# MathFest 2017

# Prizes and Awards

MAA

MATHEMATICAL ASSOCIATION OF AMERICA

**Chicago, IL**
**Hilton Chicago,**
**International Ballroom South**
**11:30 am**
**July 27, 2017**

Program for the MAA Prize Session

Opening and Closing Remarks
Deanna Haunsperger, President
Mathematical Association of America

# 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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## Brian Conrey, James Gabbard, Katie Grant, Andrew Liu, and Kent Morrison

"Intransitive Dice", *Mathematics Magazine*, Volume 89, Number 2, April 2016, pages 133-143.

Intuition suggests that transitivity should hold in matters of strength. This intuition fails spectacularly in an example described by Martin Gardner in 1970, and originally due to Bradley Efron a few years earlier. The example consists of four 6-sided dice labeled A-D, with all faces having numbers belonging to {1, 2, 3, 4, 5, 6}, such that A beats B with probability 2/3, B beats C with probability 2/3, C beats D with probability 2/3, and D beats A with probability 2/3.

The fundamental question asked in *Intransitive Dice* is: how rare is this? In other words, given a random set of dice, how likely is it that one could put them into a cycle that is intransitive? The question is a tantalizing one, and the authors deftly move from the concrete to the abstract in their search for the answer.

The authors first look for intransitive triples of dice. The frequency of ties in the setting of 6-sided dice may leave one unsatisfied, so the authors go on to consider triples of $n$-sided dice, allowing numbers in $\{1,\ldots, n\}$ and imposing the condition that the sum of the numbers on each die be $n(n+1)/2$. The authors conjecture that as $n$ grows, the probability of a tie goes to 0, while the probability of an intransitive triple goes to 1/4. After

giving some computational evidence for these conjectures, they prove that as the number of sides grows, the probability of an intransitive cycle when there are no ties is 1/4.

The authors conclude by returning to the four-dice setting of the original example, and taking n-sided dice where the sum of all numbers on each die is $n(n+1)/2$. They present both heuristic and computational evidence that as $n$ grows the probability of an intransitive cycle approaches… 3/8. Even more provocatively, they conjecture that for $k$ such dice, the limiting value approaches an expression in $k$ that in turn goes to 1 as $k$ grows. As they write, "…our intuition that intransitive dice are rare and that larger sets are even rarer is completely unfounded. They are common for three dice and almost unavoidable as the number of dice grows."

It's not exactly common for high school students to participate in a Math Circle that leads to a published article in a mathematics journal, but in the case of *Intransitive Dice*, we have just that. The authors of this article hit on all of the important modes of mathematical research. They collect data, generalize patterns, look for conjectures, and even prove theorems. All of this is tied together in a fun article that touches on many areas of mathematics and keeps the reader engaged to the end.

## Response From the Authors

It is both an honor and a pleasure to be recognized with the Allendoerfer Award this year. For all five of us this work has been an unusual experience. James, Katie, and Andrew were high school students in Morgan Hill, California when they met Brian through the outreach program of the American Institute of Mathematics. They were looking for advice and mentoring for a science fair project in mathematics, and Brian suggested a topic that he liked to use in his "Untuition" talk aimed at high school students and teachers. For their science fair project, which eventually received an Honorable Mention for First Place in the 2013 California State Science Fair, they focused on systematic construction of sets of intransitive dice. From this work a precise question was formulated. Suppose that you have three random dice A, B, and C, with A stronger than B and B stronger than C. How likely is it that A is stronger than C? They decided to concentrate on "one-step" dice, which are as close to the standard die as possible. After they figured out completely how two one-step dice do not tie, then it was possible to write a

computer program to find the patterns for triples of one-step dice that do not have any ties, and this enabled us to count the intransitive triples with enough accuracy to prove that as n goes to infinity, the answer to the question (for one-step dice) is that the two possibilities are equally likely. Further computer experiments convinced us that the intransitivity phenomenon is generic for larger sets of proper dice (i.e., those whose n faces use numbers between 1 and n with total n(n+1)/2). We have not found a proof or even a promising way to attack this grand conjecture, but we hope that our article stimulates interest in the conjecture and ultimately leads to its resolution.

## Biographical Notes

**Brian Conrey** is the Executive Director of the American Institute of Mathematics in San Jose, a position he has held since 1997. He has taught at the University of Illinois and Oklahoma State University. He received his B.S. from Santa Clara University and his Ph.D. from the University of Michigan. His research interests are in analytic number theory and random matrix theory.

**Kent Morrison** received his B.A. and Ph.D. degrees from the University of California, Santa Cruz. After thirty years on the faculty of Cal Poly, San Luis Obispo, including nine years as department chair, he is now Professor Emeritus. Since 2009 he has been affiliated with the American Institute of Mathematics, where he helps in various capacities and directs the AIM Open Textbook Initiative to encourage the development and use of open source and open access textbooks for undergraduate mathematics courses. He has found it difficult to stick to one area of mathematics but in recent years his interests have been in combinatorics, probability, and game theory, and especially in mixtures of these areas. “Intransitive Dice” is his fifth article in *Mathematics Magazine* and his third to have student co-authors.

**James Gabbard** is an undergraduate at the University of Southern California where he is majoring in mechanical engineering and applied mathematics. In his spare time he enjoys backpacking and performing with the USC marching band.

**Katie Grant** is pursing a B.S. in management science and a minor in computer science at the University of California, San Diego. Her favorite classes have been Decisions Under Uncertainty, Econometrics, and Introduction to Probability. In addition to her studies she has worked in an internship with TD Ameritrade and is a registered investment advisor.

**Shang-Chi Andrew Liu** attends the University of California, Los Angeles, where he is majoring in political science with a double-minor in philosophy and cognitive science. In his spare time he enjoys playing tennis and exploring the city of LA with his friends.

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## Vladimir Pozdnyakov and Michael Steele

"Buses, Bullies, and Bijections," *Mathematics Magazine*, Volume 89, Number 3, June 2016, pages 167 – 176.

*"In times past in a country far away, passengers on intercity buses were all assigned seat numbers, and the buses were always full. There were many casual people, and there were a few people who were real sticklers for the rules. This is where our problem begins."*

Suppose $n$ people are assigned to $n$ seats on a bus such that person $i$ is assigned to seat $i$, for $1 \leq i \leq n$. Persons 2 through $n$ enter the bus and take seats randomly. When person 1 (A) enters, A sits in his or her assigned seat if it is available, otherwise A forces the person in his or her seat to move and A requires the displaced person to take his or her assigned seat, possibly forcing someone else to move. This process continues until there are no more displaced persons. The authors ask: What is the probability that person 2 will have to move? This simple question starts the reader on a journey through the world of bijections on the symmetric group $S_n$.

The answer to the question comes from observing there is a bijection between permutations that have 1 and 2 in the same cycle and those that do not. The authors elegantly tackle more involved questions about bumping passengers and the associated bijections, permutations, and cycles.

The authors conclude with a glimpse at how tools like those developed in their paper can address other questions. Topics touched on include derangements, Spitzer's identity from combinatorial probability, and finally the famous Robinson-Knuth-Schensted correspondence, which is a bijection from permutations to pairs of Young tableaux. The authors demonstrate that there is much to be learned by examining certain bijections on the set of permutations.

The entire paper is intriguing and accessible. The writing is engaging, the explanations lucid, and the results remarkable in their simplicity. The authors clearly took great delight in sharing this story with the reader. There is almost a literary wink, where the authors say if you thought that was neat, wait until you see what's next.

## Response from Vladimir Pozdnyakov and Michael Steele

What a surprise and a delight it is to hear that we have been awarded the Allendoerfer prize! When we began this project, we knew we had a story that we enjoyed telling to friends and students, but we had no idea that it might be acknowledged in this special way. We are both long-time readers of *Mathematics Magazine*, and, even from high school days, we have had a love for expositions of interesting, accessible mathematics. It is marvelous to hear that we have made a real contribution to this generations-long conversation where we have been eager listeners for so many years. We are genuinely moved. Thank you!

