MathFest 2007

PRIZES and AWARDS

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Program

Opening and Closing Remarks
Joseph A. Gallian, President
Mathematical Association of America

Carl B. Allendoerfer Awards

The Carl B. Allendoerfer Awards, established in 1976, are made to authors of expository articles 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.

Carl V. Lutzer

"Hammer Juggling, Rotational Instability and Eigenvalues,"
***Mathematics Magazine*, vol. 79, no. 4, 2006, pp. 243-250.**

The author analyzes the physical phenomenon familiar to tennis players and hammer jugglers that certain objects flip when rotated about one of their three rotational axes – the 'middle' axis. The article is organized so that readers can understand the main ideas in a quick reading, but it also invites the reader to delve into the details. The mathematics is not trivial, but the exposition is lively and engaging.

Lutzer uses Euler's equation, which gives the torque on a spinning object in $\Re^3$ in terms of the angular velocity. The behavior of the rotating system is governed by a 3×3 real symmetric matrix whose eigenvalues are positive and distinct. The author proves the positivity result using normed linear operators, which gives the reader a taste of the kind of mathematical methods typically used in the field.

The stability of any rotation is easy to see when the alignment with the axis of rotation is perfect, but perfection is impossible to achieve in practice. The author then shows that when the system is perturbed slightly, the rotation about the axis corresponding to the dominant eigenvalue remains stable, so there is no flipping along the longest axis. However for the middle eigenvalue, small perturbations rapidly propagate to produce large components along the other axes, so the object flips when rotated along this axis.

The author interweaves mathematical rigor with physical intuition throughout the paper. It could form the basis of a research project for students interested in physical applications of mathematics. In particular, students with some background in linear algebra and multivariable calculus should be able to follow all of the details. For any reader, the article rewards careful study with a deeper understanding of a widely observed but not widely understood phenomenon.

Biographical Note

Carl Lutzer is an Associate Professor of Mathematics at the Rochester Institute of Technology, and was selected for inclusion in the “Who's Who Among America's Teachers” in both 2003 and 2004. He was a finalist for RIT's Richard and Virginia Eisenhart Provost's Award for Excellence in Teaching in both 2002 and 2003, and was a 2000-2001 ExxonMobil Project NExT Fellow. He earned his Ph.D. from the University of Kentucky under the direction of Dr. Peter Hislop. His mathematical research interests tend to lie in the analysis of partial differential equations and their application to physics and biology. In addition to mathematics and teaching, he enjoys writing fiction, fencing (the sport, not the barrier), and being a father.

Response from Carl Lutzer

I've always enjoyed the articles in *Mathematics Magazine*, so I was excited when my article, "Hammer Juggling, Rotational Instability and Eigenvalues," was accepted for publication. Winning the Carl B. Allendoerfer Award has redoubled that excitement, and I now find myself speechless---I've struggled for a week to write this simple paragraph! So I'll just say that I am tremendously honored to win this award. I'd like to thank the editor and referees for their helpful suggestions, as well as my friends and colleagues at RIT for being so supportive. Lastly, I'd like to thank Ray Hodges for introducing me to the phenomenon, saying, "Hey, watch this!"

Saul Stahl

"The Evolution of the Normal Distribution," ***Mathematics Magazine*****, vol. 79, no. 2, 2006, pp. 96–113.**

All students who take a statistics course, and anyone who analyzes data, encounter the normal curve early in their study. This article traces the historical roots of the normal distribution and its early development by mathematicians and statisticians. This fascinating account includes false starts by some very famous mathematicians, disagreements about whether the mean or the median should be used to summarize data (or whether any single number should be used at all), and shows where the word 'normal' came from.

Throughout the 18th and 19th centuries, scientists needed tools to analyze the data they were collecting. The author begins with an early example of the binomial distribution: the Dutch mathematician Willem 's Gravesande analyzed data to decide whether the difference between the number of male and female births in London from 1629 to 1710 was explainable by chance. Such calculations were difficult, and in 1733, De Moivre found a way to approximate the binomial distribution using the normal curve, now familiar to all statistics students.

Much of the motivation for the development of the subject came from attempts to understand the errors associated with observations in astronomy. The author does an admirable job of tracing this history. Gauss plays a central role here, with his calculation of the orbit of Ceres leading to his proof that the normal distribution describes the distribution of observational errors. The author presents Gauss' proof here; a reader with a background in calculus should be able to understand the entire argument.

Stahl does a wonderful job of blending some interesting historical research with mathematical details to appeal to a very wide audience. Along the way, we encounter many familiar mathematical names: Jacob and Daniel Bernouli, Cotes, Simpson, Laplace, and Gauss, of course. The extensive bibliography will be valuable for readers wishing to learn more of the historical details.

Biographical Note

Saul Stahl was born in 1942 in Antwerp, Belgium. He received his B.A. from Brooklyn College in 1963, his M.A. from the University of California at Berkeley in 1966, and his Ph. D. from Western Michigan University in 1975. He served in the Peace Corps in Nepal, worked as a systems programmer for IBM in Endicott, NY and also as a postdoctorate fellow at Wright State University in Fairborn, Ohio. He joined the faculty of the University of Kansas in 1977 where he is now a Professor of Mathematics. Most of his research was done in the area of graph theory. He has written six textbooks at the junior-senior level whose exposition is very much informed by the evolution of their respective subject matters. Saul's current hobby is the Tango Argentino. His concern with the center of gravity of the dancers fits in nicely with his current research on the center of mass in hyperbolic geometry.

