MAA Awards and Prizes

August 2021

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

maa.org/awards

Awards and Prizes

A list of awards and prizes appears below. The full citation, winner responses and bios start on p. 6. Clicking on a winner's name will take you to the citation.

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MAA Award for Inclusivity

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Henry L. Alder Awards

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Kim Seashore, *San Francisco State University*

Carl B. Allendoerfer Awards

Nancy Ho, James Godzik, Jennifer Jones, Thomas W. Mattman, and Dan Sours

"Invisible Knots and Rainbow Rings: Knots Not Determined by Their Determinants," *Mathematics Magazine*, 93:1, 4–18. 10.1080/0025570X.2020.1685320

Jocelyn R. Bell and Frank Wattenberg

"The Slippery Duck Theorem," *Mathematics Magazine*, 93:2, 91–103. 10.1080/0025570X.2020.1708693

Mary P. Dolciani Award

John Ewing, *Math for America*

Trevor Evans Award

Cornelia A. Van Cott

"The Integer Hokey Pokey," *Math Horizons*, vol. 28 no. 2, 24–27. 10.1080/10724117.2020.1809284

Paul R. Halmos – Lester R. Ford Awards

J. H. Conway, M. S. Paterson & Moscow (U.S.S.R.)

"A Headache-Causing Problem," *The American Mathematical Monthly*, 127:4, 291–296. 10.1080/00029890.2020.1712168

Brian S. Thomson

"The Bounded Convergence Theorem," *The American Mathematical Monthly*, 127:6, 483–503. 10.1080/00029890.2020.1736470

Zhaodong Cai, Matthew Faust, A. J. Hildebrand, Junxian Li and Yuan Zhang

"The Surprising Accuracy of Benford's Law in Mathematics," *The American Mathematical Monthly*, 127:3, 217–237. 10.1080/00029890.2020.1690387

Ben Blum-Smith and Japheth Wood

"Chords of an Ellipse, Lucas Polynomials, and Cubic Equations," *The American Mathematical Monthly,* 127:8, 688–705. 10.1080/00029890.2020.1785253

Merten M. Hasse Award

Zvi Rosen, Jessica Sidman, and Louis Theran

"Algebraic Matroids in Action," *The American Mathematical Monthly*, 127:3, 199–216. 10.1080/00029890.2020.1689781

George Pólya Awards

J.M. Christian and H.A.J. Middleton-Spencer

"On the *N*th Roots of –1 and Complex Basin Boundaries: Fractals from Newton-Raphson," *The College Mathematics Journal*, 51:2, 95–104. 10.1080/07468342.2020.1703452

Adam Hammett

"Euler's Limit and Stirling's Estimate," *The College Mathematics Journal*, 51:5, 330–336. 10.1080/07468342.2020.1811058

Meritorious Service Awards

Douglas Ensley, *Shippensburg University*
Eastern Pennsylvania and Delaware (EPaDel) Section

Mariah and Brian Birgen, *Wartburg College*
Iowa Section

Abraham Mantell, *Nassau Community College*
Metro New York Section

Jennifer Galovich, *St. John's University and the College of St. Benedict*
North Central Section

Nancy Ann Neudauer, *Pacific University*
Pacific Northwest Section

April Ström, *Chandler-Gilbert Community College*
Southwestern Section

Competitions

The 81st William Lowell Putnam Mathematical Competition

Unofficial competition, no rankings, no winners, no prize money, no honorable mentions

The United States of America Mathematical Olympiad

The USAMO (United States of America 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 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 13–14.

Winners (in alphabetical order)

Quanlin Chen, *Princeton Intl School of Math/Sci, NJ*
Xinyang Chen, *Glenda Dawson High School, TX*
Kevin Cong, *Phillips Exeter Academy, NH*
Gopal Goel, *Krishna Home School, OR*
Daniel Hong, *Skyline High School, WA*
Maxim Li, *Michigan State University, MI*
Luke Robitaille, *Robitaille Homeschool, TX*
Eric Shen, *University of Toronto Schools, ON*
Noah Walsh, *Westview High School, OR*
William Wang, *West Windsor-Plainsboro High School North, NJ*
Zifan Wang, *Princeton Intl School of Math/Sci, NJ*
Jaedon Whyte, *Archimedean Upper Conservatory, FL*
Daniel Yuan, *Montgomery Blair High School, MD*

The International Mathematical Olympiad

Ankit Bisain, *Canyon Crest Academy, CA*
Quanlin Chen, *Princeton Intl School of Math/Sci, NJ*
Maxim Li, *Michigan State University, MI*
Luke Robitaille, *Robitaille Homeschool, TX*
Noah Walsh, *Westview High School, CA*
Zifan Wang, *Princeton Intl School of Math/Sci, NJ*

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 Kutaisi, Georgia, it was held virtually on April 9–15, 2021. The United States was represented by the following team of four who took second place with four individual gold medals.

Team Members (in alphabetical order)

Serena An, *Brookings High School, SD*

Yunseo Choi, *Phillips Exeter Academy, NH*

Sanjana Das, *BASIS Independent Silicon Valley, CA*

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

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 13th RMM will be held from October 11–16, 2021. The United States will be represented by the following team of six.

Team Members (in alphabetical order)

Ankit Bisain, *Canyon Crest Academy, CA*

Maxim Li, *Michigan State University, MI*

Quanlin Chen, *Princeton Intl School of Math/Sci, NJ*

Luke Robitaille, *Robitaille Homeschool, TX*

Noah Walsh, *Westview High School, CA*

Zifan Wang, *Princeton Intl School of Math/Sci, NJ*

MAA Certificate of Merit

The MAA Certificate of Merit is awarded at irregular intervals by the Mathematical Association of America for special work or service to mathematics or the broader mathematics community.

In 1983, the Committee for the Award for Distinguished Service proposed that the 1984 MAA Award for Distinguished Service "be presented jointly to Mary W. Gray and Alice T. Schafer." This award was intended, in part, to recognize their work on AWM and its accomplishments. MAA leadership demurred, however, and decided not to give the award to Gray and Schafer. Fourteen years later, Schafer was awarded the Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service. Recently, while reviewing documents in the MAA archive, the details of the 1983 incident came to light. In response, MAA would like to recognize the accomplishments of Mary Gray and rectify this omission.

In addition, MAA is contributing $5000 to the fund that supports the AWM Mary and Alfie Gray Award for Social Justice, established as part of the celebration of AWM's fiftieth anniversary.

Mary Lee Wheat Gray

American University

"I'm always for action." With these four words as her guide, Mary Lee Wheat Gray has amassed a substantial body of work during her lifetime that significantly improved the mathematical community. The MAA is honored to recognize and celebrate Gray's contributions with a Certificate of Merit for sustained application of mathematics to challenge injustice, promote equity, and elevate humanity. Her extraordinary accomplishments, especially her advocacy for women and members of underrepresented groups in mathematics, helped colleagues envision and work towards a more expansive and equitable profession. In particular, she played a critical role in the founding of the Association for Women in Mathematics in 1971, serving as its first president from 1971–1973. With her willingness to challenge authority, her ability to see beyond the status quo to what was fair and equitable, and her persistent commitment to justice, she has used her mathematical and statistical acumen, combined with her subsequent degree in law, to advance the cause of social justice throughout her life.

A member of the mathematics faculty at American University since 1968, it did not take long for Gray to effect change. In her first year, she established a program, funded by the Alfred P. Sloan Foundation, that would help women and minorities earn PhDs in math. Throughout her career at American, she has directed 34 PhDs, many of whom are women or members of underrepresented groups, and mentored countless undergraduates.

In the late 1960s, very few mathematics departments included women on their faculties. It was rarer still for a woman to chair a department of mathematics in America. Neither the MAA nor the AMS had ever elected a woman president. *The American Mathematical Monthly* was still more than a half century away from its first woman editor. But this scarcity of women was not just limited to mathematics. It was reflective of broader society as a whole. Women in America were focused on equity issues that would become formalized in the Equal Rights Amendment movement in 1972.

In 1971, the idea of forming a group of women in mathematics was first introduced at the end of a Mathematics Action Group meeting at the Joint Math Meetings (JMM) in Atlantic City. At Joanne Durken's urging, six women remained after the session, Gray among them, and discussed forming a caucus for women. The next month, Gray posted a small announcement for a new organization, the Association

of Women in Mathematics [later changed to "for Women"] in the *Notices*, and, three months later, she authored the first issue of the *AWM Newsletter*. Throughout the 1970s, the AWM became the unofficial hub for correspondence from women documenting discrimination and seeking assistance or advice. Gray, who was the most qualified to respond, handled many of these concerns.

The 1971 Atlantic City JMM served as another important milestone for change for women in mathematics. And Gray was at the center of it. Gray had observed the absence of women invited to deliver addresses at AMS meetings and/or serve on AMS committees. In an attempt to redress this issue, she made a point to attend the AMS Council meeting. The President of the AMS, Nathan Jacobson, asked Gray to leave. In response, Gray noted that the AMS bylaws did not state that the Council meetings were closed to outside attendees, and she intended to stay. Jacobson apparently informed Gray that the meetings were understood to be closed by a "gentlemen's agreement." Gray replied, "Well, obviously, I'm no gentleman." Sometimes it takes a small act of defiance—a woman staying seated when she is asked to move—to be a catalyst for change. With her (literal) seat at the table, she asked members of the Council to urge all professional math societies to encourage women and minorities to study mathematics and support them in their pursuits.

Following Gray's bold move, the AMS Council opened their meetings to observers. Even more, just a few months later, in April 1971, the AMS formed a Committee on Women in Mathematics to identify the disadvantages that women mathematicians experience and to make recommendations to address them. Later, Gray was elected to the Council and, in 1976, she was nominated by petition and elected as the second female vice president (the first was Charlotte Scott seventy years earlier).

During the 1970s, Gray's work on human rights cases for Amnesty International inspired her to move beyond pure mathematics and study statistics. She soon used this knowledge to work for equitable pensions when she learned TIAA-CREF paid 15% more to men than to women. In that process, one of the attorneys for the opposing side told Gray that "maybe you understand statistics, but you just don't understand the law." This comment spurred her to attend and earn her Juris Doctorate from Washington College of Law and subsequently write the brief for the case when it appeared before the Supreme Court. Her pivot to statistics and her law degree combined to make her even more effective in her fight for equality and women's rights. Florence Fasanelli captured the extent of Gray's influence when she observed that "… she might easily be found in Bosnia, Chile, Israel or Rwanda. She might be found testifying before congressional committees on Capitol Hill or appearing as an expert witness in California courtrooms. Through her knowledge of law and statistics, and her attention to social justice, she has found many ways to use her professional training to help people around the world.…"

Gray has received a host of professional accolades for her work. The AWM honored her at their twentieth anniversary celebration in 1991. In 1993, she was appointed Chair of the USA Board of Directors of Amnesty International. In 1994, she received the Mentor Award for Lifetime Achievement from the American Association for the Advancement of Science. In 2001, President George W. Bush awarded Gray the Presidential Award for Excellence in Science, Engineering, and Mathematics Mentoring. In 2012, she received the Elizabeth L. Scott Award from the Committee of Presidents of Statistical Societies.

These awards celebrate Gray's accomplishments on a grand scale. At the same time, each of them points to her influence on the lives of thousands of individuals. She not only envisions a just world, but she also remains committed to goals and creates structures to achieve it. Along the way, she used mathematics to challenge injustice, promote equity, and elevate humanity.