## Biographical Notes

**Vladimir Pozdnyakov** received his Ph.D. in statistics in 2001 from the University of Pennsylvania. Since that time he has taught at the University of Connecticut, where he is currently professor of statistics. His research is mostly in applied probability, and he has a particular interest in the discovery and exploitation of martingale tricks.

**J. Michael Steele** received his Ph.D. in mathematics from Stanford University in 1975. He has taught at U.B.C., Stanford, CMU, Princeton, and the Wharton School of the University of Pennsylvania. He has worked

in many parts of probability theory, and he is the author of several books including *The Cauchy Schwarz Master Class* published by the MAA.

## 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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## Cornelia A. Van Cott

"A Pi Day of the Century Every Year", *Math Horizons*, Volume 23, Number 3, February 2016, pages 24–27.

This is a very well written article with a pace and level accessible to undergraduate mathematics majors as well as to more mature mathematicians. The author takes the popular mathematical concepts of circle and diameter (from which $\pi$ arises) and generalizes the notion of circle and hence diameter. Readers are led to learn the general structure of norms on the plane as they ponder other kinds of distance besides the normal Euclidean distance. The explanations are both precise and intuitive, and are supported by helpful illustrated examples.

## Response from Cornelia Van Cott

I am honored to receive this award from the MAA. I thank the students and faculty at Wellesley College who listened to my first presentation on the topic in their math colloquium in 2014. Their enthusiastic questions motivated me to write the talk down in expository form. Many thanks also to Nathan Carter, who discussed the mathematics with me at length and gave feedback on early versions of this article. Finally, I thank Dave Richeson, editor of *Math Horizons*, who made valuable suggestions during the publication process.

# Biographical Note

Cornelia Van Cott is associate professor of mathematics at the University of San Francisco, where she has been since 2008. She received her B.S. in mathematics at Wheaton College (Wheaton, Illinois) and her Ph.D. at Indiana University. Outside of teaching, Cornelia enjoys thinking about 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.

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## Harold P. Boas

"Mocposite Functions", *The American Mathematical Monthly*, Volume 123, Number 5, May 2016, pages 427-438.

Expressions such as $\sqrt{1-z^2}$, $\cos\sqrt{z}$, and log sin *z* invite confusion when complex variables are considered. For example, $\sqrt{1-z^2}$ can be interpreted in several different ways, and the behavior of this expression depends heavily upon the chosen domain. The author considers the peculiar and sometimes paradoxical behavior of functions which our notation suggests are composite, yet cannot be composite in the literal sense of the word. For example, a Taylor expansion at the origin confirms that $\cos\sqrt{z}$ is entire. However, $\sqrt{z}$ cannot be defined on all of $\mathbb{C}$, so $\cos\sqrt{z}$ is not a true composite function on $\mathbb{C}$. In the author's terminology, it is a "mocposite" function.

The author provides a whirlwind overview of mocposite functions, highlighting the surprises and misconceptions, along with the required remedies. In fact, he warns that "my tale includes both a caution on confusing conventions and a pedagogical praise of pedantry." The article

is also packed with historical references and takes a lively view of the subject, playfully referencing the work of Lewis Carroll.

## Response from Harold P. Boas

An engineering student knocks on the office door of a mathematics professor: “You don’t know me, but I wonder if you could help me with an integral that I need for my Master’s thesis.” How should the professor respond?

When this scenario happened to me, granting the request turned into a positive experience. Enlightening the student gave me valuable practice translating between mathspeak and engineering lingo; subsequently serving on the student’s graduate committee earned goodwill in the engineering school for my department; and later writing an exposition of the fundamental problem offered me the satisfaction of creative activity.

I am delighted that the resulting article is being recognized by an award named for two notable editors of *The American Mathematical Monthly*. I would like to thank all editors of this journal—past, present, and future—for their essential efforts enhancing expository excellence.

## Biographical Note

After earning degrees from Harvard University in 1976 and the Massachusetts Institute of Technology in 1980, **Harold P. Boas** taught for four years at Columbia University before joining the faculty of Texas A&M University in College Station, where currently he is Regents Professor and Presidential Professor for Teaching Excellence. His past MAA activities include service on the editorial boards of *The American Mathematical Monthly*, the Carus Mathematical Monographs, and the Anneli Lax New Mathematical Library. In a previous life, he once played chess with fantasy author George R. R. Martin.

## Adrien Kassel and David B. Wilson

"The Looping Rate and Sandpile Density of Planar Graphs", *The American Mathematical Monthly*, Volume 123, Number 1, January 2016, pages 19-39.

Given a graph or lattice, suppose we pile grains of sand on the vertices. If any vertex has at least as many grains as its neighbors, it "topples," sending one grain to each neighbor, which can set off a chain reaction of toppling until the system finally stabilizes. When grains of sand are added at random and the sandpile stabilizes, there is a stationary sandpile distribution. The sandpile density is the resulting average number of grains at each vertex in such stationary stabilized sandpiles. Sandpile density has been previously determined for certain lattices through the use of computations; however, these computations do not motivate why these densities appear to be governed by relatively simple rules. In this insightful paper the connection between sandpile densities and spanning trees is used to generate a new and beautiful method to compute these values for many common planar lattices. The authors have given us a wonderful demonstration of how good exposition and good mathematics go together.

## Response from Adrien Kassel and David B. Wilson

It is a great honor for us that our paper was distinguished and we are grateful for this recognition of our work. The book of Paul Halmos, *Problems for Mathematicians, Young and Old*, was a source of inspiration to think about math problems in our earlier days, and a beautiful model of elegant mathematical exposition. It is humbling to receive an award named partly after him.

We have greatly enjoyed reading *The Monthly*, and we were thrilled that our paper made it in its pages. We chose to publish in *The Monthly* rather than a specialized journal because the rather simple method we found has the potential of being widely shared among readers of different mathematical backgrounds. We are convinced by the aims of *The Monthly* to share mathematics widely in an accessible way, and we tried our best to meet this goal. We hope that our paper will encourage others to learn about spanning trees, sandpiles, and related topics, and will

facilitate access to recent developments in the theory of exactly solvable statistical physics models.

## Biographical Notes

**Adrien Kassel** holds a CNRS research position at Ecole Normale Supérieure de Lyon, France. Native from Strasbourg, he studied mathematics at ENS in Paris, earned a PhD from Université de Paris-Sud in Orsay (for work done in the USA and France, under Richard Kenyon), and held a post-doc position at ETH Zurich. He works on stochastic processes and geometric structures in the context of discrete statistical physics models such as spanning trees, loop soups, sandpiles, spin models, and their universal continuum scaling limits. He is also interested in fostering exchanges between mathematicians and people of other fields of science and the arts, and society at large.

**David B. Wilson** graduated from MIT in 1991 with degrees in electrical engineering, mathematics, and computer science, and graduated again from MIT with a Ph.D. in mathematics in 1996. He specializes in probability and algorithms, and has a longtime interest in trees and sand. In his spare time he enjoys hiking, juggling, and change ringing.

## Deborah Kent and David Muraki

“A Geometric Solution of a Cubic by Omar Khayyam ... in Which Colored Diagrams Are Used Instead of Letters for the Greater Ease of Learners", *The American Mathematical Monthly*, Volume 123, Number 2, February 2016, pages 149-160.

In this lovely paper, the authors resurrect the colorful, geometrical language of Oliver Byrne (1810-1880) to communicate the subtle geometric reasoning and intuition of Omar Khayyam and other medieval Islamic mathematicians. Oliver Byrne devised his visual language to teach Euclidean geometry graphically through colorful diagrams, thereby avoiding cumbersome notations and wordy proofs. In this paper the authors introduce us to Byrne's system and then use it to illustrate one of the arguments from Khayyam's treatise on solving cubic polynomials, which employed intersections of conic sections to provide geometric solutions. The historical perspective focuses on Khayyam's use of ratios,

conic sections, and dimensional reasoning, allowing the modern reader to glimpse the workings of the 11th century mind of Omar Khayyam.