Response from Saul Stahl

I am honored to receive the Carl B. Allendoerfer Award from the MAA. The gathering of the information for the article that earned me this award was greatly facilitated by the excellent histories written by Anders Hald and Stephen M. Stigler.

Trevor Evans Awards

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

Robert Bosch

"Opt Art," ***Math Horizons*****, February 2006, pp 6-9.**

Many of us have learned about applications of optimization techniques to fields other than mathematics, but how many of us have studied or taught linear programming as it can be applied to art? In the creative article, "Opt Art," Robert Bosch introduces the reader to several such pictorial constructions, including photomosaics, domino artwork, and continuous line drawings. The pictures are made from building blocks, and the striking results are reminiscent of the pointillism style of painting. The mathematics in this article is clearly explained, and will inspire readers to try sketches of their own.

Biographical Note

Robert (Bob) Bosch is Professor of Mathematics and the Robert and Eleanor Biggs Professor of Natural Science at Oberlin College. He specializes in optimization, the branch of mathematics concerned with optimal performance. Since 2001, Bosch has devoted increasing amounts of time and effort into devising and refining methods for using optimization to create pictures, portraits, and sculpture. He has had pieces commissioned by mathematics departments at Colorado College, Western Washington University, Occidental College, Spelman College, and the organizing committees of several academic conferences. He operates a website, www.dominoartwork.com, from which it is possible to download free plans for several of his domino mosaics.

Response from Robert Bosch

I look forward to each issue of *Math Horizons*. So I was very excited when Art Benjamin and Jenny Quinn invited me to write and submit an article describing my artwork for a special issue on Mathematics and Art. Writing the article was great fun, as it gave me the chance to share what I love to do with what I consider to be a 'dream' audience. I was delighted when I got word (via e-mails, mainly) that readers were enjoying the article. And I am thrilled that I've been awarded the Trevor Evans Award! I'd like to thank Art and Jenny, my students, and my colleagues. But most of all, I'd like to thank my wife Kathy and son Dima, for all their support and for their having to put up with a constant stream of questions from me like, "Which looks better, this picture or that picture?"

Adrian Rice and Eve Torrence

"Lewis Carroll's Condensation Method for Evaluating Determinants," *Math Horizons*, November 2006, pp. 12-15.

This delightful article ties mathematics to poetry, as Adrian Rice and Eve Torrence explore a technique for computing determinants called "condensation." This method was developed by the Reverend Charles Lutwidge Dodgson, perhaps better known under his pseudonym Lewis Carroll. The authors provide clear examples, and their explanation for why condensation works is well-written and accessible to students. The article encourages readers to use the technique in the classroom, and we can all benefit from Lewis Carroll's words of advice: "Why," said the Dodo, "the best way to explain it is to do it."

Biographical Note

Adrian Rice received a B.Sc. in mathematics from University College London in 1992 and a Ph.D. in the history of mathematics from Middlesex University in 1997 for a dissertation on Augustus De Morgan. He is currently an Associate Professor of Mathematics at Randolph-Macon College in Ashland, Virginia, where his research focuses on 19th- and early 20th-century British mathematics. His recent publications include *Mathematics Unbound: The Evolution of an International Mathematical Research Community, 1800-1945*, edited with Karen Hunger Parshall, and *The London Mathematical Society Book of Presidents, 1865-1965,* written with Susan Oakes and Alan Pears.

Biographical Note

Eve Torrence received her Ph.D. in 1991 from the University of Virginia. She was a Clare Boothe Luce Professor at Trinity College, Washington, D.C. from 1991 to 1994 and is currently an Associate Professor at Randolph-Macon College. She was the chair of the Maryland-District of Columbia-Virginia Section of the MAA from 2005 to 2007 and is a member of the Pi Mu Epsilon Council. She is the co-author, with husband Bruce Torrence, of *The Student's Introduction to Mathematica, A Handbook for Precalculus, Calculus, and Linear Algebra*. Her areas of interest include geometry, origami, and mathematics education.

Response from Adrian Rice and Eve Torrence

We are honored and delighted to have been chosen as recipients of the Trevor Evans Award for our article on Lewis Carroll's work on determinants. This was a really fun subject to write about, as well as being a perfect fusion of our interests, since one of us is a historian of mathematics and the other is an algebraist. Plus, in addition to learning a lot while writing the article, the topic gave us some new ideas with regard to our teaching as well.

In addition to thanking the MAA for this great honor, we want to thank Art Benjamin and Jennifer Quinn, for their constructive comments and editorial advice during the preparation of the article, Bruce Torrence for his unstinting help and encouragement, and the Department of Mathematics at Randolph-Macon College for providing us with an environment in which colleagues from two different mathematical areas could collaborate so fruitfully.

Lester R. Ford Awards

The Lester R. Ford Awards, established in 1964, are made to authors of expository articles published in *The American Mathematical Monthly*. The Awards are named for Lester R. Ford, Sr., a distinguished mathematician, editor of *The American Mathematical Monthly*, 1942-46, and President of the Mathematical Association of America, 1947-48.

