MAA Awards and Prizes

July 2020

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

maa.org/awards

Awards and Prizes

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MAA Award for Inclusivity

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Henry L. Alder Awards

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Kenneth Monks, *Front Range Community College- Boulder County Campus (BCC)*

Brandy Wiegers, *Central Washington University*

Carl B. Allendoerfer Awards

Beth Malmskog and Kathryn Haymaker

"What (quilting) circles can be squared?" *Mathematics Magazine*, 92(3), 173–186. 10.1080/0025570X.2019.1588033

Juan Arias de Reyna, David Clark, and Noam Elkies

"A modern solution to the Gion Shrine Problem," *Mathematics Magazine*, 92(2), 110–122. 10.1080/0025570X.2019.1557007

Mary P. Dolciani Award

Henry Pollak, *Columbia University*

Trevor Evans Award

Sanaz Aliari Kardehdeh, Bruce Golden, and Eric Oden

"Experimental Graph Theory," *Math Horizons*, 27(2), 10–13. 10.1080/10724117.2019.1650490

Paul R. Halmos – Lester R. Ford Awards

Daniel Ullman and Daniel Velleman

"Differences of bijections," *The American Mathematical Monthly,* 126(3), 199–216. 10.1080/00029890.2019.1546077

Colin Adams, Allison Henrich, Kate Kearney, and Nicholas Scoville

"Knots related by knotoids," *The American Mathematical Monthly*, 126(6), 483–490. 10.1080/00029890.2019.1583971

John B. Little

"The many lives of the twisted cubic," *The American Mathematical Monthly*, 126(7), 579–592. 10.1080/00029890.2019.1601974

Balázs Gerencsér and Viktor Harangi

"Too acute to be true: The story of acute sets," *The American Mathematical Monthly*, 126(10), 905–914. 10.1080/00029890.2019.1655311

George Pólya Awards

Christopher Catone

"Bringing calculus into discrete math via the discrete derivative," *The College Mathematics Journal*, 50(1), 21–27. 10.1080/07468342.2019.1530553

Adam Glesser, Matt Rathbun, Isabel Serrano, Bogdan D. Suceavă

"Eclectic illuminism: Applications of affine geometry," *The College Mathematics Journal*, 50(2), 82–92. 10.1080/07468342.2019.1565588

Annie and John Selden Prize

Paul Dawkins, *Texas State University*

Daniel Solow Author's Award

Jim Hefferon, *Saint Michael's College*

Meritorious Service Awards

Tamara Lakins, *Allegheny College*
Allegheny Mountain Section

Ezra (Bud) Brown, *Virginia Tech*
MD-DC-VA Section

Thomas Hagedorn, *The College of New Jersey*
New Jersey Section

Lisa Mantini, *Oklahoma State University*
Oklahoma-Arkansas Section

Shawnee McMurran, *California State University, San Bernardino*
Southern California-Nevada Section

Competitions

The 80th William Lowell Putnam Mathematical Competition

December 7, 2019

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. Ashwin Sah, *Massachusetts Institute of Technology*
2. Kevin Sun, *Massachusetts Institute of Technology*
3. Yuan Yao, *Massachusetts Institute of Technology*
4. Shengtong Zhang, *Massachusetts Institute of Technology*
5. Daniel Zhu, *Massachusetts Institute of Technology*

Team Winners

1. Massachusetts Institute of Technology
   Ashwin Sah, Shengtong Zhang, Daniel Zhu
2. Harvard University
   Sehun Kim, Sheldon Kieren Tan, Franklyn Wang
3. Stanford University
   David Kewei Lin, John Mistele, Hanzhi Zheng, Yifan Zhu
4. University of California, Los Angeles
   Ciprian Bonciocat, Jacob Zhang, Kaiqi Zhu
5. University of Waterloo
   Gian Cordana Sanjaya, Kai Sun, Anzo Zhao Yang Teh

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 prizes this year go to:

Laura Pierson, *Harvard University*

Qi Qi, *Massachusetts Institute of Technology*

Hanzhi Zheng, *Stanford University*

The United States Online Mathematical Olympiad

The USOMO (United States Online Mathematical 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 USOMO 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 USOMO is a six-question, two-day, nine-hour essay/proof examination. This year it was held June 19–20.

Winners (in alphabetical order)

Ankit Bisain, *Canyon Crest Academy, CA*
Brandon Chen, *Bellevue High School, WA*
Quanlin Chen, *Princeton International School of Mathematics and Science, NJ*
Kevin Cong, *Phillips Exeter Academy, NJ*
Eric Gan, *A&M Consolidated High School, TX*
Gopal Goel, *Krishna Homeschool, OR*
Thomas Guo, *Phillips Exeter Academy, NH*
Daniel Hong, *Skyline High School, WA*
Tianze Jiang, *Princeton International School of Mathematics and Science, NJ*
Benjamin Kang, *Thomas Jefferson High School for Science and Technology, VA*
Maxim Li, *Okemos High School, MI*
Brian Liu, *High Technology High School, NJ*
Luke Robitaille, *Robitaille Homeschool, TX*
Noah Walsh, *Homeschooled, Walsh Academy, OR*
Edward Wan, *Saint John's School, FL*
Brandon Wang, *Saratoga High School, CA*

The European Girls' Mathematical Olympiad

The European Girls' Mathematical Olympiad (EGMO) is a mathematical olympiad for girls which started in 2012. While the competition was originally scheduled to be in the Netherlands, it was held virtually on April 15–21, 2020. The United States was represented by a team of four who took fourth place with one individual gold medal and three individual silver medals.

Team Members (in alphabetical order)

Sanjana Das, *Basis Independent Silicon Valley*
Ashley Ke, *Fremont High School*
Elizabeth Ke, *Fremont High School*
Christine Yang, Gilbert Classical Academy

The Romanian Master of Mathematics

The Romanian Master of Mathematics is an annual competition for students at the pre-university level, held in Bucharest, Romania; the 12th RMM was held from February 26th to March 2nd, 2020. The United States was represented by a team of five who took third place with three individual silver medals and two individual bronze medals.

Team Members (in alphabetical order)

Quanlin Chen, *Princeton International School of Mathematics and Science*
Kevin Cong, *Phillips Exeter Academy*
Eric Gan, *Miramonte High School*
Gopal Goel, Krishna Home School
Jeffrey Kwan, Harker Upper School

MAA Award for Inclusivity

William Yslas Vélez

University of Arizona

Those who know Dr. Vélez are well aware of his high-quality service to the MAA and the mathematics profession in general, but even those who have served alongside him may be surprised by the extent of his work. His long-standing passion has opened the doors to mathematics and the sciences for underrepresented groups and attracted students to the mathematics major.

His nomination recounts how he invited all first-year minority students at the University of Arizona who had declared a STEM major to come see him, and he told them they should consider minoring in mathematics. Over thirty of Dr. Velez's colleagues signed a letter explaining "For those students who came to see him, he talked to them one-on-one and at length. He discussed their career and personal goals and instructed them on what one is able to accomplish with a mathematics degree. He even helped them complete needed paperwork to add a mathematics minor, major, or to change majors altogether. By doing this, he not only helped dramatically increase the number of minority students and students of color in the mathematics department at his institution, but more importantly, let these students know that there is someone personally devoted to their success. From that moment on he was there for them throughout (and beyond) their studies at The University of Arizona."

Vélez's mentoring did not stop at the undergraduate level. Many mathematicians within the Latinx/Hispanic mathematics community have been mentored by Vélez along their way to becoming mathematicians. He has helped build a healthy and vibrant mathematical community where all are welcome.

Early in his academic career, Vélez presented papers dealing with minority participation in mathematics and the sciences, evidence of his interest that was to blossom by the late 1980s in the form of grants, publications, and regular participation on national boards and committees. The grant projects related to minority participation that Bill has either directed or co-directed have provided scholarships, funded REU programs, and supported minority recruiting and retention efforts. He has written numerous articles discussing strategies for attracting students to the mathematics major and for increasing minority participation. His tireless efforts have resulted in several advising and mentoring awards, including the 1997 President's Award for Excellence in Science, Mathematics and Engineering Mentoring Program.

Widely recognized as a leader in advancing minority participation in mathematics and the sciences, Dr. Vélez has served as President of the Society for the Advancement of Chicanos and Native Americans in Science and as Governor-at-Large for Minority Interests on the MAA Board of Governors; he presented the James R. C. Leitzel Lecture at MAA MathFest 2005 on "Increasing the number of mathematics majors: lessons learned from working with the minority community."

Vélez's leadership is evident in other roles as well. He served a term as Program Director of the NSF Algebra and Number Theory Program, and he has been an active member of many national advisory boards and committees dealing with mathematics, diversity in the profession, and education. Vélez has organized annual meetings of the Southwestern Section of the Mathematical Association of America, one of which included the Sociedad Matematica de Sonora, and another of which he organized together with a regional AMS meeting.

Bill Vélez's role in service to the profession can be characterized as unselfish, generous, passionate, high quality, and inspiring. His contributions have positively influenced the quality and culture of the American mathematical community.

Response

I am very grateful to my friends for thinking of me for this recognition. I am so pleased that the MAA has created this award to highlight the importance of inclusivity in mathematics. To quote Rochelle Gutierrez, "People need mathematics, but mathematics needs people." I think that the mathematics classroom is the most logical place to highlight the relevance of our subject. Enthusiastic teaching would go a long way in attracting students to the continued study of mathematics.

In the late 1980s, I began to address the underrepresentation of minorities in our calculus classes. My initial goal was to help students succeed in these classes. From there I moved to encouraging students to "take one more math class." From this came an increase in the number of minorities pursuing undergraduate degrees. I had hundreds of conversations with minority students about the importance of taking more mathematics and majoring in mathematics. This experience prepared me for the next step.

In 2003 I was asked to take charge of the undergraduate math major program in the department. In accepting this charge I was told by faculty that about 1% of our undergraduates were math majors. I thought the percentage should be closer to 100%. Though I dedicated 15 years to this effort, I only managed to double the number of mathematics majors. I still think that percentage should be closer to 100%.

Biographical Sketch

William Y. Vélez grew up in the warm embrace of the Mexican community in Tucson, Arizona. His grades as an undergraduate were poor, but his interest in mathematics was huge. As a result of his poor grades, he was rejected by most graduate programs and by a miracle he got into the graduate program at The University of Arizona (UA). He earned all of his degrees from the UA, completing his PhD in number theory under Henry B. Mann in 1975. In 1968-69 he served on active duty in the US Navy aboard two aircraft carriers, USS Yorktown and USS Kearsarge. His Vietnam veteran status allowed him to be supported through the GI Bill during graduate school.

He was a Member of the Technical Staff at Sandia Laboratories in Albuquerque, NM from 1975-77. He accepted a position as an Asst. Professor at the UA in 1977 and retired as Professor in 2018. He spent several summers at the Naval Ocean Systems Center in San Diego working on communications systems for submarines and earned several patents.

