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# **MathFest 2016**

## **Prizes and Awards**



**Columbus, OH**  
**Hyatt Regency Ballroom**  
**11:35am**  
**August 4, 2016**

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# Program for the MAA Prize Session

Francis Su, President

Mathematical Association of America

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## Carl B. Allendoerfer Awards

The Carl B. Allendoerfer Awards, established in 1976, are made to authors of articles of expository excellence published in *Mathematics Magazine*. The Awards are named for Carl B. Allendoerfer, a distinguished mathematician at the University of Washington and President of the Mathematical Association of America, 1959-60.

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### Julia Barnes, Clinton Curry, Elizabeth Russell, and Lisbeth Schaubroeck

“Emerging Julia Sets”, *Mathematics Magazine*, Volume 88, Number 2, April 2015

The study of discrete dynamics, taking iterations of a simple function from the complex plane to itself, is a wonderful example of rich complexity arising from the simplest of contexts. This well-written and visually intriguing paper provides a novel approach to the mathematics of Julia sets. The authors decompose a function  $f: \mathbb{C} \rightarrow \mathbb{C}$  and its iterates into real and imaginary parts and then explore the connections between the graphs of the real and imaginary parts and their corresponding filled Julia sets. This approach conveys a significant amount of information about the iterates.

The article begins with a summary of results about any nonconstant, complex analytic function, the graph of which cannot have maximum or minimum values so the surface is unbounded above and below. All critical points are saddle points, and the surface consists of waves between the critical points. When the original function is iterated, more saddle points appear; this increases the number of undulations on the graphs. The authors capture and visually illustrate this behavior.

The first examples the authors consider are simple quadratics; they discuss the filled Julia set and compare it to its corresponding real and imaginary analogs. The authors extend their results to rational functions, where the images are much more intricate and carry names like

checkerboard, perturbed rat, and Cantor sets of circles. The article includes a nice illustration of the Riemann mapping theorem using images of Julia sets. Throughout the article, intricate visualizations illustrate the theory developed.

The results presented in this paper are interesting and the visualizations are impressive. The clever choice of examples leads the reader through the complicated behavior of iterated complex-valued functions.

## **Response Barnes, Curry, Russell, and Schaubroeck**

We are humbled and honored to win the Carl B. Allendoerfer Award for our paper, “Emerging Julia Sets”. This project began when Beth and Julie, longtime friends, explored connections between Beth’s complex analysis and Julie’s complex dynamics, producing intriguing images. Julie presented initial findings at an MAA-SE Section meeting; Clinton was there and joined the project. Later, Julie and Elizabeth met at a teaching workshop in New York, escaped to an outdoor art museum to discuss math, and called Beth in Colorado, asking her to plot more graphs! The four of us, from different time zones and different career stages, continued collaborations during various MAA meetings, including a PREP workshop at West Point and JMM in San Diego. Clearly, the opportunities provided by the MAA for us to interact cannot be overstated! We are grateful to the editor and referees of *Mathematics Magazine*, whose suggestions improved our exposition. Finally, we thank the Allendoerfer Award Committee for recognizing our work with this honor.

## **Biographical Notes**

**Julia Barnes** earned her Ph.D. from the University of North Carolina at Chapel Hill under the direction of Jane Hawkins. Her academic training is a cross between complex dynamics and ergodic theory; she has published in both areas as well as on the mathematics of weather and on using hands-on teaching ideas. Julie is a Professor of Mathematics at Western Carolina University and has taught there since 1996, except for one year as a Distinguished Visiting Professor at the United States Air Force Academy. She is currently one of the Associate Directors for MAA Project NExT, serves as chair of the MAA Committee on Professional Development, and is on the PRIMUS Board of Directors. More locally, she

creates non-competitive problem solving opportunities for undergraduates by organizing a mathematical treasure hunt for her section meeting and serving as Math Club advisor at her university. In her spare time, she enjoys hiking and playing racquetball.

**Clinton Curry** received his Ph.D. in 2009, having studied topology and dynamical systems under John C. Mayer and Alexander M. Blokh at the University of Alabama at Birmingham. Clinton was a visiting lecturer at Stony Brook University and an assistant professor at Huntingdon College before he decided to turn his computer programming hobby into a computer programming career. Clinton is now a software engineer at Google, where he misses having his own office, but still learns something every single day. In his spare time, Clinton enjoys playing guitar and exploring the San Francisco Bay Area with his wife, Jessica.

**Elizabeth Russell** has been fascinated by the subject of complex dynamics ever since her undergraduate days at Hofstra University. Her love of chaos continued through a Ph.D. at Boston University where she studied under the direction of Bob Devaney. Since graduation, Liz has held a number of positions including work with the federal government and academic positions at both the United States Military Academy and Western New England University. Liz spends her spare time practicing yoga and burning the floor as a competitive ballroom dancer. She lives in Maryland with her husband Joshua.

**Lisbeth Schaubroeck** earned her Ph.D. from the University of North Carolina at Chapel Hill in 1998 under the direction of the late John Pfaltzgraff. Although her academic training is in geometric function theory, she has published in a wide range of fields, including polynomial roots and the mathematics of weather. Beth's academic career has been at the United States Air Force Academy in Colorado Springs, where she has worked as faculty development director for her department, co-coordinator for the mathematics major, and advisor for academic strategy. She enjoys teaching courses across the curriculum, from freshman calculus to senior complex analysis, and has mentored several student projects in elementary knot theory. She and Tim, her husband of 26 years, have two sons who keep their lives busy—most recently with a lot of target archery. Beth is trying to master the skill, but the little tiny bullseye still eludes her.

## Irl Bivens and Ben Klein

“The Median Value of a Continuous Function”, *Mathematics Magazine*, Volume 88, Number 1, February 2015

In “The Median Value of a Continuous Function”, Bivens and Klein take a familiar topic from introductory statistics and apply it to continuous functions in an intuitive and beautiful way. Building off the common calculus topic of the mean value of a function, the authors develop the notion of the median value of a function and immediately show the connection between their definition and a natural area minimization problem. The concept and its utility spring to life in an enlightening and entertaining way as the authors reveal many surprising results. While acknowledging that the median concept is well known in measure theory, the authors define the concept in a straightforward manner that uses only basic ideas from calculus and undergraduate analysis. This approach brings the topic within reach of first year calculus students. The writing is engaging and highly accessible, so that the paper is suitable reading for undergraduates. The authors have created a rich set of supplementary examples and exercises available online, which provide a great resource for readers interested in learning more and for faculty looking for good undergraduate projects.

In this article, the choices of examples and accompanying figures are well designed to help in understanding the exposition and development. Examples include area minimization and a clever problem involving expected value and the infamous Wile E. Coyote. After exploring various aspects of the median in the context of area, Bivens and Klein lead the reader to make the connection to measure theory. They relate Lebesgue measure to easily defined sets and provide an alternative characteristic of the median of a function, and in the process introduce sophisticated mathematics in a non-intimidating setting.

Bivens and Klein have deftly woven a path across mathematical levels and areas. With so many deep connections to familiar topics, there is something to grab the interest of a wide variety of mathematicians and students.

## Response from Irl Bivens and Ben Klein

We are deeply honored that our article has received a Carl B. Allendoerfer Award. Over the course of our careers we have worked together on many projects and this recognition is, without question, the high point of our collaborations. A special debt of gratitude is owed to Walter Stromquist, who shepherded our manuscript through the review and publication process. Walter epitomizes the best qualities of an editor, and coordinating with him was an absolute pleasure.

Our study of the median had its roots in a seemingly innocent calculus problem, to find the line through the origin that minimizes the area between that line and the graph of a given continuous function. We discovered that solutions to this problem exhibit a surprising commonality. Our attempts to understand this commonality spanned a multitude of years that witnessed the writing of more than a dozen manuscripts on the topic, the retirement of one of us (Ben), and the soon-to-be retirement of the other. We are grateful to our Department for its unending support over this time, and to the two Academic Deans who patiently tolerated the "in progress" annotation to our work on the median year after year. Finally, we express a sincere "thank you" to the Southeastern Section of the MAA for allowing us the (at least) four special session talks on the median we've given over the past decade.

