MAA MATHFEST

MAA Prize Session

Friday, August 3, 2018
8:30 A.M. - 9:10 A.M.
Plaza Ballroom
Sheraton Downtown Denver Hotel

Awards and Prizes

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

Henry L. Alder Awards

Chad Awtrey, *Elon University*

David Clark, *Grand Valley State University*

Mohamed Omar, *Harvey Mudd College*

Carl B. Allendoerfer Award

Fumiko Futamura and Robert Lehr

"A New Perspective on Finding the Viewpoint," *Mathematics Magazine*, 90:4, 267–277, 10.4169/math.mag.90.4.267.

Mary P. Dolciani Award

Al Cuoco, *Educational Development Center*

Trevor Evans Award

James Propp

"The Paintball Party," *Math Horizons*, 25:2, 18–21, 10.1080/10724117.2017.11990105.

Paul R. Halmos - Lester R. Ford Awards

Michael Barnsley and Andrew Vince

"Self-Similar Polygonal Tiling," *The American Mathematical Monthly*, 124:10, 905–921, 10.4169/amer.math.monthly.124.10.905.

Paul E. Becker, Martin Derka, Sheridan Houghten, and Jennifer Ulrich

"Build a Sporadic Group in Your Basement," *The American Mathematical Monthly*, 124:4, 291–305, 10.4169/amer.math.monthly.124.4.291.

Maria Deijfen, Alexander E. Holroyd, and James B. Martin

"Friendly Frogs, Stable Marriage, and the Magic of Invariance," *The American Mathematical Monthly*, 124:5, 387–402, 10.4169/amer.math.monthly.124.5.387.

Francis E. Su

"Mathematics for Human Flourishing", *The American Mathematical Monthly*, 124:6, 483–493, 10.4169/amer.math.monthly.124.6.483.

George Pólya Awards

Ben Blum-Smith and Samuel Coskey

"Fundamental Theorem on Symmetric Polynomials: History's First Whiff of Galois Theory" *College Mathematics Journal*, 48:1, 18–29, 10.4169/college.math.j.48.1.18.

Stephen Kaczkowski

"Mathematical Models for Global Mean Sea Level Rise," *College Mathematics Journal*, 48:3, 162–169, 10.4169/college.math.j.48.3.162.

Annie and John Selden Prize

Elise Lockwood, *Oregon State University*

Daniel Solow Award

Beth Chance, *California Polytechnic State University, San Luis Obispo*
George Cobb, *Mount Holyoke College*
Allan Rossman, *California Polytechnic State University, San Luis Obispo*
Soma Roy, *California Polytechnic State University, San Luis Obispo*
Todd Swanson, *Hope College*
Nathan Tintle, *Dordt College*
Jill VanderStoep, *Hope College*

Meritorious Service Awards

Dora Cardenas Ahmadi
Kentucky Section

Leon M. Hall
Missouri Section

Daniel J. Hrozencik
Illinois Section

John C. Maceli
Seaway Section

Mark R. Snavely
Wisconsin Section

Competitions

The 79th William Lowell Putnam Mathematical Competition

December 2, 2017

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 4500 students spend six hours (in two sittings) trying to solve twelve problems.

The Six Highest Ranking Individuals (in alphabetical order)

1. Omer Cerrahoglu, *Massachusetts Institute of Technology*
2. Jiyang Gao, *Massachusetts Institute of Technology*
3. Junyao Peng, *Massachusetts Institute of Technology*
4. Ashwin Sah, *Massachusetts Institute of Technology*
5. David Stoner, *Harvard University*
6. *Yunkun Zhou, Massachusetts Institute of Technology*

Team Winners

1. Massachusetts Institute of Technology
   Allen Liu, Sammy Luo, Yunkun Zhou
2. Harvard University
   Dong Ryul Kim, Stefan Spataru, David Stoner
3. Princeton University
   Murilo Corato Zanarella, Zhuo Qun Song, Xiaoyu Xu
4. University of Toronto
   Itai Bar-Natan, Michael Chow, Dmitry Paramonov
5. University of California at Los Angeles
   Xiaoyu Huang, Konstantin Miagkov, Ni Yan

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

Ni Yan, *University of California at Los Angeles*

The United States of America Mathematical Olympiad

The USAMO (United States of America Mathematics Olympiad) provides a means of identifying and encouraging the most creative secondary mathematics students in the country. It serves to indicate the talent of those who may become leaders in the mathematical sciences of the next generation. The USAMO is part of a worldwide system of national mathematics competitions, a movement in which both educators and research mathematicians are engaged in recognizing and celebrating the imagination and resourcefulness

of our youth. The USAMO is a six-question, two-day, nine-hour essay/proof examination. This year it was held April 17–18.

Winners (in alphabetical order)

Eric Gan
Thomas Guo
Vincent Huang*
Joshua Lee
Michael Ren*
Victor Rong
Carl Schildkraut
Mihir Singhal*
Edward Wan
Brandon Wang
Guanpeng Xu
Andrew Yao

*Member of the 2018 International Mathematics Olympiad USA Team

The European Girls' Mathematical Olympiad

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

Team Members (in alphabetical order)

Megan Joshi
Wanlin Li
Emily Wen
Catherine Wu

The Romanian Master of Mathematics

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

Team Members (in alphabetical order)

Swapnil Garg
Mihir Singhal
Colin Tang
Brandon Wang

Lectures

AWM-MAA Etta Zuber Falconer Lecture

Finding Ellipses
Pamela Gorkin, *Bucknell University*

Earle Raymond Hedrick Lecture

Nonlinear Dispersive Equations and the Beautiful Mathematics that Comes with Them
Gigliola Staffilani, *Massachusetts Institute of Technology*

MAA James R.C. Leitzel Lecture

The Relationship between Culture and the Learning of Mathematics
Talitha Washington, *Howard University and National Science Foundation*

George Pólya Lecturer

Ken Ono, *EmoryUniversity*

Awards and Prizes

Henry L. Alder Awards

Chad Awtrey

ElonUniversity

Chad Awtrey of Elon University has achieved impressive success as a teacher and mentor. His teaching evaluation scores are routinely high, and his students consistently reference his enthusiasm and effective teaching style. They describe him as someone who has inspired them to lead lives of high mathematical impact.

Awtrey is a passionate proponent of engaged learning, especially undergraduate research. In the past seven years, he has mentored a total of thirty-seven undergraduates and seven high school students on thirty-three different research projects. These students have given sixty-five presentations at national and regional meetings and have co-authored seventeen research papers with him. The founder and co-director of the Center for Undergraduate Research in Mathematics has said, "Based on Dr. Awtrey's impressive and extensive record of mentoring students in undergraduate research, I believe he ranks nationally as one of the top mathematics [undergraduate research] mentors among his peers."

To support his work with undergraduates and high school students, Awtrey received an REU grant from the National Security Agency, an MAA Dolciani Mathematics Enrichment Grant, and funding from the Center for Undergraduate Research in Mathematics. In recognition of his success as a teacher-mentor, Awtrey received the Early Career Mentoring Award from the Division of Mathematics and Computer Science, which is part of the Council on Undergraduate Research (CUR), the Distinguished Teaching Award for Beginning Faculty from the MAA Southeastern Section, and the A.L. Hook Endowed Professorship from Elon University.

Awtrey's commitment and service to undergraduate mathematics is far-reaching. He currently serves at his university as Associate Director of Undergraduate Research, regionally as a co-organizer of an annual undergraduate/graduate student research conference, and nationally as a councilor for CUR and as Secretary-Treasurer of Pi Mu Epsilon.

For all of these reasons and more, we recommend Chad Awtrey for the Alder Award.

Response

I am honored to receive the Alder Award and thankful for the hard work of everyone who helps administer the MAA's awards, grants, and other programming. As a Project NExT fellow (blue 10 dot), I acknowledge the profound impact my teachers, colleagues, and students have had on me. The past and current leaders of Project NExT embody the very best of what it means to have a "teacher's heart" and the professional development and networking they provide is difficult (if not impossible) to find elsewhere. I also thank my colleagues on the national council of Pi Mu Epsilon and in CUR's Division of Math and Computer Science, many of whom are previous Alder Awardees. Their dedication to students is inspiring, as is their commitment to high-quality undergraduate research mentoring. I am particularly grateful for my students and colleagues at Elon University and UNC-Greensboro, especially my current and former undergraduate researchers and Elon's Department of Math & Stats. My colleagues' deep devotion to active and engaged learning is remarkable, and my students' child-like willingness to research such esoteric top-

ics as Galois groups and p-adic numbers is, at times, baffling and always invigorating. Lastly, and most of all, I want to thank my wife Connie and my daughter Lily who humor my love of mathematics, even going so far as to celebrate Pi day with me by baking homemade Pi-shaped cookies for my students and wearing Pi T-shirts every year!