In the late 1980's he could no longer ignore the tremendous underrepresentation of the Chicano population in mathematics and he began his efforts to attract minorities to the study of mathematics. It was very satisfying to see so many students pursue mathematical studies simply by the act of having invited them to do so. He has enjoyed all aspects of his mathematical career.

Henry L. Alder Awards

Selenne Bañuelos

California State University Channel Islands (CSUCI)

Dr. Selenne Bañuelos of California State University Channel Islands (CSUCI) has an impressive record of teaching and mentoring students, improving the mathematics curriculum at CSUCI, and providing professional development opportunities for other mathematics teachers at her institution and beyond.

In her own teaching, Dr. Bañuelos uses active learning techniques and mastery-based assessment. When designing her courses, she takes extra care to ensure that her teaching practices will enable everyone to feel comfortable participating, especially students from groups that traditionally have been underrepresented in the mathematical sciences. One former student remarked that Dr. Bañuelos "presented mathematics not as a pretentious person atop the discipline hierarchy" but as a subject that is studied by "a community of people passionate about solving problems."

Dr. Bañuelos created a new Transition to Higher Mathematics course and convinced her department to add the course to their required curriculum. Since it was introduced, students have reported that the course has been tremendously helpful in enabling them to transition from more computational courses to proofs-based courses. Dr. Bañuelos also co-developed a topics course in topology that was not previously offered in her department, improving the preparation of students who are interested in pursuing graduate studies.

Dr. Bañuelos has mentored several undergraduate research projects, having obtained funding for one such project from the Preparing Undergraduates through Mentoring toward PhDs program and funding for another from the Center for Undergraduate Research in Mathematics. One former research student who went on to graduate school discussed how transformative the experience was. "Before that research experience, I was just a student who was good at math, but, when we were done, my curiosity and hunger for the subject had expanded beyond what I ever could have expected."

Perhaps most impressively, Dr. Bañuelos is on the leadership team of Project PROMESAS, a 5-year, $6 million Hispanic-Serving Institution-STEM grant to CSU Channel Islands funded by the U.S. Department of Education (Title III). Through this grant, Dr. Bañuelos and her teammates aim to make the calculus pipeline less "leaky" through intensive faculty development for faculty at her institution as well as three local community colleges. She facilitates workshops or gives presentations roughly 20 times each year for faculty on topics such as building classroom community and teaching with a student-centered lens.

Throughout all of her activities related to teaching, Dr. Bañuelos aims to humanize mathematics. She shares stories of her own successes and failures with her students and colleagues to help them understand that even successful mathematicians struggle. She creates an environment where her students feel comfortable sharing their own struggles with her. We enthusiastically recognize Dr. Bañuelos' achievements and her fierce care for students with the 2020 Henry L. Alder Award.

Response

I am deeply honored to be selected as a 2020 MAA Alder Awardee. I have had opportunities to learn and grow as an instructor through MAA's Project NExT fellowship and as a campus lead of CSUCI's PROMESAS SSC initiative. They have helped me move from an instructor that delivers content to one who places students as the centers and creators of knowledge. I am thankful for my CSUCI math colleagues, for our SSC initiative mathematics education expert, and for our colleagues in our partnering community colleges. The fact that they treat teaching as an ongoing process of their own education is incredibly refreshing. I recognize that the ability to transform my teaching, with all the bumps in the road that it includes, is pos-

sible because I have the privilege of their support. The 18-year-old CSUCI is the result of a 40-year effort to bring a public four-year university to the Ventura County region. I characterize my students as hard-working, humble, and revolutionary. Thank you all for reminding me every day of the transformational power of higher education.

Biographical Sketch

Selenne Bañuelos is an Assistant Professor of Mathematics at California State University Channel Islands. She earned her B.S. in Mathematics from UC Santa Barbara in 2007 and her PhD in Applied Mathematics from the University of Southern California in 2013. She is a 2014 Linton-Poodry SACNAS Leadership Fellow and a 2015 MAA Project NExT Fellow. Selenne is also the campus lead for CSUCI's STEM-Service Courses Initiative – a regional, multi-year, faculty development program designed to examine and reconstruct the mathematics courses serving all the STEM fields to focus on faculty cultural competence and use of inclusive pedagogy.

Her research interests lie in the fields of differential and difference equations and dynamical systems and its applications to mathematical biology. She has mentored several undergraduate and Master's students in research projects.

Selenne is committed to increasing the access to higher education in STEM fields for women and historically underrepresented minorities. She is a co-advisor for the SACNAS at CI student chapter, a mentor for the national Math Alliance and the CSU Alliance PUMP program, and a regular judge/mentor for AWM programs at JMM, SIAM, and MAA MathFest.

Henry L. Alder Awards

Kenneth Monks

Front Range Community College- Boulder County Campus (BCC)

Dr. Monks' love for mathematics is a family tradition. He shares his lifelong love of math as an inspirational teacher who will go to extraordinary lengths to help students achieve great things. Always eager to explore new ways of engaging students, he asks his students to take risks. Students in his Differential Equations/Linear Algebra course collaborate on homework using a free shared-editing cloud platform for LaTeX documents called Overleaf. He has authored open-source calculus texts and develops group projects for his courses in which students present in miniconference format. A particularly unique addition to his curriculum is the use of history of mathematics to add context to the material. At the invitation of the PIs of the NSF-funded TRansforming Instruction in Undergraduate Mathematics Education via Primary Historical Sources (TRIUMPHS) project, Dr. Monks has authored three "primary source projects" (PSPs) that offer students the general benefits of inquiry-based learning within this unique historical approach. These time-intensive approaches truly stretch students outside their traditional math comfort zone.

Outside the classroom, Dr. Monks adds to the overall community of FRCC and beyond. He coordinates the math lab, the Putnam club, master teacher awards, and faculty senate, as well as presenting at various academic conferences. The Putnam students have done remarkably well for freshman and sophomore level students, with a team score in the top third nationally in 2019, competing against four-year schools. Along with his family of mathematicians, they offer a summer math camp (Prove it! Math Academy) for high school students. They teach students to transition from computation-based questions to proof-based questions used in math competitions such as USA(J)MO and USAMTS. In addition, he stays busy with his research program and duties as president of the Colorado Mathematical Association of Two-Year Colleges. Having been recognized with teaching awards at his institution and in his MAA section, we believe Dr. Kenneth M Monks' dedication to the teaching and learning of mathematics deserves full consideration for the Alder Award.

Response

I was beyond blessed with my academic upbringing. From fond memories of my mother lovingly reading somewhere right around a Graham's number of books with me as a toddler, to my mathematician father providing one-on-one homeschooling for me in mathematics throughout middle and high school, to all of my professors at University of Scranton offering independent study after independent study, to my incredibly generous graduate school mentors Alexander Hulpke and Tim Penttila, I had something like a Harry Potter-level of mentors supporting me throughout my journey towards becoming a mathematician (fortunately with substantially less murder along the way). Even though I still didn't know how to cast a spell with my mouth closed, I was very excited once I obtained my PhD to plunge into teaching. I found the perfect venue for that at Front Range Community College - Boulder County Campus. To be able to work at an open-access institution, where I could help droves of first-generation college students who did not have that same gale-force tailwind that I had, is an absolute dream for me. For so many of the students, all it takes is one really energetic positive mentor to help them out here and there and believe in them, and to show them the beauty and plain simple fun that is inherent to mathematics.

I do put in a somewhat comically large amount of time into my work, and therein I owe huge thanks to my beautiful wife Faith Mata for her patience, love, and support, and for forcing me to sleep once in a while. My students are very grateful for the time I put in, and their thanks make it all incredibly worthwhile. Receiving this level of recognition from the broader mathematical community is an incredible

cherry (my favorite fruit) on top, and more than a little humbling when you read the list of past winners. Thanks so much for the support; I suppose I should keep going

Biographical Sketch

Kenneth M. Monks was born in 1984 in Northeast Pennsylvania, where his mother and father respectively teach in the mathematics departments of Penn State University - Hazleton Campus and University of Scranton. After being homeschooled by his father in mathematics, he completed a Bachelor of Mathematics at University of Scranton. He matriculated at Colorado State University where he earned a master's and then a PhD in mathematics. Upon graduation, he became faculty at Front Range Community College - Boulder County Campus (BCC), where he has worked ever since. In his time at BCC, he has found great success as a mentor to the students there, especially in coaching a competitive Putnam Club, which placed in the top third in the nation in 2019. He has become a highly active member of the OER movement, transitioning the entire BCC calculus sequence to custom authored OER in his time there. Furthermore, he has become a site tester/author/fanboy for TRIUMPHS (TRansforming Instruction in Undergraduate Mathematics via Primary Historical Sources), an NSF-backed group that is creating Primary Source Projects for the mathematics classroom and studying the effect of using them. When not talking about Euler, Ken loves lifting weights with his beautiful strong wife Faith, cooking and eating excessive amounts of eggs and pasta with their hungry 1-year old Rocco, and playing music in the Northern Colorado scene.

Henry L. Alder Awards

Brandy Wiegers

Central Washington University

As a faculty member at Central Washington University, Dr. Brandy Wiegers has demonstrated a level of distinguished teaching both inside and outside the classroom. Dr. Wiegers' teaching is highly interactive. From interactive worksheets in her calculus class to designing a class for math majors that uses writing projects and group presentations, Dr. Wiegers continues to broaden her teaching and impact her students. Her work within the classroom creates relationships that she fosters outside the classroom with major advising, graduate school application support, outreach work, and undergraduate research mentorship.

Dr. Wiegers has been especially involved in founding outreach and mentoring programs. She helped start the Kittitas Valley Math Circle through which more than sixty undergraduates have volunteered as mentors, spending time out of class working with Dr. Wiegers to learn about teaching and engaging in mathematical problem solving. More recently, Dr. Wiegers has expanded her efforts to support Spanish-speaking students in her local schools. She applied for and won an MAA Tensor SUMMA award and successfully launched a Spanish language-Math Circle for middle school students.

Dr. Wiegers also created and runs the Grad-CAMP (Graduates Creating Applications for More Professional Experiences) summer program, which supports students who are applying for graduate school and postgraduate work the summer before their graduation year. For the last five summers, she has run interactive workshop sessions for these students and mentored them through the application process. Through this she was able to work with the Mathematical Alliance of Doctoral Studies and the Field of Dreams Conference to partner CWU students with mentors for graduate school applications. As a final note, Dr. Wiegers has created the Central Convergence Research Experiences for Undergraduate (CCREU). Funded in 2018 and 2019 by a Mathematical Association of America National Research Experience for Undergraduates Program (MAA NREUP), the program has provided research experience for underrepresented undergraduates.

Dr. Brandy Wiegers has had an incredible start to her career as a mathematics professor, and we enthusiastically recommend her for the Alder Award.