## Biographical Notes

**Irl Bivens** received his A.B. degree from Pfeiffer College and his Ph.D. from the University of North Carolina at Chapel Hill. After teaching at Pfeiffer College and Rice University, he joined the faculty of Davidson College in 1982. His work with the Mathematical Association includes a term as the Section Lecturer for the Southeastern Section, fifteen years on the Board of Editors for *The College Mathematics Journal*, and service on numerous committees and subcommittees associated with publications of the MAA. For a total of fourteen years, he and his colleague, Ben Klein, wrote the North Carolina State Mathematics Contest. At Davidson he has taught a variety of courses including

differential geometry, courses on mathematics and magic, and a popular seminar on the history of mathematics. For relaxation he swims, reads, and attempts to juggle.

**Ben Klein** received his bachelor's degree in mathematics from the University of Rochester and then earned an MA and PhD (under G.A. Hedlund) in mathematics from Yale University. After four years in the Department of Mathematics at New York University, he moved to North Carolina and served on the faculty of Davidson College for thirty-seven years. He retired from full-time teaching in 2008 but has taught, off and on, on a part-time basis ever since. His involvement with the Mathematical Association of America includes terms first as chair and then as governor of the Southeastern Section. For five years, in collaboration with his colleagues Irl Bivens and Richie King, Klein edited the Problems and Solutions Section of *The College Mathematics Journal*. He has also been active with the North Carolina Council of Teachers of Mathematics and the Advanced Placement Calculus Program.

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## 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.

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### Joshua Bowman

"The Way the Billiard Ball Bounces", *Math Horizons*, February 2015

After studying how a billiard ball moves on a rectangular table, Bowman describes how a ball would move on various triangular billiard tables: first the three special triangles that tile the plane when reflected across their sides, then a table shaped like an arbitrary triangle. Finally, he gives the reader the impetus to extend the ideas to more complicated planar regions, including regions with curved boundaries. The article is enhanced by many illustrations showing the ideas, and it culminates in an exciting finale that connects everything with the work of two recent Fields Medalists.

### Response from Joshua Bowman

I am honored to receive the Trevor Evans Award for this essay about billiards. It is my belief that clear communication about mathematics is itself a mathematical activity, and I learned several new details about this topic while preparing the article. I am grateful to Dave Richeson for asking me to write the article and for ably editing it, as well as to Julianna Stockton, who invited me to speak to her undergraduate seminar and got me thinking about explaining billiards to a general mathematical audience. The research community around billiards and flat surfaces - along with their connections to moduli spaces and Teichmüller theory - has provided new, astonishing developments in this subject at conference after conference and made it a very exciting mathematical

world to inhabit. I hope we will continue to see a trend in providing exposition of rich, timely mathematical topics for readers of all levels.

## Biographical Note

**Joshua Bowman** is an assistant professor of mathematics in the Natural Science Division at Pepperdine University. He received his Ph.D. from Cornell in 2009. His research interests are in geometry, topology, and dynamics. He is the translator of *The Scientific Legacy of Poincaré*, published by the American Mathematical Society and the London Mathematical Society in 2010. He lives in Los Angeles, following several years of living, teaching, and researching on the East Coast in New York and Massachusetts. His hobbies include theology and music.

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## 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.

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## Alex Chin, Gary Gordon, Kellie MacPhee, and Charles Vincent

“Pick a Tree - Any Tree”, *The American Mathematical Monthly*, Volume 122, Number 5, May 2015

It is always lovely to find the number  $e$  appearing in a calculation, and this article provides a wonderful example of this phenomena. It begins by telling us to randomly pick a subgraph of the complete graph on  $n$  vertices that is connected and has no cycles. Our goal then is to determine the probability that such a chosen subgraph, or tree, contains all the vertices from the full graph. In other words, what are the chances that we picked a spanning tree? In just a few pages, the authors lead us through the counting and limiting arguments needed to provide an estimate to the answer, introducing us to Cayley's theorem and the Prüfer code along the way. The conversational tone and well-chosen examples make this enjoyable article highly readable.

## Response from Alex Chin, Gary Gordon, Kellie MacPhee, and Charles Vincent

We are honored (and very happy) to receive the Halmos-Ford award. The high level of writing for the MAA journals makes this award especially meaningful. The article grew out of a problem we were stuck on during an REU program at Lafayette College in the summer of 2013. In trying to solve that problem, we stumbled on the question to which this article is devoted: What is the probability a randomly chosen subtree of a complete graph spans?

Once we saw the surprising answer to this question, it was fun to see how many connections we could find between the number  $e$  and graph theory. Many thanks to the NSF for supporting the REU program for so many years, and thanks to the prize committee.

### Biographical Notes

**Alex Chin** is a Ph.D. student in statistics at Stanford University. He is interested in combining mathematical, statistical, and computational approaches to solving problems. Before moving to California, he studied mathematics, economics, and linguistics at North Carolina State University. He enjoys hiking, cooking, and playing the piano.

**Gary Gordon** received his B.A. from the University of Florida and his Ph.D. from the University of North Carolina. After teaching at Williams College for three years and working in industry, he moved to the thriving metropolis of Easton, PA to teach at Lafayette College in 1986. He has published research on a variety of topics in combinatorics and geometry, and is the co-author of *Matroids: A Geometric Introduction* (with Jenny McNulty). He ran Lafayette's REU program for a decade and is the problem editor for *Math Horizons*. His favorite current project: *The Joy of SET*, a book on the mathematics of the card game SET, with his wife, Liz McMahon, and their daughters Rebecca and Hannah Gordon.

**Kellie MacPhee** graduated from Dartmouth College in 2014 with a major in mathematics and a minor in Japanese, and is now pursuing a PhD in the Mathematics Department at the University of Washington. Her

current research interests lie mainly in continuous optimization, but her background in combinatorics and graph theory lends her to some work in discrete optimization as well. In her spare time, she enjoys playing for the UW Women's Club Water Polo Team and volunteering at the Seattle Public Library as a math tutor for elementary, middle, and high school kids.

**Charles Vincent** is currently a Ph.D. student in mathematics at the University of Iowa. He recently completed his undergraduate degree in mathematics at Lafayette College in Easton, PA. When not engaged in schoolwork, he likes to travel the world and play the saxophone. He is also that kid who doodles irrelevant nonsense in a notebook during meetings.

## **Kenneth S. Williams**

"A 'Four Integers' Theorem and a 'Five Integers' Theorem", *The American Mathematical Monthly*, Volume 122, Number 6, June-July 2015

The study of the representability of integers by quadratic forms dates back to Fermat (who showed that every prime congruent to 1 modulo 4 is a sum of two squares) and Lagrange (who proved that every natural number is a sum of four squares). Later giants such as Frobenius, Liouville, and Ramanujan considered closely related problems. As a consequence of Ramanujan's work, Halmos observed in 1938 that a quaternary diagonal integral quadratic form is universal (that is, it represents every natural number) if and only if it represents 1, 2, ..., 15. Conway and Schneeberger extended his result to positive, integer-matrix quadratic forms in any number of variables. This is the famed "15 Theorem." More recent work includes the celebrated "290 Theorem" of Bhargava and Hanke.

The author presents a whirlwind overview of this field, from its beginnings to the present day. He then provides two delightful gems concerning positive definite, ternary diagonal forms. For instance, if the form  $ax^2 + by^2 + cz^2$  represents 1, 3, 5, and 15, then it represents

every odd natural number. Similarly, if it represents 2, 6, 10, 14, and 30, then it represents all natural numbers congruent to 2 modulo 4.

## Response from Kenneth Williams

I was thrilled and honored to learn that I had won a Paul R. Halmos-Lester R. Ford Award for my article "A 'Four Integers' Theorem and a 'Five Integers' Theorem". In this article my goal was to explain as simply as possible the exciting results of Manjul Bhargava, John Conway, Jonathan Hanke, and William Schneeberger on representing integers by positive integral quadratic forms, and to give two small results of mine of this type. In writing this article I benefited greatly from the valuable suggestions of the two referees and from the editor Scott Chapman. I thank them all and ask them to consider this award as partly theirs. Finally I thank my wife Carole for all her patience with me over more than fifty years of marriage as well as for her constant love and encouragement. I know that living with a mathematician is not easy.

## Biographical Note

Kenneth S. Williams received a BSc with first class honors in mathematics from the Birmingham University, England in 1962, and a MA and PhD in mathematics from the University of Toronto. Following a year as lecturer in the mathematics department at Manchester University, Dr. Williams joined the faculty at Carleton University in Ottawa. In 1979 he was awarded a DSc degree by Birmingham University for his research in number theory. He is the author of *Number Theory in the Spirit of Liouville*, published by Cambridge University Press and co-author or co-editor of eight other books. After 36 years teaching at Carleton University, where he received several teaching awards, he retired in 2002 as Professor Emeritus and Distinguished Research Professor. In retirement he continues his research in number theory. He also enjoys bridge and chess with friends, and birding and gardening with his wife and seven year old granddaughter, Isabelle.