## Response from Deborah Kent and David Muraki

Thanks first to Oliver Byrne, who introduced his unconventional approach to Euclidean geometry with "a greater aim than mere illustration; [he did] not introduce colours for the purpose of entertainment, or to amuse by certain combinations of tint and form, but to assist the mind in its researches after the truth, to increase the facilities of instructions, and to diffuse permanent knowledge."

A delightful realization inspired this paper— that Byrne-style pictographs could effectively recast a beautiful geometric proof of Omar Khayyam. We hope that readers likewise enjoy this bit of combinatory play— when disconnected ideas become linked and novelty arises.

We are grateful to *The Monthly*, an august but grayscale publication, for considering a manuscript so dependent on colour. They have made the colour version available through JSTOR online.

Finally, we share this moment with our many colleagues whose friendship and scholarship contribute daily to an environment of creativity in which we are so fortunate to be immersed.

## Biographical Notes

**Deborah A. Kent** is an historian of mathematics whose current research focuses on the circulation of mathematics in 19th- and early 20th-century journals. She also recently co-authored *Game Theory: A Playful Introduction*, AMS 2016. As an associate professor at Drake University, she teaches mathematics and is always on the alert for colorful classroom narratives.

**David J. Muraki** is a professor of mathematics at Simon Fraser University. His usual research concerns wave propagation and atmospheric fluid dynamics. When not collaborating with scientists at the National Center for Atmospheric Research (Boulder, CO), he is an enthusiast of the visual arts.

# Lawrence Zalcman

"A Tale of Three Theorems", *The American Mathematical Monthly*, Volume 123, Number 7, August-September 2016, pages 643-656.

The first two theorems of the title are Picard's "little theorem" and Great Theorem on meromorphic functions, which were announced in rapid succession in 1879. Zalcman takes the reader on a journey that begins with Picard and continues through a series of related (and sometimes surprising) results, including the third theorem referred to in the title, Montel's Theorem. The elegant exposition chronicles both the fundamental mathematical ideas and the characters involved in the development of modern complex analysis and the study of meromorphic functions. Along the way, the author explores how each result might be extended, testing which conditions can be changed and which cannot, leading to a deeper appreciation of the amazing properties of transcendental meromorphic functions.

## Response from Lawrence Zalcman

Thank you for this wonderful honor. In writing this article, I had (appropriately enough) three aims in mind. First of all, I wanted to illustrate a pet thesis of mine: that the basic theorems of complex function theory taught in a first year complex variables course afford an ample arena for interesting and worthwhile research. I also wanted to highlight the important role that compactness notions (such as normality) continue to play in classical complex analysis. And finally, last but certainly not least, there was a cracking good tale to be told. I had a great time writing this paper, so I'm particularly glad to learn that readers are also getting some pleasure out of it.

## Biographical Note

Lawrence Zalcman studied at Dartmouth (A.B. 1964) and MIT (Ph.D. 1968) and spent the next 17 years teaching first at Stanford and then at the University of Maryland. In 1985, he relocated to Israel as Lady Davis Professor of Mathematics at Bar-Ilan University, retiring in 2011 as Professor Emeritus. Larry is the recipient of two previous Lester R. Ford

Awards (1975 and 1981), as well as the Chauvenet Prize (1976). He is just now completing his 30th (and final) year as Editor of *Journal d'Analyse Mathématique*.

## Merten M. Hasse Prize

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.

## Lasse Rempe-Gillen and Zhaiming Shen

"The Exponential Map Is Chaotic: An Invitation to Transcendental Dynamics," *The American Mathematical Monthly,* Volume 122, Number 10, December 2015, pages 919-940.

Shen and Rempe-Gillen prove in this paper a famous theorem of Misiurewicz from 1981 concerning certain orbits of the complex exponential map, and show that the complex exponential map is chaotic. This paper is remarkably accessible, elementary, and conceptual, demanding little more than an undergraduate course in complex analysis from readers. The authors smoothly and efficiently review the complex exponential map, dynamical systems, their topological properties, hyperbolic metrics, and Devaney's notion of chaos from 1989, before turning to detailed proofs. After all this, readers are further rewarded with a perspective on related results and open questions, as well as a collection of well-crafted, illuminating exercises.

The reformulation of Misiurewicz's famous theorem, reproved in the present paper by Shen and Rempe-Gillen, focuses on three kinds of orbits of the complex exponential map. Given a complex number $z$, one

repeatedly applies the complex exponential map to z and considers the resulting infinite sequence of numbers. This sequence might, for example, be periodic, or be dense in the complex plane, or approach infinity. Surprisingly, the set of starting values z leading to each of these three cases is dense in the complex plane! In other words, given a complex number, any of the three behaviors can be achieved by an arbitrarily small change. This was first conjectured by Fatou in 1926, first proved by Misiurewicz in 1981, and subsequently proved by Baker-Rippon, Eremenko-Lyubich, Goldberg-Keen, and Bergweiler-Haruta-Kriete-Meier-Terglane. The present method of Shen and Rempe-Gillen first directly proves the topological transitivity of the complex exponential map, and then concludes dense orbits exist. The exceptional exposition, crystal clear writing, and engaging style bring the fundamental ideas behind this surprising theorem to the broadest possible audience.

## Response From Lasse Rempe-Gillen and Zhaiming Shen

It is a great honour – and surprise! – to receive the Merten M. Hasse Prize for our paper, "The Exponential Map is Chaotic: An Invitation to Transcendental Dynamics". We hope that the surprising behaviour of the complex exponential map under iteration will encourage readers to further explore the magic of complex numbers and the wonders of transcendental dynamics.

This paper would not have been written without the LMS/Nuffield Undergraduate Research Bursary that supported Zhaiming's work on the project as an undergraduate at the University of Liverpool in 2013. We would encourage any undergraduate student interested in research to consider undertaking such a summer project where possible, and commend all funders, such as the LMS, who continue to make these experiences possible. We also gratefully acknowledge support from the Leverhulme Foundation through Lasse's 2012 Philip Leverhulme Prize.

# Biographical Notes

**Lasse Rempe-Gillen** received his doctoral degree in 2003 under the supervision of Walter Bergweiler; he is now Professor of Pure Mathematics at the University of Liverpool, where he has worked since 2006. His research in transcendental dynamics has been awarded an LMS Whitehead Prize in 2010 and a Philip Leverhulme Prize in 2012; he was named a Fellow of the American Mathematical Society in 2017.

Lasse is also interested in communicating mathematical research to general audiences, and in interaction between mathematics and the arts. Since 2015, he has been collaborating with noted British composer Emily Howard, who has incorporated ideas taken from his research into her compositional process.

Lasse and his wife Emma, who conducts research into mathematics education, have a two-year old son who keeps their life exciting and full of cuddles.

**Zhaiming Shen** received his Bachelor degree in mathematics at University of Liverpool in 2014, and did his bachelor thesis under the supervision of Professor Lasse Rempe-Gillen. He is now a graduate student working with Professor James Haglund at University of Pennsylvania since 2014, whose research area is algebraic combinatorics.

Zhaiming loves playing the game of go and tennis, he plays a lot with his friends during the free time. Zhaiming is looking forward to graduating in May. 2017 and get his MPhil degree in mathematics. He plans to work in industry after graduation, and now is seeking for job in areas like banking, coding and quant research.

# 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.

## Viktor Blåsjö

"How to Find the Logarithm of Any Number Using Nothing But a Piece of String", *The College Mathematics Journal*, Volume 47, Number 2, March 2016, pages 95-100.

The history of mathematics isn't a linear progression, with knowledge increasing monotonically from primitive origins to the modern state of the art. Fashions change in mathematics, and ideas and ways of thinking that were commonplace in one era may later fall into disuse. But sometimes an old-fashioned idea can become fresh and fascinating again, and that is what Viktor Blåsjö shares with us in this delightful piece which combines history, geometry, analysis, physics, and even a little bit of philosophy.

