MAA Prizes Presented in Burlington

The Mathematical Association of America (MAA) awarded a number of prizes at the Burlington Mathfest, held at the University of Vermont in Burlington in August 1995.

Carl B. Allendoerfer Awards

The Carl B. Allendoerfer Awards, established in 1976, recognize expository articles published in *Mathematics Magazine*. The awards are named for Carl B. Allendoerfer, a distinguished mathematician at the University of Washington and MAA president 1959–1960.

LEE BADGER was honored for "Lazzarini's Lucky Approximation of π" (*Mathematics Magazine* 67 (1994), 83–91). The citation says: "This interesting article combines a famous problem in probability with statistical methods of data analysis that can demonstrate fraud—or what the author more charitably calls 'hoaxes'. The example is concrete, the mathematics is rich and detailed, and the material is accessible to students with no more than a calculus background. There are broader lessons for the reader, too: rigged data are a fact of life, but so are the statistical tools that can detect them."

Lee Badger received his doctorate in logic and foundations at the University of Colorado in 1975. Today he does research in natural resource modeling and teaches pure and applied mathematics at Weber State University in Ogden, Utah.

TRISTAN NEEDHAM was recognized for "The Geometry of Harmonic Functions" (*Mathematics Magazine* 67 (1994), 92–108). The citation says: "The geometric approach of this carefully crafted and well-written article is enlightening; there is much here for the reader to learn about the interplay between geometry and analysis. In particular, we see how material almost invariably treated by analytic methods can be rethought—perhaps in ways closer to those used when the ideas were being developed. The author helps us to understand what something means and not just why it might be possible to prove it true. In this article, geometry becomes a powerful tool for conveying meaning."

Tristan Needham received his D.Phil. from Oxford in 1987, and in 1989 he left England for the University of San Francisco. His *Mathematics Magazine* paper was based on a section of his forthcoming book *Visual Complex Analysis* (Oxford University Press).

Lester R. Ford Awards

The Lester R. Ford Awards, established in 1964, recognize 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* 1942–1946, and MAA president 1947–1948.

FERNANDO Q. GOUVÊA was recognized for "A Marvelous Proof" (*American Mathematical Monthly* 101 (1994), 203–222). The citation says: "In June 1993 mathematicians were stunned by Andrew Wiles' announcement that he had proven Fermat's Last Theorem. But many of us were disappointed when we learned that only the experts in elliptic curves and modular forms would be able to understand the proof. Fernando Gouvêa has now come to our rescue with this introduction to the concepts behind Wiles' proof. Gouvêa has given us detailed yet elementary explanations of p-adic numbers, elliptic curves and their invariants, modular forms, and Galois representations, and the role they all play in Wiles' proof. An extensive list of references tells the reader where to go to learn more. Now the rest of us can understand some of the ideas behind this momentous mathematical advance."

Born in Brazil, Fernando Q. Gouvêa received his Ph.D. from Harvard University in 1987, working under Barry Mazur. Since then, he has taught at the University of São Paulo, at the Queen's University in Kingston, Ontario, and at Colby College in Waterville, Maine, where he is currently associate professor.

Robert Gray was recognized for "Georg Cantor and Transcendental Numbers" (*American Mathematical Monthly* 101 (1994), 819–832). The citation says: "Who is right? According to E. T. Bell, Cantor's insight about transcendental numbers provides no means whereby a single one of the transcendentals can be constructed, and, according to I. N. Herstein and I. Kaplansky, Cantor's idea can be used to yield an utterly explicit transcendental number. The present author's main purpose is to show (by an analysis of Cantor's original articles) that Cantor's methods lead to computer programs that generate transcendentals and determine which transcendentals are generated by the diagonal method. Theorem: a real number in the interval $(0, 1)$ is transcendental if and only if it is the diagonal number of a sequence that consists of all binary representations of algebraic reals in $(0, 1)$. The climax of the paper is a section called 'Why is Cantor's article misinterpreted?'"

"What is a paradox? …

it is a truth standing on its head to attract attention."

