JOINT MATHEMATICS MEETINGS
BALTIMORE • JAN 15-18, 2014
AMERICAN MATHEMATICAL SOCIETY
MATHEMATICAL ASSOCIATION OF AMERICA

January 2014 Prizes and Awards

4:25 P.M., Thursday, January 16, 2014

Program

Opening Remarks
Bob Devaney, President
Mathematical Association of America

Award for Distinguished Public Service
American Mathematical Society

Bôcher Memorial Prize
American Mathematical Society

Frank Nelson Cole Prize in Number Theory
American Mathematical Society

Levi L. Conant Prize
American Mathematical Society

Leonard Eisenbud Prize for Mathematics and Physics
American Mathematical Society

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics
Mathematical Association of America

Euler Book Prize
Mathematical Association of America

Chauvenet Prize
Mathematical Association of America

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman
Association for Women in Mathematics

Louise Hay Award for Contributions to Mathematics Education
Association for Women in Mathematics

M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics
Association for Women in Mathematics

Communications Award
Joint Policy Board for Mathematics

Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student
American Mathematical Society
Mathematical Association of America
Society for Industrial and Applied Mathematics

Joseph L. Doob Prize
American Mathematical Society

Leroy P. Steele Prize for Seminal Contribution to Research
American Mathematical Society

Leroy P. Steele Prize for Mathematical Exposition
American Mathematical Society

Leroy P. Steele Prize for Lifetime Achievement
American Mathematical Society

Beckenbach Book Prize
Mathematical Association of America

David P. Robbins Prize
Mathematical Association of America

Certificates for Meritorious Service
Mathematical Association of America

Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics
Mathematical Association of America

Closing Remarks
David Vogan, President
American Mathematical Society

Award for Distinguished Public Service

This award was established by the AMS Council in response to a recommendation from their Committee on Science Policy. The award is presented every two years to a research mathematician who has made a distinguished contribution to the mathematics profession during the preceding five years.

Citation

Philip Kutzko

The American Mathematical Society's 2014 Award for Distinguished Public Service is presented to Phil Kutzko for his leadership of a national effort to increase the number of doctoral degrees in the mathematical sciences earned by students from under-represented groups.

Kutzko was one of several faculty at the Department of Mathematics at the University of Iowa who undertook, in 1995, to increase minority representation in its graduate program. In this role he has served as Director of the department's Sloan Foundation Minority Scholarship Program. As a result of this departmental effort, more than twenty-five U.S. citizens of minority backgrounds have earned Ph.D.s in mathematics at the University of Iowa in the period 2001–13. Kutzko, together with colleagues in the mathematics and statistics departments at the three Iowa Regents universities, founded the National Alliance for Doctoral Studies in the Mathematical Sciences; Kutzko has written the proposals to NSF through which the Alliance is funded and has served as its Director from its inception. The Alliance, founded in 2002, has grown to be a community of more than 250 faculty nationally who work closely with math science majors from minority backgrounds together with faculty at twenty-six doctoral granting departments in the mathematical sciences.

Kutzko's area of research is representation theory of p-adic groups with applications to the local Langlands program. He has continued to maintain his research program throughout his many years working on behalf of Ph.D. students from under-represented backgrounds. Indeed, three of his advisees, all of them from minority backgrounds, received their Ph.D.s under his direction in 2012. He is a most worthy recipient of the Distinguished Public Service Award.

Biographical Note

Phil Kutzko was born and raised in New York City. He is a product of the New York City public schools, and he attended the City College of New York. He received his M.S. and Ph.D. degrees at the University of Wisconsin. He joined the University of Iowa mathematics faculty in 1974. Kutzko's research area is the representation theory of p-adic groups with applications to number theory. He is the author, with Colin Bushnell, of a monograph in the *Annals of Mathematics Studies* and was an invited speaker at the International Congress of Mathematicians in Berkeley in 1986. He is presently a University of Iowa Collegiate Fellow and a Fellow of the AAAS.

Kutzko is honored to have played a part in the University of Iowa Department of Mathematics' activities in minority graduate education and in the extension of these activities to other departments of mathematical sciences, including those of the three Iowa Regents universities. In this context, he directs the departmental Sloan Foundation Minority Ph.D. Program as well as the National Alliance for Doctoral Studies in the Mathematical Sciences, an NSF-funded project which involves mathematical sciences departments at a variety of colleges and universities and whose goal is to increase the number of doctoral degrees in the mathematical sciences awarded to students from backgrounds that are underrepresented in these fields. Kutzko was honored for his work in this area with the 2008 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. This award was presented to him by President Obama in a White House ceremony in January 2010.