The catenary problem is ancient and natural: consider the curve formed by a chain, or a piece of string, suspended at two points of equal height and drooping under its own weight. How can this curve be described mathematically? In modern notation, the answer is given by the equation $y = (e^x + e^{-x})/2$; we would say the catenary is defined in terms of the exponential function. (The article includes an elementary derivation of this equation from the first principles of mechanics and basic calculus.) But Blåsjö takes us back to the era of Leibniz, who would have put it the other way around: the exponential function, and its inverse, the natural logarithm, can be defined in terms of the catenary! Anybody who has a piece of string can create a catenary curve, and this article presents Leibniz's technique for using this simple "analog computer" to determine

the natural logarithm of any number. As Leibniz noted, “This may be helpful since during long journeys one may lose one’s table of logarithms”…or one’s scientific calculator!

Along the way, Blåsjö puts forward an impassioned [or “convincing”] argument for restoring the supremacy of concrete meaning in mathematics, in place of “chicken-scratch” algebraic formulas. With all our modern mathematical innovations, we may still have a lot to learn from the 17th century!

## Response from Viktor Blåsjö

I am very happy and honored with this recognition. I admire the MAA's commitment to sharing the joy of our subject widely through quality exposition and connoisseurship of beautiful mathematics. I am humbled that my paper was deemed a worthy contribution to these noble pursuits.

I have been fortunate to have had the opportunity to study the history of mathematics in the 17th century—an era rich in childlike enthusiasm and enterprising spirit. I am glad that I could share some of the excitement of these studies with the broader mathematical community.

## Biographical Note

Viktor Blåsjö works at the Mathematical Institute of Utrecht University. His dissertation on the history of Leibniz’s calculus formed the basis for his monograph *Transcendental Curves in the Leibnizian Calculus* (Elsevier, 2017). Having thus a “Ph.D. in calculus,” he has also put the educational import of his research to use by writing a historically informed calculus textbook and other teaching materials, available at intellectual mathematics.com. Follow him on Twitter @viktorblasjo.

# Travis Kowalski

"The Sine of a Single Degree", *The College Mathematics Journal*, Volume 47, Number 5, November 2016, pages 322-332.

At first glance, the title of this article does not suggest a topic of compelling interest. After all, the degree is a rather arbitrary unit of angle measure (as opposed to the radian), so why should its sine be a number of any inherent mathematical interest? But Travis Kowalski expertly captures our attention at the outset, by probing beyond elementary facts about sines and cosines that every student memorizes, and asking what else we might actually compute. This leads to what the author describes as a "historical romp" through geometry, algebra, and finally complex analysis, delivered with flair, erudition, and – yes – excitement!

It is easy to write down simple algebraic expressions for sin(60°),sin(45°), and, by combining these, to obtain less familiar values such as sin(15°),sin(18°) and (eventually) sin(3°). All of these expressions involve square roots, a fact which is intimately tied to the ancient problem of angle trisection. Moving beyond these computations to the subject of this article, we find the angle 1°, which cannot be constructed with a straight edge and compass (otherwise any integral-degree angle could), but whose sine satisfies a cubic equation. Solving this equation for sin(1°) gives a formula involving complex cube roots. However, evaluating this formula uncritically on a calculator gives results that are obviously wrong – e.g., complex numbers with nonzero imaginary part. The author leads us along an instructive path (with some false starts, chosen intentionally for pedagogical effect), selecting the proper roots and eventually obtaining the correct value of sin(1°). In the process, we revisit and learn more about Cardano's method for solving cubics, and other interesting and beautiful results. The paper has a rich historical bibliography that invites the reader to explore further.

## Response from Travis Kowalski

I am truly honored to be selected for the George Pólya Award, and am humbled to be considered among such brilliant mathematical expositors as Paul Halmos, Douglas Hofstadter, and Bill Dunham. This paper was inspired out of my loves of mathematics, history, and art, but it wouldn't

exist without the support of my colleagues and students at the South Dakota School of Mines and Technology, who listened to me present it at (more than one!) Pi Day celebration, and who provided comments and questions that lead to an improved and coherent story. I am also indebted to MAA's members, editors, and reviewers for their suggestions, which greatly improved the final manuscript. I am deeply thankful for this honor, and for the MAA community of which I am privileged to be a part.

## Biographical Note

Travis Kowalski graduated from the University of California, earning a B.S. in mathematics from its Riverside campus in 1997, and a Ph.D. in Mathematics from its San Diego campus in 2002. Though originally a major in studio art, he was exposed to the unexpected (to him, at least) beauty of mathematics early on in college and, to quote Travis, "never changed my major, only my medium." After a two-year visiting post at the Colorado College, he has spent the last 13 years at the South Dakota School of Mines and Technology, where he teaches a broad range of undergraduate mathematics courses with a mix of precision, pictures, and poetry. In his spare time, Travis enjoys doodling on napkins (instagram.com/travis.at.komplexify).

## Daniel Solow Author's Award

The Daniel Solow Author's Award was approved by the Board of Governors in 2015 and is given for the first time at MathFest 2017. The award recognizes the author or authors of undergraduate mathematics teaching materials with the primary criteria for selection being the material's impact on undergraduate education in mathematics and/or the mathematical sciences. This award was proposed and funded by Danny Solow, Professor in the Department of Operations at the Weatherhead School of Management, Case Western Reserve University.

## Ted Sundstrom

Professor Ted Sundstrom, of Grand Valley State University, is the recipient of the 2017 Daniel Solow Author's Award for his textbook *Mathematical Reasoning: Writing and Proof*. This text debuted in 2003 and has been adopted by at least 47 universities. The present electronic version has been downloaded over 50,000 times.

The text is designed for a bridge or transition course in a mathematics major. Faculty who have used the book in these courses testify to a structure that engages students actively, models how mathematicians think and act, draws students into a conversation about norms and conventions, and provides opportunities for students to test their understanding in class or on their own. This textbook supports instructors who want to use other-than-lecture pedagogies, and helps students get demonstrably better at reading and writing proofs. Some faculty have credited the text with changing their approach to teaching!

Sundstrom's selfless decision to use his copyright to grant an open license allowing free downloads and unlimited copying, along with producing a very inexpensive print-on-demand hard-copy version, amplifies the impact of his work by making it readily available to any student interested in mathematical reasoning. Students are led to acquire fundamental notions about making arguments, seeking counterexamples, and

scrutinizing conjectures for validity. The structure of proof is analyzed and discussed in accessible narrative. *Mathematical Reasoning: Writing and Proof* shares writing, language, formatting, and symbolic conventions with students as members of a larger mathematical community.

## Response from Ted Sundstrom

In early January, about a week before classes started, I was in a bookstore in Ann Arbor, MI and received an email informing me that I would be the recipient of the inaugural Daniel Solow Author's Award from the MAA. That was a wonderful way to begin my last semester at Grand Valley State University. Needless to say, I am thrilled and honored to receive this award for a project that has been near and dear to my heart for the past 16 years or so. I want to thank the MAA and Daniel Solow whose wonderful *How to Read and Do Proofs* was one of my inspirations for writing a book specifically designed for the introduction to proofs course at Grand Valley. It has been a very pleasant surprise that the book has been successfully used at many other colleges and universities. One of the advantages of making this book an open resource is that I have had more contact with faculty and students who have used the book than I ever did when it was commercially published. Their encouragement and suggestions have been very welcome and I am grateful to them for that. Finally, I express my sincere gratitude to Grand Valley State University, the Department of Mathematics, and my family, whose support and encouragement throughout my years of engagement with this book was essential.

## Biographical Note

Ted Sundstrom has been a faculty member at Grand Valley State University since receiving his Ph.D. in mathematics (ring theory) from the University of Massachusetts in 1973. He grew up in Grand Rapids, Michigan, and received a bachelor's degree in mathematics from Western Michigan University. In 2005, he received the award for Distinguished Teaching of College or University Mathematics by the Michigan Section of the MAA.