Biographical Sketch

Chad Awtrey received his PhD in 2010 from Arizona State University. That same year, he joined Elon University in North Carolina, where he is now Associate Professor of Mathematics and Associate Director of Undergraduate Research. A Project NExT fellow (blue 10 dot), Awtrey currently serves as a co-organizer of the annual UNC-Greensboro Regional Math & Stats Conference, on the Council on Undergraduate Research (CUR), and as Secretary-Treasurer for the national mathematics honorary society Pi Mu Epsilon. His work with students has been supported by an REU grant from the National Security Agency, a Dolciani Mathematics Enrichment Grant from the MAA, and funding from the Center for Undergraduate Research in Mathematics. In recognition of his success as a teacher-mentor, Awtrey has received the Early Career Mentoring Award from CUR, the Distinguished Teaching Award for Beginning Faculty from the MAA's Southeastern Section, and the A.L. Hook Endowed Professorship from Elon University.

Henry L. Alder Awards

David Clark

Grand Valley State University

Over the past six years, David Clark has been an innovative and energetic teacher, leader, and scholar. Beginning with his post-doc days at the University of Minnesota's Mathematics Center for Educational Programs (MathCEP), he was heavily engaged in undergraduate research which led to publication. Continuing with his work at Grand Valley State University, David mastered the use of Standards Based Grading (SBG). Concentrating on mastering skills above earning points, he fosters deep learning throughout the classroom experience. In an effort to help others learn these techniques, David has offered an MAA minicourse on SBG. As his nomination application stated, "David's success can be best defined by his students' successes." In total, twenty-two students have been mentored by him, many of them receiving awards and grants based on their work. To further serve the mathematical community, David is co-authoring a book on mathematical enrichment activities and participates in MathPath, a summer math program for students aged 11–14. We could go on but believe this is sufficient evidence to recommend David Clark for the Alder Award.

Response

I am humbled and honored to be a recipient of the 2018 Alder Award. I wouldn't be here—or anywhere near here—without the faith, support, and encouragement of a lot of people.

From the very beginning, my parents (both teachers themselves) showed me what it means to care about your students. They endlessly supported my interest in math, no matter how confused they were by it!

My high school math teacher, Diane Colbry, showed me how interesting math could be and encouraged me to go to college at Michigan Tech. At Tech, I met David Olson, who first introduced me to inquiry-based learning. It blew my mind. David also modeled what it means to be a reflective teacher and gave me many opportunities to become one myself. In my post-doc at the University of Minnesota, Jon Rogness's thoughtful and thoroughly Minnesotan mentoring helped me grow beyond what I thought was possible. He pushed me to try new things (like undergraduate research), reflect, and think deeply about my students' needs. My colleagues at GVSU have created a department and university where innovative teaching is not just valued but expected. They support me, encourage me, and make a space where I can experiment and improve. There's a reason that I often say that I teach in a "magical land".

And finally, there's no way that I could say enough about my wife and best friend, Sarah. So I won't, and I'll stop here instead.

Biographical Sketch

David Clark is an assistant professor in the Department of Mathematics at Grand Valley State University. He earned his PhD in 2012 at Michigan Technological University. He then spent two years as a teaching postdoc at the University of Minnesota's Mathematics Center for Educational Programs, where he taught talented high school students in the University of Minnesota Talented Youth Mathematics Program (UMTYMP). During this time, he joined MAA's Project NExT as a member of the Silver12 cohort. In 2014, he moved back to his home state of Michigan and accepted a position at GVSU. His research is in discrete math, and he loves working on research projects with undergraduates. Favorite topics include

guessing games (related to error-correcting codes) and games played on finite geometries. He is a founding editor of the Minnesota Journal of Undergraduate Mathematics. David is deeply committed to enrichment and outreach programs, especially through MathPath, a month-long residential enrichment program for middle-school aged students. He also co-organizes Math in Action, a professional development conference for Michigan teachers. Beyond math, he is an avid backpacker and boardgamer.

Henry L. Alder Awards

Mohamed Omar

Harvey Mudd College

Mohamed Omar of Harvey Mudd College is an outstanding instructor who believes active learning should lie at the heart of undergraduate mathematics education. His students have praised him for respecting their individual learning styles and for experimenting with non-lecture classroom formats. Dr. Omar's signature pedagogical style reflects a desire for students to immerse themselves in mathematics the way a professional mathematician would. He helps them develop deeper understanding of complex material by including open-ended problems in his advanced classes, along with guided reflection, and rewards them for work accomplished during the discovery process and not just for their final results.

Dr. Omar's concern for student achievement extends far beyond the classroom. He has created YouTube videos to help students study for the GRE Mathematics Test. He recently published a book, Number Theory towards RSA Cryptography: in 10 Undergraduate Lectures, that takes students through the proof creation process rather than starkly presenting arguments. He has also published several articles on the teaching and learning of mathematics as well as mentored over twenty-five undergraduates on a diverse set of over twenty research projects, several of which have been published in top combinatorics and algebra research journals. But what shone through most brightly in his nomination materials was his belief in inclusivity. He has been involved with organizations and conferences, such as BEAM: Bridge to Enter Advanced Mathematics and USTARS (Underrepresented Students in Topology and Algebra Research Symposium), whose aim is to provide opportunities for students from underserved groups to engage in advanced mathematics. His colleague Dr. Talithia Williams has said that Dr. Omar's "...work is exceptional and his life inspirational."

Dr. Omar has already won an Associated Students of the California Institute of Technology (ASCIT) teaching award for his creative contributions, and we feel his dedication, innovation, and focus on inclusion make him a first-rate candidate for the Alder Award.

Response

I am grateful and honored to receive the 2018 Henry L. Alder award. First and foremost I would like to thank the Harvey Mudd community. The outstanding students made my creative endeavors in the classroom possible. The supportive, genuine faculty were instrumental in my growth and reflection as an educator and I am very grateful for them.

There are particular individuals who had a profound impact on my scholarly trajectory who I can not thank enough. Dora Di Rocco-Smith was a high school teacher of mine who noticed my passion for mathematics and supplemented it with extra learning, enrichment, and guided me toward summer camps and extracurricular mathematics programs. It is through these activities that my love for mathematics transformed into the pursuit of the career I now have.

Many professors in my undergraduate years were influential in my development, but my PhD advisor stood out by far in being a model for serving the students of mathematics. His devotion to students at the undergraduate and graduate level, and his ability to inspire and mentor students toward their goals, has always served as a model for me in my career.

Last but certainly not least, I thank my parents. Not only for their never ending love and support, but for directly shaping me to become the mathematician I am. I especially thank my mom for being the best role model I've ever had for working hard day in and day out, and my dad for fostering my love for numbers very early in my life.

Biographical Sketch

Dr. Mohamed Omar is an award-winning mathematician, nationally recognized speaker, and advocate for inclusion in STEM education. He is the author of over twenty peer-reviewed research articles in internationally recognized journals, and an expert on the influence of algebraic geometry and commutative algebra on problems in discrete mathematics. Dr. Omar is currently an assistant professor in the Department of Mathematics at Harvey Mudd College. Before that, he was a Harry Bateman Research Instructor at the Caltech where he was honored with the Outstanding Teaching Award by the Associated Students of the California Institute of Technology.

Dr. Omar is a strong advocate for diversity in STEM. As a member of multiple underrepresented groups, he especially understands the struggles students battle throughout their college experience. To bring students into mathematics at all levels, Dr. Omar presents entertaining math concepts that illuminate how math concepts appear in everyday life. Dr. Omar has also bridged the STEM barrier for students by creating prep materials for national college-level standardized exams, and sitting on the problem committees of several national level mathematics competitions.

Carl B. Allendoerfer Awards

Fumiko Futamura and Robert Lehr

"A New Perspective on Finding the Viewpoint," *Mathematics Magazine*, 90:4, 267–277.

Over the centuries, great painters have mastered perspective: the sleight of hand of conveying a three-dimensional visual experience in just two dimensions. But to fully enter into the illusion, a viewer needs to be standing where the artist stood; otherwise, the spectator will see "every false relation and disagreement of proportion that can be imagined…" (in the words of Leonardo da Vinci quoted in this article). So how, using only the painted image, do we find the exact spot where a viewer should stand?

