathematical Association of America as a student club advisor in 1992. She joined the executive committee in 1998 as State Director for Georgia. Martha became Secretary-Treasurer of the Section in 2002 and Chair-Elect in 2006. She served in this position, as chair, and as past chair until 2010. Under her leadership, Georgia Southern hosted the 2007 Southeastern Section meeting. She was elected Governor for the section in 2012. In honor of her many contributions to the section and to MAA, the Southeastern Section awarded Martha the 2016 Distinguished Service Award. As one nominator wrote "As in all things, the way she carries out the duties of each position demonstrate her good sense, her careful attention to details, her leadership ability and her easy way of getting along with people."

At the national level of the MAA, Martha has been a member of the Minicourses Committee, serving as chair for three years, a member of the Basic Library List Committee, and a member and chair of the Trevor Evans Award Committee. Since 2012, she has served as chair of the Committee on Teaching Undergraduate Mathematics. Most recently she served on the Leadership Team for the MAA Instructional Practices Guide 2017 and works tirelessly in ongoing efforts of its dissemination and implementation.

Martha has published over 47 articles and books and has an even more impressive list of presentations and mini-courses at state, regional, national and international conferences. She has successfully written 29 grants. Martha was the recipient of Georgia Southern University's Award for Excellence in Scholarship and Creative Activity. Her books represent the leading edge of the mathematical community's efforts to incorporate technology into the teaching of calculus, differential equations and statistics. She is a member of 8 professional organizations and 10 honor societies. She accomplished all of this while methodically moving up the academic ladder at Georgia Southern, from assistant professor to professor to chair of Mathematics to Dean of College of Mathematics and Science. As one nominator wrote "Martha has outstanding people skills - she works positively with people, she values the many different types of contributions which different faculty make, she is easy to talk with and willing to discuss issues and hear all sides." We are privileged to honor Martha for the excellent service she has contributed to the Mathematical Association of America and to mathematics in general over the last many years.

Response

I am surprised, honored and humbled to be included in this prestigious group. As a member of the Southeastern Section, I have been fortunate to work with outstanding individuals from across Georgia, North Carolina, South Carolina, Tennessee and Alabama. The section leaders in place when I started my career 30 years ago, such as David Stone and Tina Straley, set a wonderful example of building strong connections across our region in order to provide greater opportunities for faculty and students to network, exchange mathematical and teaching ideas, and promote the mission of the MAA throughout our individual communities. Little did I know at my first Section meeting in April 1990 at Davidson College that I would return there years later as a member of the Section Executive Committee or that I would later work with colleagues at Georgia Southern to host over 400 Section meeting attendees on our own campus. I certainly never imagined being selected to serve on national committees or having the tremendous opportunity to

serve on the *MAA Instructional Practices Guide* leadership team. And while I never imagined these experiences happening, I am grateful that they did. I became a better faculty member, mentor, and administrator because of these collaborations, and I accept this award in recognition of all who worked with me along this incredible journey. I hope that I can continue to contribute to the success of the MAA for many years to come.

Biographical Sketch

Martha L. Abell is Professor of Mathematics at Georgia Southern University in Statesboro, GA, where she has been a faculty member for thirty years. After earning her BS degree in Mathematics from Mercer University, she attended graduate school at Georgia Tech where she received her MS in Applied Mathematics and PhD in Mathematics under the guidance of William F. Ames. The supportive environment at Georgia Southern made it possible for her to pursue a wide range of interests, all of which were valued by her institution. This included investigating new approaches to teaching and doing mathematics as well as contributing to the professional community through leadership positions in several organizations. Her long-time writing partnership with James P. Braselton has resulted in numerous books, papers and presentations, including *Mathematica by Example* and *Introductory Differential Equations*, both in their fifth editions. Over her career, Martha has served in various administrative roles at Georgia Southern, including Honors Director, Department Chair, and Dean. She recently returned to her faculty position full-time, where she strives to implement strategies advocated by the MAA Instructional Practices Guide to promote student engagement and equitable access to mathematics for all students.

Meritorious Service Awards

David Skoug and Muriel Skoug

University of Nebraska in Lincoln and Nebraska Wesleyan University

The Nebraska Southeast South Dakota Section of the MAA honors Dave and Muriel Skoug with the MAA's Certificate for Meritorious Service.

Dave and Muriel Skoug have long been supporters of the MAA at the national and section level. With rare exception they attend the annual section conference and have given many presentations. Their continued stalwart presence in the section has provided invaluable mentoring for the current and next generation of leadership and perspective on the section's growth and future. They provided extensive information for our section's history which was compiled for the MAA Centennial celebration. In fact, Dave had a list of the section officers dating back to its inception in 1924. Dave has served as Governor, Chair and Vice-Chair of the section.

Though now retired, both Muriel and Dave have an enduring and genuine interest in math, in the mathematics community, in our section, and in its members. They are simultaneously emblematic of our section's past, present, and future.

The Nebraska Southeast South Dakota Section wishes to extend its heartfelt thanks to the Skougs for all that they have contributed to the section, the MAA, and its members.

Response

We are honored to receive this award. As much as the Nebraska Southeast South Dakota Section feels we have contributed to it, we feel we have benefited even more from our membership in the section and in the MAA.

Biographical Sketches

Dr. David Skoug grew up near Chetek, Wisconsin. He attended River Falls State College from 1956–1960 with majors in Mathematics and Physics. He was a graduate student in Mathematics at the University of Minnesota, receiving his PhD in the summer of 1966. He was a mathematics professor at the University of Nebraska in Lincoln until retiring in 2008, serving as Department Chair from 1980–88. Dave had three PhD students and a prolific research career. Dave remains very active writing research articles and refereeing about 20 research articles each year.