At Grand Valley, his focus has been on teaching, curriculum development, writing textbooks and other materials for various mathematics courses, and incorporating the history of mathematics into certain mathematics courses. Besides *Mathematical Reasoning: Writing and Proof*, he was one of three coauthors of an abstract algebra book and coauthored a now obsolete book dealing with explorations in calculus using a graphing calculator. He and a coauthor have just completed the first draft of an open-source textbook for a one-semester trigonometry course. He is an avid reader, bicyclist, hiker, and golfer.

# George Pólya Lecturer 2015-2017

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.

## Erica Flapan

Dr. Erica Flapan was recommended by the Pólya Lecture committee and approved by the Board of Governors to serve as George Pólya Lecturer for the two academic years 2015-2016 and 2016-2017. The Association expresses its gratitude to Dr. Flapan for lectures at sections that enhance MAA's goal of high quality exposition.

## Biographical Note

Erica Flapan is the Lingurn H. Burkhead Professor of Mathematics at Pomona College. She is the author of *When Topology Meets Chemistry: A Topological Approach to Chemistry* (2000), which was one of the first books to discuss these exciting applications of mathematics to molecular structures. She is also the co-author of *Number Theory: A Lively Introduction with Proofs, Applications and Stories* (2011) which makes number theory accessible and applicable. Her research includes a variety of topics that have direct applications to the topology and symmetry of molecules, including DNA. She is also interested in questions related to the application of knot theory to graphs in 3-space. She is a Fellow of the American Mathematical Society, and currently has an NSF research grant. Known for her ability to give excellent talks at a variety of levels, she received the MAA Haimo Teaching Award in 2011.

# The 77th William Lowell Putnam Mathematical Competition

**December, 2016**

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

## The Five Highest Ranking Individuals

1. Joshua D. Brakensiek, *Carnegie Mellon University*
2. Dong Ryul Kim, *Harvard University*
3. Thomas E. Swayze, *Carnegie Mellon University*
4. Samuel Zbarsky, *Carnegie Mellon University*
5. Yunkun Zhou, *Massachusetts Institute of Technology*

## Team Winners

1. Carnegie Mellon University
   *Joshua Brakensiek, Thomas E. Swayze, Samuel Zbarsky*
2. Princeton University
   *Eric D. Schneider, Zhou Qun Song, Xiaoyu Xu*
3. Harvard University
   *Pakawut Jiradilok, Dong Ryul Kim, David Stoner*
4. Massachusetts Institute of Technology
   *Robert C. Shen, David H. Yang, Yunkun Zhou*
5. Stanford University
   *Jie Jun Ang, Huy T. Pham, Albert R. Zhang*

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:

Simona Diaconu, *Princeton University*

# The United States of America Mathematical Olympiad

The USAMO (United States of America Mathematics Olympiad) provides a means of identifying and encouraging the most creative secondary mathematics students in the country. It serves to indicate the talent of those who may become leaders in the mathematical sciences of the next generation. The USAMO is part of a worldwide system of national mathematics competitions, a movement in which both educators and research mathematicians are engaged in recognizing and celebrating the imagination and resourcefulness of our youth. The USAMO is a six-question, two-day, nine-hour essay/proof examination. This year it was held April 19-20.

**Winners** (in alphabetical order)

- Zachary Chroman, *The Nueva School, Hillsborough, CA **
- Andrew Gu, *Allderdice High School, Pittsburgh, PA **
- James Lin, *Phillips Exeter Academy, Exeter, NH **
- Daniel Liu, *Redmond High School, Redmond, OR*
- Michael Ren, *Phillips Exeter Academy, Exeter, NH*
- Victor Rong, *Marc Garneau Collegiate lnstitute, Toronto, Ontario*
- Ashwin Sah, *Jesuit High School, Portland, OR*
- Mihir Singhal, *Palo Alto High School, Palo Alto, CA*
- Alec Sun, *Phillips Exeter Academy, Exeter, NH*
- Kada Williams, *Radnoti Miklos Experimental Grammar School, Szeged, Hungary*
- Yuan Yao, *Phillips Exeter Academy, Exeter, NH*
- William Zhao, *Richmond Hill High School, Richmond Hill, Ontario*

**Member of the 2017 International Mathematics Olympiad USA Team*
Remaining IMO Team Members:
Junyao Peng, Princeton International School of Mathematics and Science, Princeton, NJ
Ankan Bhattacharya, International Academy East, Troy, MI
Vincent Huang, Jasper High School, Plano, TX

## The European Girls' Mathematical Olympiad

The European Girls' Mathematical Olympiad (EGMO) is a mathematical olympiad for girls which started in 2012. The fourth EGMO was held in Zurich, Switzerland, April 6 – 12, 2017. The United States was represented by a team of four who took first place with four gold medals.

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**Winners** (in alphabetical order)

- Angela Deng, *North Carolina School of Science and Math, Cary, NC*
- Wanlin Li, *Syosset High School, Syosset, NY*
- Qi Qi, *Phillips Exeter Academy, Exeter, NH*
- Siye Zhu, *Phillips Academy, Andover, MA*

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## The Romanian Master of Mathematics

The Romanian Master of Mathematics is an annual competition for students in the pre-university level, held in Bucharest, Romania; the 9$^{th}$ RMM was held February 22 – 27, 2017. The United States was represented by a team of four who took sixth place with three silver medals and one honorable mention.

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**Team Members**

- James Lin, *Phillips Exeter Academy, Exeter, NH*
- Zachary Chroman, *The Nueva School, Hillsborough, CA*
- Kevin Ren, *Torrey Pines High School, San Diego, CA*
- Michael Ren, *Phillips Exeter Academy, Exeter, NH*

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# Certificates of Meritorious Service

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.

## James Alvarez, Texas Section

James A. Mendoza Alvarez (University of Texas at Arlington) is a fixture of the mathematical community both in Texas and nationally. He most recently served on the MAA Board of Governors as the representative of the Texas Section and his term in the MAA Congress as Member-at-Large for Minority Interests began February 1, 2017. He serves on the Board of Directors for the Conference for the Advancement of Mathematics Teaching, and on the MAA's Gung and Hu Award Committee. He also served on the Advanced Placement Calculus Test Development Committee (2007-2010), involving himself with many other state and national organizations and initiatives.

Locally, Dr. Alvarez has overseen three PhD dissertations, and more than 35 Master's theses. He is a six-time recipient of UTA's Provost's Research Excellence Award, and earned UT-Arlington's Outstanding Honors Faculty Award in 2016, The University of Texas System Regents' Outstanding Teaching Award in 2010, and UT-Arlington's Innovation in Teaching Award in 2009. As a member of UT-Arlington's Academy of Distinguished Teachers, he holds the title of Distinguished Teaching Professor. He is also the Graduate Director of the UT-Arlington Master of Arts in Mathematics for Secondary Teachers program.

He is the recipient of more than six NSF grants, focused on improving mathematics education and participation. Dr. Alvarez has repeatedly received funding from the Texas Higher Education Coordinating Board to improve the quality of mathematics teacher preparation in Texas.

Dr. Alvarez is committed to improving mathematics education locally, regionally, and nationally. His dedication to that venture is evident from his actions, mentoring future teachers, current teachers, and mathematics students both at UT-Arlington and beyond.

## Response from James Alvarez

It is a special honor to receive the Texas Section Meritorious Service Award. As a Tejano, I care deeply about the success of the Texas Section as well as its role in influencing mathematics and mathematics education in Texas. I am fortunate to have so many colleagues from the Texas Section who have served as excellent role models in service. For example, Stuart Anderson, Neal Brand, Minerva Cordero, David Hendricks, and the late Efraim Armendariz among many others demonstrate how intense commitment, deliberate inclusiveness, and selfless service keep our Section vibrant and relevant to the mathematics community in Texas. The Texas Section mantra "it is an honor to serve" is a hallmark of this amazing spirit. I thank the Texas Section for this honor and for providing me a wonderful community of friends and colleagues.