Andrew Granville and Greg Martin

"Prime Number Races," ***American Mathematical Monthly*****,**
vol. 113, no. 1, 2006, pp. 1-33.

The races in this exciting article are between primes in different congruence classes mod q. That is, fix q and consider for varying values of integers a relatively prime to q the functions $\pi_{q,a}(x)$ = the number of primes of the form $qn + a$ less than or equal to x. The prime number theorem for arithmetic progressions tells us that, asymptotically, the results for different such a will be the same, but this does not address whether or how often $\pi_{q,a}(x) > \pi_{q,b}(x)$ for specific values of x.

Granville and Martin offer a wonderful array of refined results about $\pi_{q,a}(x)$ vs. $\pi_{q,b}(x)$, beginning with Chebychev's observation that $\pi_{4,3}(x)$ appears to be larger than $\pi_{4,1}(x)$, coupled with J. E. Littlewood's 1914 theorem that there are arbitrarily large values of x for which $\pi_{4,1}(x) > \pi_{4,3}(x)$. In addition, the authors highlight M. Rubinstein and P. Sarnak's amazing 1994 result that, as $X \to \infty$,

$$\frac{1}{\ln X} \sum_{\substack{x \le X \\ \pi_{4,3}(x) > \pi_{4,1}(x)}} \frac{1}{x} \to .9959...$$

Of course, the generalized Riemann hypothesis figures in the discussion, as does a survey of some very recent research including that of both authors, as well as of teams of graduate and undergraduate (!) students.

Granville and Martin ably capture the thrill of the chase, the mathematics, and the many questions still to explore.

Biographical Notes

Andrew Granville was the Barrow Professor of Mathematics at the University of Georgia before moving, in 2002, to a Canadian Research Chair in number theory at the Université de Montréal.

His awards include the Presidential Faculty Fellowship in Mathematics (from President Clinton) in 1994, the 1995 Hasse Prize of the MAA, and the 2006 Jeffery-Williams Prize of the Canadian Mathematical Society. He was an invited speaker at the ICM in Zurich in 1994 and a plenary speaker at the Annual Joint Meetings of 1996 and 2002. He was recently elected to be a Fellow of the Royal Society of Canada.

He helped create the questions for the MAA's Putnam exam from 1999 to 2002. He has served on the scientific advisory panels of MSRI and of the Fields Institute, as well as on prize selection committees, such as for the 2005 Cole Prize.

Because of two of Dr. Granville's mentors, Paulo Ribenboim and Carl Pomerance, who are both famous expositors and lecturers, he was long encouraged to view communication of ideas to traditional and non-traditional audiences as one of his main roles as a research mathematician.

Biographical Note

Greg Martin is Associate Professor of Mathematics at the University of British Columbia (UBC) in Vancouver, having joined the department in 2001. He first began studying prime number races at the University of Toronto, where he was a postdoctoral fellow under the mentorship of John Friedlander.

He was named a Senior Early Career Scholar by the Peter Wall Institute for Advanced Studies at UBC in 2006 and was awarded a Killam Faculty of Science Teaching Award in 2007. In 2002, he won a Lester R. Ford Award for the article "Absolutely Abnormal Numbers."

Dr. Martin earned his Ph.D. at the University of Michigan. His two supervisors, Hugh Montgomery and Trevor Wooley, both delighted in sharing and communicating mathematics to others as much as they did developing mathematics—a legacy he is proud to inherit and continue.

Response from Andrew Granville and Greg Martin

It is a pleasure for us to accept this Ford Award. The *American Mathematical Monthly* serves a wonderful purpose of making accessibly written mathematics available to a broad audience. It also gives research mathematicians the opportunity to share some of their interests if only they can be suitably described. Finally, the *Monthly*'s articles prove that "serious mathematics" and "fun mathematics" can often be one and the same.

It was very gratifying for us to work on this project: we relished our discovery and rediscovery of the phenomena described in the paper, we enjoyed talking with various researchers to better understand their work and to present it accessibly, and we were pleased to highlight two of the various undergraduate research projects that have emerged in this field. We thank the MAA for recognizing this endeavor to explain many of the aspects of "prime number races."

Jeffrey C. Lagarias

"Wild and Wooley Numbers," ***American Mathematical Monthly*****,**
vol. 113, no. 2, 2006, pp. 97-108.

Think about the multiplicative semigroup S generated by the integer 2 together with

$$\left\{\frac{2n+1}{3n+2} : n \geq 0\right\}.$$

The Weak $3x + 1$ Conjecture states that every positive integer is an element of S. In this clear and captivating article, Lagarias invites the reader to investigate the truth of this conjecture by examining two other collections, the charmingly named Wild Numbers and Wooley Numbers. These Wild and Wooley Numbers are the irreducible elements of the semigroups generated by fractions of the form $(3n + 2) / (2n + 1)$ (for Wooley Numbers) or those elements together with the additional generator ½ (for Wild Numbers).

After investigating the structure of the Wild and Wooley semigroups, the author uses a nice mixture of number-theoretic results as he guides us through a proof that the Weak $3x + 1$ Conjecture is equivalent to the Wild Numbers Conjecture: The collection of Wild Numbers is the set of all prime numbers different from 3. Then Lagarias points us to his proof (in joint work with David Applegate) that both the Wild Numbers Conjecture and the Weak $3x + 1$ Conjecture are true.