The authors begin by taking us on a tour of the rich history of solutions to this problem. They do this through a cleverly chosen case study: Hendrick van Vliet's Interior of the Oude Kerk, Delft, 1660. This vivid rendering of the oldest church in Amsterdam conveys a sense of the spaciousness of highly geometric interior, and does this through the use of two-point perspective. The authors discuss a standard geometric method for finding the correct viewpoint, which involves finding the four vanishing points and taking the intersection of two appropriately drawn semi-circles passing through the vanishing points. When applied to the Oude Kerk, this yields the surprising conclusion that one should stand almost at the left edge of the painting! (This method – as do all the others discussed in the article – also gives the height at which one's eye should be, and the distance from the canvas.) Later in the article, the authors write that from this viewpoint, "…you see the interior from the height of an average person standing in the church… the arches soar overhead and you can feel the spaciousness of the old church. The effect is magical."

However, the reader quickly sees that the standard geometric method, when applied to the Oude Kerk, involves drawing a very large semi-circle, which would be impractical in all but the largest museum galleries. The authors then discuss refinements of the standard method – still geometric in nature – due to Johann Heinrich Lambert and Brook Taylor (the latter of Taylor Series fame). These methods are more practical, but introduce new drawbacks.

The authors then skip ahead two centuries, and describe an algebraic method due to R. Greene from 1983. They provide a new derivation of Greene's method using the cross ratio, which has the added benefit of leading to simplifications of Greene's original formulas. Then comes the coup de grace: a new method for solving this age-old problem, which the authors call the "perspective slope method." It combines algebraic and geometric methods, and is superior to the other methods in certain circumstances (e.g., a two-point perspective painting with a tiled floor).

The applied nature of the question at the heart of this article is appealing. The authors close by saying, "Our great hope is that you will share this article with your local museums or at the very least feel empowered to use these techniques yourself on digital images to determine viewpoints prior to a museum visit." The article offers the reader a fascinating mix of geometry and algebra, a lesson in history, and a renewed knowledge that mathematics has for centuries played a critical role in problems of interest to artists and art-lovers alike.

Response

This is such a pleasant surprise! We are thrilled and honored to receive the Allendoerfer Award this year. To give a little glimpse into the background of the paper, Robert's original intention was to create fractals out of harmonic sets, for his project in Futamura's Geometry course. In making a number of elaborate images, tweaking them and turning them upside down, he realized that he may have stumbled upon a new way of finding the viewpoint for a two-point perspective image. Together, we solidified and refined the

idea, delved into the fascinating history of finding the viewpoint for perspective images and went through over a dozen drafts trying to find the best way to convey these ideas in a fun, informative and accessible way. We truly hope that readers will take this with them on their next museum trip to gain a more immersive experience!

Biographical Sketches

Fumiko Futamura is a Professor of Mathematics at Southwestern University, a liberal arts college in Georgetown, TX. As an artist who enjoys working in a number of different media, she didn't consider majoring in mathematics until she realized that mathematics could be considered an art form. She decided to get her PhD in mathematics to be able to work with this medium at a more advanced level. She now gets to teach art in many of her math classes as well as do research in math and art, in particular, on projective geometry and its applications to perspective drawing. She is currently working with co-authors on an inquiry-based textbook on the subject.

Robert Lehr received his BA from Southwestern University and worked for the University of Texas in Austin as a research assistant analyzing transportation behavior before continuing his education at the University of Texas School of Architecture where he is pursuing an MSSD. He wishes to incorporate his mathematical knowledge and familiarity with geometry into novel, practical architectural constructs.

Mary P. Dolciani Award

Al Cuoco

Educational Development Center

The 2018 Mary P. Dolciani Award is presented to Al Cuoco, Distinguished Scholar at Educational Development Center, for his contributions to mathematics education, especially the highly original and highly mathematical nature of these contributions to mathematics education and the national stature of his programs.

Dr. Cuoco has dedicated his professional life to all aspects of mathematics and the teaching of mathematics. He has worked as a teacher, as a mathematician, and as an educator, and has also made research contributions within both mathematics and mathematics education. Distinctive of his approach to mathematics education is his gentle but persistent emphasis on Mathematics at the Core. His ideas about mathematical habits of mind have had a powerful influence on the way mathematicians think about mathematics education and the way educators think about mathematics. As a result, these ideas were incorporated into the Common Core State Standards for Mathematical Practice.

Dr. Cuoco believes that students benefit when their teachers have a rich experience of doing mathematics for themselves, and he has worked hard to assure that teachers have access to such experiences. For many years, in conjunction with Boston University's PROMYS for Teachers program, he has organized sessions in which teachers and mathematicians collaborate on mathematical investigations arising out of their own teaching. He was also involved in Math Circle-type activities as early as 1999, when he founded a program called Building Regional Capacity, a collaboration of Lawrence Public Schools and the University of Massachusetts at Lowell, supported by NSF. The central activities were Study Groups for teachers, which were built around teachers, focused on mathematics, and run in public school settings in collaboration with mathematicians. Dr. Cuoco continues to this day to work closely with teachers at Lawrence High School—an urban Massachusetts school district.

Through his work in curriculum development, Dr. Cuoco has also brought mathematical habits of mind directly to students in their classrooms. He is the lead author of the highly regarded CME Project, a lively four-year curriculum that succeeds at illustrating mathematical habits of mind in the context of high school mathematics. The CME Project has brought rich mathematical thinking to students in New York, Chicago, Pittsburgh, Boston, and San Diego, among many other urban and rural communities. He has a vision of school mathematics informed by his own research in number theory and experience as high school teacher. He elevates high school mathematics into something interesting for students, something accessible, and something beautiful. By putting the discipline of mathematics at the center of his work, he elevates the work of teaching; mathematical ideas that are soft-pedaled by many curricula are addressed forthrightly.

Most recently, Dr. Cuoco's work has taken an equity focus. Together with national experts in equity and social justice and with teachers in the Pittsburgh Public Schools he is working to extend all of these models in ways that ensure all students have access to high quality mathematical materials and teaching.

Al Cuoco's life work closely mirrors Mary Dolciani's—a teaching career that blossomed into the development of curricula and textbooks for school mathematics. He is most deserving of the Dolciani Award.

Response

Wow. As far back as I can remember, mathematics has always been my haven, my refuge from the so-called real world. Almost by accident, I discovered that I could make my haven accessible to young people,

and that launched a career driven by two passions—for the discipline and for helping others learn to love the discipline. MAA has always been a home for people with this dual passion, and this award is one more example of MAA's dedication to bridge building.

I'm s lucky to be able to do this work. It's supported by brilliant friends and colleagues, most of whom make me look good. It's supported by my family: Micky, Alicia, Scott, and the wonderful young man, Atticus. It's supported by the talented and expert teachers I know who make me glad to be part of their profession. And it's supported by thousands of my high school students who made me understand that kids are much more talented than most grown-ups think.

Biographical Sketch

Al Cuoco grew up in the Boston area, earning his AB degree in Mathematics from Boston College in 1969. For twenty-four years (1969–1993) he taught mathematics at Woburn High School, serving as chair of the department from 1983 to 1993. In 1974, while still working full time at Woburn High School he earned his Masters Degree in Mathematics at Bowdoin College. Inspired by his involvement in the NSF Summer Institutes for Secondary Teachers at Bowdoin, he went on to earn his PhD in Mathematics at Brandeis University under the supervision of Ralph Greenberg. His highly regarded PhD thesis opened the field of higher dimensional Iwasawa Theory; he went on to publish three more influential papers, one with Paul Monsky, within the field. He eventually moved to EDC in 1991, where he has created deeply mathematical programs for students, teachers, and mathematicians inspired by his own personal experiences. Al co-authored, with Joseph Rotman, the MAA book *Learning Modern Algebra from Early Attempts to Prove Fermat's Last Theorem*. He has also published in each of the three MAA journals. He has served on many policy boards, including the Institute for Mathematics and Education, the Illustrative Mathematics Project, and the Conference Board of the Mathematical. Currently, Al is a member of the International Program Committee of ICMI Study 24.

Trevor Evans Award

James Propp

"The Paintball Party" *Math Horizons*, 25:2, 18–21, 10.1080/10724117.2017.11990105.