Response

Trained as a mathematician and converted to a statistician and lawyer, early in my career I asked myself how I could use my skills and knowledge in the broad arena of social justice. Through organizing with oth-

ers and seeking opportunities to apply the methods of the mathematical sciences I have tried to broaden the outreach of the profession and to work for equity for my colleagues and potential colleagues and well as for broaden society. It is gratifying to know that my efforts have been appreciated by the professional society of which I have been a member for the longest time.

Biographical Sketch

Distinguished professor of mathematics and statistics at American University, Mary W. Gray studies the applications of statistical methods to research and teaching, focusing on legal and ethical issues. She was a founder of the Association for Women in Mathematics (AWM) and is a fellow of the American Mathematical Society, the American Statistical Association, the American Association for the Advancement of Science, AWM, and the Association for Women in Science. Professor Gray has served as International Treasurer of Amnesty International and chair of the Board of Directors of the American Middle East Education Foundation. Her PhD in mathematics is from the University of Kansas and her JD from American University's Washington College of Law. Her more than thirty PhD students have served at universities, government agencies and industry throughout the US and abroad.

MAA Award for Inclusivity

The MAA Award for Inclusivity was established in 2019. This award is the Association's recognition of the importance of its core value of Inclusivity to building a healthy and vibrant mathematical community where all are welcome and encouraged to flourish. The MAA Award for Inclusivity is awarded annually to a person or persons (not a program) who has performed significant, sustained work to broaden access to mathematics. The award may be made based on one or several activities that exemplify inclusivity and embrace and affirm diversity. The contribution should be such as to influence the community and culture of mathematics or mathematical education in a significant and positive way on a national scale or have that potential.

William "Bill" Hawkins

University of the District of Columbia
Director of the MAA Office of Minority Participation

The Inclusivity Prize Committee (comprised of Sylvia Bozeman, Lloyd Douglas, Chris Goff, Dave Kung, Jennifer Switkes, and Deanna Haunsperger) would like to recommend that William 'Bill' Hawkins, Jr. receive the 2021 MAA Prize for Inclusivity.

Hawkins, a native of Washington, DC, earned a BS in mathematics and an MS in physics from Howard University, then an MA and PhD in math from the University of Michigan. Hawkins was an Associate Professor and Chair of the Mathematics Department at the University of the District of Columbia (UDC) for the five years leading up to 1990, when he took leave from his position at UDC to become director of the new SUMMA Program at the MAA. SUMMA's goal was "to increase the representation of minorities in the fields of mathematics, science and engineering and improve the mathematics education of minorities." The nomination for Hawkins says in part:

"Hawkins began building the SUMMA Office programs and activities. Over the next 20+ years he led the SUMMA Office to establish a range of activities that addressed a more inclusive environment at the national meetings of the mathematics organizations, addressed undergraduate mathematics education at minority institutions, and related issues. In some of these efforts he was joined by Florence Fassanelli and the team reached out to predominantly Black, Hispanic and Native American campuses to offer consulting and resources. The SUMMA Office worked closely with the MAA Committee on Minority Participation in Mathematics.

"…In the early days of SUMMA, [Hawkins] implemented a plan which helped the small group of faculty from minority populations to see other minority faculty and hear minority speakers, a small group on a large program of presentations, at national mathematics meetings. Hawkins was well known for creating a list of speakers on the program who were from minority groups and having copies of his list available for anyone who desired them. By helping the few minorities present to attend talks and interact with other minorities, he … reduced the feelings of being "the only one" or "one of a very few." … His practice became so well-known that Hawkins was often sought out for his list of minority speakers as soon as one arrived at the meetings. In this way he was able to help newcomers learn other attendees and to help create a sense of community for attendees from minority populations."

Under Hawkins's leadership, the SUMMA Office created an archival record of American PhDs in mathematics and mathematics education who are members of minority groups, initiated the Minority Chairs Breakfast annually, established the Tensor-SUMMA projects "to encourage the pursuit and enjoyment of mathematics by students who are members of groups historically underrepresented in the field of mathematics," organized panels at JMM on issues that affected minority institutions or populations, published a

poster on African and African-American Pioneers in Mathematics, and provided guidance to those who wanted to establish an intervention project.

For these reasons and many others, we wish to recommend that William 'Bill' Hawkins, Jr. be awarded the MAA Prize for Inclusivity 2021.

Response

I would like to express my deep appreciation to the Mathematical Association of America for giving me the 2021 MAA Inclusivity Award. As much as I enjoyed teaching mathematics to minority and other students, the MAA and its Strengthening Underrepresented Minority Mathematics Achievement (SUMMA) Program enabled me to have an impact far beyond my home institution. The support of the MAA Executive Directors, MAA staff, Dr. Florence Fasanelli, and the MAA Committee on Minority Participation was absolutely critical to the success of the various SUMMA initiatives.

I am especially pleased that Dr. Candice Price, Assistant Professor at Smith College, is the new director of the MAA Tensor-SUMMA Program for minority pre-college students participating in mathematical science activities at colleges and universities. She was a participant in one of the first SUMMA-funded undergraduate research programs at California State University - Chico directed by Dr. Thomas Mattman. So the circle remains unbroken. Once again, thank you so very much.

Biographical Sketch

William "Bill" Hawkins is a native Washingtonian who was educated in public and parochial schools. After graduating from Howard University with a BS in mathematics and a minor in physics, he taught at a local public high school for 7 months and developed a lifelong love of teaching mathematics. He earned an MA in mathematics from the University of Michigan and an MS in physics from Howard University before starting to work at Federal City College in DC (a predecessor of the University of the District of Columbia [UDC]). He later completed his PhD in mathematics at Michigan.

He became the Director of the MAA Office of Minority Participation under the late MAA Executive Director Marcia Sward in 1990 and was ably assisted by Florence Fasanelli during some five years of leave from UDC. Sward's successors, Tina Straley and Michael Pearson, were enthusiastic supporters and facilitators of various SUMMA initiatives. The MAA Committee on Minority Participation under Manuel Berriozabal and Sylvia Bozeman also provided oversight. Funders such as the Carnegie Corporation of New York, NSF, and the Tensor Foundation made possible a wide range of activities. SUMMA held workshops in MAA Sections to solicit members to seek funding to run precollege intervention programs or undergraduate research programs for minority students. SUMMA sponsored Minority Chairs Breakfasts as well as dissemination sessions at the Joint Meetings. SUMMA collected and disseminated information on minority PhDs in the mathematical sciences and published a poster on early African American PhDs.

In the mid-1990s, an upcoming RIF at UDC necessitated his return to full-time teaching. His direct involvement with SUMMA continued through his retirement from UDC in 2015 but his wife's declining health has necessitated a reduction in his involvement in MAA since 2017.

Henry L. Alder Awards

The Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member was established in January 2003 to honor beginning college or university faculty whose teaching has been extraordinarily successful and whose effectiveness in teaching undergraduate mathematics is shown to have influence beyond their own classrooms. An awardee must have taught full time in a mathematical science in the United States or Canada for at least two, but not more than seven, years since receiving the PhD. Henry Alder was MAA President in 1977 and 1978 and served as MAA Secretary from 1960 to 1974.

Andrew Penland

Western Carolina University

Dr. Andrew Penland is a passionate and engaging educator. Returning to teach at his alma mater after receiving his PhD from Texas A&M, his "fun and entertaining" style has earned him teaching awards at both Texas A&M and Western Carolina University (WCU). His students appreciate his approach to teaching mathematics; he creates open-ended, relevant questions and fosters a collaborative environment to solve them. As a Project NExT Fellow in 2015–2016, he engaged with colleagues nationwide to learn about life as a mathematician and share his passion for teaching mathematics.

Dr. Penland is a university leader in undergraduate research. He is co-PI on a mini-grant from the Center for Undergraduate Research in Mathematics, which sponsors two research students for the year. He has supervised five students in the Learning Environment and Academic Research Network, an NSF project of which WCU is a member institution.

Dr. Penland also has a passion for mathematics outreach. He has a strong desire to help local students know that they can compete with anyone. He serves as coach of the Smoky Mountain High School Codebusters Team. In 2019, this team took 4th in their event at the North Carolina Science Olympiad, higher than any other non-magnet public school. He has coached WCU teams in Math Jeopardy (2019 MAA Southeastern Sectional champions), the Kryptos Challenge (several top 10 finishes, including 2 teams in the top 4 in 2018), the COMAP MCM, and the Putnam Competition. He engages directly with in-service mathematics teachers in the Smoky Mountain and Blue Ridge Math Teachers' Circles. He administers the Math Puzzles Program for local high schools, and he serves as the chair for the WCU High School Mathematics Contest. He works to increase mathematical appreciation in the general community by giving general audience talks at local music venues and community colleges.

For his tireless advocacy for learning mathematics in fun and engaging ways, both at WCU and abroad, we are pleased to nominate Dr. Andrew Penland for the Henry L. Alder Award.

Response

I am grateful and humbled to receive this award. When I received the news, I immediately thought of my parents, who filled my childhood home with learning opportunities. My wife and children should share in this honor, as well. They are integral to everything I do. In particular, my wife is an early childhood educator who continually brings joy, creativity, and conscientiousness to her classroom, inspiring me to strive for the same in mine.

When I enrolled as a nontraditional student at Haywood Community College in 2005, I did not know that I was beginning amazing journey full of wonderful teachers, students, and ideas. I owe a lot to the instructors at HCC and their tireless work. I am so thankful for the mentorship I received as an undergradu-

ate student from the professors at Western Carolina University, many of whom I now count as colleagues. I am fortunate that my Department embraces the Boyer model of scholarship, giving faculty members freedom to pursue meaningful work. I also want to acknowledge the professors at Texas A&M who presented challenging in an engaging way that made it seem approachable.

Obviously, a teacher can do nothing without students. Mine have been willing to show up, engage with the class, and accept me as an imperfect person also seeking to learn. They have shown me so much. Special thanks is due to my student research collaborators. Sometimes I have no idea how to mentor them, but they always persist, inspiring me to do the same. Together, we find our way.

Biographical Sketch

Dr. Andrew Penland fell in love with the North Carolina mountains during his childhood visits to see extended family. He moved to the region as soon as he became an adult. A math-phobe throughout high school, he gradually felt drawn towards the subject based on a few synchronistic encounters at Haywood Community College. Initially, he was motivated by the seemingly impossible challenge of passing a Calculus I class.

Dr. Penland transferred from HCC to Western Carolina University in 2006, finishing Bachelor's degrees in mathematics and mathematics education in 2009. He continued to initial graduate studies at WCU, earning an MS degree in applied mathematics under the thesis guidance of Risto Atanasov. He earned his PhD at Texas A & M University, with the incomparable Zoran Sunik as his advisor, pushing to graduate a year ahead of schedule so he could pursue his dream of returning to work as a faculty member at WCU.

Dr. Penland's experience as a Project NeXT fellow in 2015–2016 introduced him to a wide variety of teaching techniques, and a newfound appreciation for the art. He shamelessly steals techniques from his colleagues in the mathematics department at Western Carolina University. He also credits youthful competition and later coaching experience in the sport of amateur wrestling with teaching him how to be mentally resilient, as well as how to break complicated skills down into simple and fun activities. He is forever thankful to the successful wrestling coach who taught him the "5 in 5" principle: in any game, an effective coach can use consistent growth to have their team in the top 5% within 5 years. He has used this principle when coaching student teams in various competitions.