In an article that uses both big guns and small arguments, Lagarias shows a deft touch as he shows us the structure of this attack on the equivalence and his enjoyment of the investigation.

Biographical Note

Jeffrey Lagarias received his Ph.D. in 1974 at Massachusetts Institute of Technology, with a thesis in number theory under the direction of Harold M. Stark. He worked at AT&T Bell Laboratories from 1974 to

1995, and at AT&T Labs-Research from 1995 to 2004, and is currently Professor at the University of Michigan. He has also held visiting positions in mathematics, computer science and physics. His research areas include algebraic and analytic number theory, computational topology, discrete geometry and mathematical physics. He has been a member of the MAA for over 40 years and delivered the Hedrick Lectures in 2005. He is a frequent contributor to the *American Mathematical Monthly*, including recent papers on Apollonian circle packings, the Riemann hypothesis, and the cited paper.

Response from Jeffrey Lagarias

I am honored to receive the Lester Ford Award for the second time. The first award, in 1985, was also for a paper on the $3x + 1$ problem. Is there a pattern here? I would like to thank David Applegate for stimulating interaction and enlightening computations in studying "Wild and Wooley Numbers." I would also like to thank Bruce Palka for valuable editorial suggestions and Trevor D. Wooley, my colleague at the University of Michigan, for selflessly contributing his name to the paper's title. Finally, I thank Philibert Schogt for writing his mathematical novel "The Wild Numbers." May its sales increase.

Lluís Bibiloni, Jaume Paradís and Pelegrí Viader

"On a Series of Goldbach and Euler,"*American Mathematical Monthly*, vol. 113, no. 3, 2006, pp. 206-220.

The series in question is

$$\frac{1}{3}+\frac{1}{7}+\frac{1}{8}+\frac{1}{15}+\frac{1}{24}+\frac{1}{26}+\frac{1}{31}+\frac{1}{35}+\ldots$$

in Euler's words, "the series….whose denominators, increased by one, are all the numbers which are powers of the integers,… . Thus, each term may be expressed by the formula $1/m^n-1$ where m and n

are integers greater than one. The sum of this series is 1." As to the importance of this series, Euler has to say "…the most astonishing feature of this kind of series would be the possibility of summing them up, as the known methods till now *require necessarily the general term* or the continuation law without which it seems obvious that we cannot find any other means of obtaining their sums."

At the heart of this paper is Euler's use of the infinitely large and the infinitely small. Euler's proof begins by assigning a 'value' to the sum of the harmonic series which, by our standards, should be considered a faulty mode of reasoning. The authors show how to salvage Euler's 'proof' introducing as few changes as possible and use this amendment as a pretext to introduce the notions of nonstandard analysis needed for the rigorisation of the argument. At the same time, it is also shown how the necessary modifications introduced allow for a rigorisation using only standard methods which purportedly are of help in making the nonstandard methods more understandable to non-specialists.

The result is informative and entertaining and specially worth rereading in the year of the 300th anniversary of Euler's birth.

Biographical Notes

Lluís Bibiloni is Associate Professor of Mathematics Education at the "Departament de Didàctica de les Matemàtiques i de les Ciències Experimentals" of the Universitat Autònoma de Barcelona. He received his Ph.D. in mathematics from the Universitat Politècnica de Catalunya. As to mathematics proper, his main research interest is the metrical theory of the continuum and related subjects. He has been deeply influenced by the work of George Pólya on problem solving and plausible reasoning, and he is pursuing Pólya's ideas at the practical teaching level as well as at the research level in mathematics education. His favorite mathematical subjects are number theory, mathematical logic, nonstandard analysis, and the philosophy and history of mathematics.

Jaume Paradís received a Ph.D. in mathematics from the Universitat Politècnica de Catalunya. He is now Associate Professor of Mathematics at the Universitat Pompeu Fabra, Barcelona. His research includes several books and papers on the history of algebra, mainly on Viète's and Fermat's contributions. He focuses his current research on metrical properties of real number representation systems and on singular functions defined with their help.

Pelegrí Viader is an Associate Professor of Mathematics at the Pompeu Fabra University, Barcelona. He received his Ph.D. in mathematics from the Universitat Politècnica de Catalunya. His main research interests are algorithms for the representation of real numbers, singular functions, and the history of mathematics. His interests besides mathematics are history at large, tennis, and enjoying the company of family and friends over a nice *paella* on a Mediterranean beach.

Response from Lluís Bibiloni, Jaume Paradís, and Pelegrí Viader

Our initial surprise when we read the mail from the MAA Secretary with the news of the Lester R. Ford Award was followed by a feeling of undeserved pride on seeing the list of the previous winners. To have a paper accepted by the *Monthly* is always a great honor, but to top that honor with the Ford Award was something we could not have expected. Of course, we had a lot of help from the Editor of the *Monthly* at the time, Bruce Palka. We want to take the opportunity to thank him and the referees who also contributed, making useful suggestions and remarks. The final privilege has been to receive the Ford Award in the Euler Year for a paper on part of his work. We are, naturally, greatly indebted to the Master of Us All, whose ideas have never stopped being a driving force! Finally, we want to thank the whole of the MAA team and specially the Lester R. Ford Award selection committee.

Harold P. Boas

“Reflections on the Arbelos," *American Mathematical Monthly*, vol. 113, no. 3, 2006, pp. 236-249.