Response from Philip Kutzko

I am deeply honored to receive the 2014 Award for Distinguished Public Service from the American Mathematical Society and doubly honored when I reflect on those who have preceded me in this honor. Our initial effort to build diversity into the core of our graduate program at the University of Iowa was greatly aided by the support, and wisdom, of Carlos Castillo Chavez, the 2010 recipient of this award. It is hard to imagine that our department—or our National Alliance—would have had the success that it has had without his advice and leadership. The work that my colleagues and I have done on types and covers for p-adic groups has its origin in the ideas of Roger Howe, the 2006 recipient of this award; it builds on the pioneering work he did in this area. Paul Sally, the 2000 recipient of this award, has provided a whole generation of mathematicians with a model we may emulate—a model for research, a model for mentoring, and, above all, a model for citizenship. My personal and professional debt to him is enormous, and it is a pleasure to acknowledge it on this occasion.

This is a critical time for our profession. It is the nature of the way in which we do mathematics that it is in constant need of renewal, of new ideas and new approaches—of new eyes. This fresh perspective will come, as it always has in the past, from the inclusion of groups that have been previously underrepresented in our profession if we will only open the door and welcome them as they take their place among us. This door was opened for me by my high school and college teachers in New York City, by my professors at the University of Wisconsin, and by the mathematicians in whose steps I follow in accepting this high honor. I am deeply grateful for this recognition of the work that my colleagues and I are doing to open these doors for others.

Bôcher Memorial Prize

This prize, the first to be offered by the American Mathematical Society, was founded in memory of Professor Maxime Bôcher, who served as president of the AMS 1909–10. The original endowment was contributed by members of the Society. It is awarded for a notable paper in analysis published during the preceding six years. To be eligible, the author should be a member of the AMS or the paper should have been published in a recognized North American journal. Currently, this prize is awarded every three years.

Citation

Simon Brendle

The 2014 Bôcher Memorial Prize is awarded to Simon Brendle for his outstanding solutions of long-standing problems in geometric analysis, including the solution with R. Schoen of the differentiable sphere theorem ["Manifolds with 1/4-pinched curvature are space forms," *J. Amer. Math*. Soc. 22 (2009), no. 1, 297–307] and the solution of the Lawson Conjecture (to appear, *Acta Mathematica,* 2013). The committee also recognizes Brendle's deep contributions to the study of the Yamabe equation.

Biographical Note

Simon Brendle was born in Tübingen, Germany, in 1981. He received his Ph.D. from Tübingen University in 2001 under the direction of Gerhard Huisken. He has served on the faculty at Princeton University and is currently a professor at Stanford University. He has held visiting professorships at ETH Zürich and at Princeton University. In 2006, he was awarded an Alfred P. Sloan Fellowship, and in 2012 he was a recipient of the European Mathematical Society Award.

Response from Simon Brendle

I feel very honored to receive the 2014 Bôcher Memorial Prize of the American Mathematical Society. I am grateful to my parents, Helga and Martin Brendle, and my high school mathematics teacher Jakob Nill who provided me with an excellent education in mathematics. Finally, I am indebted to Richard Hamilton whose ground-breaking work on the Ricci flow in the 1980s formed the basis for the proof of the Differentiable Sphere Theorem, and to Gerhard Huisken who, in 1997, introduced the idea of two-point functions which later played an important role in the proof of Lawson's Conjecture.

Frank Nelson Cole Prize in Number Theory

This prize (and the Frank Nelson Cole Prize in Algebra) was founded in honor of Professor Frank Nelson Cole on the occasion of his retirement as secretary of the American Mathematical Society after twenty-five years of service and as editor-in-chief of the *Bulletin* for twenty-one years. The endowment was made by Cole, contributions from Society members, and his son, Charles A. Cole. The prize is for a notable paper in number theory published during the preceding six years. To be eligible, the author should be a member of the AMS or the paper should have been published in a recognized North American journal. This prize is awarded every three years.