Henry L. Alder Awards

Alexander Diaz-Lopez

Villanova University

Dr. Alexander Diaz-Lopez, originally from Puerto Rico, is currently a professor at Villanova University, where he has had a significant impact on his department. Dr. Diaz-Lopez uses his considerable energy to foster community amongst faculty and students through several groups he facilitates. He helped to create a space for regular discussions about teaching amongst his colleagues through InDLG (Informal Department Lunchtime Gathering). In addition, he and a colleague match undergraduate students with research mentors through a program they call Co-MaStER (Community of Mathematicians and Statisticians Exploring Research). Dr. Diaz-Lopez himself has mentored students in research, including a team supported by a grant from the Center for Undergraduate Research in Mathematics (CURM). Together with two colleagues, he also founded the NSF-funded DREAMS (Discovering Resources and Exploring Advanced Mathematics and Statistics) program. The program exposes students to interesting mathematics problems and teaches them about career opportunities and graduate school.

Dr. Diaz-Lopez's penchant for starting programs that benefit students extends well beyond his own department. He helped to found Math SWAGGER (Mathematics Summer Workshop for Achieving Greater Graduate Educational Readiness), a program that helps students underrepresented in the mathematical sciences prepare for and succeed in graduate school. The program supported 29 students in forming a virtual community in the summer of 2020, a particularly challenging moment when students were in need of extra support. He is also a co-founder of *Lathisms*, a website that highlights accomplishments of Latinx and Hispanic mathematicians. In addition, Dr. Diaz-Lopez served the math community through his editorial work for the AMS Notices and two AMS blogs, including the PhD + epsilon blog that serves as a useful resource for new faculty.

For his care for students and drive to make the math community a more supportive and inclusive place, we enthusiastically recommend Dr. Alexander Diaz-Lopez for the 2021 Henry L. Alder Award.

Response

I am honored to receive the 2021 MAA Henry L. Alder Award. I believe that, to a degree, we are products of our environments. I want to thank my parents, wife, and sister for providing a healthy and thriving environment during my life and for supporting me through all my work.

I want to take this space to thank the (s)heroes behind my successes. I would have not received this award without their commitment to creating environments where every person is supported and can thrive. In particular, I want to thank: Frank Morgan, Reyes Ortiz, Edray Goins, Ivelisse Rubio, Matthew Dyer, Pamela Harris, Erik Insko, Alicia Prieto-Langarica, the Project NExT team, Amanda Lohss, Kathryn Haymaker, and Peter Muller for their work and support to me and to the mathematics community.

Finally, I want to thank my students for being willing to be mentored, for teaching me (I learn from them as much as they learn from me), and for engaging in challenging yet rewarding experiences. At the end of the day, they are the ones who make everything worth it.

Bio

Alexander Diaz-Lopez grew up in the small town of San Lorenzo in the archipelago Puerto Rico. While numbers and games always intrigued him, it wasn't until college that Alexander started envisioning a career as a mathematics teacher and researcher. After completing the SMALL REU program and MSRI-UP,

Alexander finished his bachelor's degree in Mathematics at the University of Puerto Rico, Mayagüez. Five years later he completed his PhD at the University of Notre Dame under the supervision of Matthew Dyer. His research is in the areas of combinatorics and Coxeter group theory.

After spending one year as a faculty at Swarthmore College, Alexander joined the Department of Mathematics and Statistics at Villanova University in 2017. Alexander has been involved in some national initiatives such as *Lathisms* and Math SWAGGER, and local ones such as Villanova's DREAMS program, Co-MaStER program, and InDLG. Through it all his goal remains to create programs and spaces where all members are welcomed, heard, and supported, giving everyone an opportunity to thrive.

Alexander loves spending time with his wife, nephews, and two dogs: Master Yoda and Kylo, and playing sports, board games, and video games.

Henry L. Alder Awards

Kim Seashore

San Francisco State University

Dr. Kim Seashore of San Francisco State University is an exceptional and inspiring teacher and mentor, who works tirelessly on making her home department a better place to work with colleagues and students. Her teaching gets high praise from her students, who write that they aspire to be such a teacher themselves someday.

An unusually active curriculum innovator, Dr. Seashore has engaged SF State mathematics faculty and teaching assistants in thinking more deeply, critically, and compassionately about their teaching. Dr. Seashore taught at middle and high schools before she decided to further her education and teach at SF State. The culture in middle and high schools dictates that teaching and curriculum development are a collective activity: teachers discuss what and how they teach constantly and they observe each other's classes very frequently. Dr. Seashore has been the force to implement a form of this in the SF State mathematics department.

Her department now collaborates and learns from each other in ways never used before. Dr. Seashore initiated faculty groups discussing teaching practices, developing classroom material and activities to be used by the instructors, in particular, by graduate teaching associates. In addition, Dr. Seashore implemented the ideas and material generated by the faculty groups in her own classes. Dr. Seashore often shares her expertise with the wider community by offering workshops and mentoring at nearby universities, including supporting recent graduates from SF State.

As a mentor, Dr. Seashore has already served as the principal MA thesis adviser to eight graduate students. In 2016, she established the Mathematics Education Research Group for Equity (MERGE) at SF State. This active research group notably includes not just students immersed in math education research. In fact, a large number of undergraduate and graduate students, including many who are not in her classes or under her official mentorship, seek out Dr. Seashore for advice on mathematics, education, and beyond.

Driven by a desire to make the Mathematics Department live up to the academy's ideals—to be nurturing, responsive to diverse needs, and to attract a community of mutually supporting students and scholars —Dr. Kim Seashore exemplifies a high-quality, inclusive, and global educational mission at its best. We enthusiastically recognize Dr. Seashore's achievements as teacher, colleague, and mentor with the 2021 Henry L. Alder Award.

Response

I am honored and humbled to be selected as a 2021 MAA Alder Awardee. I so appreciate the value that the MAA places on teaching, from offering *PRIMUS* to members to the publication of the *MAA Instructional Practices Guide*. These efforts recognize and showcase the importance of removing barriers to students' achievement. Still, we have a long way to go. Too many students continue to encounter roadblocks in learning mathematics. The population of people in the fields that use and practice mathematics is far from reflecting the diversity of the world we live in. When I joined the math department at San Francisco State University in 2015, I knew from my own experience as an SFSU masters' student eight years prior, that I was coming to join an extraordinary group of colleagues. My SFSU math colleagues have consistently defied the stereotypes about math professors. As teachers, they are creative, innovative, curious about their students, and willing to learn with and from one another. This has allowed me, as a teacher transitioning from a career in K–12 education and teacher professional development, to thrive and flourish as a college

educator. They have been eager to engage in study teams about the teaching of proofs or a calculus squad developing group worthy lessons. Their nomination of me for this award, and the letters of support of the undergraduate and graduate students I have been so fortunate to work with at SFSU, fills me with joy and inspires me to find new ways to engage with love in the humanizing work of teaching.

Biographical Sketch

Kimberly Seashore joined the math department at San Francisco State University (SFSU) in 2015. She earned a PhD in mathematics education in the SESAME program at University of California, Berkeley and an MA in mathematics from SFSU. She was a STaR fellow with the Association of Mathematics Teacher Educators (AMTE) in 2016. Earlier in her career, Dr. Seashore taught both middle and high school mathematics. She also co-directed a professional development program for mathematics teachers, the Bay Area Mathematics Project, through the Lawrence Hall of Science. Her current research focuses on equity and social justice in the teaching of mathematics and the trajectories of professional growth for mathematics teachers. She lives in a cohousing community in Berkeley, CA with her husband, sons and dog.

Carl B. Allendoerfer Awards

The Carl B. Allendoerfer Award, established in 1976, is made to authors of expository articles published in *Mathematics Magazine*. Carl B. Allendoerfer, a distinguished mathematician at the University of Washington, served as president of the Mathematical Association of America, 1959–60.

Nancy Ho, James Godzik, Jennifer Jones, Thomas W. Mattman, and Dan Sours

"Invisible Knots and Rainbow Rings: Knots Not Determined by Their Determinants," *Mathematics Magazine*, 93:1, 4–18. 10.1080/0025570X.2020.1685320

This article has it all. Fun and games for all ages? Check. Careful, logical build-up of terminology and mathematical results? Check. A writing style that is conversational yet mathematically precise? Check. Fascinating connections across seemingly disparate areas of study within mathematics? Check. Well-chosen examples that answer reader questions just before we think to ask them? Check. Drawings to show those examples and build our intuition and understanding? Check. And finally: an ending that encourages the reader to do more, simultaneously issuing a challenge while also providing support for how to proceed? Check!

"Invisible Knots and Rainbow Rings: Knots Not Determined by Their Determinants" charts a delightful path that begins with Möbius strips, instantly engaging readers with ideas for Möbius strip variations to try themselves. We quickly learn these extensions are called paradromic rings, and there are patterns based on how many half twists we make, and based on whether we bisect the strip or cut it into even more sections. There is vocabulary for all this, starting with terms like knots and links, then describing the intriguingly named invisible knots and rainbow rings of the article's title.

Paradromic ring diagrams may be colored, similar to how graphs may be colored, and this is where the mathematical details and connections in this paper shine. Coloring requirements are first stated as two seemingly simple conditions, and the diagrams for some of the easier-to-visualize cases suggest it may be straightforward to decide colorability. However, readers likely guess that more complicated cases exist! This article talks us through these cases by providing multiple ways to determine the colorability of paradromic rings. We learn that drawings, besides building our intuition, also show a consistent way to re-draw paradromic rings to better visualize and count all their crossings. We revisit the single equation of the original two simple conditions, expanding this equation into a matrix-vector equation that is generalizable to examples involving many crossings. The eigenvalues of this matrix form the crux of proofs about colorability possibilities. We then learn about torus links, which partition paradromic rings into cases: some are torus links, and some are not. The authors build their case engagingly and convincingly, using all these ideas, and culminating with a complete characterization of the colorability of paradromic rings. Though they have proved all their results, they leave one proof out of the article as a temptation for readers. We are left with an invigorating call to learn more and complete the proof, as well as with specific suggestions for books to read and topics to focus on. With this guidance, we as readers believe fully that we can progress on this work.

The authors have introduced us to their topic in a way that feels natural to anyone who has ever played with a Möbius strip. They then lead us through coloring, equations, knots, linear algebra, and proofs, all while sounding like we are chatting with a friend. They leave us inspired to try more and persuaded that we can very definitely make progress. Throughout, we remain engaged and find new connections in mathematics.

Response

It is an honor to receive this award. Getting this paper published was a long and winding road and we're grateful to the many people who helped along the way. Thomas would like to dedicate this award to the many students who worked with him, especially those who worked hard only to find that the results could not be published. We also want to encourage those who have something to say to not be discouraged and keep plugging away at it. In the hopes that it can be an inspiration, let us tell you that it took more than a decade between doing this research and getting it published.

This paper grew out of a REUT (Research Experience for Undergraduate and Teachers) at CSU, Chico that was supported in part by NSF REU Award 0354174 and by the MAA's NREUP program with funding from the NSF, NSA, and Moody's.

The first three authors were undergraduates at the time while Dan Sours is a high school teacher.

We are grateful to Yuichi Handa, Ramin, Naimi, Neil Portnoy, Robin Soloway, and John Thoo for helpful comments on early versions of this paper.

Additional funding came from CSU, Chico's CELT as part of a Faculty Learning Community. We thank Chris Fosen, Greg Cootsona, and the other FLC participants for fruitful discussions about the exposition.

Biosgraphical Sketch

James Godzik completed a Bachelor's degree at UC, Berkeley and a Master's in teaching mathematics at CSU, Fullerton.

Nancy Ho received a BA in mathematics from Mills College in 2006 and a PhD in mathematics from University of Oklahoma in 2015. She is currently working as a software engineer with Tapestry Solutions.