Beginning with a brief account of a letter received from a mathematical amateur seeking help with an elementary geometry problem, Boas rhapsodizes on the history and mathematics of the *arbelos*, the plane region bounded by three semicircles tangent in pairs and having diameters on the same line. He presents a simple argument using reflection across the diameter line to calculate the area of the arbelos and elegantly establishes Pappus' theorem on chains of tangent circles in the arbelos by means of reflection in a circle (i.e., inversion). He notes, as did Jacob Steiner in 1826, how such chains of circles are related to Pythagorean triangles.

Besides Pappus and Steiner, along the way we meet Julian Lowell Coolidge, William Thomson (Lord Kelvin), the German engineer Otto Mohr, and the dentist, avocational mathematician, and arbelos expert Leon Banko, among others. Boas provides a rich mix of classical and inversion geometry, all while deftly weaving in historical and cultural observations (from leather-working knives to *sangaku* tablets in Japanese temples) and offering some surprising facts and most beautiful proofs.

Biographical Note

After earning a Ph.D. from Massachusetts Institute of Technology in 1980, Harold P. Boas was a J. F. Ritt Assistant Professor at Columbia University for four years before joining the mathematics faculty of Texas A&M University, where he remains today. In 1995, he shared the Stefan Bergman Prize with Emil J. Straube for research on the boundary regularity of solutions of the inhomogeneous multi-dimensional Cauchy-Riemann equations. He has served as book review editor of the *American Mathematical Monthly* (1998-1999) and editor of the *Notices of the American Mathematical Society* (2001-2003).

Response from Harold P. Boas

I had a lot of fun writing an essay about the arbelos, and I am delighted that my article found an appreciative audience. One of the topics that I encountered while researching the subject was the mathematics of "Ford circles," so I am especially pleased to receive an award named in honor of Lester R. Ford, the editor of the *American Mathematical Monthly* during World War II.

In 1946, looking back at the numerous frustrations of editing a mathematics journal during wartime, Ford wryly observed that government censorship was not among the challenges he faced: "Mathematical articles are seldom of a sort to give either aid or comfort to the enemy." I thank the selection committee for counting my work among the many excellent *Monthly* expositions that do give enjoyment to a friendly readership.

Michael Mossinghoff

"A $1 Problem," *American Mathematical Monthly*, vol. 113, no. 5, 2006, pp. 385-402.

This article cleverly uses the problem of designing the shape for a $1 U.S. coin as an excuse for an excursion into polygonal maximization problems. American $1 coins, which have always been circular, have never enjoyed popular acceptance. In contrast, the 11-sided Canadian $1 coin was so successful that within two years of its release in 1987, Canada stopped issuing $1 bills. Perhaps the United States should have a polygonal $1 coin? Slogans such as *E PLURIBUS UNUM* could be inscribed on the edge, with the two faces containing appropriate artwork. These considerations lead to the polygonal isoperimetric problem, which for fixed n and fixed perimeter asks for the n-gon with largest area. The author supplies a pretty proof that the regular n-gon is the unique solution to this problem.

Vending machine operators will be interested in the diameter of a coin (the maximum distance between any two points of the coin). This leads the author to discuss the two isodiametric problems of finding a convex n-gon with fixed diameter and largest area (or largest perimeter). If n is odd, the solution to both problems is again the regular n-gon. However, for $n \geq 6$ the regular n-gon provides neither maximal area nor maximal perimeter among all convex n-gons with fixed diameter. This surprising result allows the author to lead us to some fascinating, nonregular polygons.

Biographical Note

Michael Mossinghoff attended Texas A&M University as an undergraduate, then completed a master's degree in computer science at Stanford University. After a couple of years in industry, he entered graduate school in mathematics at the University of Texas at Austin, where he studied number theory under the direction of Jeffrey Vaaler. After graduating in 1995, he taught mathematics at Appalachian State University and mathematics and computer science at UCLA, and now teaches both subjects at Davidson College in North Carolina. He enjoyed coin collecting in his youth, and today remains something of a fan of money.

Response from Michael Mossinghoff

Alas, the new US Presidential $1 coin is round! While a round coin is certainly isodiametrically optimal, perhaps future coin designers will consider a nice polygonal shape! It was a lot of fun to research and write this article, and I hope others will have as much fun reading it as I did writing it. I have greatly enjoyed reading the *Monthly* since I was an undergraduate student, and I am honored to receive this award. I would like to thank Bruce Palka for his tireless work as *Monthly* editor. I would also like to thank the MAA, my terrific colleagues at Davidson, and most of all, my wife Kristine for her constant support.

George Pólya Awards

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

Richard Jerrard, Joel Schneider, Ralph Smallberg, and John Wetzel

"Straw in a Box," *College Mathematics Journal*, vol. 37, no. 2, March 2006, pp. 93-102.

The politics of high-stakes testing. A statewide exam with an unexpectedly large number of failures. A supposedly routine application of the Pythagorean Theorem. A few students with sharp eyes and inquisitive minds. Who would have imagined that this scenario would lead to such interesting mathematics and a beautifully written article in the *College Mathematics Journal*?