## **Manya Raman-Sundström**

“A Pedagogical History of Compactness”, *The American Mathematical Monthly*, Volume 122, Number 7, August-September 2015

Manya Raman-Sundström traces the development of different distinct notions of “compactness” that have emerged, starting with the revolution of rigor and abstraction in mathematical thought in the nineteenth century. Bolzano and Weierstrass worked to characterize properties of the real line in terms of sequences, while others like Borel and Lebesgue thought in terms of open covers. As the story of compactness plays out, we witness mathematicians trying out different ideas and feeling their way along until a consensus is attained, without it being clear what the “right” definition might be. Sequential and open-cover compactness turn out to coincide for the real numbers, but are not equivalent in abstract topological spaces. The story then continues into the development of nets and filters to define open-cover compactness in a manner that makes it equivalent to sequential compactness. The author makes the efforts of an entire cast of mathematicians come alive as they developed important elements of modern analysis.

### **Response from Manya Raman-Sundström**

Thank you so much for the honor of receiving a Halmos-Ford Award for my paper on the history of compactness. This paper was a labor of love, supported by many friends and colleagues over a long time, so it is deeply gratifying that this paper managed to win an award, in addition to the privilege of being published in *The Monthly*. Compactness is one of many topics we meet in university level mathematics that are difficult to understand without historical motivation. Perhaps this paper will inspire others to uncover more history that can help clarify and demystify the mathematics we teach.

### **Biographical Note**

Manya Raman-Sundström received her MA in mathematics at University of Chicago and PhD in mathematics education at UC Berkeley. The article on history of compactness is based on her master’s thesis in mathematics

at UC Berkeley. The idea for the project came from her own experience as a student, proving theorems about compactness without really understanding what the concept was about, why it was defined with open covers, and what role it played in mathematics, more generally. Her search to find answers to those questions took her to archives on two continents, trying to make sense of nineteenth century texts written in languages she did not know. She is very grateful for the help of her advisors and mathematician friends who came to her rescue on many occasions. She is especially grateful to her reviewers who helped raise the paper to a higher level, and helped her celebrate when she managed to complete the task!

## **Zhiqin Lu and Julie Rowlett**

Zhiqin Lu and Julie Rowlett, "The Sound of Symmetry", *The American Mathematical Monthly*, Volume 122, Number 9, November 2015

Beginning with Mark Kac's 1966 article in *The Monthly* "Can one hear the shape of a drum?", the authors of this lovely article present an interactive introduction to inverse spectral theory. They entice the reader from the start with the promise that the article will explain the answer to Kac's question while simultaneously challenging the reader to complete exercises. Along with the history of this fruitful area of mathematics the reader builds up intuition from the answers to questions like "Can you hear the shape of a string?" and exercises such as "Prove that you can hear the shape of a rectangle." The main techniques of inverse spectral theory are introduced with careful discussion and motivation. These techniques are then applied to prove that one can hear the shape of parallelograms, acute trapezoids, and regular  $n$ -gons. The authors show that one can realistically hear the shape of the regular  $n$ -gons amongst all convex  $n$ -gons because it is uniquely determined by a finite number of eigenvalues; the sound of symmetry can really be heard! With this very thorough, inspiring, and carefully constructed foundation laid out, the authors leave the reader at the end of the paper with a collection of natural and intriguing open problems and conjectures to consider.

## Response from Zhiqin Lu and Julie Rowlett

We are thrilled and honored to receive the Halmos-Ford Award! More importantly, we are pleased that the subject of our paper, spectral geometry, has been recognized by the Halmos-Ford Award committee! Spectral geometry is a rich, diverse, and important field of mathematics. We hope that this award and our paper will help to disseminate knowledge of this field to a wider mathematical audience!

“The Sound of Symmetry” sprouted from our discussions on inverse spectrum problems, in which we realized that we could prove a small collection of new results in the two dimensional case. Like many, we were inspired by Mark Kac’s work in which he popularized the isospectral problem for planar domains in his *Monthly* paper, “Can one hear the shape of a drum?” There, he presented new results using a lovely synthesis of rigorous, cutting edge research level mathematics; physical explanations and motivations all in a widely accessible and enticing style.

With Kac’s work as our inspiration, we chose to present our results in a style that weaves together both rigorous proofs and pedagogical exposition. Our aim was to use the results and their proofs as an opportunity to introduce and promote the field of inverse spectral theory. Since learning mathematics is not passive, we encouraged readers to complete exercises throughout the article. The main idea behind our presentation is teaching by example, engagement, and encouragement, in the spirit of Kac. We are grateful for the example set by him and numerous other mathematicians in the field whose work has inspired and contributed to our own!

## Biographical Notes

**Zhiqin Lu** received his Ph.D from the Courant Institute at New York University in 1997. His research area is differential geometry. Zhiqin held a Ritt assistant professorship at Columbia University before moving to the University of California at Irvine in 2000. In 2003, he was awarded the Sloan Research Fellowship, and in 2004, he received the National Science Foundation Career Award. Zhiqin was recognized as an Inaugural Fellow of the AMS in 2013.

**Julie Rowlett** received her Ph.D. from Stanford University in 2006. Her research area is geometric analysis. She has held positions at the C. R. M. in Montreal, the University of California in Santa Barbara, the Rheinische Friedrich-Wilhelms-Universitaet Bonn, the Georg-August-Universitaet Goettingen, the Leibniz Universitaet Hannover, and the Max Planck Institut fuer Mathematik. Julie is currently a senior lecturer at Chalmers University in Gothenburg, Sweden.

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## 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.

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### Gordon Hamilton, Kiran S. Kedlaya, and Henri Picciotto

“Square-Sum Pair Partitions”, *The College Mathematics Journal*, Volume 44, Number 4, September 2015

Mathematicians love a good puzzle. But what does “good” mean? While answers may vary, the article “Square-Sum Pair Partitions” delivers a puzzle to warm many of our hearts. The basic version is this: *Arrange a given set of whole numbers into pairs so that the sum of the numbers in each pair is a perfect square.* For example, the whole numbers from 1 to 8 can be paired into  $\{1,8\}$ ,  $\{2,7\}$ ,  $\{3,6\}$ , and  $\{4,5\}$ . Sets of the form  $\{1, 2, 3, \dots, 2n\}$  follow, prompting readers to question when a solution exists, when a solution is unique, and how many solutions are possible in the case of non-uniqueness. Generalizations abound: sets need not start at one, and need not increase by ones, with arithmetic progressions  $\{p, p+d, p+2d, \dots, p+(2n-1)d\}$  suggested as another type of set to consider. Alternate constraints, such as summing to powers of 2, and many other extensions, turn the initial puzzle into a wealth of ideas.

Returning to the idea of a “good” puzzle, most notably, the puzzle in this article is easy to state; elementary grade students can begin to tackle it. With regard to educational goals, a priority for many puzzle seekers, the article speaks directly to mathematics teachers, suggesting ways to implement these challenges in class and providing ample resources for teachers and puzzle hobbyists. Another good puzzle quality is a compelling visual representation and the puzzles in this article have a

beautiful “rainbow pairing” shown in several colorful illustrations. It is also true that a good puzzle often has layers, with each solution prompting further questions and extensions, something demonstrated repeatedly in this article. The extensions and suggestions about proving results provide solid material for the college level and beyond. Finally, and of particular importance for the George Pólya Award, the article is written expertly, making it easy and fun for readers to enjoy the many good puzzles within.

## **Response from Gordon Hamilton, Kiran S. Kedlaya, and Henri Picciotto**

We are honored to receive the Pólya Award, and grateful to Brian Hopkins for having suggested this topic may be suitable for *The College Mathematics Journal*. This is a good example of the benefits of collaboration, as each of us contributed to this project in different ways. In particular, we believe that collaboration between mathematicians and mathematics educators has the potential to enrich both communities.

### **Biographical Notes**

**Gordon Hamilton** (Math, PhD) is a board game and puzzle designer. He founded MathPickle in 2010 to inject new ideas into the classroom. There is nothing he enjoys more than stumping students and having them stump him. MathPickle’s primary objective is to get thirteen curricular unsolved problems into classrooms worldwide - one for each grade K-12. A conference in November 2013 established the thirteen unsolved problems. To aid with their dissemination, MathPickle is looking at setting up a \$1,000,000 reward - the prize money to be split between the person who solves the problem and their most inspirational K-12 educator. Gordon is the designer of Santorini which launched April 2016 with the largest ever kickstarter for a pure strategy game (\$700,000).