Geometry, combinatorics, and finite fields are used to compose teams for seven games of paintball. Eight players are to be divided into two teams of four so each pair of players is on the same team exactly three times. Vertices of a cube in $\mathbb{R}^3$ viewed as elements of $GF(2)^3$ represent the players. Teams are formed based on the planes of $GF(2)^3$. Symmetry is employed to ensure that each pair of players is on the same team exactly three times. Readers are encouraged to explore further by considering other numbers of players, and different values for the number of times each pair is on the same team. Humor and lively writing help illustrate an excellent example of the power of symmetry. The article is well-written at a level accessible to students who have not yet encountered abstract algebra, but ramps up nicely to cover open problems at the end, having something for everyone.

Response

I›m honored to receive an award from the MAA, and it›s a special treat to have the MAA acknowledge this particular piece of writing. The life of a mathematician-with-children offers many conflicts between the personal and the professional; it›s delightful that in the case of the paintball party saga, my mathematical knowledge enabled me to be a more effective parent, and the resulting anecdote, in turn, contributed to my efforts at mathematical outreach. Editor Dave Richeson deserves special thanks; he was the one who, perusing my Mathematical Enchantments blog, singled out the paintball party essay as being especially suited to *Math Horizons*, and he did most of the work in whittling the original, longer essay down to size.

Biographical Sketch

James Propp is a Professor at the University of Massachusetts, Lowell. He did his PhD work in ergodic theory (at U.C. Berkeley) but is best known for his contributions to combinatorics and probability and his mentoring of young mathematicians through supervised research. He serves on the advisory council of the Museum of Mathematics and is an Ambassador for the Global Math Project. He blogs at mathenchant.wordpress.com, posts videos at barefootmath.org, and tweets at @JimPropp.

Paul R. Halmos - Lester R. Ford Awards

Michael Barnsley and Andrew Vince

"Self-Similar Polygonal Tiling," *The American Mathematical Monthly*, 124:10, 905–921, 10.4169/amer.math.monthly.124.10.905.

Many mathematicians are familiar with the magical beauty of Penrose tilings. These famous aperiodic tilings of the plane involve two primitive shapes: the "kite" and the "dart." They are non-local in the sense that one cannot distinguish between the uncountably many distinct Penrose tilings based upon examining any finite region of the plane. What about similar tilings that involve only one primitive shape? This fantastic article investigates the fascinating possibilities. It begins with a careful study of the tilings that arise from the "Golden Bee," an unusual six-sided polygon closely related to the Golden Ratio. The authors then proceed to a general construction of self-similar polygonal tilings. Remarkably, many of their polygons are irregular in appearance and some are not even convex. Nevertheless, they still manage to tile the plane in startling and unusual ways. Many examples are studied, each of which is accompanied by dazzling full-color artwork.

Response

We are surprised, delighted, and honored to receive this award. Since our graduate days, we have admired the aim of the *Monthly*: like an orchestra performance, not all the music has to be new, but the performance should be excellent. The first engaging mathematical endeavor, for one of us, was working on the problems in the Problem Section. Like other authors of articles in the *Monthly*, our intent was to convey our passion for the subject. Underlying the patches of tilings seen every day in art, design, architecture and nature, lie mysteries concerning the long range order of the extended tilings of the Euclidean plane. As an easily stated example, there are uncountably many distinct golden b tilings of the plane, yet it appears that there is essentially a unique tiling of a quadrant by copies of the golden b tiles. Writing this paper was a pleasure. Moreover, it has been almost a decade since the two authors began collaborating, and this has certainly been rewarding. Along with the MAA, we believe that mathematicians do well to use all possible tools to advocate for their work: pictures and words, as well as carefully crafted definitions, statements, and proofs..

Biographical Sketch

Michael F. Barnsley received his BA in mathematics from Oxford University in 1968 and his PhD in Theoretical Chemistry from the University of Wisconsin in 1972. He is now an emeritus professor in the Mathematical Sciences Institute at the Australian National University where he researches and teaches fractal geometry. In previous lives, he was an itinerant post-doc in England, France, and Italy (1973–1979); a professor in the School of Mathematics at Georgia Institute of Technology (1979–1991); and a cofounder and chief scientist of Iterated Systems, Inc. (1987–1998), where he led the development of fractal image compression technology. He is fascinated by the interplay of nature and mathematics.

Andrew Vince received his PhD in mathematics from the University of Michigan. A professor in the Mathematics Department at the University of Florida since 1981, he has held visiting positions at Chancellor College in Malawi, Makerer University in Uganda, Universität Kaiserlautern in Germany, Dokuz Eylül University in Turkey, Massey University in New Zealand, and the Australian National University. His mathematical interests lie in combinatorics and in discrete and fractal geometry. He enjoys outdoor sports such as hiking, bicycling, and kayaking. .

Paul R. Halmos - Lester R. Ford Awards

Paul E. Becker, Martin Derka, Sheridan Houghten, and Jennifer Ulrich

"Build a Sporadic Group in Your Basement," *The American Mathematical Monthly*, 124:4, 291–305, 10.4169/amer.math.monthly.124.4.291.

Most finite simple groups fall into a few easy to understand categories, but there are a few sporadic (some might say "freakish") examples that defy easy classification. The Mathieu groups are the most accessible and applicable among these sporadic groups. With a lively and informative discussion of error-correcting codes, this article describes how the Mathieu groups connect to the extended Golay code. The authors give their readers a clear path of how different models of the Golay code connect together and give a way to use this to build the Mathieu groups in a simple and beautiful representation. (Note that no basements were harmed in the writing or reading of this paper.)

Response

It is a great honor to receive the MAA Paul R. Halmos-Lester R. Ford Award. We are very grateful for this recognition by the MAA. We are particularly pleased our paper was selected from the pages of American Mathematical Monthly, which consistently produces quality expository articles. We would like to thank the editor and referees, whose suggestions significantly improved the paper.

This article is a summary of a ten-year conversation between mathematicians and computer scientists. We set out to explore a specific question from coding theory. Our collaboration resulted in several narrowly-focused papers; this Monthly article is the other stuff. It is composed of ideas traded back-and-forth, translated through different viewpoints, and flavored by experiences along the way. Eventually, these different viewpoints became the most interesting aspect of our work.

We hope our paper encourages young mathematicians and computer scientists not only to develop a love for their respective fields, but also to pursue interdisciplinary problems. For inspiration, they could consider the question that led to our work: the (possible) existence of the length-72 extremal code. If such a code existed, it would be the third in an interesting sequence that starts with the extended Golay code.

Biographical Sketch

Paul E. Becker received his MS from Michigan State University and PhD in mathematics from Central Michigan University. He is an associate professor of mathematics at Penn State Behrend. In his spare time, he kayaks and operates a family blueberry farm.

Martin Derka likes combining academic research with industry-oriented projects. He is a graduate of Masaryk University in the Czech Republic, Brock University (MSc, under the supervision of Sheridan Houghten), and University of Waterloo (PhD in computer science, 2018). His industrial experience includes both the start-up scene and large corporations. He has interned as a software engineer at Google and is co-founder and CTO of Car Media 2.0 (formerly Car Pics 2.0). In his free time, Martin enjoys traveling, outdoors, all kinds of sports, and rock-metal music.

Sheridan Houghten received her PhD degree in computer science from Concordia University, Montreal. She is a professor of computer science at Brock University. Her research interests encompass bioinformatics, computational intelligence, coding theory, and combinatorial optimization.

Jennifer Ulrich received her MS degree in mathematics from Texas A&M University. She holds a BS degree from Penn State Behrend, where she is a lecturer in mathematics. In her free time, she enjoys knitting, reading, television, and being the chauffeur for her three children.

Paul R. Halmos - Lester R. Ford Awards

Maria Deijfen, Alexander E. Holroyd, and James B. Martin

"Friendly Frogs, Stable Marriage, and the Magic of Invariance," *The American Mathematical Monthly*, 124:5, 387–402, 10.4169/amer.math.monthly.124.5.387.

Clever connections emerge in this article between a simple two-player game and the stable marriage problem. The authors take the readers on an enjoyable mathematical journey through an analysis of optimal strategy in the "friendly frogs game." In this game, a pair of frogs occupy positions among a fixed set of lily-pads; the players take turns to jump one of the frogs to a new lily-pad in such a way that the distance between the frogs decreases, until no further moves are possible. Stable matching of pairs of positions arises in a natural way; given a stable matching (as found for example by the Gale-Shapley stable marriage algorithm), one player has a winning strategy in which every move leaves the positions of the two frogs matched. The exposition flows smoothly, leading from a simple start with examples of the game into deeply engaging and accessible mathematics.