Citation

Yitang Zhang, and Daniel Goldston, János Pintz, and Cem Y. Yıldırım

The 2014 Frank Nelson Cole Prize in Number Theory is awarded to Yitang Zhang for his work on bounded gaps between primes, and to Daniel Goldston, János Pintz, and Cem Y. Yıldırım for their work on small gaps between primes. This work appeared in two papers: Yitang Zhang, "Bounded gaps between primes," *Ann. of Math. (2)* (to appear); and Daniel Goldston, János Pintz, and Cem Y. Yıldırım, "Primes in tuples. I." *Ann. of Math. (2)* 170 (2009), no. 2, 819–862.

One of the oldest problems in number theory is the twin prime conjecture: that there are infinitely many pairs p and q of primes with $p - q = 2$. With the Goldbach conjecture, this is an archetypal problem that motivated the development of sieve theory by Brun, Linnik, Chen, Selberg, Bombieri, Iwaniec, Friedlander, Heath-Brown, and many others. Yet the twin prime conjecture seemed far out of reach when in 2005, Goldston, Pintz, and Yıldırım (GPY) showed that for every $\epsilon > 0$, there exist infinitely many pairs p and q of distinct primes with $|p - q| < \epsilon \log(p)$. Their very surprising proof of this breakthrough result used standard tools—the Selberg sieve and the Bombieri–Vinogradov theorem—together with innovative new ideas that are essentially combinatorial. The Bombieri–Vinogradov theorem is an error term for the prime number theorem for primes in an arithmetic progression. It is often used as a substitute for the generalized Riemann hypothesis in arithmetic applications. The Selberg sieve is a flexible tool, and the authors found a new and ingenious way of applying it to obtain their result. Slightly earlier work of Goldston and Yıldırım on this idea played a role in the proof by Green and Tao that primes exist in arbitrarily long arithmetic progressions.

After GPY there was optimism that improvements in the Bombieri–Vinogradov theorem might yield bounded gaps between primes. Such improvements had already been found by Iwaniec, Fouvry, and Friedlander culminating in the 1989 result of Bombieri, Friedlander, and Iwaniec. This result is an error term for the prime number theorem in a family of arithmetic progressions $mx + a$ where a is fixed and m varies.

Yet within a year or two of GPY, no one saw how to use the results of Bombieri, Friedlander, and Iwaniec to prove bounded gaps between primes. So the initial optimism gave way to pessimism. But then, very unexpectedly, Yitang Zhang did find a way, and he proved the striking result that there are infinitely many pairs p, q of distinct primes with $|p - q| < 7 \cdot 10^7$. Zhang saw that a different modification of the Bombieri–Vinogradov theorem could be used, in which the modulus m is constrained, together with a modification of the sieve ideas of Goldston, Pintz, and Yıldırım. Beyond the crucial initial insight, carrying out this plan combines input from several of number theory's most illustrious ideas. For example, the Riemann hypothesis for curves, due to Weil, and that for varieties, due to Deligne, are essential parts for his argument, as is the dispersion method of Linnik, which is used to transport the sieve inequality to the relevant exponential sum bounds.

Biographical Note

Yitang Zhang received his B.S. from Peking University and his Ph.D. from Purdue University. Since 1999, he has been a lecturer in the Department of Mathematics and Statistics of University of New Hampshire. His research is mainly in the field of analytic number theory, in particular the distribution of prime numbers and the distribution of zeros of the zeta function. He received the 2013 Morningside Special Achievement Award in Mathematics from the International Conference of Chinese Mathematicians in July 2013. Recently, he has been appointed a full professor by University of New Hampshire.

Response from Yitang Zhang

I am humbled and honored to have been selected as the corecipient of the Frank Nelson Cole Prize in Number Theory. This honor should really be credited to those who have influenced my work. In particular, it is the work of Bombieri, Fouvry, Friedlander, and Iwaniec on the stronger versions of the Bombieri–Vinogradov theorem that provides indispensable tools for bounding the error terms. I am grateful to the *Annals of Mathematics* for the quick reaction on my submission and to the referees for studying the manuscript thoroughly and making useful comments; I had not expected that the paper would be accepted within a few weeks. Finally, I must thank the people who contributed great help in my academic career: Dr. Perry Tang, Professor Liming Ge, and the late Professor Kenneth Appel.

Biographical Note

Daniel Goldston was born on January 4, 1954, in Oakland, California. He attended the University of California, Berkeley starting in 1972, receiving his Ph.D. in 1981 under the supervision of R. Sherman Lehman. He worked at the University of Minnesota Duluth for a year before spending the 1982–83 academic year at the Institute for Advanced Study in Princeton. Since 1983 he has worked at San Jose State University except for semesters spent at the Institute for Advanced Study in 1990, the University of Toronto in 1994, and MSRI in 1999.