**Kiran S. Kedlaya** received his A.B. from Harvard in 1996, his PhD from MIT in 2000, and subsequently a Sloan Fellowship, a Presidential Early Career Award, and a Guggenheim Fellowship. Having been an Assistant and Associate Professor at MIT, he is currently the Stefan E. Warschawski Professor of Mathematics at the University of California, San Diego. He

has also been a long-term visitor at IAS, MSRI, IPAM, and ICERM. His research is primarily in number theory and arithmetic geometry; his additional interests include applications of number theory in computer science, mathematics competitions, games and puzzles, mathematical software, and photography.

**Henri Picciotto** is a mathematics education author and consultant. He received his BA and MA in Mathematics from the University of California, Berkeley. Henri has retired from the classroom after 42 years of teaching at every level from counting to calculus. He is the inventor of Lab Gear, a hands-on environment for algebra, and is a leading authority on the use of manipulatives and geometric puzzles in secondary school. He has been an enthusiastic (and skeptical) user of electronic learning environments since the early days of the personal computer. He has presented hundreds of workshops to teachers. Henri shares his ideas about pedagogy and curriculum at MathEducationPage.org and the associated blog. His cryptic crosswords appear in *The Nation* every week.

## Hassan Boualem and Robert Brouzet

“To Be (a Circle) or Not To Be?”, *The College Mathematics Journal*, Volume 46, Number 3, May 2015

We teach students early on that  $x^2 + y^2 = 1$  (1) represents a circle. But the arc of the curve  $x^{\frac{1}{2}} + y^{\frac{1}{2}} = 1$  (2) in the unit square  $[0, 1] \times [0, 1]$  looks awfully square itself. Thanks to the symmetry of a circle and the reciprocal nature of these equations, we might want to take a close look before deciding that (2) yields some other kind of curve.

Starting from this straightforward premise, Boualem and Brouzet take us on a tour of important techniques from algebra, geometry, and calculus, each step illustrated by a new proof that (2) is not, in fact, an arc of a circle. The chain of fourteen proofs, many framed as exercises, culminates in an application of the formula for curvature.

But the fact that (1) and (2) share a structural bond prompts the authors to linger on the topic. Surely, the two curves, although not identical, are members of a family. Indeed they are: after proving that (2) is an arc of a parabola, the authors demonstrate that these two curves are the only conics (aside from a degenerate case) that satisfy  $x^r + y^r = 1$  for  $r > 0$  in the region  $[0, 1] \times [0, 1]$ . This discussion not only revisits curvature but also relies on series expansions. The authors conclude their tour with a glimpse at Lamé's curves, a larger family that contain both (1) and (2).

If we compare the article to a mountain trail, and think of the fourteen proofs as base camps, then the article is something that a teacher can give to a student who is equipped with the tools of elementary calculus, and the student can begin to climb. Certain passes may require equipment that the student can acquire on the fly, and some of the base camps may turn out to be (for now) inaccessible. At all times, however, a view of the destination above is visible from the trail, drawing the student onwards. This article inspires persistence and rewards the hard work that we have all put into understanding what we must in order to make this journey, and thus it shares much with Pólya award winners from the past.

## **Response from Hassan Boualem and Robert Brouzet**

We are much honored and very happy to receive the 2016 Pólya Award from the Mathematical Association of America. It is a great and nice surprise for us.

The contents of our work is born from the question asked to one of us by his very young sister-in-law about a problem given by her high school teacher. We found quickly several solutions to the question and because it was funny to get more and more proofs, we pursued our research using the different approaches of the circle. Finally we decided to write the fourteen proofs we found. And because the first question was about the possibility of an arc of circle among Lamé's curves it was natural to generalize the problem by searching the arcs of conics among them.

We would like to thank the George Pólya Award Committee for recognizing our work and also the editorial board of *The College*

*Mathematics Journal*. We express a lot of thanks to Brian Hopkins who played a major role in the transformation of the bad English language of our initial paper to the good one of the final published text!

## Biographical Notes

**Hassan Boualem** was born in Oujda, Morocco, where he also studied for two years in University, followed by two years at the University of Rabat (Morocco). He completed his PhD at the University Of Montpellier, France, where his research focused on group actions and foliations theory. Hassan is currently assistant professor at Montpellier with research interest in differential geometry.

Hassan focuses on teaching as well as research and takes part in the training of high school and junior high school mathematics teachers. He has many research articles as well as three books for mathematical teaching with his co-author Robert Brouzet. He is married, has a son and two daughters, and is fond of cooking, painting, and botany.

**Robert Brouzet** was born in Marseilles (France); after his high school, he studied mathematics at the École Normale Supérieure of Fontenay aux Roses, at the University Paris 6 and at the University of Montpellier 2 where he got his PhD in 1991 dealing with the geometry of four-dimensional bi-Hamiltonian systems.

Robert has held positions as assistant professor at universities: Montpellier, Nîmes and now Perpignan. His main area of research is differential geometry and more precisely the complete integrability of Hamiltonian systems. His main collaborator for many years is Hassan Boualem from the University of Montpellier. He wrote with him three books for mathematical teaching and several research papers.

A few years ago he studied philosophy (license and master) at the University of Toulouse 2. He has four children: Christophe, Charlotte, Anna, and Victor. His main interests outside mathematics and his family are literature and philosophy, classical music and opera, mountain hiking and climbing, bibliophily and the good wines.

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## **Annie and John Selden Prize**

In November 2004, the MAA Board of Governors approved the Mathematical Association of America's Annie and John Selden Prize for Research in Undergraduate Mathematics Education honoring a researcher who has established a significant record of published research in undergraduate mathematics education and who has been in the field at most ten years.

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### **Juan Pablo Mejia-Ramos**

Dr. Juan Pablo Mejia-Ramos completed his PhD in Mathematics Education in 2008, at the University of Warwick. He is currently associate professor at Rutgers University, where he is jointly appointed in the Graduate School of Education and the Department of Mathematics. Pablo has published 26 journal articles, including 6 in *Educational Studies in Mathematics* and 2 in the *Journal for Research in Mathematics Education*. His work has also appeared twice in *Cognition and Instruction*, as well as in the *Educational Psychologist* and the *Journal of Literacy Research*. The number of articles that Pablo has written, both in aggregate and in the most prestigious outlets, is unusually high for such a young scholar. Pablo's research is mostly recognized in his works on proof comprehension. However, he has also contributed to research on student evaluation of proofs, proving practices of undergraduate mathematics students, the efficacy of instructional recommendations from mathematics education research, and understanding of mathematicians' practice. His work has a significant influence in the direction of research in undergraduate mathematics education in general, and proof education research in particular. Pablo's work draws on a wide range of experimental methodologies and philosophical perspectives. It is carried out with rigor and careful attention to detail. His co-authors praise him for raising the standards of their studies and developing additional studies to further test any emerging hypotheses.

He is currently the PI on a grant from the National Science Foundation to develop, validate, and disseminate proof comprehension tests to the mathematics community. This is expected to be a product of wide spread use.

## **Response from Juan Pablo Mejia-Ramos**

I am honored to receive this year's Selden Prize. I would first like to extend my gratitude to the MAA SIGMAA on RUME community, and Annie and John Selden in particular, for being so welcoming and supportive. Many people helped me start my career in this field: I am grateful to Fr. Francis Wehri for giving me a chance to study and then teach at Colegio San Carlos, to Hernando Echeverri for encouraging my interest in mathematics education at Universidad de Los Andes, and to David Tall for being incredibly supportive during my time at Warwick. I also thank all my collaborators, particularly Matthew Inglis and Keith Weber, from whom I have learned so much while having fun doing research. Finally, I am grateful to my family for all their support and encouragement over the years.

## **Biographical Note**

Dr. Mejía-Ramos was born and grew up in Bogotá, Colombia where he obtained his undergraduate degree in mathematics from Universidad de Los Andes. Dr. Mejía-Ramos worked as a mathematics high-school teacher at Colegio San Carlos (also in Bogotá), before moving to the U.K. to study at the University of Warwick, where he was awarded an M.Sc. and a Ph.D. in mathematics education, both under the supervision of David Tall. In 2009, Dr. Mejía-Ramos moved to the U.S. and joined Rutgers University. His research focuses on the reasoning processes involved in argumentative activities related to the notion of proof in university mathematics, including the reasoning strategies employed by students in proof construction tasks, the way students and mathematicians read proofs, the assessment of proof comprehension at the undergraduate level, and the presentation of proofs in undergraduate mathematics courses.