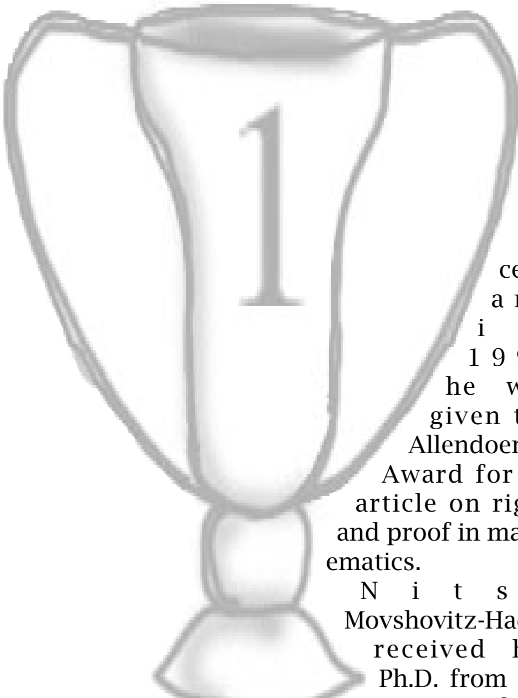
Robert Gray studied mathematics as an undergraduate at the California Institute of Technology and as a graduate student at the University of Wisconsin at Madison. In Madison he became interested in computers and left mathematics to work in the computer industry.

Jonathan L. King was recognized for "Three Problems in Search of a Measure" (*American Mathematical Monthly* 101 (1994), 609–628). The citation says: "If a compact convex region D in the plane is covered by (countably many) planks, must the sum of their widths dominate the width of D? What is the distribution of the leftmost digit in the decimal expansion of the powers of 2 (or 3, or 4, …)? If E is an ellipse inside another ellipse F, which points on the perimeter of F can be vertices of polygons that are inscribed in F and that circumscribe E? These questions are special cases of problems associated with the names of Tarski, Gelfand, and Poncelet respectively; the present paper concerns the relations among them and some of their generalizations. It is a bit of a surprise that the same kind of technique (the study of invariant measures) can be used to answer all three. Unsolved problems of the same kind still exist, and the paper ends with a charming sample: start with 2, and then square and square and keep squaring, getting the sequence $2, 4, 16, 256, 65536, \ldots$—what is the frequency of the leading digit 9?"

Jonathan King received a Ph.D. from Stanford University in 1984. He is now an associate professor at the University of Florida in Gainesville. In 1992 he spent a productive six months at MSRI, where he finally completed the "Three Problems" article, which was first conceived in 1984.

I. Kleiner and N. Movshovitz-Hadar were recognized for "The Role of Paradoxes in the Evolution of Mathematics" (*American Mathematical Monthly* 101 (1994), 963–974). The citation says: "What is a paradox? According to one answer that the authors quote, it is a truth standing on its head to attract attention. The paper consists of a discussion of some famous and important paradoxes and how they have influenced the development of mathematical ideas. The first one is the Pythagoreans' worry about the nonexistence of a rational number whose square is 2; that is followed by Wallis's skepticism about the value of negative numbers and Bombelli's about complex numbers. Logarithms led to the symbolic contradictions that 'tormented' Euler; the Dirichlet function (the characteristic function of the set of rational numbers) led Baire to offer a new definition of 'formula'. The difference between ordinary convergence and uniform convergence of series of functions and the existence of an everywhere continuous but nowhere differentiable function—all such things were paradoxical when they were first observed. Infinitesimals, different sizes of infinities, the equidecomposability of a pea and the sun—paradoxes all—are today the solid foundation on which mathematics rests."

Israel Kleiner received his Ph.D. degree from McGill University, and since 1965 he has been on the faculty of York University, where he currently holds the rank of professor in the Department of Mathematics and Statistics. In 1987 he received the Carl B. Allendoerfer Award for his article on the evolution of group theory; in 1990 he was given the George Pólya Award for his article on the evolution of the function con-



cept; and in 1992 he was given the Allendoerfer Award for an article on rigor and proof in mathematics.

Nitsa Movshovitz-Hadar received her Ph.D. from the University of California, Berkeley, where Leon Henkin served as her dissertation advisor. Since 1975 she has been on the faculty of the Department of Education at Technion-Israel Institute of Technology in Haifa, where she currently holds the rank of full professor.

William C. Waterhouse was recognized for "A Counterexample for Germain" (*American Mathematical Monthly* 101 (1994), 140–150). The citation says: "In this paper, William Waterhouse has managed to combine an introduction to quadratic forms and their use in number theory with a historical whodunit—or rather, howdunit. Beginning in 1804, Sophie Germain corresponded with Carl Friedrich Gauss under a male pseudonym, only disclosing her identity in 1807. Waterhouse reproduces for us Gauss' response to this disclosure, which contains his famous comments on the obstacles faced by women who wish to study mathematics. But Gauss' letter goes on to discuss a particular theorem from Germain's letter, pointing out an error in Germain's reasoning and presenting a counterexample to her theorem. The counterexample is a number of 13 digits, and of course it must have been computed by hand. How could Gauss have found it? Unfortunately, we don't have Germain's letter, so Waterhouse has to reconstruct it. Using clues from Gauss' letter, he deduces not only what her proposed theorem must have been, but also a key lemma she must have used in her proof and the subtle error in her proof of the lemma. Once this error is located, it is not hard to find a counterexample to the lemma, and this suggests a method of searching for a counterexample to the theorem. The method succeeds, and the first counterexample found is precisely the one given by Gauss."