Response

I am humbled to be a member of this list of award winners and to be recognized by the MAA. Most especially because the MAA has provided crucial support to the mathematician I have become, through grant funding of our community engagement programs to the MAA Teaching Guide and Project NExT experiences that I use in the classroom. That is why I am even more taken aback by this recognition. I thank the MAA for giving me this opportunity to hear from students about the impact that my work has had on their mathematical journey.

I must share that I cried twice on the day I received the news about the Alder Award, once in joyful surprise as I received the MAA email and second time in shared sorrow as a student shared a personal hardship that they had learned about while at JMM. I was struck the next day that these two experiences go hand in hand with one another, as I was only able to be there to support that student at JMM because of the relationship we gain through teaching. Thank you to the MAA for this poignant reminder of the impact that all of our work has on the community around us. Thank you also to the friends, colleagues, mentors, and most especially students who helped me become a mathematical learner and mentor.

Biographical Sketch

Dr. Brandy Wiegers is an Associate Professor at Central Washington University in Ellensburg, Washington. She grew up in Meridian, Idaho having spent her youth as a dedicated Girl Scout and student. Her undergraduate work was at the University of Idaho where she graduated with Biological Systems Engineering and Mathematics Degrees. She completed a PhD in Applied Mathematics at the University of California, Davis in 2008. Her research focused on computational mathematical biology and numerical analysis. From Davis she worked at the Mathematical Sciences Research Institute as the founding director of the National Association of Math Circles. She then made her way to San Francisco State University as the Co-Director of the (CM)^2 NSF GK12 program and the Program Director of CSME Outreach and Student Success.

Her work at Central Washington University began in 2014. Over her tenure at Central she created the Kittitas Valley Math Circle and Math Circle Mentorship and Partnership (MC-MAP) programs while supporting other opportunities for students' mathematical exploration. These projects inspired her founding and working as Editor-in-Chief of the Journal of Math Circles (digitalcommons.cwu.edu/mathcirclesjournal/). Currently Dr. Wiegers serves as a counselor on the Council on Undergraduate Research and she is an officer in several of the Special Interest Groups of the MAA including undergraduate research (UR), recreational mathematics (REC), and Math Circles for Students and Teachers (MCST).

Beth Malmskog and Kathryn Haymaker

"What (quilting) circles can be squared?" *Mathematics Magazine*, 92(3), 173–186. 10.1080/0025570X.2019.1588033.

For evidence that mathematics—and the origin of mathematical journeys—can arise in unexpected places, one needs look no farther than this article. The story begins with a question from a friend about a quilting circle: how can one arrange five rounds of quilt hand-offs among a group of five quilters so that every quilter hands off once to every other quilter? That way each quilter gets to meet every other one, rather than, say, always passing to the same person. The friend is not quite able to get this to work, and so appeals to Prof. Malmskog. As the authors write, "who could resist"?

It turns out the quilting hand-offs can be represented in the form of a Latin square. We assign each quilter a number, using the numbers 0, 1,…, $n-1$ for n quilters. The quilters are arranged into the left column of the Latin square. The quilters they hand-off-to appear in subsequent columns. A sample Latin square for four quilters is shown in Figure 1. Notice that the first row indicates quilter 0 hands off to quilter 1, who hands off to quilter 3, who hands off to quilter 2.

0	1	3	2
1	2	0	3
2	3	1	0
3	0	2	1

Figure 1: A Latin square for four quilters

The authors' goal is to find not just any Latin square, but one in which all the hand-offs are different, so that each quilter hands off to each other quilter. The hand-offs from one quilter to another correspond to the sequences (i, j) in each row of the Latin square. For instance, in the first row of Figure 1, the sequences are $(0,1)$, $(1,3)$, and $(3,2)$. To ensure that every quilter hands off once to every other quilter, we require that each pair (i, j) appear one and only one time when reading across rows. Latin squares with this additional property are called row-complete, and the Latin square in Figure 1 is an example. In addition to their desirability for quilting circles, row-complete Latin squares play a role in the design of experiments in which treatments might have residual effects, such as taste-testing experiments.

Surprisingly, no row-complete Latin squares of order 5 exist, as the authors show using a case analysis. So there was a good reason the first author's friend couldn't get things to work! The question of determining whether there is a row-complete Latin square of given size n is a deep one, which remains unresolved in full generality. Constructions for even n date from the 1940s, and constructions for odd composite n date from the 1990s. The case of prime n, aside from $n = 3,5,7$, remains mysterious.

You may notice that in the example (1), the sequence of successive differences of elements in each row, considered modulo 4, is always 1, 2, 3. Such row-complete Latin squares are called rotational, and it's possible to find them whenever n is even. Interestingly, the existence of such Latin squares is equivalent to the cyclic group of order n having a group-theoretic property called sequenceability, and a theorem from the 1960s shows that this holds only for even n.

The article closes by introducing "quiltdoku" problems: can a partially filled grid be completed to become a row-complete Latin square? A new fabric-themed puzzling craze could be upon us. The authors let us accompany them on their journey with clarity, gentleness, and efficiency. By the end, we've visited graph theory, group theory, combinatorics, and even experimental design—a pleasing patchwork of mathematical ideas.

Response

We are thrilled and honored to receive the Carl B. Allendoerfer Award! From the question that sparked our inquiry through our continuing investigations today, the work chronicled in this paper has been about building connection and community through mathematics. Even the original quilting question came to us through friendship and the surprising reach of a mathematics puzzle segment on a community radio show in Colorado—this great question was one of the perks of being known as the radio math lady within a tiny world. This award is especially wonderful to us in this context, because it lets us know that we have connected with the larger world in a meaningful way. Thank you to the awards committee and to the MAA!

Biographical Sketch

Beth Malmskog wishes more of her friends would turn their hobbies into math problems for her to work on. Dr. Malmskog received her PhD from Colorado State University in 2011. Her research is in number theory and discrete mathematics, including computational questions and applications. She is now an assistant professor in the Department of Mathematics and Computer Science at Colorado College.

Katie Haymaker obtained a PhD in mathematics from the University of Nebraska-Lincoln in 2014. She is an associate professor in the Department of Mathematics and Statistics at Villanova University. Dr. Haymaker's research focuses on coding theory and applied discrete mathematics. She is grateful that Dr. Malmskog included her in discussions of this fascinating problem, which has led to many exciting discoveries and re-discoveries.

Juan Arias de Reyna, David Clark, and Noam Elkies

"A modern solution to the Gion Shrine Problem," *Mathematics Magazine*, 92(2), 110–122. 10.1080/0025570X.2019.1557007.

This article shines a welcome light on a little-known nook of mathematical history: remarkable computationally-intensive geometry problems inscribed in wooden tablets and hung in 18th-century Buddhist temples and Shinto shrines. These formed a part of a cultural flourishing in Japan under the Tokugawa shogunate, in which kabuki theater, haiku poetry, ukiyo-e woodblock printing, and a unique style of mathematics called *wasan* enjoyed a surge of interest. *Wasan* focused on geometric problems, such as packings with circles and polygons. An especially appealing set of theorems would be inscribed on a tablet and hung in a shrine, "as an offering to the gods, a challenge to other worshippers, and an advertisement for the school producing the work," in the words of the authors. Being a closed society, the Japanese drew inspiration from Greek geometry and Chinese computation, and *wasan* problems often blended the two.

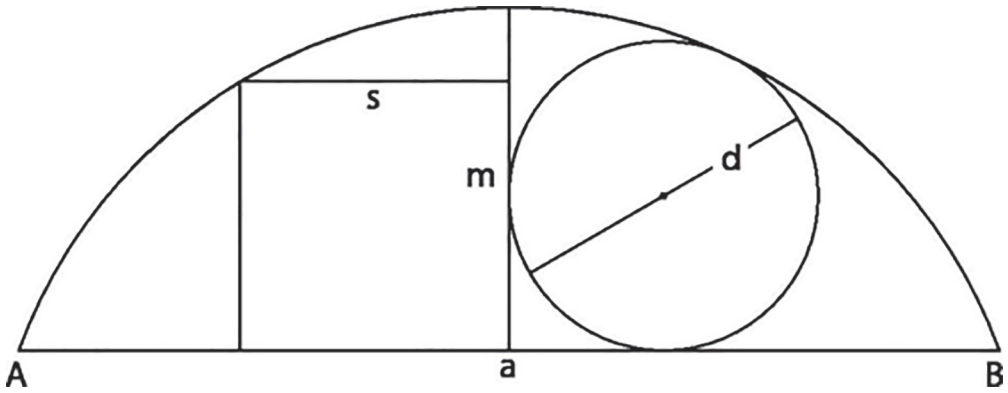

Figure 1: The Gion shrine problem

One particularly famous tablet was found in Kyoto's Gion shrine. It consists of a square and circle inscribed in a circular arc as in Figure 1. The square has side length s, the circle has diameter d, and two other segments relating to the arc have lengths a and m. The challenge is to recover a, d, s, and m given only the quantities $p = a + d + s + m$ and $q = (m/a) + (d/m) + (s/d)$, using the geometrical relationships of the quantities involved.

The first recorded solution was due to Tsuda Nobuhisa in 1749, who gave the desired quantities in terms of the roots of a degree-1024 polynomial. Further 18th century solutions reduced the degree of the necessary polynomial to 46, and then to 10. The latter uses only the Pythagorean theorem, linear algebra, and "a great deal of algebraic persistence," as the authors put it. The authors then give a modern solution that relies on trigonometric functions to describe a, d, s, and m in terms of a simpler degree-10 polynomial, with the added benefits of elucidating the existence and uniqueness of solutions.

The article then turns to a problem that would not have been on the minds of wasan practitioners, but would interest anyone who cares about Diophantine equations: is there a solution to the Gion shine problem where a, d, m, and s are all rational numbers? This leads to the problem of finding all solutions to $y^2 = x^3 - x$ with both x and y rational. Going back at least to Fibonacci, this problem was solved by Fermat using his famous method of descent, which has reverberated through modern number theory.

The article concludes with remarks about some more recent developments in the study of Diophantine equations. Thus a voyage that started in centuries-ago Japan winds up near the present day. The article

gives a vivid portrait of how widely separated parts of mathematical history can in fact be intertwined, and reminds us of the universality of mathematics in the human experience.

Response

It is a pleasure and a surprise to be awarded the Allendoerfer prize this year. In addition to being an interesting and challenging exercise, the Gion Shrine problem gave us an opportunity to portray mathematics at the intersection of art, recreation, science, history, and culture. When we arrived at the solution, one of us (Arias de Reyna, who lived under a dictator in Spain and did not have access to math books) noticed how he would have enjoyed reading it as a teenager. Our paper is written, in large part, for this young person. We hope that our solution—weaving together geometry, trigonometry, and algebra—might be read and enjoyed by someone with a similar passion for mathematics. The last part of the paper on Diophantine equations was a relatively late but very welcome addition, revealing the Gion shrine problem to be another point of intersection, this time between traditional Japanese math and Western number theory.