Jennifer Jones was an undergraduate at Colorado State University at the time of this research.

Thomas W. Mattman received a PhD in mathematics from McGill University. His mathematical interests include knot theory and graph theory and he enjoys supervising research by undergraduate students and teachers. In real life, he's a devoted husband to Shigemi and a doting father to Saya and Aki; who provide the comic relief.

Daniel M. Sours received a BS in mathematics (1985) and engineering (1981) and a MS in mathematics education (2004) from California State University, Chico. He has taught at Chico High School in Chico California since 1987 and has also served as adjunct faculty at California State University, Chico and Butte Community College. He adores his wonderful wife Mary and loves relaxing with her on the ocean in Little River, California.

Carl B. Allendoerfer Awards

Jocelyn R. Bell and Frank Wattenberg

"The Slippery Duck Theorem," *Mathematics Magazine*, 93:2, 91–103. 10.1080/0025570X.2020.1708693

From the compelling title to the surprising and satisfying results, this article is a joy to read. The authors begin with a short history of the dog-and-duck problem that has given rise to the study of pursuit curves in $\mathbb{R}^2$. Imagine a duck paddling along the edge of a pond with a given shape while a dog at the center of the pond starts making its way toward the duck. The dog's path is an example of a pursuit curve.

Bell and Wattenberg put an interesting twist on this classic problem. They assume that the dog is swimming at a constant speed *slower* than the duck, and that the duck is "slippery", that is, consistently gets away the moment the dog captures the duck. By fixing the duck's path in advance, these assumptions produce some surprising results on the limiting behavior of the pursuit curve. The authors rely primarily on results from a standard first course in differential equations and a little analysis, together with Carathéodory's existence theorem and Brouwer's Fixed Point Theorem. With these tools, the authors prove (1) the existence of a cycle in the pursuit curve, (2) that such a cycle is unique, and (3) that such a cycle is independent of the dog's starting position (i.e., a limit cycle).

The proofs are clear, and the authors' use of various common tools, together with short explanations of less-commonly-taught results, makes this an excellent article for undergraduate math majors interested in exploring the next step beyond their differential equations class. In addition, the artistically pleasing examples provided by the authors suggest a plethora of "tweaks" that faculty might make to this particular problem to develop projects for their own students to consider. In this way, anyone reading the work will find something to intrigue and inspire.

Response

We are absolutely delighted that our slippery duck paper has been selected for a Carl B. Allendoerfer award! We were searching for ways to include and engage cadets at West Point in mathematical exploration, and Hathaway's classic dog-and-duck problem from the Monthly fit the bill perfectly. We were ourselves surprised by the generality of our main result, the "slippery duck theorem". As an application of Brower's fixed point theorem, it is a nice reminder that abstract theorems in fields like topology sometimes have practical applications.

We really had fun working on this problem, especially investigating limit cycles for different "duck paths". We used Mathematica but any software that supports graphics and numerical solutions of systems of differential equations should work. This is a really rich source of student projects. There is a lot left to discover.

Biographical Sketches

Jocelyn Bell received her PhD in 2011 from the State University of New York, with a concentration in general topology. From 2011 to 2016 she held a postdoctoral position at West Point, where she also worked on problems in network science. Since 2016 she has been an assistant professor in the department of mathematics at Hobart and William Smith Colleges. She has three little girls who love "playing numbers".

Frank Wattenberg retired at the end of June 2020 after over 50 years as a mathematician and mathematics teacher primarily interested in mathematical modeling for personal and public policy decisions. Like many of us, he has been forced by recent events to question the assumption that good science and good science education by themselves empower us to improve our world. The work of Dan Kahan and others at

the Cultural Cognition Project is particularly important. Frank is hard at work on:

Seeing Stories through Everyday Cellphone Photography

Most of our students always have with them cellphones with remarkably capable cameras. *Seeing Stories* is about developing our students' powers of visual expression and narrative and about developing lifelong habits of everyday visual dairying. Visual narrative can nurture our sense of self and place in history and foster understanding and empathy across cultural divides.

Seeing Stories can become an engaging theme throughout students' academic lives—appearing in units from 15 minute units on "pictures of the day" from the morning's newspapers or Twitter feed to open-ended personal and creative projects. Along the way, students will develop standard material from the STEAM disciplines. As one example, middle school geometry and understanding of proportion and ratios is essential to composing effective photographs.

Seeing Stories is an example of the synergy between the sciences and the arts—for example, da Vinci's study of anatomy as he sought to capture people and animals on canvas—and modern digital image processing powering the creation of new mixed realities. *Seeing Stories* also multiplies the individual powers of images and words. Finally, and perhaps most importantly, students developing their powers of visual and verbal narrative do so by an ascending double helix of intertwined art appreciation and art creation.

Mary P. Dolciani Award

The Mary P. Dolciani Award recognizes a pure or applied mathematician who is making a distinguished contribution to the mathematical education of K–16 students in the United States or Canada. The award is named for Mary P. Dolciani Halloran (1923–1985), a gifted mathematician, educator, and author, who devoted her life to developing excellence in mathematics education. A leading author in the field of mathematical textbooks at the college and secondary school levels, she published under her professional name Dr. Mary P. Dolciani. This award is made possible by a gift from the Mary P. Dolciani Halloran Foundation.

John Ewing

Math for America

John Ewing graduated with a BS in mathematics from St. Lawrence University in 1966 and a MS and PhD from Brown University in 1971. During a distinguished 50-year career, he has made important contributions to mathematics and mathematics education, first as a professor of mathematics at Indiana University, then as Executive Director of the American Mathematical Society, and currently as President of Math for America (now MfA).

John joined the department of mathematics at Indiana University as an assistant professor after a two-year postdoctoral appointment as a John Wesley Young Research Instructor at Dartmouth College. During a 22-year career at Indiana, he was promoted to professor and served two terms as chair of the department of mathematics. During this part of his career, he published 38 research papers with an emphasis in algebraic topology.

John served as Editor-in-Chief of the *Mathematical Intelligencer* (1980–1986) and Editor-in-Chief of the *American Mathematical Monthly* (1992–1996) and was a member of several other editorial boards. He was the first MAA George Pólya Lecturer in 1991–92 and later served for three years as chair of the George Pólya Lecture Committee. John also was the co-author of one book and editor/co-editor for three others. During this period, John received the MAA Lester R. Ford Award for Expository Writing, the MAA George Pólya Prize for Expository Writing and an honorary doctorate from St. Lawrence University. More recently, in 2013–14 he received the Horace Mann medal from Brown University.

From 1995 to 2008, John served as Executive Director of the AMS. He is widely credited for his leadership and his expertise as a publisher. While Executive Director of the AMS, John edited the publication, *Towards Excellence: Leading A Doctoral Mathematics Department in the 21st Century*. During this period, John authored a number of professional articles including "Mathematics: A Century Ago – A Century from Now" which was published in the Notices of the AMS in 1996 and "Paul Halmos: In his Own Words" which appeared in the *Notices* in 2007.

In 2008, John was named the President of Math for America (now MfA), a position he still holds. Under his leadership, MfA has grown from a fellowship program that supported slightly fewer than 200 mathematics teachers to a one-of-a-kind professional organization that supports over 1000 math and science teachers in New York City. MfA is now a fellowship-driven community where teachers are supported, celebrated and treated as professionals. Each semester, MfA teachers are able to choose from over 400 professional development workshops, most led by other MfA teachers, to enhance their knowledge of mathematics, science and teaching.

The success of MfA has led to other programs modeled on MfA in Los Angeles, Berkeley, Boston, San Diego and Washington, DC. In 2013, New York State launched the New York State Master Teacher Program in partnership with MfA. Currently the New York State program supports another 800 math and science teachers who share a passion for their own STEM learning. A New Jersey STEM Innovation

Fellows program is now in its second year and the 2020 Democratic platform advocates for the creation of a "national science corps of outstanding STEM teachers serving in their schools and communities."

Going beyond his leadership of MfA, John truly believes that teachers are professionals and that we can best advance K–12 math and science education by advocating for and supporting our best math and science teachers, just as we honor out best mathematicians, instead of focusing attention on the poorest teachers. He rejects the idea that teachers need to be "fixed" and has used his standing as a mathematician and educational leader to passionately advocate for teachers as practitioners of their disciplines and experts of their craft.

To publicly advocate for teachers, John has tirelessly and eloquently focused his writing in recent years on communicating with citizens broadly through the popular media. Between 2015 and 2017 he was a regular contributor to the *Huffington Post* and more recently has regularly published in *Forbes*. For example, in 2017 his article "We are Absolutely Not Losing at Everything and Teachers are to Thank" appeared in *Education Week Teacher* and "Where are the teachers?" appeared in *Forbes* in 2020.

Over the past 12 years, John has had a tremendous impact on math teachers and math teaching. As one teacher wrote, "His leadership of Math for America alone is a tremendous accomplishment …. (but) it's his tireless and passionate advocacy in public and academic arenas that is perhaps most meaningful to us as teachers."

For his career as a research mathematician, a writer and editor, a leader in the mathematics profession, and most importantly for his impact on mathematics teachers and teaching, John Ewing is an outstanding selection for the 2021 Mary P. Dolciani Award.

Response

I am honored and genuinely humbled to receive this award. Previous recipients had spectacular achievements in mathematics education. I was merely lucky. Lucky to have learned calculus from a brilliant and exquisitely talented high school teacher, Mr. Latino. He changed my life. He influenced every class I taught for more than a quarter century, and so changed the lives of many thousands more. When I went to the AMS, I was lucky to have colleagues— Bus Jaco, Sam Rankin, and especially Jim Lewis—who had already made education respectable in a research-focused society. I learned from them. I came to understand that vibrant education is essential to vibrant mathematics. And by very great fortune, I moved to M*f*A near the end of my career, where I discovered that schools have many, many Mr. Latinos—mathematically savvy teachers who are expert at their craft and dedicated to their students. They deserve our admiration, our gratitude, and our respect. They change lives every day, mine among them.

I was extraordinarily lucky in one more way … when I met my wife Janice more than 60 years ago. It turns out she actually likes being around mathematicians (go figure). For the past six decades we've been partners in each of our lives. Whatever I've accomplished, we've accomplished together.

Biographical Sketch

John Ewing has served as president of Math for America (M*f*A) since 2009. Before joining MfA, he was Executive Director of the American Mathematical Society (1995–2008) and previously professor of mathematics at Indiana University (1973–1995). Ewing received his BS from St. Lawrence University and PhD from Brown University. In addition to his research, he has been active in mathematical exposition, both as writer and editor, and has written extensively on scholarly publishing and more recently on education. Among other awards, he is a Fellow of both the AAAS and the AMS, was awarded an honorary degree from St. Lawrence University, received the MAA's Gung-Hu Award for distinguished public service, and was presented the 2013–14 Horace Mann medal from Brown University. He and his wife Janice live in Yonkers, just north of New York City.

Trevor Evans Award

The Trevor Evans Award, established by the Board of Governors in 1992 and first awarded in 1996, is made to authors of expository articles accessible to undergraduates and published in *Math Horizons*. The Award is named for Trevor Evans, a distinguished mathematician, teacher, and writer at Emory University.