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## George Pólya Lecturer 2014-2016

George Pólya, renowned teacher and writer, embodied the high quality of exposition that the MAA seeks to encourage. To further this goal, the George Pólya Lectureship was created in 1991. Each Section is entitled to a Pólya Lecture for a Section meeting approximately once every five years. In any given year, there are two Pólya lecturers. William Dunham served as Pólya lecturer for the academic years 2014-2015 and 2015-2016.

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### William Dunham

I have very much enjoyed being the Pólya Lecturer these past two years. When I learned of this assignment, I cobbled together a talk that I called “Two (More) Morsels from Euler.” As the title suggests, this addressed a pair of spectacular, although not well-known, results of my favorite mathematician. I was invited to present this at the Florida, Rocky Mountain, Illinois, and Wisconsin Section meetings.

I remember my trips vividly, from the January warmth (and alligators!) in Florida, to the April blizzard in Colorado, to the howling winds of the American heartland in Jacksonville, IL, and La Crosse, WI. These Pólya Lectures allowed me to share some of Euler’s magic with receptive MAA audiences from across the country. And they gave me a chance to make some new friends.

I’ll always be grateful to the Mathematical Association of America for granting me this wonderful opportunity.

## Biographical Note

William Dunham served 22 years as Koehler Professor of Mathematics at Muhlenberg College (*emeritus*, 2014) and has subsequently taught the history of mathematics as a visiting professor at Harvard, Princeton, Penn, and Cornell. In 2009, he was a visiting scholar at the University of Cambridge, and the following year he recorded a DVD course titled “Great Thinkers, Great Theorems” for The Teaching Company. He is the author of four books: *Journey Through Genius* (Wiley, 1990), *The Mathematical Universe* (Wiley, 1995), *Euler: The Master of Us All* (MAA, 1999), and *The Calculus Gallery* (Princeton, 2005). Most recently, he is co-editor, along with MAA stalwarts Don Albers and Jerry Alexanderson, of *The G. H. Hardy Reader* (MAA Press and Cambridge, 2015). Dunham is presently a Research Associate in Mathematics at Bryn Mawr College.

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# The 76<sup>th</sup> William Lowell Putnam Mathematical Competition

## December, 2015

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

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### Putnam Fellows (Six Highest Ranking Individuals)

Pakawut Jiradilok, *Harvard University*

Bumsoo Kim, *Princeton University*

Gyujin Oh, *Stanford University*

Daniel Spivak, *University of Waterloo*

David H. Yang, *Massachusetts Institute of Technology*

Yunkun Zhou, *Massachusetts Institute of Technology*

### Team Winners

Massachusetts Institute of Technology

*Mark A Selke, Bobby C. Shen, and David H. Yang*

Carnegie Mellon University

*Joshua Brakensiek, Linus Hamilton, and Thomas E. Swayze*

Princeton University

*Rodrigo S. Angelo, Andre A. Arslan, and Eric D. Schneider*

Stanford University

*Jie Jun Ang, Gyujin Oh, and Albert R. Zhang*

Harvard University

*Calvin Deng, Ravi Jagadeesan, and David W. Stoner*

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

Danielle Wang, *Massachusetts Institute of Technology*

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# United States of America Mathematical Olympiad 2016

The USAMO (United States of America Mathematics Olympiad) provides a means of identifying and encouraging the most creative secondary mathematics students in the country. It serves to indicate the talent of those who may become leaders in the mathematical sciences of the next generation. The Mathematical Association's 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.

## **Winners** (in alphabetical order)

Ankan Bhattacharya, *International Academy East, Troy, Michigan*

Ruidi Cao, *Missouri Academy, Maryville, Missouri*

Hongyi Chen, *Fairview High School, Boulder, Colorado*

Jacob Klegar, *Choate-Rosemary Hall, Wallingford, Connecticut*

James Lin, *Winchester High School, Winchester, Massachusetts*

Allen Liu, *Penfield Senior High School, Penfield, New York*

Junyao Peng, *Princeton International School of Mathematics and Science*

Kevin Ren, *Torrey Pines High School, San Diego, California*

Mihir Singhal, *Palo Alto Senior High School, Palo Alto, California*

Alec Sun, *Phillips Exeter Academy, Exeter, New Hampshire*

Kevin Sun, *Phillips Exeter Academy, Exeter, New Hampshire*

Yuan Yao, *Phillips Exeter Academy, Exeter, New Hampshire*

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## Robert P. Balles Annual Mathematics Award

The Robert P. Balles Annual Mathematics Award was presented to each winner. Robert Balles, a life-long student of mathematics and former college teacher, established this prize in an effort to reward high achievement in the world of mathematics competitions.

### Akamai Scholarships

The Akamai Foundation presented Akamai Scholarships to the top three winners of the USAMO 2016: **Allen Liu, Junyao Peng, and Kevin Ren**

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## International Mathematical Olympiad 2016 U.S.A. Team Wins First

United States team won **first** at IMO in Hong Kong, July 6-16, with all members of the team being awarded gold medals for their individual scores.

### Team Members:

Ankan Bhattacharya, *International Academy East, Troy, Michigan*

Michael Kural, *Greenwich High School, Riverside, CT*

Allen Liu, *Penfield Senior High School, Penfield, New York \**

Junyao Peng, *Princeton International School of Mathematics and Science*

Ashwin Sah, *Jesuit High School, Portland, OR*

Yuan Yao, *Phillips Exeter Academy, Exeter, New Hampshire \**

\*Perfect Test Scores

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## European Girls' Mathematical Olympiad

The United States team won second place at the European Girls' Mathematical Olympiad (EGMO) for the third year in a row. This very competitive Olympiad, held in Busteni, Romania, April 10 to 16, is an international math competition with 147 contestants this year representing 38 countries. Meghal Gupta and Rachel Zhang won gold medals for their individual scores. The United States has placed in the top four at the EGMO since this Olympiad began in 2012.

**Team Members** (in alphabetical order):

Demi Guo, *Hangzhou No. 2 High School, China*

Meghal Gupta, *Monta Vista High School, Cupertino, California*

Celine Liang, *Saratoga High School, Saratoga, California*

Rachel Zhang, *Parkway South High, Ballwin, Missouri*

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## Romanian Master of Mathematics

The United States team of six high school students won first place in the 2016 Romanian Master of Mathematics (RMM), one of the most challenging international high school mathematics competitions in the world. Sixteen countries were invited to compete in the RMM, held from February 24 to 29 in Bucharest, Romania. In addition to the team victory, U.S. student Eshaan Nichani achieved the highest individual score in the contest, winning a gold medal; Junyao Peng also won gold. The United States has placed in the top three at the Romanian Master every year.

**Team Members** (in alphabetical order)

Eshaan Nichani, *Canyon Crest Academy, San Diego, California*

Alec Sun, *Phillips Exeter Academy, Exeter, New Hampshire*

Calvin Lee, *Hunter College High School, New York, New York*

Junyao Peng, *Princeton International School, Princeton, New Jersey*

Celine Liang, *Saratoga High School, Saratoga, California*

Michael Ma, *Jasper High School, Plano, Texas*

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## Meritorious Service Awards

Meritorious Service Awards 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.

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### Nancy Hagelgans, EPADEL Section

Nancy Hagelgans launched her prolific MAA service career in 1986, when she was elected to a three-year term on the EPADEL Executive Committee. In that role, she took on the additional job of coordinating the Consultants and Speakers Program. In addition to four years as president and vice president, she oversaw the rewriting of the section bylaws. She also gave an invited talk at the section's 1996 spring meeting on one of her specialties, cooperative learning in discrete mathematics.

Nationally, Nancy's breadth of service showcases her remarkable flexibility, as she served as member of the Committees on the Teaching of Undergraduate Mathematics, on Professional Development, on the Merten Hasse Prize, and on Sections (which she eventually chaired), as well as a member of the MAA Notes Editorial Board. She served three three-year terms on the MAA Board of Governors, one term as Section Governor representing EPADEL and two terms as Chair of the Committee on Sections. During the years that she chaired the Committee on Sections, she was a member of the MAA Executive Committee. Nancy's tirelessness, dedication, and wealth of know-how led her into additional roles that are, if unenviable, at the heart of our Association's mission: Chair of two different Strategic Planning groups (Sections and Professional Development)

Outside of the MAA, Nancy has shown herself to be similarly fearless about taking on new tasks and excelling at them. At one point, she retrained to teach Computer Science, so she could teach across the board; she co-wrote the MAA Notes volume *A Practical Guide to Cooperative Learning in Collegiate Mathematics*; stories of her personal

and meaningful mentoring of students and young mathematicians abound. Because of her many contributions to her institution and the profession, in 1997 her colleagues at Ursinus awarded her the Laughlin Professional Achievement Award. The MAA has been fortunate to have a person who is so well admired devoting much of her time and talents to our Association.