Biographical Sketches

J. Arias De Reyna learned mathematics from books starting at age thirteen; at the time, even books were difficult to get in dictator Franco's Spain. He has published a book about Carleson's proof on the convergence of Fourier series, defining the largest known rearrangement invariant space of functions with almost everywhere convergent series. He also obtained good bounds for the Riemann-Siegel expansion.

David Clark was trained as a quantum topologist, but has recently become interested in the history of Japanese mathematics. In 2017 he hosted an international conference on the topic in Ashland, Virginia. Clark regularly takes students to Japan to learn about sangaku tablets, and has written about his experiences in Math Horizons.

Noam D. Elkies is a number theorist, much of whose work concerns Diophantine geometry and computational number theory. He was granted tenure at Harvard at age 26, the youngest in the University's history. Outside of math, Elkies' main interests are music—mainly classical piano and composition—and chess, where he specializes in composing and solving problems.

Mary P. Dolciani Award

Henry Pollak

Columbia University

Henry Pollak joined the Mathematics and Statistics Research Center at Bell Labs in 1951. While at Bell Labs, he published thirty-three research papers in fields including complex variables, special functions, operations research, and combinatorics. After becoming director of the Center in 1961, Henry guided the research of the technical staff, famously reading every paper they submitted for publication—about 200 per year—marking typos and providing suggestions on the exposition and the mathematics.

Perhaps uniquely among mathematicians employed in industry, Henry made significant contributions to mathematics education, beginning by the age of 30. His first publication on education, "On the future mathematical curriculum for electrical engineers," was published in 1958. That same year, he joined the writing team for the emerging School Mathematics Study Group (SMSG), becoming chair of its advisory board in 1963. Since the 1960s, Henry has been a leader of the most important groups active in the reform of mathematics education. In addition to SMSG, these included the steering committee of the Cambridge Conference on School Mathematics, original member of the Mathematical Sciences Education Board, chair of the Conference Board of the Mathematical Sciences, executive committee of the U.S. National Commission on Mathematics Education, executive committee of the International Commission on Mathematical Instruction, and chair of the NSF's Advisory Committee for Science Education. After attending all prior congresses, in 1980 Henry chaired the program committee and executive committee for the 4th International Congress on Mathematical Education.

A distinguishing feature of Henry's career is his direct relationship with classroom teachers. He served on the initial Board of Trustees of the North Carolina School of Science and Mathematics (NCSSM), the first state-wide residential high school emphasizing science and mathematics. He helped NCSSM teachers develop a precalculus curriculum that introduced data analysis and mathematical modeling as a fundamental topic of study.

Henry was instrumental in the work of the Consortium for Mathematics and Its Applications (COMAP), an organization that its Executive Director, Sol Garfunkel, says would not have existed without Henry.

Henry championed adding statistics and mathematical modeling to the secondary school curriculum. To this end, Henry and teacher Dan Teague organized the Woodrow Wilson National Fellowship Foundation summer mathematics programs, which ran for nine years. The first summer program in 1984 was on statistics and had an amazing affect on the teaching of statistics in high schools. In fact, every high school teacher involved in the first five years of the AP Statistics program (members of the College Board Task Force who wrote the initial proposal and course description, the members of the test development committee, and the leaders of the initial teacher workshops) came out of that Woodrow Wilson summer program which eventually included about 450 classroom teachers.

Henry published about 74 articles in mathematics education, about half of which were written directly for secondary teachers to enrich their knowledge of mathematics, especially mathematical modeling. He also served on the advisory board of Square One Television (a series that taught children mathematical concepts).

Recently, Henry was a member of the writing team for the 2016 GAIMME Report, Guidelines for Assessment & Instruction in Mathematical Modeling Education, published by COMAP and SIAM. He gave a well-received plenary lecture at the 16th International Conference on the Teaching of Mathematical

Modeling and Applications. Henry continues his work as a Visiting Professor of Mathematics Education at Teachers College, Columbia University where he has supervised five doctoral students.

Teacher Landy Godbold describes an experience in the 1970s with Georgia's Governor's Honors Program, a summer residential program for high achieving high school students, that typifies why Henry Pollak so richly deserves the Dolciani Award:

Throughout his time on campus, Henry listened to students as they described their projects for the summer. His genuine interest in their work—questioning, prodding, probing, complimenting—had each student walking on air for a week. (His "fee" as visitor and lecturer was a basket of Georgia peaches.)

Response

I am very grateful for, and feel truly honored by, this prize. The customary list of "thank you's" needs to be a little different in my case: I owe the most to two organizations, to the Bell Telephone Laboratories (BTL) and to the Mathematical Association of America (MAA). My early years at BTL taught me that "applicable mathematics" included many topics outside of the traditional analysis called "applied mathematics" and that there were innumerable applications of mathematics to areas of interest and importance other than physics and engineering. I also began to learn that mathematical modeling in the real world has many stages both before, and after, the stage beloved by mathematicians called "solve the equation". In 1958, NSF, The National Science Foundation, began to fund a thorough look at mathematics in schools, called the School Mathematics Study Group (SMSG). I was asked to join SMSG and I began to try out some of my thoughts on what was applicable mathematics.

About two years later, the NSF decided that a thorough look at mathematics beyond high school was also necessary for the country's welfare. However, this did not seem to require a new structure, like SMSG had been. The MAA was right there, it already had CUP, the Committee on the Undergraduate Program, which had already produced some very interesting variants of college mathematics and unconventional textbooks. This is not the place to go into the size and comprehensiveness of the resulting effort. But how did it affect me? I had already worked on SMSG, and I was invited to join the new CUPM, (an "M" for "Mathematics" was soon added to CUP), and also CUPM's subcommittee on mathematics for the physical sciences and engineering. It was a wonderful seven years of exploration of all the different purposes and connections of college mathematics. (I might have said "functions" of college mathematics, but that could be misunderstood). All three, Bell Labs, SMSG and the MAA, encouraged my interest in all aspects of mathematics. In particular, my long-standing involvement with the MAA led to so many of my other activities.

I retired from the telephone companies after 35 years, and have now been a part-time visiting professor at Teachers College of Columbia University for almost that long. In recent years, mathematical modeling has really flourished within mathematics education. I regret that at my age I cannot be much more than a spectator and cheerleader. At Bell Labs I used to be paid for what I was going to do; now I live on what I used to do. Thank you again.

Biographical Sketch

Dr. Henry O. Pollak joined Bell Laboratories in 1951 and became Director of Mathematics and Statistics Research in 1961. In 1983, in connection with the breakup of the Bell System, he joined the new laboratory created to serve the needs of the operating companies as Assistant Vice-President for Mathematical, Communications, and Computer Sciences Research of Bell Communications Research. Inc. Dr. Pollak retired in 1986 after years of work being a consultant and a visiting professor of mathematics education at Teachers College, Columbia University since 1987.

Dr. Henry Pollak was born on December 13, 1927. He earned a BA degree from Yale University in 1947. Dr. Pollak then received his MA in 1948 and PhD in 1951 from Harvard University. He was elected a Fellow of the American Association for the Advancement of Science in 1971. For his distinguished service to mathematics he received the Yueh-Gin Gung and Charles Y. Hu Award from the Mathematical Association of America in 1993 and the Lifetime Achievement Award from the National Council of Teachers of Mathematics in 2010.

Since joining Bell Laboratories, he has engaged in mathematical research in communication. He is the author of over 40 technical papers on analysis, function theory, probability theory, and mathematics education. He holds a patent (joint with Dr. R. L. Graham) for his work on Interconnected Loop Digital Transmission Systems.

Dr. Pollak has been an active member of the MAA since 1955 while also serving many other mathematical and educational societies throughout his life.

Trevor Evans Award

Sanaz Aliari Kardehdeh, Bruce Golden, and Eric Oden

"Experimental Graph Theory," *Math Horizons*, 27(2), 10–13. 10.1080/10724117.2019.1650490.

This article brings readers along on a mathematical journey in which computational experimentation precedes and guides the construction of rigorous proofs. The authors' explorations embolden them to generalize a technique for counting spanning trees to a new class of graphs. The clear and engaging writing presents mathematical research as an accessible endeavor, in a way that could inspire readers.

Response

We are honored to receive this award from the MAA for our work on experimental graph theory. What began as a short conversation during one class ended up taking us on a pleasant mathematical exploration which we were happy to describe in our article. We are hopeful that our paper will encourage other students and their instructors to use computational experimentation to help them answer mathematical questions of their own. We thank Dave Richeson, Editor of *Math Horizons*, for his valuable comments and help throughout the publication process.

Biographical Sketch

Sanaz Aliari Kardehdeh is currently a PhD student in transportation engineering at the University of Maryland. Her research interests include operations research, optimization techniques, and machine learning. Her research enables her to apply her learnings to everyday life problems, such as the routing and scheduling of ride-sharing systems, which is the focus of her PhD research. The current work was conducted in the summer of 2018 when she was studying network optimization under the supervision of Dr. Bruce Golden.

Bruce Golden has been involved in the applied math program at the University of Maryland for decades. This is his third paper on counting spanning trees. His first paper appeared in *The American Mathematical Monthly* in 1975.

Eric Oden is a PhD student studying applied mathematics at the University of Maryland in College Park, where he thoroughly enjoys his work as a TA. He received his B.S. in Mathematics and Physics at Southwestern University (Georgetown, Texas).

Daniel Ullman and Daniel Velleman

"Differences of bijections," *The American Mathematical Monthly*, 126(3), 199–216. 10.1080/00029890.2019.1546077.

The sequence $1, 2, 3$ can be written as a difference of permutations of the integers modulo 3: for example, $3, 2, 1$ and $2, 3, 1$ are permutations of the integers modulo 3, and their difference, taken entry-wise and modulo 3, is $1, 2, 3$. But the sequence $1, 2, 3, 4$ can't be written as a difference of permutations of the integers modulo 4. The article explains why this is and what it has to do with juggling. More generally, which functions from an abelian group to itself can be written as the difference of two bijections? This is pursued in increasing generality, for finite and then infinite groups, and then with injections and surjections instead of bijections, and finally beyond the realm of group theory, leading to transversals in Latin squares.

Response

Our collaboration on this project began with a suggestion from Dan Kalman that we find a topic on which we could write a "three Dan" paper. Unfortunately, Dr. Kalman didn't have time to work on the project, but we thank him for discussions leading to our "two Dan" paper. We were led to our topic by a question posed by Louis Funar in Richard Guy's "Unsolved Problems" column in the *Monthly* in 1986: Given an arbitrary function f from the reals to the reals, do there exist functions g and h, the first one bijective and the second one injective, such that $f = g + h$? Our research eventually led us to discover that the problem was actually not unsolved; the solution could be found in a 1958 paper (in German) by László Fuchs, building on work of Marshall Hall, Jr. from 1952. We enjoyed discovering and extending this literature, and we are very pleased and honored that the MAA has chosen to recognize our work with this award.