Cornelia A. Van Cott

"The Integer Hokey Pokey," *Math Horizons*, vol. 28 no. 2, 24–27. 10.1080/10724117.2020.1809284

In this lively article, the author leads the reader on an investigation of positive integers. Van Cott invites the reader to imagine integers doing a numerical Hokey Pokey dance: reversing the order of their digits upon being multiplied by a positive integer n. Integers that can do the dance are called n-flips and generalize integer palindromes (1-flips). Foundational questions about n-flips are answered using only logic and arithmetic. The analysis reveals the role of the Fibonacci sequence in the count of the number of integers of length k that are 9-flips or 4-flips (the only n-flips, other than palindromes, in base 10). With complete answers in hand for what n-flips exist and how many there are among integers with any fixed number of digits, Van Cott proposes considering the same questions in other bases. By sharing some of the partial results and describing a useful combinatorial tool (a decorated directed graph), Van Cott inspires the reader to prove those results and find more. The article closes with mention of cyclic integers of length k, whose digits are cyclically permuted upon multiplication by 1, 2, …, $k-1$, and k, and their connection with full period primes. The reader is left with clear ideas for continued play, further reading, and hard work if so inclined.

Response

What a wonderful surprise and honor to receive this award from the MAA! My first time speaking on the topic of this article was back in 2015 at MathPath, a summer camp for children interested in mathematics. The campers' enthusiastic engagement with the subject motivated me to write things down in expository form, and so I thank these campers for their contributions and inspiration during that hot summer of 2015. In addition, I thank Adrienne Slawik, a student at Pacific Lutheran University, who contributed the artwork for the front page of the article. Finally, I thank Tom Edgar, editor of *Math Horizons*, for his support during the publication process.

Biographical Sketch

Cornelia Van Cott is associate professor of mathematics at the University of San Francisco, where she has been since 2008. She received her BS in mathematics at Wheaton College (Wheaton, Illinois) and her PhD at Indiana University. Outside of teaching, Cornelia enjoys thinking about geometric topology and speaking about mathematics to all audiences—from children to adults.

Paul R. Halmos - Lester R. Ford Awards

The Paul R. Halmos-Lester R. Ford Awards recognize authors of articles of expository excellence published in *The American Mathematical Monthly*. The awards were established in 1964 as the Ford awards, named for Lester R. Ford, Sr., a distinguished mathematician, editor of *The American Mathematical Monthly*, 1942–1946, and President of the Mathematical Association of America, 1947–1948. In 2012, the Board of Governors designated these awards as the Paul R. Halmos–Lester R. Ford Awards to recognize the support for the awards provided by the Halmos family and to recognize Paul R. Halmos, a distinguished mathematician and editor of the *Monthly*, 1982–1986.

J. H. Conway, M. S. Paterson & Moscow (U.S.S.R.)

"A Headache-Causing Problem," *The American Mathematical Monthly*, 127:4, 291–296.
10.1080/00029890.2020.1712168

The title of the article is explained in the second paragraph. It is a typical Conwayesque game. Since the article was originally published in 1977, the application to Fermat's Last Theorem (Wiles Theorem or Wiles-Taylor Theorem) was a nice touch. From the acknowledgement part we learn that "the paper has had a major impact on the early developments of epistemic logic in Amsterdam."

Response

I am greatly honored by this award from the MAA. The paper is most unusual in a variety of ways. You will already have noticed that the three co-authors are Conway, J.H., Paterson, M.S., and Moscow, U.S.S.R., but may not yet have seen the acknowledgments at the end of the paper.

John Conway and I worked on this problem, between sessions at the 1966 International Congress of Mathematicians in Moscow. I heard nothing more until John wrote essentially this paper for a Festschrift in Amsterdam in 1977. The acknowledgments say:

> "The work described here was carried out when the first and second named authors enjoyed the hospitality of the third. The second and third authors are indebted to the first for expository details. The first and third authors gratefully remark that without the constant stimulation and witty encouragement of the second author this paper … was completed".

So with that understanding I can say what a great paper this is, combining John's idiosyncratic wit and intellectual clarity. Other unusual aspects are the single reference, which is to the paper itself, and the order of presentation which begins with a disproof of the main theorem, then followed by the proof.

Sadly, John died last year but he was very pleased to be shown this article in the *Monthly* in hospital shortly before then.

Biographical Sketches

Mike Paterson took degrees in mathematics at Cambridge and rose to fame as the co-inventor of *Sprouts* with John Conway. He evolved from president of the Trinity Mathematical Society to president of the European Association for Theoretical Computer Science, and migrated from MIT to the University of Warwick, where he has been in the computer science department for 50 years.

John Horton Conway was an English mathematician active in the theory of finite groups, knot theory, number theory, combinatorial game theory and coding theory. He also made contributions to many branches of recreational mathematics, most notably the invention of the cellular automaton called the *Game of Life*.

Brian S. Thomson

"The Bounded Convergence Theorem," *The American Mathematical Monthly*, 127:6, 483–503. 10.1080/00029890.2020.1736470

In this well written exposition, the Brian Thomson gives a nice account of the bounded convergence theorem. The theorem was originally formulated for Riemann integrable functions by Cesare Arzelà and rediscovered independently by William Fogg Osgood for continuous functions. Thomson gives proofs for these statements that depend only on undergraduate tools. As an application, he discusses Volterra's problem concerning the existence of a bounded derivative that is not Riemann integrable. In the Appendix, he gives an extension of the Osgood Theorem to abstract spaces using the same elementary method.

Response

It is both an honor and a surprise to receive the Halmos-Ford Award. Over the many years of my interest in real analysis I have seen nearly every mathematician I admire publish interesting and articulate *Monthly* articles. Previous recipients of this award have been masters of exposition. To have my name appear in the same list is humbling. This is my fifth contribution to the *Monthly*.

Biographical Sketch

Brian S. Thomson graduated from the University of Toronto and from the University of Waterloo in the 1960s. He was a lecturer at the latter for three years before moving to a mountaintop on the west coast of Canada to join the faculty at the then new Simon Fraser University. He has long served on the editorial boards of the *Journal of Mathematical Analysis and Applications* and of the *Real Analysis Exchange*.

Paul R. Halmos - Lester R. Ford Awards

Zhaodong Cai, Matthew Faust, A. J. Hildebrand, Junxian Li and Yuan Zhang

"The Surprising Accuracy of Benford's Law in Mathematics," *The American Mathematical Monthly*, 127:3, 217–237. 10.1080/00029890.2020.1690387

This inspiring article finds new mysteries in sequences as familiar as the powers of 2. The leading decimal digits of these powers are known to be distributed following Benford's law, but numerical data from the first billion powers of 2 indicates that the predictions from Benford's law can be surprisingly accurate—perhaps suspiciously so. Could the observed accuracy for these first billion powers be a mirage, perhaps one caused by Guy's "strong law of small numbers"?

To explain these small errors, the authors go further and actually investigate their distributions. They give elementary explanations for some cases, then use the theory of Diophantine approximation to go further. The hardest cases are those in which the distribution appears to be normal. In these cases, even cutting edge theory falls short, leading to interesting and unexpected conjectures.

Response

We are thrilled, honored and humbled to receive this award. Our article is the outgrowth of a multi-year research adventure that started out as an undergraduate research project at the University of Illinois in spring 2016 and continued for the better part of the following two years—an adventure filled with unexpected twists and turns and the joys and frustrations of mathematical research and discovery. Much of our work was carried out in weekly meetings in historic Altgeld Hall, the home of the mathematics department at the University of Illinois and the very same building in which Paul Halmos had spent much of his formative years while he was a student here during the 1930s.

We thank the mathematics department of the University of Illinois for providing a wonderfully supportive environment for undergraduate research through its Illinois Geometry Lab and the University of Illinois for providing computational resources for our work through its Illinois Campus Cluster Program. We also thank the editor and referees of the *Monthly* whose comments and suggestions helped improve the presentation of our article.

Biographical Sketches

Zhaodong Cai began his college education at the University of Illinois at Urbana-Champaign, where he spent many happy winters thinking about mathematics. He graduated with a BS degree in 2017, receiving summa cum laude honors. He went on to become a PhD student at the University of Pennsylvania, where he is currently studying arithmetic geometry.

Matthew Faust received BS degrees in mathematics and computer engineering from the University of Illinois in 2018. Currently he is working towards a PhD in mathematics at Texas A&M University under the supervision of Dr. Frank Sottile. His current research interests are in combinatorial algebraic geometry and spectral theory. In his free time, he enjoys playing strategy games, preferably with Yuan Zhang.

A.J. Hildebrand received his PhD in mathematics from the University of Freiburg and has been on the faculty of the University of Illinois since 1986, becoming professor emeritus in 2012. His research interests are in the areas of number theory, probability and statistics, and combinatorics. Since retiring from the University of Illinois he has supervised over one hundred undergraduates on research projects in pure and applied mathematics and allied areas.

Junxian Li received her PhD from the University of Illinois in 2018. She then spent a year at the University of Göttingen and is currently at the Max Planck Institute for Mathematics as a postdoc. Her research interests lie in analytic number theory, additive combinatorics and automorphic forms. During her PhD studies, she enjoyed working with enthusiastic undergraduates at the Illinois Geometry Lab on various research projects.

Yuan Zhang began his college education at the University of Illinois as a major in natural resources and environment sciences. After his freshman year, he switched his major to mathematics, receiving his BS degree in 2018. He is currently pursuing a PhD in mathematics at the University of Virginia under the supervision of Dr. Peter Abramenko. His current research interests are in Tits buildings and are mostly focused on their algebra aspects. In his free time, he enjoys playing RPGs and strategy games, preferably with Matthew Faust.

Paul R. Halmos - Lester R. Ford Awards

Ben Blum-Smith and Japheth Wood

"Chords of an Ellipse, Lucas Polynomials, and Cubic Equations," *The American Mathematical Monthly*, 127:8, 688–705. 10.1080/00029890.2020.1785253

Mark off n equally spaced points on a unit circle and draw the chords connecting one of the points to the remaining $n-1$ others. The product of the lengths of these chords is n, even though all or most of the lengths of the chords are irrational. To start this paper, the authors give an interesting history of the circle problem and a generalization of this problem to the ellipse by Thomas Price. The authors then reorganize Price's proof of the generalization for the ellipse, with some new ideas, and connect the result to classical mathematics. Connections include Cardano's solution of the cubic equation, Newton's theorem on power sums, generalized Lucas polynomials, and generalized Fibonacci polynomials.

Response

We are thrilled to be recognized for this honor, and to now have our names associated with Paul Halmos and Lester Ford, as well as the long list of other excellent expositors who have been so lauded.

This article was 10 years in the making, and would never have come into being if not for a fortuitous confluence of events. In 2010–2011, we were working together on the faculty of Bard College's Master of Arts in Teaching program. Several of our colleagues in high school classrooms had just come back from the Secondary School Teachers' Program at the Park City Mathematics Institute, and were very energized by the Developing Mathematics course taught by Bowen Kerins and Darryl Yong. Among these teachers was math blogger Sam Shah. Bowen and Darryl had thrown the circle problem and the ellipse generalization into a problem set, as a super-extra-challenge, and Sam blogged about it. At the time, Ben was reading the chapter on cyclotomic equations in Gauss' Disquisitiones Arithmeticae. This made the pairing of the circle and ellipse problems tantalizing: the circle problem was immediately amenable to the ideas in Gauss—surely it couldn't be that hard to adapt them to the ellipse? The method seemed to carry over, except a cyclotomic polynomial was replaced with a polynomial we didn't immediately recogniz—what was it? Meanwhile, Japheth had been developing math circle lessons about solving polynomial equations of degrees 2, 3, and 4 with a nod to the historical development. And somehow, we were co-teaching a course for the Bard College preservice teachers that included a unit on Cardano's solution to the cubic. The ellipse problem cracked open for us when we recognized that the roots of our mystery ellipse polynomial had the same shape as Cardano's formula—something we had just taught our students.