Response from Daniel Goldston

The mathematical work for which this prize has been awarded was aided by many mathematicians over many years, but I will not attempt to thank them all individually. Let me tell a story which starts in 1999, when, for many of us, the recent stunning work of Yitang Zhang would have seemed less likely than a proof of the Riemann Hypothesis.

Cem and I were both visiting MSRI in Berkeley, and one day he came in and said that rather than working on the paper we were supposed to be writing, he had been trying to work out a triple correlation divisor sum. We started working on this together and, after a few weeks, began to see that it was possible to work out asymptotic formulas for this type of sum. Over the rest of the term we continued to work on this, at first getting different answers each time we did the calculation but eventually tending toward only one answer. Cem went back to Turkey, but we continued our joint work by email, slowly working out asymptotic formulas for these sums. This was incremental research, the only kind I actually know how to do, where we used standard classical methods and neither knew nor expected any exciting applications. At the time with little kids of ages 0, 2, and 4 in the house and fragmented times for work, doing these calculations was ideal since they could be interrupted and then easily resumed. Finally, when the kids were 3, 5, and 7 in 2003, Cem and I thought we had made a breakthrough on gaps between primes but, while we received a lot of publicity, this did not help change the fact that the proof was wrong. Math can be a tough business, and while mathematicians often do not have much humility, we all have lots of experience with humiliation. Fortunately, in this case our work was not destined for the wastebasket, and in 2004 Green and Tao found a use for our formulas in their work on arithmetic progressions of primes, and in 2005 with János Pintz we obtained the GPY method which proved new results on gaps between primes, and provided part of the foundation for Zhang's great advance in 2013.

Biographical Note

János Pintz received his M.Sc. at the Eötvös Loránd University in Budapest, Hungary, in 1974 and his Ph.D. (so-called *candidate's degree*) from the Hungarian Academy of Sciences in 1975 under the supervision of Professor Paul Turán. After working for a few years at Eötvös Loránd University, since 1977 he has been a research fellow at the Mathematical Institute of the Hungarian Academy of Sciences, which today is called Alfréd Rényi Mathematical Institute of the Hungarian Academy of Sciences after its founder and first director, Alfréd Rényi. During this period, he was visiting professor at several foreign universities for a few years. His research focuses on prime number theory. In the past twenty years he worked mostly on three of the four famous problems mentioned by Landau more than a hundred years ago in his invited address at the International

Congress of Mathematicians in Cambridge in 1912; namely, the Goldbach conjecture, the twin prime conjecture, and large gaps between consecutive primes. He is a member of the Hungarian Academy of Sciences and the Academy of Europe.

Response from János Pintz

I am grateful to the American Mathematical Society and the Selection Committee for the great honor of choosing me as one of the corecipients of the 2014 Frank Nelson Cole Prize in Number Theory. I have to say that when I first learned some three or four decades ago that my famous fellow citizen, Paul Erdős, received this award for his contribution to the elementary proof of the Prime Number Theory, I could not have imagined that one day I would be honored with the same distinction. This is even more true if one takes a quick look at the list of giants in number theory who received this prize after Paul Erdős in the past sixty years. First I would like to thank my late Professor Paul Turán, who showed me the beauty of primes in his lecture when I was still a first-year undergraduate student at Eötvös University, and who was my advisor until his unduly early death at age 66 in 1976. I also would like to thank my friends and colleagues Endre Szemerédi and Gábor Halász from whom I learned very much in the later stage of my career. My special thanks are due to my co-authors, friends, and corecipients of this prize, Dan Goldston and Cem Yıldırım, for the very friendly and fruitful collaboration during the past years which led to a number of results about small gaps between primes. I also thank my wife and children, the Alfréd Rényi Mathematical Institute of the Hungarian Academy of Sciences, and finally God for a fortunate life, in that I was able to devote most of my time to my work, hobby, and obsession: to think about mathematical problems, especially those connected with the mysteries of primes. In this respect I can quote one of the greatest mathematicians of all times, Leonhard Euler, who once said, "Mathematicians have tried in vain to this day to discover some order in the sequence of prime numbers, and we have reason to believe that it is a mystery into which the human mind will never penetrate." I am very glad that standing on the shoulders of giants, such as Birch, Bombieri, Deligne, Fouvry, Friedlander, Heath-Brown, Iwaniec, Motohashi, Selberg, and Weil, we, the recipients of the 2014 Frank Nelson Cole Prize, could somewhat reduce the domain of mysteries of primes into which the human mind can never penetrate.