A multiple choice question on the New York Board of Regents exam asked for the longest straw that could fit into a 3 inch by 4 inch by 8 inch box. For most students, this problem merited only brief attention to either compute an answer for the longest line segment or to move on to other problems that seemed less daunting. But a few paused to ponder whether a literal (perhaps we should say accurate?) interpretation of the problem might lead to an answer other than the one the test creator intended. Jerrard, Schneider, Smallberg, and Wetzel lead us through the many geometric, algebraic, numerical, and computational twists and turns in seeking a more accurate solution to the problem. They show that the intuition of those suspicious students was indeed correct, and along the way make many mathematical connections. The result is an interesting, engaging, and satisfying story for a wide audience, including mathematically inclined high school students, college students, professionals in the discipline, and amateur mathematicians of all sorts.

Biographical Note

After stints as a military pilot and an engineer, **Richard Jerrard** received his Ph. D. from the University of Michigan in 1958. Since then he has been at the University of Illinois, where he is now an Emeritus Professor. He started as an applied mathematician and gradually migrated to topology and geometry, with stays at Cambridge University and the University of Warwick along the way. His recent work has been with Professor John Wetzel on 'fitting problems,' of which this is an example.

Response from Richard Jerrard

The paper concerns an ambiguously worded problem in the 2003 New York State Regents examination. Surprisingly, it seems likely that this is the first solution of the most difficult interpretation of the problem. I am very pleased that my colleagues and I have been selected for the George Pólya Award. Pólya was such a fine expositor and gifted mathematician that I never expected to be mentioned in the same sentence with him. I am happy to thank the MAA for this award.

Biographical Note

Joel Schneider received his Ph.D. in number theory from the University of Oregon in 1968. He developed an interest in mathematics education early in his career while teaching at Pennsylvania State University. This led him first to the Comprehensive School Mathematics Project in St. Louis and then, in 1983, to New York City to join Sesame Workshop (formerly Children's Television Workshop.) There, he directed the content for the mathematics television show, *Square One TV*, tutored his most famous pupil, The Count, from *Sesame Street*, and led many of the Workshop's other efforts in mathematics, science, and health education. The Joint Policy Board for Mathematics recognized his contributions to informal mathematics education with their 1993 Communications Award. At his untimely passing on September 12, 2004, he was Vice President for Education and Research of the Workshop and recognized internationally for his work using mass media for the intellectual and emotional betterment of children.

Biographical Note

Ralph Smallberg has an M.A. in anthropology from Pennsylvania State University and an M.B.A. from New York University. He lives in New York City and is an independent developer of curricular software and educational television for children. He has contributed to several nationally recognized initiatives in both informal and school mathematics and science education over the years including *3-2-1 Contact*, *Square One TV*, and *The Voyage of the Mimi*, and has also served as an advisor to many major educational publishers. Currently, he is a content director for an NSF sponsored American-Chinese collaboration on astronomy education for young children. While he is sure there is a difference between his vocational and avocational pursuits, he has been unable to distinguish them reliably and has given up trying.

Response from Ralph Smallberg

I am delighted to see the tale of the *Straw in a Box* receive recognition from the MAA. The tale started with Joel Schneider, who was the first to have detected the problem with the problem amid all the accompanying controversy within the mathematics education community. For those who knew him, this isn't surprising because Joel, with his good-natured grace, was a master at preserving the integrity of mathematical ideas communicated to non-mathematical audiences. The tale has reached its present (but hopefully not final!) resting place in the skilled hands of Jack Wetzel and Dick Jerrard, who have exposed its surprising richness. As an unabashed amateur in mathematics who has relished the tale from its origins, I would like to express my gratitude to my three co-authors who are pros.

Biographical Note

John Wetzel did his undergraduate work at Purdue and received his Ph.D. in mathematics from Stanford University in 1964. He retired in 1999 from the University of Illinois at Urbana-Champaign. He has been interested in problems in "elementary" geometry throughout his career, and in recent years he has been studying a variety of problems involving covering one shape by another, problems that truly are "fitting problems for retirement."

Response from John Wetzel

I am very pleased to learn that our article has been chosen for an MAA Pólya award, a wonderful honor. "Fitting" problems of this kind are fascinating. Easily stated and disarmingly elementary, they often prove to be unexpectedly difficult to solve - and, indeed, many remain unsolved. Their one redeeming feature is that they are great fun.

Allen Schwenk

"Distortion of Average Class Size: The Lake Wobegon Effect," *College Mathematics Journal*, vol. 37, no. 4, September 2006, pp. 293-296.

Allen Schwenk's Classroom Capsule presents an example of a statistical paradox and provides the analysis to give insight into a deeper result. The ideas presented extend previous work in an interesting article by David Hemenway that appeared in *Mathematics Magazine*. They are surprising, yet on further reflection the reader nods in agreement, "Oh, but of course!"

The opening paragraph immediately engages the reader with a clearly developed example to show how average class size depends on your point of view. By calculating average class size from the perspective of the university administration and comparing this to the handful of classes actually taken by an individual student in a particular year Schwenk shows the reader how these really are two different things leading to very different perceptions. Through a series of well-developed examples that set up the underlying concepts, he prepares even the casual reader for the proofs which follow.

Allen Schwenk has given us a superb example of the kind of writing that is engaging and enlightening not only for professional mathematicians and statisticians, but also for students and any other reader lucky enough to spend some time in the pages of the *College Mathematics Journal*.