Response

We are honored to receive this award! We are strong supporters of the MAA's mission of advancing the understanding of mathematics, and are delighted to be recognized in this way.

Stable marriage is a true gem of mathematics: elegantly simple yet subtle and incredibly useful. We strongly recommend reading the seminal (and very accessible) 1962 paper of Gale and Shapley (in the *Monthly*!) and the 2012 citation of Roth and Shapley for the Nobel Memorial Prize in Economic Sciences.

We were excited when we noticed an unexpected connection between stable marriage and the beautiful and instantly appealing area of combinatorial games. When we realized that the connection also provided an opportunity to showcase beautiful ideas of modern probability theory, involving translation invariance, ergodicity, and mass transport, it became clear that the *Monthly* would be the perfect place to share these discoveries. We very much enjoyed this project, and it was a great pleasure to be able to share that enjoyment more widely with readers of the *Monthly*.

Biographical Sketch

Maria Deijfen is a professor in Mathematical Statistics at Stockholm University. She received her PhD from Stockholm University in 2004 and held research positions at Vrije Universiteit Amsterdam, Eurandom (Eindhoven), and Chalmers University of Technology (Gothenburg) before returning to Stockholm University in 2006. Her research area is discrete probability theory, with particular emphasis on spatial structures and random graphs.

Alexander E. Holroyd received his PhD in 2000 from the University of Cambridge. Based in Seattle, he holds affiliate positions at the University of Washington and the Pacific Institute for Mathematical Sciences, and is currently visiting the University of Cambridge. Previously he was at the Theory Group of Microsoft Research, the University of California in Los Angeles and Berkeley, and the University of British Columbia. He works on discrete probability theory with emphasis on percolation, cellular automata, matching, and coupling.

James B. Martin received his PhD in 1999 from the University of Cambridge. After working in Paris for INRIA and for the CNRS, in 2005 he moved to Oxford, where he is based in the Statistics Department and at St. Hugh's College. He works in probability theory, with particular interests including interacting particle systems, models of random growth and percolation, models of coalescence and fragmentation, and random combinatorial games. Outside mathematics, he is a keen singer, organist, and pianist, and other favorite pursuits include skiing, cricket, and a wide variety of board games and card games.

Paul R. Halmos - Lester R. Ford Awards

Francis E. Su

"Mathematics for Human Flourishing", *The American Mathematical Monthly*, 124:6, 483–493, 10.4169/amer.math.monthly.124.6.483.

Francis Su's stirring article asks us to reflect on the question: Why do mathematics? How we answer affects who we think should be doing mathematics, and how we will teach it. Throughout his essay, Su draws on his own experiences, those of his students, and the writings of Simone Weil to illustrate how the pursuit of mathematics can meet basic human desires for play, beauty, truth, justice, and love. He shows us how the fundamentally human drives that motivate us to do mathematics can be channeled to build a world in which all can truly flourish.

Response

I'm truly grateful for this honor, and to the *Monthly* for publishing my piece. I am fortunate to have colleagues and students who constantly challenge me to be a better teacher, and who have blessed my life through friendship that cannot be separated from rich mathematical experiences. It is through them that I have come to understand that if we are to teach mathematics well, we must tap into basic desires all human beings share, and we must elevate the humanity and the dignity of those we teach.

Biographical Sketch

Francis Su is the Benediktsson-Karwa Professor of Mathematics at Harvey Mudd College, and past president of MAA. He received his BS from UT-Austin and his PhD from Harvard University. His research is in geometric combinatorics, and he has a passion for popularizing mathematics: he has a popular Math Fun Facts website and is creator of MathFeed, the math news app. From MAA, he received the 2001 Hasse Prize for expository writing and the 2004 Alder Award and 2013 Haimo Award for distinguished teaching. He is currently writing a full-length book on "Mathematics for Human Flourishing," to be published by Yale University Press in 2019.

George Pólya Awards

Ben Blum-Smith and Samuel Coskey

"Fundamental Theorem on Symmetric Polynomials: History's First Whiff of Galois Theory" *College Mathematics Journal*, 48:1, 18–29, 10.4169/college.math.j.48.1.18.

Modern treatments of Galois theory rely on facts about vector spaces over a field. This material was not available to Galois, whose approach mirrored Newton's explorations of symmetric polynomials. This article focuses on these polynomials as an accessible way for readers who do not know Galois theory to get acquainted, while also providing insight to informed readers that they may have missed in more streamlined treatments of the subject.

Symmetric polynomials (e.g., $4x_1x_2x_3$ and $x_1 + 2x_1x_2 + x_2$) are unchanged by any permutation of their variables, and among them are the elementary symmetric polynomials (e.g., in three variables, $x_1 + x_2 + x_3$, $x_1x_2 + x_1x_3 + x_2x_3$ and $x_1x_2x_3$). The fundamental theorem on symmetric polynomials (FTSP) reads:

> *Any symmetric polynomial in n variables may be represented in a unique way as a polynomial in the elementary symmetric polynomials in n variables.*

For example (from the article), the symmetric polynomial $(x_1 - x_2)^2$ can be represented as $(x_1 + x_2)^2 - 4x_1x_2$. The authors give two proofs of this result—one classical (by Gauss), the other developed by participants in a 2009 course taught by the first author—and begin to shed light on its connection with Galois Theory. The classical proof uses lexicographic order to identify a leading monomial, which is then eliminated by subtracting an appropriate product of elementary symmetric polynomials. The authors suggest that focusing on a single monomial hides the symmetry that originally interested Newton and Galois. They propose an alternate proof, logically similar to the first proof but first identifying (and then eliminating) a full symmetry class consisting of monomials for which the exponent strings have maximum variance. This proof appeals more directly to symmetry and adds geometric insight via an appealing and intuitive "brick-stacking" argument. The authors then explain how the first proof is, in a sense, the limit of the second, and sketch an argument proving this by extending the original variance proof to arbitrary *p*th moments.

Response

We are very honored to receive this award. This article grew out of Ben's desire to explore the teaching and learning of the foundations of Galois theory. He organized a like-minded group of learners and began teaching about symmetries, and later polynomials and solvability. One day a lesson about the fundamental theorem on symmetric polynomials hit an obstacle because the participants could not think of the clever trick needed to continue. Instead of accepting the solution and moving on, the two of us searched for another approach that would not have seemed so clever. Along the way, we explored some history as well as some new ways to look at the problem. Any small investigation between friends or students, together with some follow-up sleuthing, can lead to an article just like this one. We are grateful to the CMJ for providing a forum for this type of exposition.

Biographical Sketches

Ben Blum-Smith worked as a classroom teacher and teacher trainer for a decade before earning his PhD from NYU. In an oblique way, his thesis research, on a delicate structural property of modular invariant rings, grew out of the present article. He continues to be an active invariant theorist, and also has a more recent interest in interactions between mathematics and democracy. He is currently doing a TED residency exploring the latter. Ben writes about math, education and democracy at researchinpractice.wordpress.com, and tweets about them at @benblumsmith. In his spare time, he enjoys cooking and karaoke.

Sam Coskey received his PhD from Rutgers University, studying set theory. He participated in Project NExT and is now in the math department at Boise State University. Sam co-founded and co-directs the Boise Math Circle. Outside of math, he enjoys science fiction novels and cycling.

George Pólya Awards

Stephen Kaczkowski

"Mathematical Models for Global Mean Sea Level Rise," *College Mathematics Journal*, 48:3, 162–169, 10.4169/college.math.j.48.3.162.

It is not every day that one can address a topic of urgent interest in the calculus classroom. We often say that mathematics training develops modeling and problem solving skills, but the examples we present are often poor, with the result that our students lack confidence when it is time to address a real problem. The paper fills a gap, by illustrating to an undergraduate audience how mathematical modeling can be used to explain climate phenomena including, here, the important phenomenon of sea level rise caused by global climate change. The paper first presents the main causes for the rise in ocean level, namely (1) thermal expansion due to rising temperatures of the ocean water, and (2) melting of the ice caps over Greenland and Antarctica, which releases huge amounts of fresh water into the oceans. The mathematics of the paper then focuses on (1) for the period 1971 to 2010. Under a simplifying hypothesis of constant salinity, the paper first presents the relationship between seawater density on one side, and temperature and pressure on the other side. These relationships do not exist as "formulas", and have to be determined empirically from curves or data appearing in the literature. It is the decrease in the seawater density that results in a rise of the global mean sea level. This occurs in the upper layers of the oceans, down to a depth of 700 meters. Since the phenomenon depends on the depth, the global mean sea level rise h is obtained by integrating the expansion of the volume of the ocean in thin layers of constant depth, and this expansion of the volume comes from the change of density $\Delta\rho$ of the seawater due to the temperature increase. Evaluating this $\Delta\rho$ as a function of depth from 1971 to 2010 requires using data in the literature at four different depths and extrapolating from these. The results obtained are within the range of the estimations of the 2013 Intergovernmental Panel on Climate Change (IPCC) report, namely an average of 0.6 mm/yr of sea level rise since 1971, inside a confidence interval [0:4; 0:8]. The paper then briefly addresses the effect of the melting of the ice sheets and glaciers on land.