Biographical Note

Cem Yalcın Yıldırım was born in Bloomington, Indiana, in 1961. He grew up in Ankara, Turkey, and received his B.Sc. degree in physics from Middle East Technical University (METU), Turkey, in 1982, and his Ph.D. from University of Toronto, Canada, in 1990 under the supervision of John B. Friedlander. Since 2002, he is professor of mathematics at Boğaziçi University, Istanbul, Turkey, studying mostly analytic number theory and classical analysis.

Response from Cem Y. Yıldırım

I am humbled and honored to be one of the recipients of the 2014 Frank Nelson Cole Prize in Number Theory. My education began at home, where I was raised in an intellectually stimulating environment. I am grateful to my parents for always encouraging me to concentrate upon anything that interested me. I was completely enraptured when I stumbled upon the classic book on number theory by Hardy and Wright in the library of my high school, and from then on I knew what area I wanted to learn most. The Department of Mathematics at METU had an excellent atmosphere for an undergraduate eager to absorb mathematics.

I am grateful to the University of Toronto, where I was granted scholarship throughout the years I pursued my studies toward a dissertation, and to my Ph.D. thesis supervisor, John B. Friedlander, who always gave me his support even well after I graduated. In 1995 I began collaborating with Dan Goldston on his so-called lower bound method while on sabbatical at San Jose State University. Later on, visits to MSRI, MFO, and IAS were very beneficial to me. I am deeply indebted to Dan Goldston and János Pintz for always sharing ideas freely. Our collaboration has been a great learning process for me. I would also like to thank Boğaziçi University for providing enlightened and peaceful working and living conditions.

Levi L. Conant Prize

This prize was established in 2000 in honor of Levi L. Conant to recognize the best expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years. Levi L. Conant (1857–1916) was a mathematician who taught at Dakota School of Mines for three years and at Worcester Polytechnic Institute for twenty-five years. His will included a bequest to the AMS effective upon his wife's death, which occurred sixty years after his own demise.

Citation

Alex Kontorovich

The 2014 Levi L. Conant Prize is awarded to Alex Kontorovich for his article, "From Apollonius to Zaremba: Local-global phenomena in thin orbits," *Bull. Amer. Math. Soc.* 50 (2013), no. 2, 187–228.

This article introduces us to a new field of number theory that has proven to be extremely fruitful, even in shedding light on some ancient problems. The author illustrates the new ideas by focusing on three problems, which at first glance seem totally unrelated, but each of which is an attractive mixture of algebra and geometry. The first problem (Zaremba's Conjecture) asks whether every integer is the denominator of a fraction which can be expressed as a continued fraction

$$x = \cfrac{1}{a_1 + \cfrac{1}{a_2 + \ddots}},$$

where the a_j are constrained to be 1,2,3,4,5. The second problem is more overtly geometric and asks whether all sufficiently large integers (not prohibited by congruence conditions) occur as curvatures in an integral Appolonian gasket, a configuration of circles with many tangencies. Finally, the third problem asks if there are infinitely many primes that occur as hypotenuses in a thin orbit of Pythagorean triples.

Kontorovich masterfully introduces the general reader to these problems and the ways in which they are connected through the concept of orbits of groups of matrices that are of infinite index in a group of integral matrices (hence the "thin"). He also introduces the "circle method," a heuristic principle for going from local to global results.

The article is full of pictures, interesting history, and references to a great deal of mathematics, some very classical and some very modern. As the author points out, it is a side of number theory that borrows freely from L-functions, the Langlands program, and classical sieve theory as well as a number of other fields without being subsumed by any of them.

The article dips into some deep mathematics while maintaining a casual flow so that both expert and novice readers alike are entertained throughout this look at ancient problems through a modern lens.

Biographical Notes

Alex Kontorovich is an assistant professor of mathematics at Yale. He was born in 1980 in Voronezh, Russia, and grew up in New Jersey after the family emigrated in 1988. He received a B.A. from Princeton in 2002 and a Ph.D. in 2007 from Columbia, advised by Dorian Goldfeld and Peter Sarnak. Following a Tamarkin Assistant Professorship at Brown (2007–10), he taught at Stony Brook (2010–11) before moving to Yale. He is the recipient of an NSF Postdoctoral Fellowship, an NSF CAREER Award, a Sloan Research Fellowship, and has twice been a year-long member at the Institute for Advanced Study. His other joys include music and spending time with his family, wife Amy and son Harry.