Biographical Note

Allen Schwenk received his bachelor's degree in mathematics from Caltech where he won the E. T. Bell Undergraduate Research Prize. He earned his Ph.D. degree under Frank Harary at the University of Michigan. Before coming to Western Michigan University in 1985, he taught at the U. S. Naval Academy for nine years and had visiting positions at Michigan State, the University of Waterloo, and the Office of Naval Research. He is serving as Editor of *Mathematics Magazine* for 2006-2010. He and his wife Pat have three grown children and three grandchildren. He enjoys duplicate bridge and bicycling. In December 2006 in Hawaii he rode half of the bicycle route from the famed Iron Man Triathlon, but no swimming and no marathon. He maintains that this qualifies him for the title Tinman.

Response from Allen Schwenk

It is an honor and a special pleasure to receive an award named for George Pólya, one of my mathematical heros. But it was certainly unexpected. For at least ten years I sat on the "Lake Wobegon Effect," considering it too trivial to publish. This is a piece of fluff. Only after having dozens of conversations with mathematicians who never heard of it did I decide that this is a message deserving wider exposure. One referee asked if I hoped to change the way universities report average class size. Heavens no; let's not overestimate our influence. I once explained this effect to a dean with detailed examples and stated that we have a mathematical proof that the students always see classes larger than the average that the university reports. He replied, "I'm sure you do, but I am also certain that I could contrive a different example where the student average is smaller than what the university reports." He and I have a different perception of the meaning of the word proof.

Merten M. Hasse Prize

In 1986 an anonymous donor gave the Mathematical Association of America funds sufficient to support a prize honoring inspiring and dedicated teachers. The prize was to be named after Merten M. Hasse, who was a former teacher of the donor, and who exemplified these qualities of a fine teacher. The prize is designed to be an encouragement to younger mathematicians to take up the challenge of exposition and communication. 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.

Franklin Mendivil

"Fractals, Graphs, and Fields," ***American Mathematical Monthly*****, Vol. 110, No. 6, June 2003, pp. 503-515.**

This fine article draws three seemingly unrelated ideas together in a compelling way. It starts with the question: how can one render a fractal efficiently on a computer monitor of some fixed resolution, and arrive at a particularly neat solution by means of deBruijn sequences and finite fields. Along the way, we get a nice description of an iterated function system (a system of contracting linear maps) as a contraction on the space of compact subsets, and a fractal as the unique fixed point of this contraction. As a contraction, we see that past some number of iterations, the outcome is independent of the starting point but only on the sequence of maps chosen. It is here a deBruijn sequence (of maps) enters the picture, generated by an Eulerian path construction in a graph of maps. In a final twist, the author asks how to generate such a path on-the-fly, to minimize the memory that the algorithm must use, and motivates a construction involving polynomials over finite fields.

With smooth and lucid exposition, and well-chosen examples and illustrations, "Fractals, Graphs, and Fields" makes this connection among iterated function systems, deBruijn sequences, and finite field constructions seem inevitable, and one can't help but want to explore each of these subjects further. These are marks of great exposition.

Biographical Note

Franklin Mendivil is Associate Professor at Acadia University in Nova Scotia, Canada. After receiving his Ph.D. at Georgia Tech in topology, he worked on fractal methods in digital imaging in the Applied Mathematics Department at the University of Waterloo and then was an NSF University-Industrial postdoctoral fellow at Georgia Tech and Iterated Systems, Inc. (now part of Interwoven). He considers himself incredibly lucky to be a mathematician with the freedom to work on many different problems.

Response from Franklin Mendivil

It is an amazing honor to receive the Merten M. Hasse prize and to be recognized by the Mathematical Association of America. I firmly believe in the value of clear mathematical exposition and its ability to spark interest in things mathematical. Showing how different parts of mathematics are related and part of a unified whole is very important, as students often obtain only a fragmented view of mathematics. Mathematics is a beautiful subject and this beauty should be shown to as large an audience as possible. The publications of the MAA contain many examples of exciting and illuminating mathematics, which makes this award doubly meaningful to me.

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

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

Timothy Chartier

Timothy P. Chartier is applauded for his successful, influential teaching at Davidson College. His ability to tailor teaching methods and research projects to meet the needs of students is exceptional. In his courses, he wisely matches different modes of teaching to courses' pedagogical goals, and in his research work with students, he effectively chooses projects that respond to particular talents and abilities. An active expositor of mathematics, he not only serves on the editorial board of *Math Horizons* but also inspires undergraduates to write expository articles themselves. Professor Chartier coaches increasingly successful teams in the Mathematical Contest in Modeling and also finds time to run a popular weekly Math Coffee for students and faculty. Last—but certainly not least—he performs his very own *Mime-matics* show, à la Marcel Marceau, at elementary and middle schools and museums, demonstrating that mathematics is certainly fun! The MAA is pleased to present the Henry L. Alder Award to Timothy Chartier.

Biographical Note

Timothy Chartier received a B.S. and M.S. from Western Michigan University and a Ph.D. in applied mathematics from the University of Colorado. After a VIGRE postdoctoral position at the University of Washington, he arrived at Davidson College in 2003. Tim conducts research in numerical analysis, often in collaboration with national laboratories. He serves on the editorial board of *Math Horizons*. With professional mime training, Tim combines mathematics and art in public performances.