## Biographical Note

James A. Mendoza Alvarez grew up near Saspamco, Texas on a farm his great-grandfather, a Mexican immigrant, purchased around 1900. As a child, he always enjoyed mathematics and teaching it to others. He intended to become a high school mathematics and physics teacher, but then pursued his PhD in mathematics at UT-Austin. He was fortunate to work closely with Uri Treisman in the early years of the Emerging Scholars Program at UT-Austin. This profoundly shaped his trajectory and involvement in key mathematics education initiatives as well as his work on increasing access and equity for historically underrepresented students in the mathematics-based disciplines. He served on the Fort Worth Youth Orchestra Board of Directors in his role as president of the FWYO Parents' Guild. He loves to sing and currently is cantor for his church. In addition, he enjoys traveling, genealogy research, dancing, and spending time with family.

# Scott Hochwald, Florida Section

Scott Hochwald was nominated for membership to the MAA as he graduated from Brooklyn Technical High School and joined in 1975. He became a member of the Florida Section in 1984 when he accepted a position in the Mathematics Department at the University of North Florida. Since then, he has served as Governor of the section, twice as President, as Vice-president for Programs, and twice as Vice-president for Site Selection. Even when not holding a formal office, Scott has been a member of the section Executive Committee serving annually on either the Awards Committee or the Nominations Committee. Scott received the Section's Distinguished Teaching Award in 2001 and the Distinguished Service Award in 2011.

The Florida Section is divided into six geographic regions and Scott has been a guiding catalyst in the First Coast Region (Jacksonville area). For many years Scott helped with the coordination and staging of a one-day regional meeting that brings together local area mathematicians from the public and private institutions in northeast Florida. Scott often presents at these meetings and at the annual section meeting, held each February, Scott is one of the most popular speakers; the Programs Committee must always ensure that Scott's talk is scheduled in a big classroom so as to accommodate the size of his audience.

For over twenty years, the University of North Florida has hosted an annual Mathematics Olympics competition for community college students. Scott has run this competition with much support from UNF faculty and students. He creates two of the three exams used in the competition and coordinates a myriad of logistical details each year. This competition is quite popular in the state and is attended by teams of students from as far away as the Miami area, the Tampa Bay area, and the Florida Panhandle.

Within the inner workings of the Executive Committee of the Florida Section, Scott is the keeper of the section history. He can recall from memory actions and initiatives taken in the past and the outcomes that they achieved. As the voice of reason in deliberations Scott keeps meetings focused and on track. Scott's long, continuing service to the

Florida Section of MAA and our profession is recognized with this Meritorious Service Award.

## Response from Scott Hochwald

It is a great honor to be selected by the Florida section for this award. I have been fortunate to be surrounded by mathematicians throughout the state of Florida who have helped me in all the areas that were mentioned. I have been an MAA member for over 40 years because it is the mathematics organization that best suits my view of mathematics. I was inspired to get involved in service by senior members of the section and I hope I have been an inspiration to new members over the years.

## Biographical Note

Scott Hochwald discovered the beauty of mathematics while he was a member of a Brooklyn Technical High School math class that spent three years under the guidance of Lawrence Zimmerman. He learned how to do mathematics at Caltech, where Richard Dean and Fred Dashiell played key roles in that phase of his education. He received his Ph.D. in mathematics from Berkeley under the direction of Don Sarason in 1984. Since that time he has been at the University of North Florida, where he is currently the Chair of the Department of Mathematics and Statistics. His research interests include Operator Theory, Linear Algebra, Number Theory, and History of Mathematics. It doesn't take much to get Scott to talk about mathematics and he has given such talks at many high schools, regional and state math meetings, and at teacher conferences and meetings.

## Heidi Keck, Rocky Mountain Section

Heidi Keck became a member of the Rocky Mountain Section of MAA in 1997 when she joined the faculty at Western State Colorado University. She received her B.S. from Bemidji State, M.S. from the University of Utah, and her Ph.D. from the University of Montana. She has been very active in the section over many years and has served as the section meeting program chair, on several section committees, and also two terms as the section Secretary/Treasurer.

The Secretary/Treasurer position is a crucial officer in our section governance since all section activities depend on the involvement of the section Secretary/Treasurer. Heidi has managed to keep the section financially secure and she has also played a vital part in the growth of our section awards program. Our section has a long tradition of recognizing outstanding teaching with the Burton W. Jones Distinguished Teaching Award, but Heidi has worked hard to add a new Early Career Teaching Award just this past year, and still manages to oversee the Section Activity Grant program. When support of regional undergraduate mathematics conferences ended and Pikes Peak Regional Undergraduate Mathematics Conference (PPRUMC) approached the Section for assistance, Heidi was influential in bringing the collaboration with PPRUMC to a successful conclusion. The timing of this Meritorious Service Award is fortuitous since we can recognize Dr. Keck at the conclusion of her second term as Secretary/Treasurer and the Rocky Mountain Section is also celebrating its centennial year.

## Response From Heidi Keck

I am greatly honored and humbled to receive the MAA Meritorious Service Award. Thank you to the members of the Rocky Mountain section, particularly Kyle Riley, for nominating me. I have enjoyed working with many wonderful people through my involvement with MAA. I am grateful for the opportunity for professional development and service that our section provides. Thanks also to my colleagues at WSCU who allow me to devote service requirements to the MAA.

## Biographical Note

Heidi Keck is Professor of Mathematics at Western State Colorado University, where she has been teaching for nearly twenty years. During this time she developed an interest in how people build internal models of mathematical concepts and worked on trying to find a way to assess this building process. In addition to working with undergraduate students, she is the director of the WSCU Mathematics Enrichment Day Camp for middle school students. The camp combines non-school based mathematics activities with outdoor adventures in an effort to convince young people that mathematics and fun are not opposites. In her spare

time she enjoys transforming written language, symbols and charts into unique (and sometimes useable) visual objects by knitting.

## Jean Johnson, Kansas Section

Jean Johnson has been an active member in the Kansas Section for more than twenty years. Jean often works quietly behind the scenes without receiving any recognition but her faithful attendance at annual meetings and participation in business meetings has provided a strong backbone for the Kansas Section. During 2000-2001, Jean served as the chair of the Kansas Section, hosting the Section Meeting at Baker University. Throughout her time she has served on various committees, including the executive committee, nominations committees and bringing students to the meetings and competitions. Her effective leadership style was taken to the next level in 2009-2012 when she served as Governor of the Kansas Section and a member of the Committee on the Undergraduate Program in Mathematics. Through her quiet and consistent leadership, Jean is always there, willing to assist in any way to help the section and its members and provide a wonderful role model for other female faculty in the section.

## Biographical Note

Jean Johnson is Professor of Mathematics at Baker University where she has been a faculty member for thirty years; she has been Chair of the Department of Mathematics, Computer Science, & Physics for the last twelve years. Jean is also active with Baker's institutional research. She served as governor of the Kansas Section and as a member of MAA's Committee on Undergraduate Programs in Mathematics. Jean completed her B.S. at Allegheny College and an M.S. and Ph.D. at Iowa State University.

## Jason Molitierno, Northeastern Section

Since embarking on his career at Sacred Heart University in 2001, Jason Molitierno has been dedicated to supporting the Northeastern Section. From 2002-2006 he organized and hosted annual Section Dinner Meetings at Sacred Heart, and he gave many presentations at section

meetings, regional dinner meetings, and MathFest. He has co-chaired the Program, and chaired the Local Arrangements Committee. From 2002-2005, 2007-2008 and 2009-2010 he served on the Distinguished Teaching Award Selection Committee of the Northeastern Section, chairing the committee for the 2008 and 2010 teaching awards. Jason has held numerous leadership positions in the Section. He is the current Governor of the Northeastern Section. He served as Chair of the Section from 2007-2009. An active member of the Executive Committee, he helped to revise the bylaws for the Section as well as to write the Section's guidelines for Program and Local Arrangements Committees. A Section NExT alumnus, he served as the Section NExT Coordinator for the Northeastern Section. In recognition of his rich contributions to the Northeastern Section, Dr. Jason Molitierno is recognized with a 2017 Meritorious Service Award.