William C. Waterhouse received his Ph.D. from Harvard University, with John Tate supervising his dissertation. He is currently professor of mathematics at Pennsylvania State University. In 1984 he won the Ford Award for "Do Symmetric Problems Have Symmetric Solutions?"

George Pólya Awards

The George Pólya Awards, established in 1976, recognize expository articles 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.

Anthony P. Ferzola was honored for "Euler and Differentials" (*College Mathematics Journal* 25 (1994), 102–111). The citation says: "In this fascinating glimpse of Leonhard Euler in action, Ferzola begins with a review of the understandings (and misunderstandings) about differentials in the work of Leibniz and Johann Bernoulli and then describes Euler's fresh approach to the subject. We are treated to Euler's derivation of the power, product, and quotient rules from differential calculus. Well-chosen special cases led Euler to the formula for the total differential and a false start to the change of variable formula for multiple integrals. In this interesting and timeless paper, Ferzola draws upon the original eighteenth century sources, with their mix of archaic procedure and brilliant insight. The author reminds us 'how much fun it is to read Euler,' and in the process the reader learns how much fun it is to read Ferzola as well."

Anthony P. Ferzola is an associate professor of mathematics at the University of Scranton. He received his Ph.D. in 1986 from New York University. He has been teaching undergraduate mathematics for the past seventeen years; twelve years were spent at the Maritime College, State University of New York.

Paulo Ribenboim was recognized for "Prime Number Records" (*College Mathematics Journal* 25 (1994), 280–290). The citation says: "This attractively organized and useful piece attacks four direct, unambiguous questions: How many prime numbers are there? How can one generate primes? How can one know if a given number is a prime? Where are the primes located? We get not just records, but masterly introductions to some of the principal results of Euler, Möbius, Fermat, Riemann, Mersenne, Gauss, Chebyshev, Littlewood, and a goodly collection of more recent players. There's no 'typical' record to single out among all the interesting records, facts, and formulas. Good professors such as Ribenboim teach us a lot through 'asides' such as ‘The primes are closer together than are, for example, the squares,’ since Euler showed that the sum of the reciprocals of the primes diverges, while the sum of the reciprocals of the squares of the integers converges. Pólya would be understandably delighted to see here in a Pólya Award paper his own proof that there are infinitely many primes.”

Born in Brazil, Paulo Ribenboim initially studied with J. Dieudonné in Nancy and W. Krull in Bonn. He received his Ph.D. at the University of São Paolo in 1957, when he became one of the first research professors at the Instituto de Matemática Pura e Aplicada in Rio de Janeiro. In 1962 he accepted a position at Queen’s University in Kingston, Canada, which he occupied for thirty-two years until his recent retirement. He is author of about 130 research papers and thirteen books, which include the famous books *13 Lectures on Fermat’s Last Theorem* and *The Book of Prime Number Records*.

Merten M. Hasse Prize

The Merten M. Hasse Prize was established in 1986 to encourage younger mathematicians “to take up the challenge of exposition and communication.” In alternate years it recognizes a noteworthy expository paper appearing in an MAA publication where at least one of the authors is younger than forty years of age.

ANDREW J. GRANVILLE was recognized for “Zaphod Beeblebrox’s Brain and the Fifty-ninth Row of Pascal’s Triangle” (*American Mathematical Monthly* 99 (1992), 318–331). The citation says: “Zaphod Beeblebrox’s Brain (more precisely, two brains) is a metaphor for ‘seeing the unexpected by looking in unexpected ways.’ Andrew Granville gives us an engaging example of just that sort of thinking. His paper is simultaneously an exhilarating romp through some amazing and unexpected congruences in the rows of Pascal’s much studied triangle, and an enlightening account of the often twisted creative processes that underlie mathematical discovery. With enthusiasm, charm, and considerable dexterity, Andrew Granville’s (presumably) single brain has crafted an original and extremely enjoyable exposition.”

Andrew Granville earned his Ph.D. in 1987 under the direction of Paulo Ribenboim at Queen’s University in Canada. Last year, he was named a Presidential Faculty Fellow and was an invited speaker at the International Congress of Mathematicians in Zürich. He is the David C. Barrow Professor of Mathematics at the University of Georgia.

— from MAA Prize Information