Biographical Sketch

Daniel H. Ullman received his AB degree from Harvard University in 1979 and his PhD from the University of California, Berkeley in 1985. Since then he has been a member of the faculty at George Washington University. He served as Department Chair from 2001 to 2006 and as Associate Dean for Undergraduate Studies from 2011 to 2015. He is an author of *Fractional Graph Theory* (with Ed Scheinerman) and *The Mathematics of Politics* (with Robbie Robinson). In 1991 and 1992, he was Deputy Leader (Cecil Rousseau was Leader) of the US delegation to the International Mathematical Olympiad. He served as the American Mathematical Society AAAS Science Policy Congressional Fellow from 2006 to 2007. He is presently the director of the William Lowell Putnam Mathematical Competition and he also serves as an editor of the Problems and Solutions column of the *Monthly*.

Daniel J. Velleman received his BA from Dartmouth College in 1976 and his PhD from the University of Wisconsin–Madison in 1980. He was an instructor at the University of Texas before joining the faculty of Amherst College, where he taught from 1983 to 2017. He has also taught at Erindale College, Middlebury College, St. Michael's College, and he is now an adjunct professor at the University of Vermont. He is the author of *How To Prove It, Which Way Did the Bicycle Go?* (with Joe Konhauser and Stan Wagon), *Philosophies of Mathematics* (with Alexander George), *Calculus: A Rigorous First Course*, and the forthcoming *Bicycle or Unicycle?* (with Stan Wagon). He was the editor of the *American Mathematical Monthly* from 2007 through 2011 and he currently serves as an editor of the Problems and Solutions column of the *Monthly*.

Colin Adams, Allison Henrich, Kate Kearney, and Nicholas Scoville

"Knots related by knotoids," *The American Mathematical Monthly*, 126(6), 483–490. 10.1080/00029890.2019.1583971.

A knot is an embedding of a circle in a 3-dimensional Euclidean space; a knotoid is the projection of a knot with open ends (so a projection of an embedding of an interval). We can look at the equivalence of knotoids in the same way as we look at equivalence of knot diagrams but performing the equivalence moves away from the open ends. Two knots are said to be knotoid equivalent if there is a knotoid whose closure by an arc over the top of the diagram is one of the knots and whose closure by an arc under the diagram is the other. An interesting open question was to determine which pairs of knots were knotoid equivalent. The authors use a sequence of clever moves to prove the new result that in fact *every* pair of knots are knotoid equivalent. Their method makes use of knotoids with a high number of crossings, which generates some interesting open problems.

Response

We had so much fun writing this paper! The story of how the paper came about is almost as interesting as the results themselves. It involves one faculty member asking another to treat them like an undergraduate researcher so they could work on a project together, despite the fact that they work in different research areas. Another collaborator joined the duo because working on the team sounded like a fun avenue for thinking about some new problems. Finally, a fourth (surprise!) collaborator went from being an anonymous referee to being an essential member of the team.

We are still in awe that this unlikely sequence of events allowed us to complete this joint project. Most of all, we are grateful to Susan Colley, Editor of the *Monthly*, for being such a wonderful steward of this paper, to our referees who gave us useful feedback and encouragement, and to those who decided to honor us with this award.

Biographical Sketches

Colin Adams received his PhD from the University of Wisconsin in 1983 and is now the Thomas T. Read Professor of Mathematics at Williams College. He is particularly interested in knot theory in all its forms. The author/co-author of nine books, including one math comic book and one math novel, he is also the humor columnist for the expository magazine the Mathematical Intelligencer. He turns many of the columns into scripts which are then performed with the help of a great band of mathematicians/actors at the Joint Math Meetings every year.

Allison Henrich is a Professor of Mathematics at Seattle University, having earned her PhD in 2008 from Dartmouth College. This is the second time Allison has been honored with the Halmos-Ford Award, first winning the award with Louis Kauffman for their paper "Unknotting Unknots" in 2015. Allison has found an outlet for her love of high-quality, mathematical exposition by serving on the editorial boards of several journals, including *Mathematics Magazine* and the *College Math Journal* and publishing in most of MAA's journals. She has also co-authored and co-edited several books, including *An Interactive Introduction to Knot Theory* (with Inga Johnson), *A Mathematician's Practical Guide to Mentoring Undergraduate Research* (with Michael Dorff and Lara Pudwell), and *Living Proof: Stories of Resilience Along the Mathematical Journey* (with Emille Lawrence, Matthew Pons, and Dave Taylor).

Kate Kearney earned her PhD from Indiana University in 2011. After a postdoctoral position at Louisiana State University, she joined the faculty of the Gonzaga University Mathematics Department in 2014. Kate has been working with knots since she learned about them in an undergraduate summer research project, and she now enjoys introducing them to her own undergraduate research students.

Paul R. Halmos - Lester R. Ford Awards

John B. Little

"The many lives of the twisted cubic," *The American Mathematical Monthly*, 126(7), 579–592. 10.1080/00029890.2019.1601974

Beautiful ideas have a tendency to continue to show up over and over in mathematics in many different forms. One of these beautiful ideas is the twisted cubic (in one form expressed as (t,t^2,t^3)) and the author takes us on a journey from the mathematics of ancient Greece through projective space, into differential and algebraic geometry, and through Bézier curves and algebraic statistics. This winding and scenic road that the author has taken us on shows us the amazing power and versatility that lies in simple ideas.

Response

It is a complete surprise and great honor to receive a Halmos-Ford Award for my article "The Many Lives of the Twisted Cubic" published in the *American Mathematical Monthly*. I would like to thank the MAA for this recognition and also for publishing the *Monthly*, an outlet where works of mathematical synthesis and exposition can find a home. Finally, I would like to thank my frequent collaborators David Cox, Don O'Shea, and Hal Schenck for their encouragement.

Biographical Sketch

John B. Little is Professor of Mathematics in the Department of Mathematics and Computer Science at the College of the Holy Cross in Worcester, Massachusetts, where he has taught since 1980. He received his AB from Haverford College in 1976 and his PhD from Yale University in 1980. His research interests are in algebraic geometry and commutative algebra, computational methods, and applications to areas such as error-control coding theory. He has published several textbooks, including *Ideals, Varieties, and Algorithms* (coauthored with David Cox and Don O'Shea) which won an AMS Steele Prize for Exposition in 2016. He has been active as a mentor for undergraduate research projects at Holy Cross and in the SIMU, PREMUR, MSRI-UP, and PURE Math summer programs promoting diversity and inclusion in the mathematical sciences.

Paul R. Halmos - Lester R. Ford Awards

Balázs Gerencsér and Viktor Harangi

"Too acute to be true: The story of acute sets," *The American Mathematical Monthly*, 126(10), 905–914. 10.1080/00029890.2019.1655311.

Erdős popularized the problem of finding a large set of discrete points in high dimensional space with the property that any triangle formed by these points has acute angles. The authors then follow the threads of the history of the problem, from early linear bounds, to probabilistic exponential bounds, up to the current state of the art where the authors prove the current best bound which is within a factor of 2 of optimal. This gives more than just a problem and a result, but an understanding of how problems evolve over time and insight into how mathematics is done.

Response

We wrote this article with the goal of sharing the remarkable story of acute sets with a greater audience. The story includes: an Erdős problem with a proof from The Book; the first exponential construction, so aptly demonstrating the power of the probabilistic method; a simple and beautiful deterministic construction from a high-school student beating all prior results by a huge margin; and a crucial observation from an anonymous math enthusiast leading to the final twist in this problem.

All the results hinge on elegant ideas and do not require advanced mathematical tools. So we really wanted to make the paper as digestible and enjoyable as possible, hoping to reach high-school students as well. We are greatly honored by this recognition and hope that many readers will find this story just as fascinating as we do.

Biographical Sketch

Balázs Gerencsér and **Viktor Harangi** became familiar with acute angles in the same high-school class, where they even shared a desk. Currently, twenty years later, they share an office at the Rényi Institute, Budapest, where they work as research fellows. They have their own desks now. They both earned MSc and PhD degrees in mathematics from ELTE Eötvös University, Budapest.

Balázs Gerencsér spent a year at MIT as a Fulbright fellow and held a postdoctoral position at the Université Catholique de Louvain, Belgium. Since 2015 he has been a research fellow at the Rényi Institute and an assistant professor at ELTE Eötvös University. His work is mostly on Markov chain mixing behavior and on related distributed algorithms for networked systems, alongside graph limits and synchronizing automata.

Viktor Harangi was a postdoctoral fellow at University of Toronto, after which he returned to Budapest and started to work at the Rényi Institute. His main research interests are graph limits, random processes, and random graphs. He is managing editor of the journal *Combinatorica*.

George Pólya Awards

Christopher Catone

"Bringing calculus into discrete math via the discrete derivative," *The College Mathematics Journal,* 50(1), 21–27. 10.1080/07468342.2019.1530553.

For a sequence of real numbers a_n, its discrete derivative Δa_n is nothing more than the differences between successive terms: $\Delta a_n = a_{n+1} - a_n$. Starting from this extremely simple concept, Catone shows us how to develop an entire theory of discrete differential and integral calculus, with striking similarities to its continuous cousin. There are product, quotient, power and exponential rules; integration is summation; and the "fundamental theorem of calculus" describes telescoping sums. Taylor polynomials appear, and discrete differential equations correspond to recurrence relations.

The article's title promises to "bring calculus into discrete math," and indeed the discrete derivative turns out to be very useful for solving commonly encountered discrete problems, such as finding closed-form expressions for sequences and series. (Do you know how to write $\sum_{k=1}^{n} k \cdot 2^k$ in closed form? You will after reading this article, and the trick is "summation by parts!") This article also accomplishes the reverse: by working in a discrete setting, where there are no limits to complicate matters, one can see very explicitly the basic reasons behind the properties of the usual derivative, and understand more deeply why familiar calculus formulas look as they do.

Throughout the article, Catone pays attention not only to the beautiful mathematical ideas illustrated by the discrete derivative, but also how to bring them into the classroom. The article is full of helpful tips on incorporating these ideas into lesson plans and student projects, in either discrete math or calculus courses, with a particular focus on opportunities for active learning and self-discovery. Although the article is addressed to teachers, the elementary nature of its topic, combined with Catone's clear and straightforward exposition, makes it likewise accessible to students.

This engaging article is a joy to read. All readers of this article, whether beginning students or experienced teachers, and whether interested mainly in calculus or in discrete mathematics, are sure to come away with new insights into both!

Response

As a graduate student, I watched George Polya's video "Let Us Teach Guessing" and have been an admirer of his work ever since. It is an absolute honor to be chosen for this award that bears his name. *The College Mathematics Journal* is an excellent publication with both original and expository articles. I am happy to be able to contribute to this exposition and highlight a topic that is sometimes forgotten in the undergraduate mathematics curriculum. I am also very humbled to be recognized in a list that includes some of the most esteemed teachers of mathematics of the past half-century. Many thanks to the MAA for this great honor.