## Response from Jason Molitierno

It means a great deal to me to be honored to be the recipient of this award. I thank my colleagues in the Northeastern Section for nominating me. The work that I have done over the past several years for the Northeastern Section never felt like work to me because I have enjoyed it so much. To me, the MAA is my mathematical home – especially the Northeastern Section. I am grateful for the many friends that I've made in the section and for the professional opportunities that the section has offered me. The Northeastern Section and the national MAA have immensely shaped my career. I feel that I am a better mathematician and colleague because of the Northeastern Section of the MAA.

## Biographical Note

Jason Molitierno is associate professor of mathematics at Sacred Heart University. He earned his B.A. in mathematics from Connecticut College in 1996 and his Ph.D. from the University of Connecticut in 2001. He has been teaching at Sacred Heart University since 2001 when he was fresh out of graduate school. He has been the department chair since 2011 and was recently elected to serve a third term as chair. Jason's research interests are in applications of matrix theory to graph theory. In addition to publishing several articles, his book *Applications of Combinatorial Matrix Theory to Laplacian Matrices of Graphs* was published in 2012 by Taylor & Francis / CRC press. In his time at SHU, he has taught most of

the undergraduate curriculum and has advised several senior theses. Jason currently lives in Cheshire, CT with his wife Kim. He is an avid New York Yankees fan, New York Giants fan, and has season tickets to UConn football where he loves a good tailgate.

## Gerard Venema, Michigan Section

Gerard A. Venema has been a pillar supporting the Michigan Section of the MAA, and the MAA generally, for decades. He joined the Michigan Section in 1979 as a member of the faculty at Calvin College. As the first member of his department to involve undergraduate students in research, and co-director of a Research Experience for Undergraduates program run jointly with Hope College, he created the connections between mathematicians and engagement with mathematics that characterize the MAA.

However, it is in his active support and work with the Section and the MAA more broadly that Gerard has made his larger mark. He has been involved with the Michigan Section in many capacities. He served as vice-chair, chair, and past chair of the Section, and also served as chair for the local arrangements committee for the 2006 Section meeting held at Calvin College.

Gerard has been a fixture in the leadership of the national MAA for many years, and has served for the last 8 years as Associate Secretary. In this capacity he has responsibility for all aspects of the scientific program at MAA's two annual meetings---MathFest and the Joint Mathematics Meetings. That Mathfest has thrived and grown under his stewardship is a testament to his dedication to and success at this position. In addition, he served for ten years as an Associate Editor of the *American Mathematical Monthly*, and currently sits on the editorial board of *MAA FOCUS*. Gerard's engagement with the MAA extends beyond these particular roles; he is present and engaged at local and national meetings, and his publications include an MAA text, *Exploring Advanced Euclidean Geometry with GeoGebra*.

Gerard's record outside of the MAA is similarly characterized by a broad service to his community. He served as department chair on three separate occasions, for a total of eight years. In this capacity he shepherded several important initiatives, from curricular revisions to

obtaining educational grants to improving procedures and goals for his college and department.

Gerard Venema is recognized with a MAA Meritorious Service award for his record of service at all levels of the profession.

## Response from Gerard Venema

I am surprised, honored, and grateful to receive this award from the MAA. I want to thank the Michigan Section for recommending me for the award and also to express my gratitude to colleagues at Calvin College who have consistently supported the service work I have done. For the past eight years, I have had the privilege of serving as the MAA Associate Secretary. I have enjoyed and appreciated the opportunity to work with hundreds of dedicated volunteers around the country who do an amazing amount of work to produce the rich and diverse scientific programs at the MAA's national meetings.

## Biographical Note

Gerard Venema is Professor of Mathematics Emeritus at Calvin College and MAA Associate Secretary. He earned an A.B. in mathematics from Calvin College and a Ph.D. from the University of Utah. He spent two years as an instructor at the University of Texas at Austin and another two years as a Member of the Institute for Advanced Study in Princeton, NJ, before returning to his *alma mater*, where he was a faculty member for 37 years. While on the Calvin College faculty he also held visiting positions at the University of Tennessee, the University of Michigan, and Michigan State University. He served two years as Program Director for Topology, Geometry, and Foundations at the National Science Foundation.

Venema's primary professional interest is Geometric Topology and he is coauthor, with Robert Daverman, of the research monograph *Embeddings in Manifolds*. More recently he has focused on undergraduate geometry and is the author of two textbooks in that field: *Foundations of Geometry* and *Exploring Advanced Euclidean Geometry with GeoGebra*.

# 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.

## Steven Klee

Steven Klee of Seattle University is an enthusiastic, innovative, and engaging teacher and research mentor. His students describe him as wonderful, passionate, and an amazing professor and they give him high ratings in all of his courses. He is said to have an almost perfect persona in the classroom: he's cheerful, speaks thoughtfully and eloquently, and demonstrates an infectious passion for mathematics. In addition to being a superb teacher, Dr. Klee has excelled at mentoring students in their work on research projects. In the past six years, he has mentored 31 research students on 15 different projects and has served as co-PI, co-director, and research mentor in the Seattle University Mathematics Early Research (SUMmER) REU program. His students have published papers and given talks and posters at the Joint Mathematics Meetings, the Nebraska Conference for Undergraduate Women in Mathematics, the Northwest Undergraduate Math Symposium, and a variety of MAA meetings. He has also incorporated his undergraduate research into the curriculum by developing a course for students to work on projects related to baseball sabermetrics.

Dr. Klee's impact extends beyond the undergraduate arena, and into the K-12 community. He co-founded and co-directs a program that is the first and only of its kind in the United States: the UW Math Olympiad and Math Hour provides 125 students in $6^{th}$ – $9^{th}$ grade each year the opportunity to compete in an oral math competition, and also offers lectures on interesting and accessible math topics to audiences of more than 200 students and parents. Additionally, Dr. Klee is the co-director of a local math circle for $7^{th}$ and $8^{th}$ graders, and he has served as a counselor, an invited speaker, and a course instructor for the Summer Institute for Math at the University of Washington for gifted high school students.

## Response from Steven Klee

I am humbled to receive this tremendous honor, which would not be possible without my amazing students. Their hard work, insightful questions, and energy make my job fun every day.

I am profoundly grateful to my high school teachers, who exposed me to a breadth of mathematics at a young age. Rick Gillman and Zsuzsanna Szaniszlo opened my eyes to combinatorial research while I was an undergraduate at Valparaiso, while also teaching me the importance of communicating mathematics well. This continues to inspire me to do research with my own undergraduate students. At the University of Washington, Julia Pevtsova and Ron Irving helped me grow as a teacher through math outreach programs. I am lucky to have had amazing advisors in Isabella Novik and Jesús De Loera, who showed me that excellence in research and excellence in teaching are not mutually exclusive endeavors. Most of all, I am grateful to my wife, Bridget, my son, Henry, and my parents for their continual love and support.

## Biographical Note

Steven Klee received a BS in mathematics from Valparaiso University in 2005 and a PhD in mathematics from the University of Washington in 2010. He was a VIGRE postdoctoral fellow at UC Davis from 2010-12, and has been an Assistant Professor at Seattle University since 2012. He is co-director of the University of Washington Math Circles and the University of Washington Math Hour Olympiad for middle school

students, and he has spent many summers teaching gifted high school students at the Summer Institute for Mathematics at the University of Washington. He is equally passionate about involving undergraduate students in research projects, working with his own students at Seattle University and with students from other institutions as the co-PI on the NSF-funded Seattle University Mathematics Early Research REU. He is the author of over 30 research papers, many of which have been written with undergraduate collaborators.