The paper is very well written. The hypotheses and simplifications are clearly stated, both in the modeling part and in the analysis of the equations. Although the author cautions that the model is not developed enough to use for future predictions, the paper ends with further questions and an invitation to more exploration. Climate studies are very complex and good modeling is an art: one must capture in the model the essential features and neglect the others. But mathematics alone cannot tell what are the essential features! Reading this paper, inexperienced mathematicians can gain confidence in their ability to contribute to the modeling of a complex system; yet the paper is honest about the limitations of a simple model. It is hoped that it will inspire students of calculus—and their teachers—to pursue these ideas further and learn more about the subject!.

Response

I am so grateful that you have chosen to recognize my work by honoring me with this award. I thank the editors and referees of *The College Mathematics Journal* for their role in encouraging teaching and research in mathematics. This project was inspired by my wife's coastal engineering work along various U.S. East Coast beaches; sea level rise is frequently discussed by the engineers and scientists who work in shoreline management, and it is good to see that an environmental topic like this one has struck a chord within the mathematical community.

Biographical Sketch

Stephen Kaczkowski completed his PhD in mathematics in 2010 from the Rensselaer Polytechnic Institute in Troy, NY. He is currently an instructor of mathematics and statistics at the South Carolina Governor's School for Science and Mathematics. He enjoys teaching and researching a variety of topics in both pure and applied mathematics. His non-mathematical interests include playing classical and sacred piano music, and traveling with his wife to various beaches along the East Coast.

Annie and John Selden Prize

Elise Lockwood

Oregon State University

We are pleased to recommend Dr. Elise Lockwood for the 2018 Selden Prize. Her publication record is impressive with twenty journal articles, six appearing in top-tier journals. Her work has been recognized through an NSF CAREER grant award and two RUME best paper awards. The nominators draw attention to Dr. Lockwood's model of combinatorial thinking, its theoretical and empirical foundation, and its broad use within mathematics education research. Of particular note are Dr. Lockwood's conclusions about the role of example-based reasoning that focuses on sets of outcomes in providing insights to combinatorics tasks.The nominators and the selection committee were also impressed with Dr. Lockwood's efforts to share her work, reaching out to classroom teachers through NCTM practitioner journals and to mathematicians through *Notices of the American Mathematical Society* and *PRIMUS*. Overall, we find Dr. Lockwood to be an excellent researcher and well deserving of this recognition.

Response

I am extremely honored to receive the Selden Prize. The RUME community has been tremendously formative in my professional development. I have felt encouraged and supported since the beginning of my career, and my RUME colleagues continue to challenge me to become a better researcher. I am grateful for the example that Annie and John Selden have set—their commitment to mentoring and their genuine love for the field is something I wish to emulate throughout my career. I want to thank my mentors, my collaborators, and my students, all of whom have inspired me, sharpened my thinking, and fueled my passion for the research we are lucky enough to conduct. I also want to thank my wonderful family and friends for the support, perspective, and fun that they bring to my life.

Biographical Sketches

Elise Lockwood is an Assistant Professor in the Mathematics Department at Oregon State University. She received her PhD in Mathematics Education from Portland State University and was a postdoctoral scholar at the University of Wisconsin-Madison. Her primary research interests focus on undergraduate students' reasoning about combinatorics, and she is passionate about improving the teaching and learning of discrete mathematics. In 2017 she was awarded an NSF Career Award, through which she will investigate ways that computational activities can be leveraged to help students solve counting problems more successfully. In her spare time, Elise enjoys traveling, running, cooking, cheering for the Portland Trail Blazers, and playing with her Ragdoll cats.

Daniel Solow Award

Beth Chance, Allan Rossman, Soma Roy
California Polytechnic State University, San Luis Obispo

George Cobb, *Mount Holyoke College*
Todd Swanson, *Hope College*
Nathan Tintle, and *Dordt College*
Jill VanderStoep *Hope College*

Beth Chance, George Cobb, Allan Rossman, Soma Roy, Todd Swanson, Nathan Tintle, and Jill VanderStoep are the recipients of the 2018 Daniel Solow Award for their textbook, Introduction to Statistical Investigations. With generous NSF support (DUE-1140629 and DUE-1323210), the author team is leading a national conversation about the use of simulation-based methods in introductory statistics and driving widespread use of these methods in introductory courses, with the Introduction to Statistical Investigations curriculum at the forefront of these efforts. The authors have led over 30 national and regional workshops for more than 1000 faculty over the last four years, including e-workshops, which are archived and freely available for any to use. These workshops challenge faculty to examine pedagogy, content, and assessment in their statistics courses in an effort to improve student engagement and learning.

The *Introduction to Statistical Investigations* curriculum focuses on helping students think statistically. It does this by using a spiral approach to teach the statistical investigation method, using simulation-based methods to introduce statistical inference while focusing on the logic and scope of inference. The curriculum integrates exposition, examples, and explorations, and uses freely-available applets and real data from genuine studies.

Additionally, the authors have led efforts to document the impact of their curriculum in peer-reviewed research. Their first paper showed improved post-course conceptual learning gains as compared to the standard introductory statistics curriculum at the original institution where the materials were developed. The team later demonstrated improved post-course retention of statistical concepts relative to the standard curriculum in this same population. The team also documented that students at numerous additional institutions showed improved conceptual understanding and significantly more gain (especially on assessment questions related to Data Collection and Tests of Significance) when using this curriculum.

Response

It is an honor and a pleasure to be recognized with the Daniel Solow Author's Award this year. For the seven of us who have worked together since 2009 on the project that ultimately became *Introduction to Statistical Investigations,* it has been a long, but fun, exciting, and transformative process. Our team came together through a joint passion to help improve students statistical thinking in a course taken by millions of students annually. We are humbled by the opportunity we had to stand on the shoulders of other innovators in statistics education who came before us, in order to put together a curriculum that we hope will inspire students to truly learn and appreciate how to draw conclusions from data they observe about the world in which they live. So many class testers, workshop participants, colleagues and, most of all, students, have had a tremendous positive impact on our materials—pushing us to think harder, do better, and ultimately result in the published book. We are truly humbled by this honor.

Biographical Sketches

Nathan L. Tintle is Professor of Statistics at Dordt College. He has led efforts to develop and institutionalize randomization-based curricula at two institutions (Hope College 2005–2011; Dordt 2011–present),

and currently leads the curriculum development project. He has been an invited panelist for a number of statistics education sessions at national meetings, served on the Executive Committee of the Section of Statistical Education of the ASA, received the 2013 Waller Education Award for teaching and innovation in Introductory Statistics, the 2017 Robert V. Hogg Award for Excellence in Teaching Introductory Statistics, and served as a member of a national advisory committee to the ASA President on training the next-generation of statisticians. He has co-authored multiple articles on student learning using the randomization curriculum, one of which won an award for best paper of the year from the Journal of Statistics Education.

Beth L. Chance is Professor of Statistics at California Polytechnic State University. She is co-author with Allan Rossman of the *Workshop Statistics* series and *Investigating Statistical Concepts, Applications, and Methods*. She has published articles on statistics education in *The American Statistician, Journal of Statistics Education*, and the *Statistics Education Research Journal*. She has also collaborated on several chapters and books aimed at enhancing teacher preparation to teach statistics and has been involved for many years with the Advanced Placement Statistics program. She is a Fellow of the American Statistical Association and received the 2002 Waller Education Award for Excellence and Innovation in Teaching Undergraduate Statistics. The Rossman/Chance collection of online applets for exploring statistical concepts was awarded the 2009 CAUSEweb Resource of the Year Award and a 2011 MERLOT Award for Exemplary Learning Materials.