Biographical Sketch

Christopher Catone is Associate Professor and Chair of the Mathematics department at Albright College, a liberal arts college in eastern Pennsylvania. He received his BA from The College of New Jersey and his PhD from the University of Colorado Boulder under the direction of Jeanne Clelland. Catone's interests are in differential geometry, geometry, and pedagogy. He has won teaching awards from Albright College and The University of Colorado and is currently working on an undergraduate geometry textbook. When not doing mathematics, you might find Chris hiking, biking. skiing, playing guitar, or sipping coffee with a classic novel at one of Philadelphia's many coffee shops.

Adam Glesser, Matt Rathbun, Isabel Serrano, Bogdan D. Suceavă

"Eclectic illuminism: Applications of affine geometry," *The College Mathematics Journal*, 50(2), 82–92. 10.1080/07468342.2019.1565588.

There are many geometric properties that are easy to prove when you are in a particular case. For instance, it is trivial to show that the medians of an equilateral triangle or those of a right isosceles triangle are concurrent. But what if the special case were the general case? Any triangle can be sent by an affine transformation to a given equilateral or right isosceles triangle. The medians of the triangle are sent to the medians of the new triangle and concurrence of three lines is preserved by affine transformations. Hence, the theorem is proved in the general case.

This far-reaching idea is the theme of the article at hand. It is in the spirit of the Erlangen Program published by Felix Klein in 1872, in which different geometries are characterized by their groups of transformations and the corresponding invariants. The group of affine transformations is the natural group for Euclidean geometry. The paper explores this group at length. Since an affine transformation is completely determined by the image of three non-collinear points, all triangles are affine equivalent. Parallelism is preserved by affine transformations, and all parallelograms are affine equivalent. Trapezoids are affine equivalent if and only if their base ratios are equal, hence the family of trapezoids depends on a positive real parameter. When one considers a quadrilateral, any three consecutive vertices can be sent to$(1,0)$, $(0,0)$ and $(0,1)$, yielding two parameters (a,b) for the position of the fourth vertex. These simple, but deep, considerations are used throughout the paper to elegantly prove several theorems of Euclidean geometry.

The last example discussed is that of Pascal's theorem, which states that if the vertices of a hexagon lie on an ellipse and the three pairs of lines containing the opposite sides intersect, then the three points of intersection are collinear. Using an affine transformation, it suffices to prove the theorem when the ellipse is a circle. This example is an opportunity for the authors to open a window on the extension to projective geometry. In this larger context, not only are all ellipses projectively equivalent to a circle, but also to all parabolas and hyperbolas. Moreover, in projective geometry, parallel lines intersect at infinity. Hence, the extension to projective geometry gives for free the result that if the vertices of a hexagon lie on a conic, then the points of intersection of the three pairs of lines containing the opposite sides are collinear.

This paper is truly a jewel. It presents very deep ideas, and it is likely to have a profound influence on anyone teaching Euclidean geometry. The writing is extremely clear and engaging, and the diagrams are very helpful. This paper should be very readable by students and provides a nice selection of exercises to keep all readers entertained.

Response

We are deeply honored to be selected for the George Pólya Award. George Pólya, who outstandingly played the role of mathematician, educator, and writer, was a true intellectual of his time, and it is genuinely humbling to have his name within any neighborhood of ours. We all share a deep love of mathematics, and a passion for sharing it. We hope that this article will bring insight and new perspective to many readers, and we are overjoyed by the recognition of our efforts to advance the philosophy and accessibility of the Erlangen program. The College Mathematics Journal is a splendid and highly motivating editorial environment, inviting us all to better explain—at a fundamental level—the mathematical ideas that matter the most to us. We are also extremely grateful for the very inspiring intellectual atmosphere permeating the Department of Mathematics at CSU Fullerton. For being instrumental in creating this wonderful depart-

mental culture, we are particularly indebted to our retired department chair, Stephen W. Goode, forever our friend and colleague.

Adam Glesser, Matt Rathbun, and Bogdan Suceavă would like to thank their respective doctoral advisors, Robert Boltje, Abigail Thompson, and Bang-Yen Chen, from whose lectures, papers, and books they learned how to think and how to write. Isabel Serrano would like to thank the MAA and its members for introducing her to mathematics' versatility and power to provide insight into numerous fields. As an undergraduate who consistently attended regional and joint meetings, these gatherings exposed her to what a career in research could be and provided the network and motivation to continue her academic career.

Biographical Sketch

Adam Glesser received his PhD in 2006 from the University of California, Santa Cruz, where he worked under the direction of Robert Boltje studying open conjectures in the representation theory of finite groups. He has since worked at the University of Aberdeen (Scotland), Suffolk University (Boston), and for the last eight years, California State University, Fullerton. His work has appeared in, among others, *Trans-actions of the American Mathematical Society, Journal of the London Mathematical Society*, as well as on his YouTube channel. He is a proud father of three boys with whom he loves spending time playing sports, board games, and music. He is also in awe of his superhero wife who, along with taking care of everybody at home, helps bring new life into the world as a labor & delivery nurse.

Matt Rathbun studied Mathematics at the University of California, Berkeley, and earned his Ph.D. at the University of California, Davis. After a year at Michigan State University, and three years at Imperial College London, he has been very fortunate to return to California and is finishing his sixth year at California State University, Fullerton. His research is in pure and applied knot theory and low-dimensional topology, though his student research projects and enthusiasm for teaching keep him quite busy with new and fascinating mathematics.

Isabel Serrano earned a BA in Mathematics with a Concentration in Applied and Computational Mathematics at California State University, Fullerton. In addition to her love of mathematics, Isabel pursued a minor in History and co-authored papers with Dr. Bodgan Suceavă focused on the history of mathematics. During her undergraduate career, Isabel also worked on mathematically modeling the 2016 Zika virus outbreak under the guidance of Dr. Anael Verdugo. Currently, Isabel is pursuing her PhD in Computational Biology at the Universi-ty of California, Berkeley, where she is employing computational approaches to study the diversity in aging.

Bogdan D. Suceavă graduated from the University of Bucharest, Romania, earning a BSc in Mathematics in 1994 and a MSc in Geometry in 1995. He pursued his doctoral program with Michigan State University and defended his doctoral thesis, written under Bang-Yen Chen's supervision, in 2002. His works have appeared in the *Houston Journal of Mathematics, Taiwanese Journal of Mathematics, American Mathematical Monthly*, the *Mathematical Intelligencer, Beiträge zur Algebra und Geometrie, Differential Geometry and Its Applications, Czechoslovak Mathematical Journal, Publicationes Mathematicae, Results in Mathematics, Notices of the American Mathematical Society,* and several other journals. Two of his papers (both co-authored with Isabel M. Serrano, and one co-authored with Lucy H. Odom) have been selected for the *Best Writings in Mathematics* anthologies, published by the Princeton University Press. Besides his mathematical papers, he is the author of 17 literary books written in Romanian, including the novels *Coming from an Off-Key Time* (Northwestern Univ Press, 2011) and *Miruna, a Tale* (Twisted Spoon Press, 2014), which was presented with the Bucharest Writers Associ-ation Fiction Award 2007.

Annie and John Selden Prize

Paul Dawkins

Texas State University

Dr. Paul Christian Dawkins completed his PhD in Mathematics Education in 2009 at The University of Texas at Arlington. He is currently an associate professor in the Department of Mathematics at Texas State University. Dawkins is a prolific author; since his dissertation, 17 of his articles have been published in the prestigious journals *Educational Studies in Mathematics, The Journal of Mathematical Behavior, For the Learning of Mathematics,* and the *International Journal of Research in Undergraduate Mathematics Education*. He has also contributed 3 chapters for books on mathematics research and pedagogy. Both in their number and in their intellectual depth, these publications represent an unusually high level of production for a young scholar. Throughout his career, Dawkins has used heuristics such as guided reinvention and constructivist conceptual analysis to develop ways to help students formalize their prior mathematical understandings in advanced mathematical settings and to enable researchers to study student responses to various instructional strategies. In a variety of different ways, Dawkins' research has focused on exploring the complex interactions between everyday use of language and advanced mathematical language, especially the interplay of semantics, syntactics, and pragmatics for developing student understanding of proof and disproof. Two of his articles have won awards at conferences of the Special Interest Group on Research on Undergraduate Mathematics Education, and he is currently co-principal investigator on a grant from the National Science Foundation to adapt research-based K–12 practices for orchestrating discussion to the context of an undergraduate proof-based mathematics course. From the beginning, Dawkins has carried out his work with extraordinary energy and precise attention to detail. A co-author wrote that "I can honestly say that I have become a better researcher simply by mimicking Paul's example." Dawkins' nominator described him as "one of the strongest theoreticians in our field," who "perceives the same issue two levels deeper than myself and most of my colleagues."

Response

I am very thankful to receive affirmation that the work that I enjoy so much is of value to my peers. To be nominated is a joy and to be awarded is incredibly humbling. I am grateful to a number of people who have helped and taught me throughout my career thus far. My wife Stephanie makes all of life more fun because we do it together. She is such a wonderful partner, friend, and mother. I want to give credit to my father Ross Dawkins for fostering my love of learning and for being a humble man of intellectual and moral integrity. I am thankful to more senior scholars like James Alvarez, Christopher Kribs-Zaleta, Pat Thompson, Marilyn Carlson, Chris Rasmussen, Keith Weber, Amy Ellis, and Mike Oehrtman who have taught me how to conduct valuable research in mathematics education. Not only have I learned from their scholarship, but they have always welcomed me into the research community and given their time and attention to help me grow. I am thankful to collaborators and friends such as Kevin Moore, Kyeong Hah Roh, John Paul Cook, Rob Ely, Dov Zazkis, Michael Tallman, and Shiv Karunakaran with whom I have enjoyed learning. It is a wonder to get to work in the business of learning and producing new knowledge. It is made so much better by getting to do it with people that I admire and enjoy. In receiving this award, I am mindful of the many ways that unmerited privilege has helped me get to this point. I sincerely hope that I can use what influence I have to foster learners and scholars who have to fight much harder in the face of inequity and adversity. Finally, I thank Jesus for giving me life, peace, and the perspective to try to value things worth valuing.

Biographical Sketch

Dr. Paul Christian Dawkins is an associate professor at Texas State University. He previously taught and researched at Northern Illinois University for nine years. His dissertation work on student reasoning and defining in real analysis began a journey of investigating what it means for students to engage in advanced mathematical practices. This has branched into research on student defining, axiomatizing, proving, and reading and speaking mathematical language. Through all of these explorations, Dr. Dawkins seeks to understand how to create opportunities for students to apprehend the power and beauty of mathematical epistemology in the context of their ongoing mathematical journeys. His research methodologies draw heavily upon teaching experiments and conceptual analysis in the Radical Constructivist tradition and guided reinvention and progressive mathematization in the Realistic Mathematics Education tradition. His ongoing passion is to understand how students can construct mathematical logic from within their own mathematical activity. Outside of his roles as a teacher and researcher, Paul is a husband, father, pastor, music lover, and board gamer. He partners with his wife Stephanie to raise their daughter Lily and their son Ransom in a loving home.