## **Response from Nancy Hagelgans**

I am greatly honored and extremely pleased to receive the MAA Meritorious Service Award. I sincerely thank the members of the EPADEL section for nominating me. I enjoyed the many friendships I made through my involvement with MAA. In particular, I valued my visits as an MAA speaker to many MAA sections, where I met gracious mathematicians and observed fine programs in collegiate mathematics. I am grateful for the opportunity that I had to expand my knowledge of undergraduate mathematics and its teaching during many years of my participation in the EPADEL section and the greater MAA.

## **Biographical Note**

**Nancy Hagelgans** is Professor Emerita of Mathematics and Computer Science at Ursinus College, where she taught a great variety of mathematics and computer science courses. She served two terms as department chairperson. After her retirement from Ursinus, she taught graduate computer science courses at Villanova University as adjunct faculty for several years. She earned a Ph. D. in mathematics at Johns Hopkins University and later an M.S. in computer science at Villanova University. Her A. B. in mathematics was awarded by Goucher College, where she was elected to Phi Beta Kappa. Her interests include discrete mathematics, computer solutions to mathematics problems, and student learning. Completely retired from academia, she currently plays the violin in a symphony orchestra and various chamber music groups, and she attends yoga and dance classes.

## **Ruth Berger, Iowa Section**

Since moving to Decorah, Iowa in 1993 to join the faculty at Luther College, Ruth Berger has been active in the Iowa Section. She is a faithful attendee and regular presenter at the annual section meetings. But Ruth's commitment goes far beyond that. For most of the last two decades she has also served as either an officer or committee chair for the section.

Serving as vice-chair, Ruth organized the section meeting in spring 1998 and she continued her service on the section executive committee as chair and past chair. This was followed by a term (2001-2004) as section governor.

Further, Ruth's commitment to the section and to undergraduate mathematics education is best exemplified through her service as coordinator/director of the Iowa Collegiate Mathematics Competition. The competition is in its 22<sup>nd</sup> year and Ruth Berger has been its driving force for the last 15 of those years. Undergraduates from across the state work in teams of three to solve challenging mathematics problems in order to lay claim to the traveling trophy, a blown-glass Klein bottle. Ruth faithfully organizes all the details for the competition each year, finding an expert problem-writer to draft contest problems, overseeing arrangements on the host campus, publicizing the competition across the state, registering teams from participating colleges and universities, and organizing faculty to score the students' work. The competition owes its success to Ruth's continuing dedication.

## **Response from Ruth Berger**

What a surprise! I am honored to be the recipient of an MAA Meritorious Service Award. Thank you to the nominating committee and all members of the Iowa section; I have enjoyed interacting with you over the last twenty-three years, and am looking forward to our Iowa MAA centennial celebration this fall. Thank you also to my supportive colleagues and the Dean at Luther College who always finds extra money in the budget if my attendance of MAA meetings exceeds our limited faculty travel funds.

## Biographical Note

**Ruth I. Berger** is a Professor of Mathematics at Luther College in Decorah, Iowa. She received her Vordiplom in Germany from Universität des Saarlandes, and her PhD from Louisiana State University. Her first academic position was at Memphis State University (now University of Memphis), before she decided to move to a Liberal Arts environment. Ruth enjoys the interaction with undergraduate students at Luther College where she has been teaching since 1993. Her favorite courses are geometry, abstract algebra, and elementary number theory. In her free time Ruth enjoys jogging, volleyball, and spending time with her son.

### **Raymond N. Greenwell, Metropolitan NY Section**

Raymond N. Greenwell of Hofstra University has faithfully served the Metropolitan New York Section for thirty-three years. His official involvement began in the 1980's with his service as a Departmental Liaison; since the 1990's he has served as Liaison Coordinator and Webmaster of the section. He has also served as Vice Chair for Four-Year Colleges, Chair of the section, and as governor. Professor Greenwell was the Section's Service Award co-winner in 2003, and the 2010 Teaching Award winner; he has chaired the Service Award Committee since 2004. For many years, he has been a member of the planning committee for the annual meeting and gave a talk at the Metropolitan New York/Seaway joint section meeting in 2006.

Professor Greenwell's service to MAA is not limited to service to the section. He is a reviewer for the *College Mathematics Journal* and since 1993 has served as a reviewer for the Media Highlights column of this journal, in which he has also published. He has contributed to MAA's Project NEXt as a consultant for many years and has been a Project NEXt panel participant.

Colleagues in the Metropolitan New York Section say that Professor Greenwell is an amazing person and leader. For many years he has involved, inspired, and encouraged Section officers, young MAA members, and members of the mathematical community. Many have

joined the MAA and stayed actively involved with the organization because of him. Through all these years in the section he kept his focus on the activities, life, and survivability of the section and the MAA as a whole.

Active involvement in the MAA is just part of his involvement in the mathematical community and education. He is the author of textbooks, thesis advisor of several graduate students, and involved in the MAA's William Lowell Putnam Mathematical Competition as the Hofstra team coordinator.

## **Response From Raymond N. Greenwell**

I am honored to receive this award and grateful to the Metropolitan New York Section for nominating me, especially to Elena Goloubeva, the current chair. The MAA, particularly the Metropolitan New York Section, has been a big part of my life since I moved to the New York area in 1983. Whatever I have given in service to the MAA, I have received far more, having learned so much from the talks I've heard at meetings and the articles I've read in MAA journals, and through the friends I've made by being part of this Association.

## **Biographical Note**

**Raymond N. Greenwell** earned a B.A. in Mathematics and Physics from the University of San Diego, and a Ph.D. in Applied Mathematics from Michigan State University. He taught at Albion College in Michigan from 1979 to 1983, and since 1983 has been at Hofstra University. He currently lives in Hewlett, New York with his wife Karla Harby. His publications include articles in statistics, mathematical sociology, fluid mechanics, mathematical biology, genetic algorithms, combinatorics, and undergraduate mathematics education. He is coauthor with Margaret L. Lial and Nathan P. Ritchey of the texts *Finite Mathematics* and *Calculus with Applications*, published by Pearson. He is a member of many other professional associations, including the Association of Christians in the Mathematical Sciences. He has taught at the Royal University of Phnom Penh through the International Mathematical Union Volunteer Lecturer Program. He loves outdoor activities, including rock climbing, surfing,

hiking, and cross-country skiing; he leads trips with the Sierra Club's Inspiring Connections Outdoors Program.

## **Deanna Haunsperger and Stephen Kennedy, North Central Section**

Dr. Deanna Haunsperger and Dr. Stephen Kennedy of Carleton College are recognized for their joint service in contributing to the work of the MAA and in the furthering of undergraduate mathematics education in many ways.

Deanna and Stephen spent the last decade as co-chairs of the Centennial Celebration Committee for the MAA. This entailed countless hours brainstorming for ideas on how to best celebrate the Association's first 100 years. Often section officers were included in this brainstorming activity – particularly during section officer's meetings at JMM. They led in the selection of speakers for MathFest 2015 as well as the creation of a centennial video. Their enthusiasm and leadership were evident in the successful Centennial Celebration a year ago in Washington, DC.

Among the most significant contributions of Deanna and Stephen is the effort put into establishing a Summer Mathematical Program for Women at Carleton College. This program, which started in 1995, brought together eighteen undergraduate women majoring in mathematics for four weeks each summer to take two intensive classes, be a part of colloquia, work on problem solving, and attend panel discussions. The goal was to encourage the women to continue in mathematics throughout their lives, and many former participants have gone on to graduate school and earned Ph.D.'s. Running this program over the years has taken considerable dedication, time, and effort on the part of the organizers, and they have been devoted to it and to the participants.

Deanna and Stephen also served as co-editors of *Math Horizons* for four years, often writing articles for the magazine along with the usual time consuming duties of editors. It is for their joint contributions to the MAA and to the wider mathematical community over many years that Dr.

Haunsperger and Dr. Kennedy are recognized with a 2016 Meritorious Service Award.