George W. Cobb is Robert L. Rooke Professor Emeritus of Statistics at Mount Holyoke College and has extensive knowledge of statistics education, expertise in developing imaginative and innovative curricular materials and the honor of having brought the conversation on randomization-based approaches in introductory statistics to the mainstream via his 2005 USCOTS presentation and 2007 paper. He served as the first chair of the Joint Committee on Undergraduate Statistics of the Mathematical Association of America and American Statistical Association (1991–98) editing that committee's 1992 report, "Teaching Statistics." He served for three years on the National Research Council's Committee on Applied and Theoretical Statistics and served as vice-president of the American Statistical Association. He is a Fellow of the ASA and received the ASA's Founders Award in 2007. He has published/edited a number of books.

Allan J. Rossman is Professor and Chair of the Statistics Department at California Polytechnic State University. He earned a PhD in Statistics from Carnegie Mellon University. He is co-author with Beth Chance of the *Workshop Statistics* series and *Investigating Statistical Concepts, Applications, and Methods*, both of which adopt an active learning approach to learning introductory statistics. He served as Program Chair for the 2007 Joint Statistical Meetings, as President of the International Association for Statistical Education from 2007–2009, and as Chief Reader for the Advanced Placement program in Statistics from 2009–2014. He is a Fellow of the American Statistical Association and has received the Mathematical Association of America's Haimo Award for Distinguished College or University Teaching of Mathematics in 2010 and the American Statistical Association's Waller Distinguished Teaching Career Award in 2016.

Soma Roy is Associate Professor of Statistics at California Polytechnic State University. She is the current editor for the *Journal of Statistics Education* and has presented talks related to the randomization-based curriculum and student learning at national meetings. She has written and reviewed assessment tasks for the Illustrative Mathematics Project, an initiative to support adoption of the K-12 core standards for statistics. She has been serving as a reader for Advanced Placement exams in Statistics since June 2012. She co-leads, with her colleagues at Cal Poly, a teacher-preparation workshop for AP Statistics teachers. She also has an active research program in health statistics involving undergraduates.

Todd Swanson is an Associate Professor of Mathematics at Hope College. He is a co-author of *A Spiral Approach to Financial Mathematics, Precalculus: A Study of Functions and their Applications, Understanding our Quantitative World, Projects for Precalculus*, which was an INPUT Award winner, and *Introduction to Statistical Investigations*, which was a Most Promising New Textbook Award winner. He has published articles in *Mathematics Teacher, Journal of Statistics Education, Statistics Education Research Journal*, and Stats: *The Magazine for Students of Statistics*. He has presented at numerous national meetings, workshops, and mini-courses about innovative ways to teach mathematics and statistics that focus on guided-discovery methods and projects.

Jill L. VanderStoep is an Adjunct Assistant Professor of Mathematics at Hope College. She has participated in efforts to develop and implement simulation/randomization-based curricula at Hope College since 2005. She has presented on the curriculum and assessment results at national conferences and has co-led workshops on introducing and implementing the simulation/randomization-based curriculum. She has co-authored articles published in the *Journal of Statistics Education, Statistics Education Research Journal,* and *The American Statistician*.

Meritorious Service Awards

Dora Cardenas Ahmadi

Morehead State University

Dora Ahmadi has been an active MAA member in the Kentucky Section and at the national level. In the section, she has served as AMC Coordinator, Student Chapters Coordinator, Co-organizer of the KYMAA Section NExT, Chair-Elect, and Section Chair. She has also been involved in the organizing of several section meetings. At the national level, she served on the Committee on the Undergraduate Program in Mathematics (CUPM) and the Editorial Board of the 2004 CUPM Online Guide and Illustrative Resources. Dora Ahmadi recently completed six years of service as Chair of the Committee on Undergraduate Student Activities and Chapters.

In Kentucky, Dr. Ahmadi has conducted teacher workshops integrating science and mathematics. She initiated Mathematics Awareness Week celebrations at Morehead State University; she involved teachers, students, businesses, and government officials in the celebrations. Dr. Ahmadi greatly enjoys promoting mathematics at all levels. She initiated and conducted mathematics enrichment sessions for fourth and fifth graders at Rodburn Elementary, she initiated Rowan County MathCounts at Rowan County Middle School, promoted AMC competition at regional high schools, and initiated the Kentucky Team representation at the American Regional Mathematics League. In her department at Morehead State University, she served as Department Chair for ten years. In acknowledgement for her contributions, Dr. Ahmadi is recognized with the 2018 Meritorious Award.

Response

I am really surprised, greatly honored, and humbled to have been selected by my colleagues in the Kentucky Section for this award. Since I graduated from the University of Oklahoma and I arrived in Kentucky to begin my professional journey, I made the MAA my academic home. Through my involvement in the section, I have worked with wonderful and dedicated colleagues who served as role models. I am deeply thankful to my section for the opportunities to serve and to my colleagues in Kentucky for nominating me for this award..

Biographical Sketch

Dora Cardenas Ahmadi spent her undergraduate years at Mercy College of the University of New York where she earned BS degree in mathematics, and at the University of Houston where she completed a BS degree in chemical engineering. She received her MA and PhD in mathematics from the University of Oklahoma. Dr. Ahmadi taught middle school and high school students before advancing to the college level. She then became a member of the faculty at Morehead State University. During her tenure there, she attained the rank of Associate Professor of Mathematics, and she served as the Chair of the Department of Mathematics, Computer Science, and Physics for 10 years. She retired in July 2017 after twenty-two years of service to Morehead State University.

Dr. Ahmadi has been active in several professional organizations. Her membership in Project NExT sparked interest in new ways of teaching. She has given numerous talks on the use of technology, reading, writing, oral communication, and group work to promote active learning. She was the 2005 Kentucky Section of the MAA Distinguished Teaching Award winner.

Meritorious Service Awards

Leon M. Hall

Missouri University of Science and Technology

Leon Hall has been a stalwart, hard-working member of the Missouri MAA Section for over thirty years, seldom missing a section meeting and usually giving a talk. He has served as the Missouri Coordinator for the American Junior High School Mathematics Exam, a three-year term as Vice-Chair, Chair and Past Chair, Web Page Administrator, and Governor. He was a member of the Missouri Collegiate Mathematics Competition Committee when it began in 1995 and continues to serve in this capacity. In addition, he has served on the section's nominating committee and the most recent committee to revise the section bylaws. He has supported the Missouri Section's Distinguished College/University Teaching Award by both initiating nominations and writing supporting letters. Nationally, he served a term on the MAA Committee on Science Policy. On his own initiative, he researched and wrote the History of the Missouri Section for the MAA Centennial Celebration. As a result of this work on the section history, he initiated the collecting of Missouri Section material, which was sent to the Archives of American Mathematics as one of the section's centennial projects.

Leon was an early pioneer in the Missouri Section on using computational tools in mathematics, and organized Derive and Mathematica Workshops and ran a Mathematica session at the 1991 Missouri Section Meeting. More recently, he was part of the Missouri group involved in discussing and planning the historic joint meeting of the Iowa, Kansas, Missouri, and Nebraska/SE South Dakota Sections held in Maryville, MO in 2013. He has contributed and/or refereed articles for *The American Mathematical Monthly, The College Mathematics Journal,* and *Mathematics Magazine* several times over the years.

The Missouri Section is pleased to wholeheartedly recognize Leon Hall for his continuing valuable service to the section with this Certificate of Meritorious Service.

Response

Thank you, Missouri Section, for this wonderful honor and recognition. My thirty-plus year professional association with the people in the Missouri Section has been one of the most rewarding parts of my mathematics career, and I look forward to continued MAA activities and relationships for the foreseeable future. Reflecting on and knowing the accomplishments of the previous Missouri recipients of this Certificate, Troy Hicks, Harold Hager, Curtis Cooper, Al Tinsley, Vic Gummersheimer, and Yungchen Cheng, each of whom I have learned from, looked up to, and am privileged to call a friend, it is especially meaningful to become the newest member of this group.

Biographical Sketch

Leon M. Hall, Jr. was born on his father's fiftieth birthday, so deciding on his name was easy for his mother. He grew up in Sedalia, Missouri, and around age twelve or thirteen, he noticed, but didn't prove because he didn't yet know what a proof was, that the partial sums of the odd integers yielded the squares. This was a neat little fact, but at the time he was more interested in baseball, with girls beginning to appear on the horizon as well. The idea of mathematics as a career path, except for K–12 teaching, wasn't really on his radar. Later, thinking of a possible engineering career, he enrolled at the University of Missouri, Rolla, but not knowing much about the various engineering fields, he signed up as an Applied Mathematics major, intending to switch to the engineering department he liked best later. The switch never happened, and he remained both at UMR and in the Mathematics Department through his PhD, under the direction of

Louis Grimm, in 1974. His first academic position was at Nebraska, where he stayed eleven years before returning to UMR as a faculty member in 1985. He started some involvement with MAA while at Nebraska, but his principal MAA activities have been since his return to Missouri. He became Department Chair at UMR in 1998, remaining in that role until retirement (but not retirement from MAA) in 2013. Leon's research interests began with differential equations and have broadened to touch on special functions, algebraic curves, and the history of mathematics. He has supervised two PhD students. His family has been wonderfully supportive of his career, cheerfully accepting occasional vacations planned around mathematics conferences.