Daniel Solow Author's Award

Jim Hefferon

Saint Michael's College

Professor Hefferon's text *Linear Algebra* has been a model for the open source community. Made freely available in 1996, this was one of the first such texts, and it continues to be perhaps the most successful and the most popular. It has been downloaded millions of times, an average of about 1200 times per week in recent years. It has been adopted at scores of colleges, both in the United States and abroad, at institutions ranging from community colleges to research universities.

In particular, this text is known for its exercises and applications. In a review at theassayer.org/cgi-bin/asbook.cgi?book=29, Ben Crowell speaks to the quality of these aspects of the book.

> One thing that makes this book very different from the undergraduate math texts I used is the many interesting applications. Some of these are in separate sections, and some are interspersed throughout the text. The physics applications—such as crystals, electrical networks, and dimensional analysis —are excellent. It's a measure of the quality of the book that I was intrigued by the applications that were outside my specialty, such as voting paradoxes.

The nomination packet for Dr. Hefferon's work spoke directly to how *Linear Algebra* works extraordinarily well for students. Not every student will have the same interests or abilities, but all can be encouraged and supported as they explore the parts of the subject that they can grasp and build on. As recent research has shown, active learning is demonstrably more effective than traditional lecture, and the book's approach helps teachers to get students involved. This is especially true of the application sections that are highlighted in Crowell's review, as they give plenty of opportunity to have students put recently learned theory into context.

Another way that *Linear Algebra* serves students is that it integrates modern technology, particularly Sage, with plenty of fundamental practice in computing and writing. The nominators highlighted how easy it is to supplement the text by using computational tools such as Matlab and Python. This sort of integration is much more smooth with a text with an online version than with a traditional print-only book, because material can be copied or made a link, instead of transcribed.

The clear writing style, tremendous variety of exercises, amenability to use with active learning strategies, and the careful attention to detail in preparation mean that the text is exceptionally adaptable.

The open source nature of the book means that the content is influenced and refined by the larger mathematical community, not just a single author and a handful of reviewers. Many who have used the book have suggested homework problems and other improvements, and contributors are credited in the text materials. Another way in which this book belongs to the whole community is that Prof. Hefferon is extraordinarily generous with his time when instructors using the book have questions or comments.

For being a trailblazer in the open source area and for the impact of the text *Linear Algebra* on undergraduate education, the MAA congratulates Dr. Jim Hefferon with the 2020 Solow Award.

Response

I am honored. Thank you to the MAA, the nominators, and the Solow committee. Thank you also to the community of people who have contributed to the text, particularly Lon Mitchell. And, I share this moment with my wife, who has been incredibly patient and supportive.

Linear Algebra is a key course in the development of students. The undergraduate class that I took seemed to me to consist of a great deal of puzzlement punctuated by brief moments of elaborate subscript

manipulation. When my graduate classes explained it, I felt invited into a world that made beautiful sense. As a teacher I wanted to pass that sense on, and I felt that the students in front of me needed an approach that both respected the mathematics and respected where they were. Today, I sometimes get emails from people saying that the text did help them see that the subject is about ideas. Those notes brighten my day.

The citation mentions the Free license. I wrote the text on a Free system, using Free tools, and since the subject is part of our common mathematical heritage, this approach felt right to me. I must however acknowledge the support that Saint Michael's College has given my professional activity even without a named publisher, which I believe was unusual. I hope that this award helps more scholars and educators see this kind of work as requiring expertise and specialized skills, as time-consuming, as a real contribution to the discipline, and as worthy of professional recognition. Again, thank you.

Biographical Sketch

Jim Hefferon graduated from the University of Connecticut with a thesis in the Theory of Computation. After three years at Union College, he has been at Saint Michael's College in Vermont for almost thirty years. He is active in the TeX community and helped run the archive site CTAN for a decade. Besides *Linear Algebra*, his work in freely available texts includes *Introduction to Proofs: an Inquiry-Based Approach*, and a *Theory of Computation* text that is under development.

Meritorious Service Awards

Tamara Lakins

Allegheny College

Tamara has served her Section in many different offices: Second Vice Chair (2000–2001), First Vice Chair (2001–2002), Section NExT Co-Coordinator (2002–2003 and 2008–2012), Chair (2003–2005), Governor (2011–2014), and Newsletter Editor (2014–2015). She has also served on countless section committees.

It is important to note that Tamara should not be known simply by her long list of offices. While this list is important, the strength of the leadership that she has displayed over the past twenty years is equally impressive. Her leadership style is professional, creative, and inclusive; and we all know that if Tamara is in charge of something, it will be done and it will be done well. For example, during her time as Chair, Tamara led the Section through a thorough and much-needed revision of the bylaws. It was due to Tamara's determination and hard work that the revised bylaws were successfully approved in 2005. Fifteen years later, those who worked with Tamara at that time still remember her efforts in this regard.

Tamara's leadership was also vital to launching and sustaining the Allegheny Mountain Section's successful Section NExT program. A Project NExT Fellow herself (Green dot, 1995), she was one of four section members to write the initial grant proposal in 1999 that got the program off the ground. After the funding was approved, Tamara helped run the first Section NExT workshop in April 2000. She then served as one of the first co-coordinators of the program, a role she took up again for an extended period some years later. In addition to providing such valuable leadership for Section NExT, Tamara has also contributed to the program by serving as a speaker or panelist at a few workshops.

Tamara has also done important service for the broader MAA community. She has organized sessions at national meetings and served as a member and Chair of the Basic Library List Committee. Tamara currently serves on the Classroom Resource Materials Editorial Board.

The Allegheny Mountain Section previously recognized Dr. Tamara Lakins with its Service Award in 2009, and we are thrilled to be able to acknowledge her dedication to the MAA once more with the Certificate of Meritorious Service.

Response

I am greatly honored to receive the 2020 MAA Certificate of Meritorious Service. It has been my privilege to serve with the many colleagues in the Allegheny Mountain Section who are deeply committed to the objectives and success of the MAA. I am thankful for the many friends I have made over the years while serving the Allegheny Mountain Section, and I look forward to continuing these friendships and professional relationships for years to come!

Biographical Sketch

Tamara Lakins is Professor of Mathematics at Allegheny College, where she has taught since 1995. She received her BS and MS degrees at Western Illinois University, where her undergraduate mentor Dr. Iraj Kalantari played an influential role in encouraging her to pursue a career in academia. In 1993, Dr. Lakins received her PhD from the University of Illinois at Urbana-Champaign, specializing in computability theory. Prior to arriving at Allegheny College, she held a John Wesley Young Research Instructor teaching postdoc at Dartmouth College. She is a 1995 Project NExT fellow.

Dr. Lakins served as Chair of the Mathematics Department at Allegheny College in 2011–2019, co-authoring an in-house open source calculus textbook with several colleagues during that time, and facilitating her department's recent revision of its calculus curriculum. Her textbook, *The Tools of Mathematical Reasoning*, was published in 2016.

Meritorious Service Awards

Ezra (Bud) Brown

Virginia Tech

Since joining Virginia Tech in 1969, Bud has influenced nearly every aspect of the department. In curriculum he developed or revamped courses in Graph Theory, History of Mathematics, Discrete Mathematics, and Cryptography. He helped establish and direct the Calculus Emerging Scholars Program (ESP). This was supported with internal grants totaling $339,540. He has supervised seventeen undergraduate research projects in mathematics and worked with more than fifty students at the NSA Director's Summer Program. Finally, he was a member of the University Commission on Undergraduate Studies for nine years, twice serving as its chair.

Bud has dedicated himself to teaching, embodying excellence in the profession, serving as a role model to others, directly encouraging the development of other teachers, and recognizing them when they have achieved great things. In the 1990s, he led NSF workshops for high school teachers at Mount St. Mary's College. He has received many teaching awards at Virginia Tech, including the University-wide William E. Wine Award for teaching excellence and the Edward S. Diggs Teaching Scholar Award (College of Arts and Sciences Certificate of Teaching Excellence) and our MAA section (the John M. Smith Award).

Bud has also served both Virginia Tech and the MAA in recognizing others. At Virginia Tech he served on the selection committees for the Alumni Teaching Award, the Wine Award, and the Diggs Award, eventually chairing all three of these teaching committees. For the MAA he served on the Committee to Select Recipients of the Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member and chaired the MAA MD-DC-VA Section Teaching Award Committee.

He has been extensively involved with Project NExT. He's served as a consultant since 1999 and given a Project NExT course at two MathFests and two Joint Mathematics Meetings.

The MA-DC-VA Section has recognized him with the John M. Smith Award for Teaching Excellence in 1999 and the Sister Helen Christensen Service Award in 2014. The MAA selected him for three Carl B. Allendoerfer Awards for Excellence in Expository Writing and three George Pólya Awards for Excellence in Expository Writing. He has been invited to give plenary lectures at the MAA Carriage House (Distinguished Lecture), the MD-DC-VA, Northeastern, EPaDel, and Louisiana-Mississippi sections, and MathFest.

For the MD-DC-VA Section, Bud has served as its Teaching Award Committee chair (2000–2005), its Program Chair (2004–2006), its Governor (2007–2010), as the moderator for its Student Math Jeopardy contest since 2007, as a Section Next consultant (2001–2009), and as Local Arrangements Coordinator for the Fall 2001 Section Meeting. Nationally, he has served on the Council on Prizes and Awards, the Editorial Board of *Math Horizons*, one of the *American Mathematical Monthly* problem editors for over 30 years, the Committees to Select Recipients of the Allendoerfer and Merten M. Hasse Writing Awards and the Henry L. Alder Teaching Awards. In 2013 he chaired the Search Committee for the Editor of *Math Horizon*s, and he headed Task Forces on the Daniel Solow Writer's Award (2015–16) and on Senior Members and Memberships (2017–18). Finally, he was the music director and accompanist for four "stagings" of *MAA: The Musical*—three times (2011, 2012, and 2015) at MathFest and also at an EPaDel section meeting in 2015.

In short, Bud Brown's service for his university, the mathematics community, and especially for the MAA has left a mark on all of us who have seen his talks, his classes, and just his general entertaining, enthusiastic self, and we are happy to nominate him for an MAA Certificate of Meritorious Service.

Response

It is a great honor to be selected for this award by my colleagues in the MD-DC-VA section. Home is where you go for your hugs and to be with your family – and the MAA, both our section and the larger community, has been my mathematical home for almost five decades. My view of service is likewise very simple: service is a way of life. A major part of my grandparents' lives was devoted to helping others, and they taught me that service is a part of my cultural heritage. It has been a privilege and a joy to serve in our community, and I have gotten much more out of the MAA and our section than I have put into them: friendships, colleagues, and mainly people who share your views about mathematics and education. Finally, what's so special about the MAA in general and the MD-DC-VA section in particular? Simply put, you meet the nicest people there.