## Mary Beisiegel

Mary Beisiegel is a superb teacher of mathematics, an accomplished scholar and teacher of the teaching of mathematics, and a model teacher for her students and colleagues alike. In her classroom Dr. Beisiegel seamlessly blends small group work, short lectures, large group discussions, Socratic lectures, and student work at the board to convey as much mathematics as she can to as many students as possible. Her students call her a wonderful instructor and a great teacher; they applaud the fact that she is interested in her students discovering things for themselves, and they give her extremely high ratings even in classes like College Algebra, which are not known for producing stellar course evaluations. Dr. Beisiegel's colleagues see her as one of the very best teachers in a department known for excellent teaching, and report that her teaching is nothing short of spectacular. They especially value the fact that her focus is always on her students, and they are struck by the intense, ongoing reflective (and critical) stance she has taken toward her own teaching, which she is always seeking to improve.

Outside her classroom, Dr. Beisiegel is her department's expert on the professional development of teachers at all levels. She is the PI at Oregon State for the SUMMIT-P initiative, which is a five-year multi-institutional teaching partnership aimed at improving connections between science and mathematics in lower division courses. She coordinates the many faculty and TAs teaching differential calculus in her department, an activity to which she brings much-appreciated ideas and energy. She has redesigned her department's graduate TA training program, using her knowledge of the mathematics education literature to transform the support her department offers its graduate TAs. This work makes a

positive impact on the education of nearly every student who takes a math class at Oregon State.

## Response from Mary Beisiegel

It is a huge understatement to say that I am honored by my colleagues' and students' statements about my teaching and to receive the Alder award from the Mathematical Association of America. I love that I have a job that allows me to think about mathematics and mathematics teaching every day, a job that allows me to constantly learn about mathematics, how my students think about mathematics, and about my own teaching. I would like to thank my 10th and 11th grade math teachers – it is because of them that I decided to earn a degree in mathematics. I would also like to thank the National Science Foundation and leaders at Oregon State University for sponsoring a weekend symposium for women undergraduates in STEM fields – it is because of that weekend that I decided to go to graduate school. And thanks to all my family, friends, and colleagues who humor and encourage me as I constantly think and talk about mathematics and teaching mathematics.

## Biographical Note

Dr. Mary Beisiegel is an assistant professor in the Department of Mathematics at Oregon State University. She earned her PhD in 2009 at the University of Alberta. Her first position as an assistant professor was in the Mathematics Department at Western Oregon University, where she became a Project NExT Fellow and focused on teaching mathematics content courses to future teachers. In 2010, she accepted a research fellowship at the National Center for Teacher Effectiveness housed in the Harvard Graduate School of Education, working on a national study of elementary mathematics teaching. It was in this position that she learned to study mathematics teaching. In 2012, she moved back to her home state of Oregon, accepting a position in the Department of Mathematics at Oregon State University. Her current research focuses on post-secondary mathematics teaching and the mathematics offered to students during lectures and in active learning settings. She is currently a co-PI on a National Science Foundation sponsored project, which has as its main goal to strengthen connections between mathematics and sciences in lower-division courses.

## 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.

## Tatiana Shubin

Born in the former Soviet Union, Professor Shubin attended a school in Siberia founded by A. N. Kolmogorov. She received her B.S. in mathematics from Moscow State University and M.S. from the Kazakh State University in Alma-Ata, followed by an M.A. and Ph. D in Mathematics from UC Santa Barbara. She has published several papers and given a number of conference presentations on geometric combinatorics.

The variety of experiences she has had shaped her activities in Math Circles – open-ended problems, multiple approaches in problem solving, working in groups – both in general and in the Navajo Math Circles in particular. She came to understand the situation of indigenous populations because of her time in Kazakhstan. She has worked as a high school mathematics teacher in Leningrad, a research mathematician for a radio-electronic equipment factory, also in Leningrad, a lecturer at UC Davis, and as a long-time faculty member at San Jose State University. She founded the San Jose Math Circle and has run it for almost two decades.

Her Math Circles work expanded its scope dramatically when, in the mid 2000's, she co-founded the Math Teachers' Circle Network. This extended the Math Circle idea to groups of teachers, and, as the Conference Board of the Mathematical Sciences has put it, established "communities of mathematical practice in which teachers and mathematicians can learn about each others' profession, culture, and work." The Math Teachers' Circle Network has grown to more than 100 professional development communities throughout the United States, each of which involves dozens of teachers, so that colleagues estimate that the Network has an impact on around 175,000 students a year. Professor Shubin also initiated the MAA SIGMAA on Math Circles for Students and Teachers.

In 2012 during her first sabbatical in 27 years, she went to Navajo country on her own, and, working with Navajo educators, became the driving force behind what have now become half a dozen thriving circles. She also began running mathematics Teachers Circles at the Diné College, to train Navajo reservation teachers to organize student math circles. Over 2000 Navajo middle school and high school students have now been served, as well as about 250 teachers, and the project continues to grow. The recent film by George Csicsery, "Navajo Math Circles," sensitively portrays the role of Math Circles in the Navajo cultural context and also highlights Professor Shubin's contributions.

Beyond these achievements, Professor Shubin has presented and published many papers, and conducted many workshops, on Math Circles, teaching, and problem-solving. She won the Outstanding University Teacher of the Year Award of the Santa Clara Valley Mathematics Association in 2003, and the MAA Golden Section Award for Distinguished College or University Teaching of Mathematics in 2006. She co-founded the Bay Area Mathematical Adventures public lecture series, co-founded the MSRI/AMS Math Circles Library, and was co-winner of the Alfred Kalfus Founder's Award for her work in co-organizing the Western regional ARML competition.

## Response from Tatiana Shubin

I received the news of the award on my flight to the JMM 2017. To say that I was stunned is to say too little.

It is hard to express my gratitude to the MAA, to the Dolciani Foundation, to all my friends, to the entire mathematics community, and to mathematics itself. The feeling is far beyond any words. Once again, it proves that it is the very place I want to be at and the very people I want to serve and be friends with.

Mathematics is beautiful, magical, and generous. It is the most sublime way of applying human intellect. And we want to share its wonderful world with all, especially with young people. Having received the Mary P. Dolciani award proves to me yet another time that the mathematics community is well aware of the task and is fully supportive of it.

Irvilinda Bahe, a Navajo High School student and participant of Navajo Math Circles, said, "I got to realize that my love for math can take me places." What we are trying to achieve is exactly this – helping all budding mathematicians and all students to go marvelous places in their spiritual and physical journeys. The Mary P. Dolciani award will help me to continue this endeavor.

## Biographical Note

Tatiana Shubin joined the faculty of San Jose State University in 1985 after earning her Ph.D. in Mathematics from UC Santa Barbara. In 2006, she won the Northern California, Nevada, and Hawaii Section (a.k.a. Golden Section) of the MAA Award for Distinguished College or University Teaching of Mathematics.

She was born and grew up in the USSR, and as an eighth grader attended a specialized physics and mathematics boarding school in Siberia. These years were instrumental in kindling her passion for mathematics, and convinced her that interaction with working mathematicians can give young students much more than merely a solid training in the subject. This experience prompted her to co-found San Jose Math Circle and the Bay Area Math Adventures in 1998 – both projects have been running ever since - and to become one of the leaders of the National Math Circles movement. Shubin translated and edited several books published by the AMS in the MSRI Mathematical Circles Library. She is also the chair of the editorial board of this series.

She is a co-founder and co-director of Navajo Nation Math Circles project which is aimed at launching and supporting math circles for students and teachers on the Navajo Nation, and providing other mathematically rich experiences, such as summer math camps, to Navajo children. This project started in 2012 and is now expanding to include other Native American communities.

In 2006, Tatiana became a co-founder of the first Math Teachers' Circle in the US (and, in fact, in the world). This circle proved to be a seed which germinated to produce the entire Math Teachers' Circle Network. She has since remained a member of the leadership team of the organization.

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# Award Recipients

*(Alphabetically)*