## **Response from Deanna Haunsperger and Stephen Kennedy**

We are deeply honored to receive this citation; it has been a great, and continuing, joy to contribute to mathematics and the MAA. It truly is the case that the work for which we are being cited has been its own reward. Our lives have been enriched in immeasurable ways by our association with the MAA. That the MAA feels we have been of service is a deep satisfaction and we are grateful for the recognition.

### **Biographical Notes**

**Deanna Haunsperger** is Professor of Mathematics at Carleton College and MAA President-Elect. She earned a PhD from Northwestern University and a BA from Simpson College. Her teaching career began at St. Olaf College, where she learned the great value of being an MAA member. She was co-Editor (with Stephen Kennedy) of *Math Horizons* from 1999-2003. She served as Second Vice President of the MAA 2006-2008, co-Chair (with Stephen Kennedy) of the Centennial Planning Committee 2004-2015, and Chair of the Council on Outreach Programs 2012-2016. She co-founded and has co-directed (with Stephen Kennedy) the Carleton Summer Mathematics Program for Women since 1995.

**Steve Kennedy** is Professor of Mathematics at Carleton College and Senior Acquisitions Editor for MAA Press. He earned a PhD from Northwestern University and a BS from Boston University. In addition to Carleton, he has taught at Loyola (Chicago) University, the University of Delaware, and Saint Olaf College. He was co-Editor (with Deanna Haunsperger) of *Math Horizons* from 1999-2003. He has published two books with MAA Press: *The Edge of the Universe* and *A Century of Advancing Mathematics*. He co-founded and has co-directed (again with Deanna Haunsperger) since 1994 the Carleton Summer Mathematics Program for Women which, as of this writing, enjoys more than 85 alumnae with earned PhDs.

## **Stuart Boersma, Pacific Northwest Section**

Stuart Boersma has been an active member of the Pacific Northwest section since 2000 when he started at Central Washington University. He has taken on several leadership roles in the section which include section chair, section governor and member/chair of the Distinguished Teaching Award committee. He has regularly contributed to the Pacific Northwest section NExT program which started in 2000. In 2010, he was chair of the SIGMAA on Quantitative Literacy and has given several presentations about quantitative literacy at various MAA events. In 2011, he and Cheryl Beaver started the *Kryptos* contest which is a cryptanalysis contest for undergraduate students that occurs in April. Roughly 50 undergraduate students from three Pacific Northwest states participated in the first competition in 2010; this has increased to about 150 undergraduate participants from 20 states across the country in 2015. In short, Stuart has been involved with several different areas within the mathematics community and always makes a positive impact.

### **Response from Stuart Boersma**

Having served as a chair and governor of the Pacific Northwest section of the MAA, I am aware of the large number of individuals who volunteer enormous amounts of their time to improve the quality of undergraduate mathematics education. Thus, I was completely surprised by this announcement and am truly honored to receive this award. I wish to thank all the hard working mathematics instructors in the Pacific Northwest, the leadership of the PNW-MAA, and the Mathematical Association of America for the support I've received in the past and the recognition I am receiving now.

### **Biographical Note**

**Stuart Boersma** received his B.S. from the University of Puget Sound, his Ph.D. from Oregon State University, and is currently the chair of the mathematics department at Central Washington University. He is a Project NExT Fellow (green dot), has been a member of the Pacific Northwest Section of the MAA since 2000, served as Chair of the section 2005-2007 and was the section governor 2009 – 2011. He is a member

of SIGMAA-QL, the National Numeracy Network, and is currently the chair of the CUPM subcommittee on Curriculum Renewal Across the First Two Years (CRAFTY). He also serves as an associate editor for the journal *Numeracy*.

Stuart has always been dedicated to the improvement of undergraduate mathematics education through innovative curricular change and believes in the necessity of organizations like the MAA to encourage and support these improvements. He enjoys reading and contributing to *Math Horizons* and looks forward to regularly presenting at regional and national meetings. Most recently, he has served as a lead author on a variety of math pathway curricular initiatives sponsored by the Carnegie Foundation for the Advancement of Teaching as well as the Charles A. Dana Center. Stuart Boersma is also a co-author of *Case Studies for Quantitative Reasoning: A Casebook of Media Articles* and is a co-director of the annual cryptanalysis competition *Kryptos*.

## **Tom Gruszka, Southwestern Section**

Tom Gruszka has been a faithful contributor to the Southwestern Section of the MAA for many years. Some of his contributions are obvious – he served as Governor of the Section as well as twice being the Section Chair for the annual Section conferences, taking on most of the responsibility in 1999 and 2009 when the meeting was held at his home institution, Western New Mexico University.

Perhaps more impressive is his service as newsletter editor for over 10 years (1996 – 2007), a thankless task of trying to extract articles from all of the forgetful department liaisons. These official roles only cover part of what Tom has done (and continues to do) for the Section. He has a real knack for convincing people that they can do a job they initially do not want; twice he has found us a webmaster and a newsletter editor, and he talks people into writing articles, contributing at the meetings, and more.

Tom is at section meetings whether they are held in New Mexico, Arizona, or El Paso. His long experience helps to solve problems that arise, and his easy-going personality serves to smooth out many difficulties.

Tom Gruszka is a mainstay of the Southwestern Section and for his outstanding service, he is recognized with a 2016 Meritorious Service Award.

## **Response from Tom Gruszka**

I would like to thank my colleagues and friends from the Southwestern Section who nominated me for this award. It's actually a privilege to serve in any capacity for the Section. It has allowed me in small ways to support the hard work and consistent efforts of all the officers of the Section for the last almost twenty-five years. And, specifically, I would like to thank Joanne Peeples, our Section's long-time Secretary and Treasurer, the gentle force that not only keeps our Section together but also keeps us on task in our attempts at providing quality service to the members of our Section. Thank you, Joanne!!

## **Biographical Notes**

After receiving his B.S. in Mathematics from Rochester Institute of Technology, **Tom Gruszka** received his M.S. and Ph.D. in Applied Mathematics from the University of Arizona. It was in graduate school that Tom fell in love with teaching mathematics. He launched his professional career at Grand Valley State University, where he worked with an enthusiastic group of faculty who introduced him to using technology as a pedagogical method for teaching mathematics. Wishing to return to the southwest, Tom was fortunate to be offered a position at Western New Mexico University, where he has continued to work for the last twenty-five years and currently serves as department chair. In addition to teaching at Western New Mexico, Tom works with other mathematicians and math educators around the state to provide professional learning opportunities for K-12 teachers of mathematics. Tom is always interested and excited to learn about new applications of mathematics, whether in the physical or biological sciences, the social sciences, or the arts. Tom has been married for over thirty years during which time he has been blessed with six children, currently ranging in age from sixteen to twenty-eight. Tom enjoys playing basketball with colleagues and students, and he enjoys hiking and camping with family and friends.

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## **Henry L. Alder Awards for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member**

The Alder awards were 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 Ph.D. Henry Alder was MAA President in 1977 and 1978 and served as MAA Secretary from 1960 to 1974.

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### **Benjamin Galluzzo**

Benjamin Galluzzo of Shippensburg University is described by his students and colleagues as an inspiring and creative teacher with boundless enthusiasm, and a leader in applied mathematics education. His students consistently applaud and value his commitment to challenging them to analyze authentic, real-world problems in all his courses, from college algebra to the most advanced courses in the math major. Dr. Galluzzo has substantially revised his department's mathematical modeling course, moving the focus from small, single-day, in-class models to the exploration of big real-world problems that illustrate how mathematical ideas can be effectively used to help us better understand the world. In addition, he is one of the few in his department to include service learning and field experiences in his courses.

Dr. Galluzzo's impact goes far beyond his classrooms. He has advised 14 undergraduate research projects, he has mentored 19 three-person math modeling teams, and he is the founding director and annual host of the Cumberland Valley Math Modeling Challenge. His expertise in the teaching and learning of mathematical modeling has been recognized

nationally, as demonstrated by his selection as a co-author of both the Guidelines for Assessment and Instruction in Math Modeling Education (GAIMME) Report and a chapter of the MAA's CUPM Curriculum Guidelines (2015). Additionally, he has organized numerous workshops, mini-courses, and professional development activities on mathematical modeling and sustainability for high school and college educators.

## Response from Benjamin Galluzzo

I'm thrilled, honored and extremely thankful to be recognized by the MAA as a Henry L. Alder Award winner. I've been incredibly fortunate to have supportive friends, colleagues and family to help me pursue my passion for teaching mathematics as well as students enthusiastic to learn and explore. I'm especially appreciative of the relationships I've developed through Project NEXt, SIAM/Moody's Mega Math Challenge and the PDC, the MAA PREP program and, of course, in my department at Shippensburg University.