We pursued all this purely recreationally. The problem had come to us through a problem set—surely we were just reinventing some wheel, for edification and fun. It wasn't until we had a complete solution in hand that we noticed how many different parts of mathematics it seemed to touch, and Japheth suggested it might be interesting enough to write down. Thus commenced a whole new project: to track down the source of the ellipse problem—it turned out to be the beautiful theorem of Thomas Price—and to sort through how what we'd done related to everything that had come before. It is these relationships, more than the solution itself, that drive the story we tell in the final version of the article.

We would like to express gratitude to the Halmos-Ford Award Committee for choosing to recognize our work, and also to the several individuals who gave us encouragement, suggestions, and feedback. We would particularly like to thank Bowen Kerins who offered early encouragement; and Tom Edgar who encouraged us much later, and also made the suggestion of compiling a history of the circle problem. The anonymous referees at the *American Mathematical Monthly* gave us extremely valuable feedback that

helped us bring out the paper's central story more clearly. And of course the whole inquiry would never have taken place without the beautiful work of Thomas Price.

Biographical Sketches

Ben Blum-Smith received a BA in anthropology from Yale University in 2000, an MAT in mathematics teaching from Tufts University in 2001, and a PhD in mathematics from NYU in 2017, with a thesis in representation and invariant theory of finite groups. He worked as a middle and high school teacher in public schools in Cambridge, MA and New York City, and then as a mathematics professional development specialist for high schools and as a faculty member of Bard College's MAT program, before beginning his training as a research mathematician in 2011. He is currently a part-time faculty member of Eugene Lang College's Department of Natural Sciences and Mathematics, and a Visiting Academic at the NYU Center for Data Science. His research interests lie in invariant theory, algebraic combinatorics, their applications to data science, and connections between mathematics and democracy. He is a founding organizer of the Math and Democracy Seminar at the NYU Center for Data Science, and serves on the editorial board of the American Mathematical Society's Teaching & Learning Blog. He is also engaged in mathematical outreach through the Bridge to Enter Advanced Mathematics, an organization focused on creating a realistic pathway for underserved students to enter the mathematical sciences.

Japheth Wood received his PhD in mathematics from U.C. Berkeley, and his undergraduate math degree from Washington University in Saint Louis. He is a continuing associate professor of mathematics at Bard College, where he is the director of quantitative literacy and also directs the Bard Math Circle. Japheth has taught in Bard College's MAT program, the Bard Prison Initiative, as well as in Bard College's undergraduate college. Japheth enjoys developing math enrichment opportunities for all students, and is serving on the Anneli Lax New Mathematical Library Editorial Board.

Merten M. Hasse Award

The Merten M. Hasse Prize is for a noteworthy expository paper appearing in an Association publication, at least one of whose authors is a younger mathematician. The prize is named after Merten M. Hasse, an inspiring and dedicated teacher of the anonymous donor who gave funds to MAA in 1986 to support the prize honoring such teachers. The Hasse prize is designed to be an encouragement to younger mathematicians to take up the challenge of exposition and communication.

Zvi Rosen, Jessica Sidman, and Louis Theran

"Algebraic Matroids in Action," *The American Mathematical Monthly*, 127:3, 199–216, 10.1080/00029890.2020.1689781

The 2021 Merten Hasse Award for expository writing goes to "Algebraic Matroids in Action" by Zvi Rosen, Jessica Sidman, and Louis Theran. This compelling and engaging work allows any interested reader to get a taste of matroids, an important topic which deserves to be better understood by the general mathematical public. Using the unifying theme of the connection between algebraic independence and combinatorial independence, complemented by easily understood examples, the authors expertly weave a tale that explores the ways algebraic matroids appear in a wide variety of settings. Along the way, the authors describe bits and pieces of the history of the development of matroids, including work of van der Waerden, Birkhoff, Mac Lane, Whitney, and Rota. In addition to presenting the theoretical foundations of matroids, with connections to well-known concepts such as prime ideals and varieties, the authors showcase the applications of matroids to matrix completion and rigidity theory. In these settings, the fundamental problem is to determine the extent to which certain unknowns depend algebraically on given data. Algebraic matroids provide a particularly efficient, and elegant, answer to these sorts of questions. Throughout, the authors consistently return to their small set of examples to demonstrate key ideas. Anyone wanting to know more about the fundamental idea of algebraic matroids (and matroids in general) along with their connections to other areas of mathematics would be well served by reading "Algebraic Matroids in Action."

Response

It is a delightful surprise to receive the Merten M. Hasse Prize for our paper "Algebraic matroids in action." The circle of ideas explored in the paper emerged from interactions between different communities: combinatorics, discrete geometry, algebraic geometry, and statistics. This synthesis guided our presentation, and we hope that our paper will be valuable as a guide. At the same time, all the concepts and tools have a deep historical background, which we quite enjoyed exploring.

We would like to thank Bernd Sturmfels for his encouragement on this project. Zvi and Louis would like to thank Franz Király for many interesting conversations about algebraic matroids and matrix completion.

Biographical Sketches

Zvi Rosen has been an assistant professor in the Department of Mathematical Sciences at Florida Atlantic since 2018. He received a BA and MA in mathematics from the University of Pennsylvania, and a PhD from the University of California, Berkeley. Zvi has been finding matroids in unusual places since graduate school; most recently, he explored oriented matroids arising in neural coding. He is very grateful to both of his co-authors for their mentorship, going as far back as the 2009 Mount Holyoke REU.

Jessica Sidman is the Professor of Mathematics on the John S. Kennedy Foundation at Mount Holyoke College, where she has been since 2004. She received a BA in mathematics from Scripps College and a MS

and PhD from the University of Michigan. She enjoys exploring connections between algebraic geometry, combinatorics, and applications and is currently very excited about using rigidity theory to design tent frameworks.

Louis Theran is a lecturer in mathematics at the University of St Andrews, where he has been since 2016. He received a BS in computer science and mathematics and an MS and PhD in computer science from the University of Massachusetts, Amherst. He works on discrete geometry, especially around geometric and algebraic aspects of rigidity theory, plus occasional forays into related problems in statistics and physics.

George Pólya Awards

The George Pólya Awards, established in 1976, are made to authors of articles of expository excellence published in the *College Mathematics Journal*. The awards are named for George Pólya, who was a distinguished mathematician, well-known author, and professor at Stanford University.

J.M. Christian and H.A.J. Middleton-Spencer

"On the *N*th Roots of –1 and Complex Basin Boundaries: Fractals from Newton-Raphson," *The College Mathematics Journal*, 51:2, 95–104. 10.1080/07468342.2020.1703452

Beginning with the simple question "Can you find the roots of a quadratic equation?", the reader is led seamlessly from quadratic equations to cubic equations to the *N*th roots of –1—creating beautiful and enchanting color pictures along the way. Of course, the roots of –1 are well-known. But, this article focuses on the process of finding them numerically through the Newton-Raphson method. Since the results of that iterative scheme involve the choice of an initial input, the authors color-code regions of the Argand plane corresponding to whether or not Newton-Raphson leads to convergence or non-convergence.

With their exposition, Christian and Middleton-Spencer convey a sense of surprise and wonder as they take an elementary numerical scheme for root-finding and guide the reader to the unexpected emergence of stunning fractal patterns. The origins of those patterns can be viewed through the prism of dynamical systems, with some terminology introduced along the way. Readers are drawn into this amazing universe, invited to explore the alluring pull of the attractors, and see the mind-bending Wada property. The underlying geometry of the basins of attraction for these roots is identified and the reader is led carefully from one exploration to the next by rotations in the Argand plane. Finally, the authors illustrate how the uncertainty dimension can be estimated in order to quantify the degree of complexity in fractal basin boundaries. Such a property has very deep implications in physics and mathematics, and it is linked inextricably to the famous butterfly effect.

The problem is stated straightforwardly, yet challenges the reader to consider larger questions of nonlinearity, chaos, and fractals. The explorations presented in this paper can engage undergraduates and established mathematicians alike in some interesting mathematics, physics, and computation in a way that is both simple and elegant. All readers will enjoy this exciting journey.

Response

Our paper started life as a short piece of coursework undertaken by Holly during James's computational physics classes in 2016/17. From there it snowballed into a collaborative venture, as one question after another arose to confound us both. Over a year later, we were able to answer some of those questions (at least to our own satisfaction) and the decision to try and publish was a no-brainer. We were hoping to entice students into playing with Newton-Raphson fractals for themselves, discovering the beauty and complexity hidden in such deceptively simple maps. Moreover, we wanted them to have as much fun in so-doing as we'd had. *The College Mathematics Journal* (*CMJ*), with its relaxed and informative style, was the perfect vehicle: another no-brainer.

We are profoundly grateful to *CMJ* for seeing fit to publish our work in the first place, and to the Mathematical Association of America for bestowing the George Pólya Award upon us. It is indeed an honor and a privilege to have our paper selected in the midst of so many superb articles that inspire and enthuse the mathematics students of the day. We hope we have given them something new to think about, and we thank *CMJ* for the opportunity to be part of its readership's educational experience.

At their heart, *CMJ* and the George Pólya Awards celebrate education. As such, JMC wishes to acknowledge the historical role played by Dr. Richard J. Potton in providing part of the motive power behind of our article. I was introduced to the fascinating field of nonlinearity and chaos—including the classic cube roots of –1 problem—as a student sitting in Richard's inspirational lectures some 20 years ago. His teaching instilled in that ignorant young undergraduate a love of physics and mathematics which survives intact to this day.

Biographical Sketches

James Christian has spent his entire academic career at the University of Salford, UK. He received his undergraduate (MPhys) degree in 2002, by which time it had become apparent that experiments were not for him. Rather than endure more laboratory work, he undertook a PhD in Theoretical Physics—focusing mainly on solitons in nonlinear optics—which was awarded in 2006. He spent the next five years working as a postdoc, and was for some reason appointed Lecturer (Assistant Professor) in 2011. Nowadays, his research interests include electromagnetic scattering problems (particularly those involving fractal screens), spontaneous pattern formation and, most recently, boundary-integral formulations in fluid dynamics. Teaching-wise, over the years he has lectured on relativity, statistical physics, nonlinear phenomena, photonics, classical waves, mechanics, and vector calculus.

Holly Middleton-Spencer started her PhD in Applied Mathematics at Newcastle University in 2018. She works on modelling Bose-Einstein Condensates with particular focus on how turbulence is generated in experiments and the visualization of said condensates. She completed her bachelor's and master's degrees at the University of Salford, under James Christian. When not doing mathematics, she spends her time playing the flute, trying to master various languages and reading about ancient mathematics.

George Pólya Awards

Adam Hammett

"Euler's Limit and Stirling's Estimate," *The College Mathematics Journal*, 51:5, 330–336. 10.1080/07468342.2020.1811058

One is always fascinated by the definition of e through Euler's limit, $\lim_{n\to\infty}(1+1/n)^n = e$. It is not easy to prove that this limit exists if one does not use l'Hôpital's rule… And how many of us vaguely know about Stirling's estimate $n! \approx \theta\sqrt{2\pi}n^{1/2}(n/e)^n$? Those of us who do, may avoid mentioning Stirling's estimate in the classroom because of the difficulty of proving it, despite the fact that this estimation is used to calculate $n!$ in software packages for values of n on the order of 100. The paper, "Euler's Limit and Stirling's Estimate," precisely addresses this gap and proposes a natural path to discuss these questions in a calculus course.