Dr. Muriel Skoug grew up on a dairy farm near Grantsburg Wisconsin. She attended River Falls State College from 1957–1961 graduating with a major in Mathematics. An excellent, female, mathematics instructor there strongly encouraged Muriel to consider doing graduate work in mathematics. After teaching high school mathematics for three years, Muriel took this advice and earned a Masters of Mathematics degree at the University of Minnesota. In the fall of 1966 she moved to Lincoln, Nebraska with her husband Dave and continued to study mathematics at UNL, then took a position at Nebraska Wesleyan University teaching mathematics until retiring a few years ago. In 2000, while at NWU, Muriel earned a doctorate from Idaho State University. Muriel first joined the MAA in 1984 and greatly benefited from being a part of the NE/Southeast South Dakota section, giving talks, organizing meetings, and keeping in touch with faculty from other colleges in the area.

Meritorious Service Awards

Christopher Swanson

Ashland University

This year the Ohio Section is proud to nominate Dr. Christopher Swanson for the MAA Meritorious Service Award. Dr. Swanson has been actively involved in the MAA at the national and section level. He currently serves as the Past President of the Ohio Section after completing a two-year term as President. He worked diligently on the most recent update of the section bylaws to bring them in-line with the updates from the National MAA and also served on the Ohio Section of the MAA's Committee on Curriculum from 2001–2003.

Dr. Christopher Swanson is a devoted supporter and leader of Project NExT serving as the Ohio Section NExT Co-coordinator from 2004 until he took over as Section President in 2016. He was a co-PI with Wiebke Diestelkamp of University of Dayton and John Prather of Ohio University on an MAA grant ($5000) awarded to Ohio Section of the MAA to support the recruitment of early-career, two-year college faculty to participate in Ohio NExT workshops. He served as a faculty mentor for the graduate student paper session "Great Talks: Coached Presentations by Grad Students" at MathFest in 2012 and 2016. Dr. Swanson has also presented multiple invited national panel discussions and section NExT workshops, including:

- "Engaging Mathematics Majors Outside the Classroom" at Ohio NExT in Cleveland, Ohio (October 2013)
- "Experiencing Spherical Geometry: A Non-Axiomatic Approach to Teaching College Geometry" at National Project NExT in Madison, Wisconsin (August 2012, July 2008 and August 2007)
- "Joining the Mathematical Community" at National Project NExT in Madison, Wisconsin (July 2012)
- "How to Run a Senior Seminar" at National Project NExT in Madison, Wisconsin (July 2008)
- "Active Learning in the Non-Calculus Classroom: My Favorite Activities" at Ohio Project NExT workshop at Shawnee State University in Portsmouth, Ohio (April 2007)
- "Experiencing Spherical Geometry: A Non-Axiomatic Approach to Teaching College Geometry" at Ohio Project NExT in Columbus, Ohio (April 2003)

Dr. Swanson is also passionate about student related activities within the MAA. He served on the Ohio Section of the MAA's Committee on Student Members from 2003 to 2011, helping to develop problems for and judge the student math competition. He led an invited student activity entitled "Games Mathematicians Play" at MathFest in Columbus, Ohio (August 2016). He has also served as a judge and session moderator at the MAA Student Paper Session at MathFest. Dr. Swanson co-organized and facilitated a panel discussion entitled "Promoting the Mathematics Major" during AMS-MAA Joint Mathematics Meetings in Washington, DC in 2000.

Dr. Christopher Swanson's continued service to the Ohio Section and National MAA make him an ideal recipient for this year's Meritorious Service Award.

Response

I am greatly honored to be nominated by the Ohio Section for the MAA Meritorious Service Award, especially when there were so many additional strong candidates for this award. While it can be tough being a Michigan Wolverine fan living in Ohio, I feel blessed to be part of the very active Ohio Section of

the MAA. Being able to interact with colleagues across the Ohio Section at our Fall and Spring Meetings always rejuvenates me as I head back to campus to finish off each semester. I wish to thank my colleagues at Ashland University during the early part of my career—Tom Dence, Cathy Stoffer, Vickie Van Dresar, Gordon Swain and Darren Wick—who never asked if I planned to attend the Ohio Section meeting, but rather how many students I could fit in my car. I wish to thank the MAA for selecting me to be a Project NExT Fellow, teaching me the "Just Say Yes" attitude that resulted in my desire to do service for the Ohio Section. I wish to thank Ohio Section of the MAA for sponsoring Ohio NExT and allowing me to stay involved with this group as a co-coordinator for 12 years after I "aged out," so that I could continue to develop professionally and feel young. Finally, I would like to thank my wife and children for the support and understanding they have given me throughout my career, not making me feel guilty when I missed yet another trick-or-treat night so that I could attend the Fall meeting of the Ohio Section.

Biographical Sketch

Dr. Christopher Swanson is a native Ohioan who received his BS from Denison University in 1994. In 1999, he received his PhD from the University of Michigan and immediately joined the faculty at Ashland University where he has also been the Director of the university-wide Honors Program for the last 12 years. His research interests are combinatorics and probability. In 2006, Dr. Swanson received the national Alder Award from the MAA in recognition for distinguished teaching by a beginning mathematics faculty member and he received the Ohio Section of the MAA Distinguished Teaching Award in 2014. In his spare time, Dr. Swanson enjoys watching movies, playing disc golf, cycling, annoying Ohio State fans and participating in the applied probability seminar