I look forward to continuing to create, learn and have fun with all of you for years to come. Thank you!

## Biographical Note

**Ben Galluzzo** passionately promotes mathematics as a tool for investigating and developing understanding of real world issues. He has a Master's degree in Mathematical Finance from Boston University and a PhD in Applied Mathematics and Computational Science from the University of Iowa. Upon arrival at Shippensburg University he established an annual 24-hour math modeling contest that attracts undergraduate students from around the region; the contest has been replicated at multiple campuses across the country. As PI on NSF DUE grant "Undergraduate Sustainability Experiences in Mathematics", Ben has organized numerous workshops, including three MAA PREP workshops resulting in the development of dozens of sustainability-focused, classroom-ready activities. He is a founding executive committee member of the SIAM Activity Group on Applied Mathematics Education, a head judge and Problem Development Committee member for Moody's Mega Math Challenge and co-author of "Mathematical

Modeling: Getting Started Getting Solutions” a free handbook that provides instructions and a process for building mathematical models. Ben also enjoys collaborating with colleagues across disciplines at his home institution to engender community wide engagement in identifying, investigating and solving sustainability issues.

## **Jana Gevertz**

Jana Gevertz of The College of New Jersey is a dedicated, inspiring, energetic, and highly effective teacher. She engages a wide variety of students in her courses, which range from beginning-level Calculus through upper-level applied mathematics, and in undergraduate mathematical biology research projects.

Dr. Gevertz is beloved among her students, who give her high ratings in all of her courses. Evaluations cite that her teaching success can be attributed to her accessibility, her enthusiasm and contagious passion for mathematics, her innate ability to connect with undergraduates, and her pedagogical thoughtfulness. Several students report initially signing up for one of Dr. Gevertz’s courses just to satisfy a requirement, only to be inspired to take more mathematics. Some feel so empowered that they even choose to participate in one of her research projects.

Not only is Dr. Gevertz a department leader when it comes to supervising student research – over the past three years she has supervised 11 of the 17 undergraduate research students in her department – her influence also extends beyond her classroom and research students. In 2012 Dr. Gevertz helped to redesign her department’s differential equations syllabus so that it incorporates more qualitative and numerical methods, places further emphasis on modeling and dynamical systems, and introduces students to more technological tools. Related to this effort, she worked with colleagues at Mercer University to develop a course-culminating project in mathematical oncology, which she discussed in a talk at the 2012 Joint Mathematics Meetings, and published in a 2015 article in the journal *PRIMUS*. Dr. Gevertz has also played an important role in the development of her department’s new Applied Mathematics

specialization, and in her college's Computational and Mathematical Biology minor. She is a Project NExT fellow (Green 09) and a co-director of the MAA-New Jersey Section NExT. In this role she has co-organized several professional development meetings and workshops for participating new mathematics faculty in the state of New Jersey.

## Response from Jana Gevertz

It feels like just yesterday that I was at my first MathFest, listening to the speeches of the Alder Award winners. As someone just embarking on my professional career, I was in awe of what these early career faculty had accomplished, and I recall wishing that I would someday have even a *fraction* of the success they had in the classroom. Fast forward seven years, and I am humbled, honored, and quite frankly a bit shocked to be added to the list of exceptional faculty who have been recipients of this award. So many factors have contributed to my success as an educator. First, I am grateful to my PhD advisor at Princeton University, Dr. Salvatore Torquato, for being supportive of my deep pedagogical interests and my career goal of working at an undergraduate-oriented institution. Second, the opportunity to participate in Project NExT played a critical role in my formation as a reflective teacher-scholar, especially as I embarked on my academic career with very minimal teaching experience. Third, I have been incredibly fortunate to work at The College of New Jersey in a department with wonderfully supportive colleagues who have taught me a great deal about being an effective educator. Finally, I am infinitely grateful to the students at The College of New Jersey – they are as kind, curious and hard-working as they come, and they make my job as an educator an absolute pleasure. All the work we do is for them. Finally, I want to thank my husband, Dan, my parents, other close family and friends for their continuous support and understanding that the job of an educator is not one that works on a 9-5 schedule, and not one that is easily put down at the end of the day.

## Biographical Note

**Jana Gevertz** is an Associate Professor in the Department of Mathematics and Statistics at The College of New Jersey. Supported by a National Science Foundation Graduate Research Fellowship, she received her

Ph.D. in Applied and Computational Mathematics under the supervision of Dr. Salvatore Torquato at Princeton University in 2009. Since her experience in the undergraduate classroom of Dr. Eduardo Sontag at Rutgers University, Gevertz has been fascinated by mathematical biology. Her research focuses on predicting tumor growth and treatment response, and in fact she has spent the 2015-2016 academic year on sabbatical at Rutgers working with the very professor who originally sparked her interest in mathematical biology! As a faculty member at a primarily undergraduate institution, she seeks to bring biology applications into the mathematics classroom, to encourage biology students to further study mathematics, and to mentor undergraduates in intensive research experiences.

## **Dandrielle Lewis**

Dandrielle Lewis of the University of Wisconsin-Eau Claire is described by her students as a source of inspiration, who exemplifies passion and enthusiasm for mathematics and teaching. Her classroom is described as a current, vibrant learning environment that is rich with interactive lectures and activities. In addition to being a superb teacher, Dr. Lewis has excelled at mentoring students in their work on research projects, both on campus and through programs such as the WiscAMP summer program for minorities in STEM and the University of Wisconsin-Stout REU. She currently serves as a Co-PI on a National Science Foundation grant to integrate research in the undergraduate curriculum.

Dr. Lewis's influence extends far beyond her own classroom, in part through her outreach to a variety of community groups. She works with members of the Somali Immersion Program on understanding the challenges faced by minority women, she has organized multiple successful Sonia Kovalevsky Days for high school and middle school girls, and she volunteers as a mentor for the Association for Women in Mathematics mentoring program. On her campus, Dr. Lewis has advised student leaders of the Opportunities for Outstanding Mathematics Performance for Hmong program and served as advisor for the Women in STEM club. In recognition of her work as a mentor and campus leader,

Dr. Lewis received a 2015 University of Wisconsin System Woman of Color in Education award for advancing “work of diversity, equity, and Inclusive Excellence.”

## **Response from Dandrielle Lewis**

I am very honored to receive the Henry L. Alder award. Oprah Winfrey said, “At different times in our journeys, if we are paying attention, we get to sing the song we’re meant to sing in the perfect key of life. Everything we’ve ever done and all we’re meant to do comes together in harmony with who we are. When that happens, we feel the truest expression of ourselves.” At UWEC, I have grown professionally and personally, and have found a place where I not only fit in but where I have discovered many of my gifts and am able to use them. I am singing the song I was meant to sing in the perfect key of life. It feels wonderful to know that my colleagues and students are inspired by me and that they appreciate my work and passion. I am able to create a great teaching environment, do research, and mentor students because I have a supportive Mathematics Department chair, Alex Smith, who always listens to my wild ideas and encourages me to pursue them. Ursula Whitcher, thank you for leading the team that nominated me for this award. I am grateful to work where I am appreciated not only in my department, but outside of it as well through a supportive Chancellor, Provost, and Dean.

I am who I am because I have a strong support system; many people have invested in my journey to become my best self and a better and thriving professor. Although there are too many mentors to name, they are worth mentioning because they keep me focused and encouraged; they include my family, close friends, and colleagues. This award is not just for me, it is for all of us, and thank you all for being active and supportive in my life.

## Biographical Note

**Dandrielle Lewis** is a tenured Associate Professor in Mathematics at University of Wisconsin-Eau Claire. She received her Bachelor of Science from Winston Salem State University in 2001, her Masters of Science from the University of Iowa in 2006, and her Ph.D. from SUNY Binghamton in 2011. Since 2011, she has served as a member of the University of Wisconsin Women and Science Advisory Board.

She continues to be an advocate for broadening the participation of women and minorities in STEM as director and organizer of UWEC's Sonia Kovalevsky Math Days for high school and middle school girls. She also serves as co-facilitator of a Domestic Intercultural Immersion Program, "Embracing the Somali Immigrant Experience in Midwestern Public Schools." She has served as a panelist for the National Science Foundation and the UW System. She is scholarly active within her field of mathematics, finite group theory, and has given presentations on her research locally and nationally. When she is not working, she enjoys spending time with her family and friends, cooking, and travelling.

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