The proof of the formulas goes through an analysis of the function $f_c(x) := (1+1/x)^{x+c}$ for $c \in \mathbb{R}$ and positive x. This study highlights the special role played by the value $c = 1/2$, which is needed for Stirling's estimate. To be precise, Hammett proves that $\lim_{n\to\infty} n!/n^{1/2}(n/e)^n$ is a positive constant K. Determining the precise value $K = \sqrt{2\pi}$ is not addressed in the paper, since this cannot be done by elementary means. Hence, a significant merit of the paper is that it separates the elementary part of Stirling's formula from the non-elementary one.

By considering $g_c(x) = \ln f_c(x)$, it is easy to show that f_c is decreasing for $c > 1/2$, and increasing for sufficiently large c when $c < 1/2$. This experimental fact leads to the natural question: *What happens for* $c = 1/2$? Also, it is straightforward that $\lim_{x\to\infty} g_c(x) = 1$ for all c, which yields Euler's limit when taking $c = 0$.

As for the convergence of the sequence $\{\gamma_{n(c)}\} := \{(n!/n^c)(e/n)^n\}$ to a positive real number, one first observes that the sequence is monotonically increasing for $c < 1/2$ and monotonically decreasing for $c > 1/2$. A finer analysis is needed in the particular case $c = 1/2$: the author uses an elegant trick to show that $\gamma_{n(1/2)}$ is both monotonically decreasing and bounded from below by a positive constant through the use of the trapezoid rule for approximation of integrals.

The paper is well-written, clear and entertaining. It presents in an elementary way some deep and important results of analysis that are too often left aside because they are believed to be difficult to present. This paper should be very readable by students as a nice application of calculus and introductory analysis.

Response

This is truly humbling for me. I love *The College Mathematics Journal*, and consider it to be one of the most important publications for college mathematics educators. On numerous occasions, I have been enriched in my own thinking and classroom preparedness because of a featured article. My students and I have mutually benefited in tremendous ways because of this journal, and so to be recognized as having contributed significantly to its content is an honor that I do not take lightly. Thank you.

This particular article's entire content flowed from a seemingly trifling question: *Does the Stirling sequence* $\left\{\frac{n!}{\sqrt{n}}\left(\frac{e}{n}\right)^n\right\}$ *tend to its limit monotonically*? If it were, say, monotonically decreasing (which turns out to be true), then writing down the inequality for consecutive terms of the sequence,

$$\frac{(n+1)!}{\sqrt{n+1}}\left(\frac{e}{n+1}\right)^{n+1} < \frac{n!}{\sqrt{n}}\left(\frac{e}{n}\right)^n,$$

and rearranging and canceling leads us to the equivalent inequality $e < (1+1/n)^{n+1/2}$. This gave me the idea to consider the monotonicity of the function family $(1+1/x)^{x+c}$ for various $c \in \mathbb{R}$, which was just the ticket.

For me this was a lesson, yet again, that we need to keep asking questions and tinkering. You never know what may come of it!

Biographical Sketch

Adam Hammett earned his PhD in combinatorial probability from The Ohio State University in 2007. Ever since he has taught at the college level, and currently serves as professor of mathematics at Cedarville University, where he has been since 2015. He enjoys overseeing undergraduate research projects, reading, and spending time outdoors with his wife Rachael and their four children Isabelle, Madison, Daniel, and Esther.

Meritorious Service Awards

Certificates of Meritorious Services are presented, on the recommendation of the Sections of the Association, for service at the national level or for service to a Section of the Association. The first such awards were made in 1984. Each year, honorees from several Sections are recognized.

Douglas Ensley

Shippensburg University

With great pleasure the Eastern Pennsylvania and Delaware (EPaDel) Section of the Mathematical Association of America (MAA) nominates Professor Douglas Ensley for the MAA Meritorious Service Award. Doug has been an extremely active member of the MAA for over 25 years. His breadth of service to the EPaDel section includes Secretary, Vice Chair, Chair, and Governor. He adeptly organized the section's speaker series and student paper awards for many years. As EPaDel's inaugural Project NExT Coordinator, Doug truly welcomed many junior faculty to the section. He arranged numerous sessions that provided both beneficial early career information and activities, while he simultaneously encouraged the NExTers to become involved in the section. He has an incredible gift for inspiring others and cultivating enthusiastic participation.

At the national level, Doug has served as Deputy Executive Director, Visiting Mathematician, Second Vice President, and member of many committees and councils.

Doug is a tireless advocate for using technology to aid the teaching and understanding of mathematics. As MAA Visiting Mathematician, he helped lay the groundwork for the Mathematical Sciences Digital Library. In collaboration with Barbara Kaskosz, Doug created numerous resources for the MAA MathDL Digital Classroom and was its editor from 2001 to 2009. Doug has been a pioneer in using technology for teaching proof techniques and creating mathematics teaching apps for mobile devices. His resources have not only benefited those who used them to learn but have also inspired other educators to create similar materials.

Since arriving at Shippensburg University, Doug has supervised 36 students on a total of 29 separate research projects. He has given over a dozen invited plenary addresses to at least ten different sections of the MAA. He has organized numerous sessions, national workshops and minicourses at both MAA MathFest and the Joint Mathematics Meetings. He continues to be involved in many MAA projects such as META Math, CoMInDS and the *MAA Instructional Practices Guide*.

Doug's formal list of service endeavors to the MAA is extensive. But what cannot be listed is all the behind-the-scenes help, assistance, and guidance that he has always given, unassumingly and freely, to others. For his dedication and untiring service to the MAA and the mathematics community the EPaDel section is proud to nominate Douglas Ensley.

Response

It is an indescribable honor for me to join the list of EPaDel recipients of this award. Our section has a sense of community that practically glows when we get together, and it's been like that since Louise Berard gave me my first EPaDel job in 1994. While I am immeasurably grateful to my section colleagues for this recognition, my biggest "thank you" goes to my family, especially Amy, who has made possible every conference trip and working weekend over many, many years. I am very aware that not everyone has this level of home support, a fact that sits at the center of my mind whenever I think about how I can serve others in our community. When I say this work is a privilege, I mean that sincerely in more ways than one.

Biographical Sketch

Doug Ensley is professor of mathematics and a recovering former department chair at Shippensburg University, where he has been on the faculty since 1993. His first leadership position in mathematics was being named co-captain of the Grissom High School Math Team by legendary Alabama math teacher, Dorothy Wendt. From there Doug proceeded to the University of Alabama at Huntsville and then onto Carnegie Mellon University, where he earned his PhD in the area of mathematical logic. In addition to being a chronic organizer of professional development sessions and workshops, Doug has been PI for several NSF-funded projects focused on the use of technology in teaching and he has written extensively about teaching discrete mathematics. He served as Deputy Executive Director of the MAA from 2016 to 2018.

Meritorious Service Awards

Mariah and Brian Birgen

Wartburg College

Over the past two decades Mariah and Brian Birgen have been an "integral" part of the Iowa Section of the Mathematical Association of America, participating regularly in section activities and assuming various leadership roles. We can always count on one or both of the Birgens to speak at the annual section meeting and to bring one or more student teams from Wartburg College to the Iowa Collegiate Mathematics Competition. When their children were younger, section activities were frequently a family affair. Mariah and Brian traded off parenting duties so that each had the opportunity to present a talk, chair a session, and otherwise interact with their Iowa Section colleagues.

Mariah and Brian have both been members of the section's executive committee with each serving a term as Section Chair, Mariah in 2006–2007 and Brian in 2014–2015. When the Iowa-NeXT program was established in 2007, Brian was a member of the initial steering committee, and Mariah was serving as Section Governor when the MAA transitioned to its new governance structure in 2017. It is difficult to imagine the Iowa Section without the leadership of both Birgens.

Since it can be difficult to "differentiate" the service of individuals when they do so much together and in support of each other, the Iowa Section of the MAA feels that it is appropriate to award the Certificate of Meritorious Service jointly to Mariah and Brian Birgen in recognition of their leadership and service, individually and together, to the section.

Response

We are honored to be recognized by the Iowa Section. We have both enjoyed our time working with other members and getting to know them. We have found the Iowa Section to be a vibrant, diverse, and deliberately welcoming community with innovative ideas and collegiality. We are pleased that the section is a place where new members have the opportunity to get involved and participate and take on leadership roles relatively early in their careers.

Biographical Sketches

The Drs. Birgen met as freshman at the University of California, Berkeley where they received their respective undergraduate degrees (engineering physics and mathematics) in 1991, married, and left for graduate school. They earned their respective doctorates (microlocal analysis and several complex variables) from the University of Michigan in 1997.

Dr. Mariah Birgen was hired as an assistant professor of mathematics at Wartburg College in 1997 where she has been ever since. While this was going on Dr. Brian Birgen was a post-doc at Purdue University and a visiting assistant professor at the University of Northern Iowa until he was hired as an assistant professor of mathematics at Wartburg College in 2001. Mariah was a 1997 Project NeXT Peach dot, while Brian was a 1998 Silver dot.

In addition to raising three mathematically inclined children, they worked together to completely re-design Wartburg's Calculus sequence and develop a modeling calculus course grounded in differential equations and numerical analysis. Mr. Dr. Birgen has reinvented himself in the area of actuarial science including developing a major at Wartburg College. Dr. Mrs. Birgen, in addition to substantial contributions to Wartburg Faculty Governance and the Wartburg Honors Program, has taken advantage of the recent COVID-19 pandemic to enter the field of data science and now knows just enough to be dangerous.

Mariah fosters kittens and works as a poll worker in local elections. Brian is an avid geocacher and bicyclist and serves on the Waverly City Council. They have lived in the same 150-year-old house for the entire length of their children's lives. They enjoy road trips and exploring new locations together.

Meritorious Service Awards

Abraham Mantell

Nassau Community College

Abraham Mantell's contributions to the MAA and the Metro NY Section are quite extensive and span many years. Of particular note is his role as the editor of the section's newsletter, which is highly regarded by our members: he has held this position for over two decades. He also helped to craft the newly revised section by-laws last year. He has represented the section at MathFest and the Joint Meetings on a regular basis; he also recruits new members for the section and provides guidance to our section with his extensive knowledge and experience at the section level.

Over the last two decades, Abe has consistently volunteered to assist the section as needed in a multitude of ways. A few examples are: having attended all our delegate assembly meetings since 1999 and being an integral part of the planning and running of our section meetings; serving as a moderator and/or panelist at sectional meetings and our local Project NExT panel discussions; and chairing or co-chairing some important ad-hoc committees (i.e., Teaching and Service Awards Committees, and the By-Laws Committee).

Additionally, in the fall of 2019 Abe began the process of arranging for his institution to serve as an AMC testing site for students within our section who desire to participate, but whose schools do not. Unfortunately, this has been put on hold due to the COVID-19 pandemic. However, once we can return to pre-pandemic status, Nassau Community College will be ready to serve in that capacity.

A list of the various positions he has held follows:

MAA Section Level: Metropolitan New York Section

Newsletter Editor (1999–present)
Speakers Bureau Chair (2006–2014, 2018–present)
Governor (2014–2017)
Chair (2003–2006)
Chair-Elect (2001–2003)
Vice-Chair for Two-Year Colleges (1999–2001)

MAA National Level

Member of the Committee on Panels, Poster Sessions and Workshops (2018–2021)
Board of Governors (2014–2017)
Member of the Committee on Two-Year Colleges (2015–2018)

Response

I am honored to be a recipient of the MAA's Meritorious Service Award. My service over the last 20+ years has largely been driven by the desire to not only promote mathematics on a local level, but to also encourage students and colleagues to get involved with professional organizations. I am gratified by the numerous students and faculty who have benefitted from such activity due to my urging. However, as the years progressed, other driving forces emerged. In particular, the camaraderie, friendships, and professional relationships with so many fine and talented individuals that have been forged. All these experiences are what motivate me to maintain my involvement in the MAA for as long as I am able.