Response from Timothy Chartier

It is an immense honor to be selected by the MAA for this distinguished award, which affirms a larger journey. As such, I acknowledge some of those who significantly contributed to my development. My colleagues at Davidson College inspire me with their innovation in and commitment to teaching. I am grateful to Project NExT for its varied programming that repeatedly illustrated many available paths in academia. I am thankful to William Morrow, Steve McCormick, James Curry, Don Bonar, Ginger Warfield and Anne Greenbaum for their affirmation. I acknowledge Niloufer Mackey and S. F. Kapoor who are among the finest teachers from whom I have studied mathematics. Similarly, I thank Marcel Marceau for his masterful teaching and individual affirmation. I thank my parents who have modeled lifelong excellence in teaching and to my young son and daughter who exemplify the benefits of playful curiosity. Listed last only for emphasis, I express immense gratitude to my wife who serves as a deep well of insight on teaching and as a companion in my life journey.

Satyan Devadoss

Satyan Devadoss is said to have students raving about his teaching at Williams College. He has developed many new well-received courses for which there were no existing text materials. Among these innovations is a freshmen seminar on "The Shape of Nature" exploring geometrical aspects of science and nature. He has worked with a variety of students from seven different institutions in Williams' summer REU program and has 12 student co-authors on research papers. Furthermore, Professor Devadoss has an NSF grant to work with computer scientists and geodetic scientists. The project involves students in exploring the application of topological tools to explicit geographical data in order to create virtual surfaces representing actual geographic surfaces. He has given many talks in the schools, at other colleges, at AMS meetings and conferences, and at mathematics and art conferences. He authored a feature article in the *Notices* of the AMS and continues to do research with other faculty. For all these accomplishments and more, Satyan Devadoss is an Alder Award recipient.

Biographical Note

Satyan L. Devadoss is an Associate Professor of Mathematics at Williams College. He received his B.S. from North Central College, his Ph.D. from Johns Hopkins University, and was a Ross Assistant Professor at the Ohio State University. His research interests include combinatorial topology (from physics), computational geometry (from computer science), and the display of information (from art). Satyan has received grants from the NSF and funding from his home institutions for both research and teaching pursuits. He thrives on involving students in his research, focusing on the interplay of visual mathematics with the arts and sciences. Other than spending time with his wife and kids, Satyan enjoys drawing, photography, ice cream and the lack of exercise.

Response from Satyan Devadoss

I would like to thank the MAA for this fantastic honor. I am deeply grateful. Having been immersed at Williams College, surrounded by brilliant scholar-teachers, this award is certainly a collective adventure. In particular, I would like to recognize the fabulous colleagues in my department for providing me with a supportive and inspiring atmosphere, offering themselves as academic role models. Thanks also go to my mentors during my academic journey, especially Professors Shirley Wilson, Jack Morava, and Peter March. And of course, nothing would be possible without my students, who have been devoted, passionate, and patient in putting up with my teaching. Most importantly, I would like to thank my wife for her sacrificial commitment to me, and my Appa and Amma for instilling in me the gift of teaching.

Darren Narayan

Darren A. Narayan is an effective, enthusiastic classroom instructor at Rochester Institute of Technology. To help students learn and appreciate mathematics, he incorporates innovative teaching tools, such as web-based Java Applets and out-of-class projects involving real world applications. For example, he has collected problems from Microsoft Research, Mack Trucks, JetBlue Airways, and elsewhere for classroom use. Professor Narayan has an NSF grant, "The STEM Real World Applications Modules Project," that involves faculty members from departments outside mathematics in writing modules for the classroom. He continues to do research in mathematics, and has also built up a research experience program for undergraduates that has involved students from underrepresented groups. He has co-authored published research articles with students, and he served as a co-organizer of a session for presentation of research by undergraduates at the national AMS/MAA meetings. Further, he has worked with high school teachers at DIMACS Connect Institutes. For all these accomplishments and more, the Henry L. Alder Award is presented to Darren Narayan.

Biographical Note

Darren Narayan is currently an Associate Professor and Director of Undergraduate Research in Mathematics at the Rochester Institute of Technology. He received his B.S. in mathematics at SUNY Binghamton and M.S. and Ph.D. degrees from Lehigh University. Narayan currently holds two NSF grants focusing on education and undergraduate research. He has published sixteen refereed research papers and ten expository articles. In addition to mentoring students in his undergraduate research program, Narayan has helped secure over $12,000 for student travel. He has advised 13 undergraduate research students and one MS student, publishing papers with nine of them. While not doing mathematics, Darren enjoys reading, playing tennis, gardening, and spending time with his wife Tamara and daughters Sedona and Micada.

Response from Darren Narayan

I am thrilled to be named among this year's Alder Award winners. I am grateful to both the Alder family and to the MAA. It is surprising to be honored for doing something that I love in a career that is so rewarding. I would like to thank my parents, Jack and Marion Narayan, who have been the greatest teachers I have ever known. They have endowed in me a lifelong commitment to education. Thank you to Sophia Maggelakis for my nomination and tremendous support. Thanks to Joe Gallian who reminds me that we have the greatest job in the world. I am grateful to Project NExT, where I met my wife Tamara Burton. I depend on her not only for raising our daughters and keeping the household going, but also for her writing talents that make my grant proposals shine. Finally, I would like to thank all of the students I have had the pleasure of teaching. I have learned as much as I have taught.

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