Meritorious Service Awards

Daniel J. Hrozencik

Chicago State University

Daniel J. Hrozencik became a member of the Illinois Section of the MAA (ISMAA) in 2002 when he joined the faculty at Chicago State University and has been an active participant in the MAA at both the local and national levels.

For the Illinois Section, Dan served on the ISMAA Board of Directors from 2008 to 2016, providing excellent knowledge of national MAA policy, practice,and issues of concern for dialogue at the section level. In 2007, when the ISMAA merged responsibilities of webmaster and newsletter editor into one role, Dan became the Section's first Information Coordinator. For nine years, Dan ably maintained the section website and communicated Section news to Illinois MAA members. Dan served as chair of the Section Two-Year College Committee from 2012 to 2015. For his commitment to the Illinois Section, Dan Hrozencik was recognized with the ISMAA Distinguished Service Award in 2015. His service to the ISMAA continues through his role as Chair of the Finance Committee (2013–present; Chair, 2016–present).

Prior to joining the Illinois Section, Dan served for five years as Newsletter Editor for the Allegheny Mountain Section when he was the chair for the Department of Mathematics and Computer Science at Westminster College. At the national level, Dan has served on the MAA Committee on Sections (2014–present), the MAA Council on Meetings and Professional Development (2016–present), the MAA MathFest Invited Speaker Committee (2015–2017; Chair, 2015–2017), the AMS-MAA MathFest Speaker Committee (2015–2017; Chair, 2017) and the MAA Beckenbach Book Award Committee (2015–2017; Chair, 2016– 2017).

Beyond his service to the MAA, Dan Hrozencik is a founding member and fellow of the Intercollegiate Biomathematics Alliance and has been the Section Editor for Letters in Biomathematics since 2014.

For his long, continuing service to the Illinois Section of MAA and our profession, the ISMAA nominates Dr. Dan Hrozencik for the 2018 MAA Meritorious Service Award.

Response

I am deeply honored to accept this award from the MAA. I've always admired and enthusiastically supported the work of the MAA to promote mathematics and encourage active involvement of its members. I am pleased to be a part of this organization and to do what I can to help the MAA reach its goals. I look forward to many more years of participation in the MAA!

Biographical Sketch

Dan Hrozencik earned his PhD in Mathematics from the University of Notre Dame in 1988. He served on the faculty at Westminster College (1990–1998) and was an active member of the Allegheny Mountain Section. He is currently a full Professor of Mathematics at Chicago State University, where he has taught since 2002. He has been active in the Illinois Section since 2002. He is a Fellow of the Intercollegiate Biomathematics Alliance and is a Section Editor for Letters in Biomathematics.

Meritorious Service Awards

John C. Maceli

Ithaca College

The Seaway Section is delighted to be able to express its deep gratitude to John Maceli, Professor Emeritus, Ithaca College, via this Meritorious Service Certificate. As a previous recipient of this award remarked, "John is really an unsung hero of the Section. Often it is his behind-the-scenes work and counsel that keeps the Section running smoothly."

John served as first vice-chair and program chair of the section from 1992–1994, and again in 1995–1996. Ever since, he has been a stable presence in the governance of the section, consistently attending the executive committee meetings and offering creative ideas and wise guidance to each new group of executive committee members. Indeed, his informal role of committee member-at-large was deemed so helpful that this position was enshrined in the section bylaws in 2013. John filled this position formally from 2013 until Spring 2016. John's assistance has ranged from suggesting and inviting outstanding speakers for section meetings, extensive informal mentoring and advising of first vice-chairs and chairs of the section, and recruiting individuals to agree to be nominated to the essential and often time-consuming positions on the executive committee of the section. Over the years, John chaired the Gehman Lecture Committee and the Nominations Committee for the section.

Here is an example that epitomizes the way John has, over the years, again and again stepped in to "save the day." At a recent section meeting, an invited speaker had travel issues and did not arrive in time for her talk. Somehow, John had on hand dozens of decks of playing cards, distributed them to the audience, and kept everyone engaged by teaching card tricks–and the mathematics behind them–until the speaker finally arrived.

On the national level, John has served on the Committee on Sections (2015–2016), the Committee on Short Courses (2011–2014), and the Committee on Minicourses (2005–2011).

Response

I am honored and humbled to receive this award from the MAA. I would like to thank my colleagues in the Seaway Section for their kind and thoughtful words. It is also gratifying to join the list of past winners of this Meritorious Service Award. They along with others have been great role models and mentors. Here is a brief anecdote about my work in the Section. For many years I have volunteered for a local bus service that takes seniors and disabled people to doctor's appointments, etc. I once characterized this work as the "best fours of the week." (family things aside!) In any case, I can say that my forty-plus year relationship has been some of the best parts of my service to the mathematical and mathematical education communities. As we all know we don't do this kind of service to get awards but it's nice to be recognized by one's peers. The Seaway Section (as do all sections of the MAA) has many people that work very hard to make things run smoothly. I have been lucky to have had many such colleagues that inspired me. I only hope that I have been able to pass some of this inspiration to others.

Biographical Sketch

John Maceli had a more than forty year teaching career at Ithaca College. He retired in 2012 and is now Emeritus Professor of Mathematics. While doing his graduate work at Cornell University, he developed an interest in mathematical modeling, in particular as applied to the social sciences. This interest in modeling

persisted throughout his career. He developed and taught one of the first courses in the United States on fair allocation and equity, and taught Quantitative Literacy courses for many years. His interest in mathematical modeling led to his involvement in K–12 mathematics education. At the time of his retirement, John was assistant director of COMPASS, a national implementation center for high school mathematics curricula based on modeling. He is co-author, with colleagues from Ithaca College, of *Calculus: An Active Approach with Projects*, published by the MAA. Recently he has begun learning mathematical magic and uses this in workshops for middle and high school students and teachers.

Meritorious Service Awards

Mark R. Snavely

Carthage College

The MAA Wisconsin Section is proud to select Mark Snavely of Carthage College for the MAA Meritorious Service Award. Mark has distinguished himself in numerous services to the Wisconsin Section. He served on the MAA Wisconsin Executive Committee in the years 2002–2005 as Chair-elect (and thus conference organizer of the Spring Meeting), then Chair, and Past Chair; as Secretary/Treasurer for a six-year stint from 2006–2012, and then as Section Governor from 2014–2017. He served this role as governor during a very critical time when the Association rewrote its bylaws and shifted from the Board of Governors to the MAA Congress. In all, he served as a member of the executive committee of the section for an impressive period of twelve years in different capacities. Mark initiated the Executive Committee listserv and continues to maintain it. Mark has many of his undergraduate students give presentations at the MAA Section Spring Meeting and they compete in our Section Student Face OFF competition of which Mark is also the scorekeeper. Through his service, Mark embodies the vision and mission of the MAA.

Response

I was surprised and honor to be nominated for the Meritorious Service Award by the Wisconsin Section. I would like to thank my colleagues in Wisconsin for nominating me for this award, for the amazing work they do for the section, and for the encouragement and inspiration they have provided over the years. It has been a pleasure to contribute my time and energy to such a worthwhile organization. Thanks also to the faculty at Carthage College, particularly the Mathematics Department. Their passion for mathematics and mathematics education makes every day a joy, and for that I am truly.

Biographical Sketches

Mark Snavely earned his PhD and MA in mathematics at Northwestern University, and his BS in mathematics and computer systems from Grove City College. He joined the Carthage College faculty in 1990 and has chaired the Mathematics Department at Carthage since 1995. Mark is very active in undergraduate research, particularly in the areas of discrete mathematics and mathematical modeling. His students have presented their research at Pi Mu Epsilon conferences, meetings of the Wisconsin Section of the MAA, MAA MathFest, the Joint Meetings, and National Conferences on Undergraduate Research (NCUR). Outside of mathematics, Mark enjoys music, cooking, and coaching his son's baseball team.