Biographical Sketch

Abraham Mantell is a professor in the Department of Mathematics, Computer Science, and Information

Technology at Nassau Community College, where he began his full-time appointment in 1993. Abe is also an adjunct associate professor in mathematics at Hofstra University, having started there in 1996. He received his BS in mathematics from Rensselaer Polytechnic Institute, an MS in applied mathematics from Stony Brook University, and completed three years of PhD studies also in applied mathematics at Stony Brook.

In addition to his active involvement with the MAA for more than two decades, he has been heavily involved with the New York State Mathematics Association of Two-Year Colleges (NYSMATYC). Positions held with NYSMATYC have been: Webmaster, Scholarship Chair, Member-at-Large, President-Elect, President, and Past-President (having served the presidential cycle twice), and Math League Contest Coordinator since 2009. He has given over thirty presentations at regional and national conferences and as an invited speaker at local area events. He received the 2010 Distinguished Service Award by the Metro NY Section of the MAA and the 2010 Outstanding Contributions Award by NYSMATYC.

Meritorious Service Awards

Jennifer Galovich

St. John's University and the College of St. Benedict

The MAA North Central Section is enthusiastically nominating Dr. Jennifer Galovich, Emeritus Professor at College of St. Benedict / St. John's University for a Certificate for Meritorious Service. Jennifer has been a long-standing leader in the North Central Section and the National MAA. She has been a fixture at section meetings. She has provided numerous presentations to the section. She served as the President of the NCS from 2004–2005 and a member of the National MAA Board of Governors (2007–2010).

Jennifer has attended MATHFEST and JMM regularly. She was a member of the Committee on the Undergraduate Program in Mathematics (CUPM) 2007–2010). She is currently serving a four year term as Chair of the Council on Communities for the MAA. She has played an active role in the Biology and Mathematics Special Interest Group of the MAA (BioSIGMAA). For BioSIGMAA she was a founding member, acted as treasurer, and organized short courses for national MAA meetings.

Jennifer also has extensive service outside of the MAA at the national level. She has served as a member of the Membership Committee for the Association for Women in Mathematics (2008–2012), a member of the National Council for Pi Mu Epsilon (1999–2005), and other professional organizations.

She has also served as a program reviewer for mathematics departments and has been an active member of the College of St. Benedict / St. John's University faculty, where notably the annual award for faculty service was recently named in her honor.

We are extremely grateful for Jennifer's leadership and service for the MAA both locally and nationally.

Response

What a delightful surprise! I am pleased and honored, and wish to thank the North Central Section for nominating me for this 2021 Meritorious Service Award. My association with the MAA began when I was in college. My calculus prof (Dr. John Leadley) mentioned it in class one day and I thought—well, I plan on being a mathematician, and I guess this is what one does! So I signed up—that was more than fifty years ago, and I have thrived from my MAA connections ever since. My service at both the section and national levels has always been a pleasure—I find it energizing and look forward to continued service to the MAA.

Biographical Sketch

Jennifer Galovich is Professor Emerita of Mathematics at St. John's University and the College of St. Benedict in Minnesota. She received the BA in Mathematics from Reed College, the MA from Brown University and the PhD from the University of Minnesota, where she fell in love with combinatorics. Some years later she became aware of connections between combinatorial thinking and molecular biology and as a result was a charter member of the SIGMAA on Computational and Mathematical Biology. Having just finished a four year term as Chair of the MAA's Council on Communities, she is looking forward to editorial work with the Dolciani Editorial Board. She is entertaining herself in retirement by teaching at the local correctional facility, learning to play the oboe, and, during COVID, volunteering as a Case Investigator with the Minnesota Department of Health.

Meritorious Service Awards

Nancy Ann Neudauer

Pacific University

Nancy Ann Neudauer has been an active member of the Pacific Northwest section since 1998 when she started at Pacific Lutheran University and became a Project NExT fellow (silver dot). She moved to Pacific University in 2001, staying in the section. She has taken on several leadership roles in the Pacific Northwest section which include Vice Chair (2000–01, 2004–05, 2005–06), Governor (2006–09), Invited Program Chair (2006–07, 2009–10), and Chair Elect-Chair-Past Chair (2014–18). She was instrumental in establishing the Pacific Northwest Section NExT program which started in 2000 and held the position of Associate Director of Section NExT until 2018. In addition to being one of the program chairs for several PNW-MAA section meetings, she would regularly find potential speakers for our section meetings and connect them with the meeting planners. She also organized numerous special sessions and panel discussions with diverse titles such as "Research and Pedagogical Trends in Discrete Mathematics," "Directed Reading, New Technologies, and Other Strategies for Increasing Student Engagement," "Keeping Your Research Alive," "Expository Writing in Mathematics," and "A Conversation on Mathematics Outreach." Finally, as a matroid enthusiast, she helped resurrect the Combinatorial Potlatch in 2002, which is an annual conference in the Pacific Northwest, and has been the Program Chair for it ever since (now the Cascadia Combinatorial Feast). Outside the section her contributions to the MAA are substantial and include Program Director for the Dolciani Mathematics Enrichment Grants, Associate Editor on the Board of the College Mathematics Journal, and Co-Director of the Center for Undergraduate Research in Mathematics. She is also well known internationally for her travels to Africa for which she received multiple Fulbright awards to support her work at the African Institute for Mathematical Sciences. In short, Nancy has been active in several different areas within the mathematics community and always makes a positive impact.

Response

I am surprised, delighted, and honored to be nominated for this award by my colleagues in the Pacific Northwest section. And I am humbled to be amongst those who have won the award. My involvement with the MAA has been one of my most rewarding professional experiences. I was motivated by a professional duty and a desire to give back—I had not anticipated that the more profound impact would be on me.

The MAA has given me vast opportunities to be involved in service (perhaps earlier than I was ready sometimes!) and the chance to gain leadership experience, and at the same time has offered the support to succeed in these roles. It has introduced me to an eclectic and nurturing mathematical community. These connections have resulted in numerous visitors to my university and to fruitful research collaborations. I leave MAA meetings, both section and national, feeling invigorated both personally and professionally.

I want to thank all the people with whom I have organized PNW Section meetings, sessions, and other soirées, without whom none of this would have been as much fun. I know that a community sustains through the persistence of its members. In particular, I must thank Jennifer McNulty with whom I ran PNW NExT for many years and who convinced me and Brian Gill to organize a section meeting in our first year out of graduate school. And Brian for the escapade of organizing that meeting. I thank Robert Beezer for resurrecting the Combinatorial Potlatch with me, organizing a section meeting, inviting me to Africa, and making me believe that not only was this all possible, it was the natural course of what comes next. And Frank Farris for convincing me that *Mathematics Magazine* readers would care about matroids. The greatest appreciation goes to my parents for instilling in me a strong work ethic including the impor-

tance of belonging to, and contributing to, our professional organizations. And my partner, Mark Lincoln, who has attended more mathematics conferences than many mathematicians ("Wouldn't it be more efficient if you became a mathematician," he was recently asked), for never letting me slow down, and for supporting me on all my adventures, which have become our adventures.

Biographical Sketch

Nancy Ann Neudauer is the Thomas and Joyce Holce Professor of Science at Pacific University. She received her MA and PhD in mathematics, with a minor in business and law, and her BBA in actuarial Science and risk management, all from the University of Wisconsin. She has been actively involved with the vast Pacific Northwest Section (comprising 10 states, provinces, and territories) and believes that section activities extend the reach of the MAA by allowing many more people to be regularly engaged than might be possible otherwise by only attending national meetings. Through national engagement she has learned of (and adopted) activities from other sections.

Actively involved with the MAA for as long as she can remember (she gave her first talk at an MAA meeting while still a high school student), she is the Director of the MAA Dolciani Mathematics Enrichment Grant Program, which funds projects for middle and high school students, a PI on the NSF-funded META Math (the Mathematical Education of Teachers as an Application of Mathematics) project, and the recipient of a Distinguished Teaching Award. She has served on, and chaired, several national MAA committees, including Invited Address Committees for both MathFest and the Joint Meetings, Gung & Hu Award for Distinguished Service to Mathematics committee, the Council on Outreach Programs, the Committee on Sessions of Contributed Papers, a CUPM Curriculum Guide study group, and the AMS-MAA Joint Lecture Committee. Nancy was the Visiting Mathematician to the national offices of the MAA, and sits on the Board of Editors of the College Mathematics Journal.

Beyond her primary mathematical research in matroid theory, graph theory, combinatorics, and enumeration, a current project is to build a research community of women mathematicians in Africa. She is particularly interested in bringing matroids to a wider audience by introducing them to working mathematicians and their students in every corner of the world. As a Fulbright Specialist, her outreach extends to African Institute of Mathematical Sciences (AIMS) Centres in South Africa, Tanzania, Ghana, Cameroon, and Rwanda. When not sharing the beauty of mathematics with her students, she races sailboats and travels wherever she can, rarely leaving the house without her passport and a packed bag, just in case.

Meritorious Service Awards

April Ström

Chandler-Gilbert Community College

The Southwestern Section's Meritorious Service Awardee is April Ström. For over 20 years she has enthusiastically taught math to community college students. She is currently at Chandler-Gilbert Community College in Chandler, AZ.

For the MAA she is active in two of its special interest groups—MKT and RUME. She has served on various committees—COMET, Committee on Sessions of Contributed Papers and JMM/MAA Invited Address Committee. She worked on the *MAA Instructional Practices Guide*, and is currently Vice President for the MAA. This is only a portion of what she has done! She is also currently the Southwest Vice President of AMATYC, and was the president of ArizMATYC and the founding chair of AMATYC's Research Committee.

The MAA Southwestern Section meets in Arizona every other year, and has its spring conference with ArizMATYC. Every year April helps make this joint conference a success.

April Ström is an important force in bringing together these two organizations in the mathematics community—MAA and AMATYC. She realizes we have similar goals, and more can be achieved by working together. We all need to thank her for all the work she is doing.

Response

I am truly honored to have been selected for this award! I would like to express my gratitude to the MAA Southwest Section for this nomination. I consider myself blessed to get the opportunity to serve our students, colleagues, and community through the work with the MAA, AMATYC, and ArizMATYC. What a fun and rewarding journey it has been! I could not have charted out a more fulfilling career than teaching community college students. They continue to amaze me by their perseverance, hard work, and determination in changing their life trajectory towards a college degree. This award is for them! I look forward to future opportunities to continue serving the MAA for the betterment of our students!

Biographical Sketch

Dr. April Ström has taught mathematics at the community college level for over 23 years. In addition to serving as the MAA Vice President, she is also currently a member of the U.S. National Commission on Mathematics Instruction and serves as the AMATYC Southwest Vice President. April has served as PI and Co-PI on various NSF-funded projects focused on both research in mathematics education and professional development of K–14 instructors. April co-lead the writing of the Classroom Practices chapter of the *MAA Instructional Practices Guide* and served on the steering committee for the AMATYC IMPACT guide. She received her PhD in curriculum & instruction (emphasis in mathematics education) from Arizona State University, and holds MA and BA degrees in mathematics from Texas Tech University.