Biographical Sketch

Ezra (Bud) Brown grew up in New Orleans, has degrees from Rice and Louisiana State University, taught at Virginia Tech for 48 years, and recently retired as Alumni Distinguished Professor Emeritus of Mathematics. He has done research in number theory, combinatorics, and expository mathematics—and one of his favorite papers is one he wrote with sociologist C.J. Dudley titled "Social relativity: the motion of groups and actors". He is a frequent contributor to the MAA journals and has been known to impersonate Alex Trebek at the spring meetings of the MD-DC-VA section of the MAA. He is the junior author of *The Unity of Combinatorics*, a book in the Carus Monograph series; his coauthor is the late Richard Guy. He enjoys baking biscuits (they're better if you use softened butter), singing (anything from opera to rock 'n' roll), playing jazz piano, and watching an occasional bird.

Meritorious Service Awards

Thomas Hagedorn

The College of New Jersey

Dr. Thomas Hagedorn is professor and chair of the Department of Mathematics and Statistics at The College of New Jersey. His service to the New Jersey Section of the Mathematical Association of America (MAA-NJ) is outstanding. Dr. Hagedorn was elected to be the MAA-NJ Congress Representative for the term 2018-2021. He served as the section's Chair Elect, Chair, and Past Chair from 2012 through 2016 and as MAA-NJ's Vice Chair for Speakers from 2008 to 2013. He organized or co-organized contributed paper sessions at MAA NJ meetings in 2003 (Use of Technology for Teaching Undergraduate Mathematics), 2004 (Technology in the Mathematics Classroom), and 2017 (Innovations in the Precalculus Curriculum), and co-organized a workshop, Using WeBWorK, for the joint fall 2010 meeting with EPADEL.

Dr. Hagedorn founded and organized the New Jersey Undergraduate Mathematics Competition (NJUMC) in 2004. He served on the Garden State Undergraduate Mathematics Conference (GSUMC) 2004 organizing committee and the NJUMC organizing committee from 2005–2006. He served as the GSUMC director in 2007 and 2008, and served as co-director in 2009 and 2010. Most recently, Dr. Hagedorn chaired the MAA NJ Nominating Committee (2017–present) and the Awards Committee (2017–present).

At the national association level, Dr. Hagedorn currently serves as an associate editor for the American Mathematics Competitions (AMC) 8 and was a member of the AMC 8 committee from 2017–2019. From 2014 to 2018, he served on the Deborah and Franklin Tepper Haimo Award Committee and was its chair from 2016–2018. From 2013 to 2015, he served on the Ad Hoc Invited Address Committee for JMM 2015. Dr. Hagedorn served on the Contributed Paper Session Committee from 2008 to 2014, during which time he co-organized the General Contributed Paper Sessions for JMM 2011 and MathFest 2013. Currently, he is a member of the MAA Congress Election Committee.

Dr. Hagedorn has organized or co-organized several contributed paper sessions at national MAA meetings: "Open and Accessible Problems in Number Theory and Algebra" at MathFest 2010 and MathFest 2012, "Perspectives and Experiences in Mentoring Undergraduate Students in Research" at JMM 2015 and "Successful Implementation of Innovative Models for Developmental and General Education Mathematics" at JMM 2017. He also co-organized the poster sessions on "Me and My Gadgets—Teaching with Technology" at JMM 2016 and 2017.

We are very grateful to Dr. Thomas Hagedorn for his many years of effective and dedicated service to the New Jersey Section of the Mathematical Association of America and the Association level of the MAA.

Dr. Hagedorn has been actively involved in many activities in the mathematical community other than MAA. He has been a member of the Advisory Board for the National Museum of Mathematics, NYC, since 2010. He was elected and served as a member of the Princeton Board of Education (K–12), NJ, from 2014–17. He was the PI for an NSF/DUE S-STEM award (2014-2019) to support students from economically challenged backgrounds majoring in mathematics and computer science.

Response

I am honored to have been selected by the New Jersey section for this award. My introduction to the MAA was almost 40 years ago when I first took the AHSME (American High School Mathematics Examination). My high school math teacher, Mr. Larry Devanney at St. Xavier High School in Cincinnati, then shared articles from the Monthly that inspired me to pursue further study in mathematics. Over the years, the MAA has continued to be influential in my professional development and I have sought to pay it forward

to others through my service. I thank the wonderful members of the New Jersey section and the MAA for making my service so enjoyable through all these years.

Biographical Sketch

Thomas Hagedorn is professor of mathematics at The College of New Jersey, where he has taught since 1996. He has been chair of the Department of Mathematics and Statistics for the past nine years and served as the coordinator of TCNJ's First-Seminar Program for four years. He currently serves as the MAA Congress representative for the New Jersey section and is an AMC 8 Associate Editor. Tom completed his AB at Princeton University and a AM and PhD at Harvard University. He lives on a semi-rural property at the edge of Princeton with his lovely wife, mathematically-inclined son, and a small herd of deer.

Meritorious Service Awards

Lisa Mantini

Oklahoma State University

Lisa first became involved with the Oklahoma-Arkansas Section of the MAA in 1992 and has continued attending the annual Section meeting regularly, delivering numerous presentations on topics including group theory and its applications, recreational mathematics, the history of mathematics, and mathematics education. In 1994, the Oklahoma-Arkansas section presented Lisa with its Award for Distinguished College or University Teaching of Mathematics. This was followed by her being awarded the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics at the national level from the MAA in 1995. Lisa was elected to a term as the Governor to the MAA from the Oklahoma-Arkansas Section in 2002-2005, and again from 2014–2017. She is the only person to have served the Oklahoma-Arkansas Section as Governor for two terms. She has served on numerous committees for the MAA at both the national and section level including the Coordinating Council on Awards, the Committees on Membership and on Assessment, the Haimo Teaching Awards Selection Committee, and at the Section level on the teaching awards selection committee, nominating committee, and the committees for the N.A. Court Lecture and the R.B. Deal Lecture.

Lisa served as the local Co-Chair for the 75th Annual Meeting of the Oklahoma-Arkansas Section at Oklahoma State University in 2013. She has also worked since early in her career to support student competitions, including sponsoring the local Putnam Exam at Oklahoma State University since the 1990's and working to help recognize the highest-ranking contestant from the Oklahoma-Arkansas Section at the Section's annual meeting.

Response

I am surprised, honored, and very pleased to have been recognized with the 2020 Meritorious Service Award. My association with the MAA, both at the national level and with the Oklahoma-Arkansas Section, has led to opportunities to develop professionally and personally, new relationships, new ideas, and many happy memories. I plan on my relationship with the MAA continuing for many more years!

Biographical Sketch

Lisa Mantini received the BS in Mathematics from the University of Pittsburgh and the AM and PhD in Mathematics from Harvard University. She taught at Wellesley College before joining the faculty of Oklahoma State University in 1985. She has worked in the representation theory of Lie groups and in mathematics education. She was the recipient of the AAUW's Founder's Postdoctoral Fellowship in 1994 and has visited at the Institute for Advanced Study, Princeton University, MSRI, Arizona State University, and the Universität Göttingen. She delivered the undergraduate lectures at the Mentoring Program for Women in Mathematics in 1998. Her current interests include studying the effectiveness of online teaching of mathematics, the representations of finite groups, and mathematical origami.

Meritorious Service Awards

Shawnee McMurran

California State University, San Bernardino

The Southern California-Nevada Section of the MAA wishes to recognize the extensive and praiseworthy contributions of Shawnee McMurran, California State University, San Bernardino, by nominating her for the Certificate of Meritorious Service.

Dr. McMurran has contributed to the mathematical community through her work as a scholar, in her university, in her section, and with the national MAA. Over the last 15 years, Dr. McMurran has served as a member of the Southern California-Nevada Section's governing board. She first came to the board in 2003 when she took on the role of 2nd Program Vice Chair, progressing to 1st Program Vice Chair, and then Program Chair in 2005–06. In 2007, Dr. McMurran took on the role of section secretary for three years, and since 2010 she has been the Treasurer for the Section. Curtis Bennett, past Treasurer for the Section comments on how much he appreciates Dr. McMurran's "hard work, her careful attention to ensuring that things get done in a timely manner, and her willingness to take on duties for the good of the Section."

In addition to her service to the section, Dr. McMurran has been very active with the MAA. After organizing many special sessions at meetings, she co-organized the general contributed paper sessions at the AMS-MAA joint meetings from 2003–2006 as well as the general contributed paper session at MathFest in 2005. She served on the Committee on Minicourses from 2006–2012 as well as the Committee on Sessions of Contributed Papers from 2002–2008 and 2009-2012. During the later term she chaired that committee. She further served on the Council on Meetings from 2009–2012. From 2011–2018 she served on the Editorial Board of the MAA book series Spectrum. Su Dorée comments on how good Dr. McMurran is "at keeping folks in the loop and, as a committee chair, communicated how much she valued the work of everyone."

Dr. McMurran has served the mathematical community in her department, university, and broader community. She has facilitated 6th and 7th grade lesson studies with the NSF Mathematics and Science Partnership's Algebraic Concepts for Elementary Students program as well as professional development seminars for 4th-8th grade teachers. Dr. McMurran has served as a Faculty Advisor for the Inland Counties Mathematics Project since 2006. From 2018–2019, Dr. McMurran took on the duty of department chair for CSU, San Bernardino, at a time when the California State University system's math requirements were undergoing upheaval. Her willingness to take on this difficult position is a testament to how much she gives to the mathematical community.

In addition, Dr. McMurran is a scholar of mathematics history with over 25 peer-reviewed publications in the area, many of which were done in collaboration with her colleague James Tattersall. Her scholarship also serves the mathematical community by raising awareness of and bringing new insights to the work of Mary Cartwright, John Littlewood, and women who pursued and influenced higher education during the late nineteenth century.

Response

What a surprise and honor! In addition to thanking the Southern California-Nevada section for this nomination, I wish to express my gratitude for the tremendous commitment and support that my MAA colleagues constantly offer. Working with the MAA, both within my section and nationally, has always been a pleasure. I'm grateful to all who have welcomed me into the MAA fold and provided friendship and collegiality throughout these many years. This Certificate of Meritorious Service is really a testament to the team effort put forth by all of us.

Biographical Sketch

Shawn McMurran is a professor in the Department of Mathematics at California State University San Bernardino. She earned her BS and PhD in Applied Mathematics from the University of California, Riverside. Her mathematics trajectory took a turn during her first teaching position at Providence College where she met James Tattersall, who introduced her to the fascinating field of the history of mathematics and with whom she has collaborated on math history projects for nearly 30 years. Her other interests include mathematics education and applied mathematics.