Response from Alex Kontorovich

I am deeply humbled and very surprised to receive the 2014 Levi L. Conant Prize from the American Mathematical Society. The idea of writing an expository article had never occurred to me until Andrew Granville planted the seed in my head years ago. Over time, Andrew gently prodded until I finished the task, making innumerable comments and suggestions which drastically improved various drafts along the way (of course his writings were my model of outstanding exposition); a share of the prize belongs to him. Another share belongs to Jean Bourgain: the main theorems discussed in this paper are part of our ongoing collaboration, and I am grateful for his tutelage. There would have been nothing to report had Peter Sarnak not introduced us to Apollonian gaskets, and Curt McMullen to Zaremba's conjecture. I should also like to take this opportunity to thank my many teachers. In addition to the more obvious (advisors and co-authors), these include Yakov Sinai, Eli Stein, John Conway, John Morgan, and Ioannis Karatzas. I greatly enjoyed the opportunity and challenge to collect some aspects of thin groups in this paper; hopefully, it might encourage more people to go into this new field.

Leonard Eisenbud Prize for Mathematics and Physics

This prize was established in 2006 in memory of the mathematical physicist Leonard Eisenbud (1913–2004) by his son and daughter-in-law, David and Monika Eisenbud. Leonard Eisenbud was a student of Eugene Wigner. He was particularly known for the book *Nuclear Structure* (1958), which he coauthored with Wigner. A friend of Paul Erdős, he once threatened to write a dictionary of *English to Erdős and Erdős to English*. He was one of the founders of the physics department at Stony Brook University, where he taught from 1957 until his retirement in 1983. In later years he became interested in the foundations of quantum mechanics and in the interaction of physics with culture and politics, teaching courses on the anti-science movement. His son, David, was President of the American Mathematical Society 2003–04.

The prize will honor a work or group of works that brings mathematics and physics closer together. Thus, for example, the prize might be given for a contribution to mathematics inspired by modern developments in physics or for the development of a physical theory exploiting modern mathematics in a novel way.

The prize will be awarded every three years for a work published in the preceding six years.

Citation

Gregory W. Moore

The 2014 Leonard Eisenbud Prize for Mathematics and Physics is awarded to Gregory W. Moore for his group of works on the structure of four-dimensional supersymmetric theories with extended supersymmetry. His works on supersymmetric solitons in a variety of contexts—including black holes in supergravity, branes in string theory, and monopoles in gauge theory—have led to an explanation of the wall-crossing phenomena in the BPS spectrum. Moore's research has injected new physical ideas and created new constructions in the mathematical fields of cluster algebras, integrable systems, and hyperkähler geometry.

In particular the following papers are cited:

1. Frederik Denef and Gregory W. Moore, "Split states, entropy enigmas, holes and halos," *J. High Energy Phys.* 129 (2011), no. 11, i, 152 pp.

2. Duiliu-Emanuel Diaconescu and Gregory W. Moore, "Crossing the wall: branes versus bundles," *Adv. Theor. Math. Phys.* 14 (2010), no. 6, 1621–1650.

3. Davide Gaiotto, Gregory W. Moore, and Andrew Neitzke, "Four-dimensional wall-crossing via three-dimensional field theory," *Comm. Math. Phys.* 299 (2010), no. 1, 163–224.

4. Davide Gaiotto, Gregory W. Moore, and Andrew Neitzke, "Wall-crossing, Hitchin systems, and the WKB approximation," *Adv. Math.* 234 (2013), 239–403.

5. Davide Gaiotto, Gregory W. Moore, and Andrew Neitzke, "Spectral networks," *Ann. Henri Poincaré*, 14 (2013), no. 7, 1643–1731.

Biographical Note

Gregory W. Moore received his A.B. in physics from Princeton University in 1982 and his Ph.D. in physics from Harvard University in 1985. He then joined the Harvard Society of Fellows and in 1987 became a five-year member at the Institute for Advanced Study (IAS) in Princeton. In 1989 he joined the faculty at Yale University. He moved to the Department of Physics and Astronomy at Rutgers University in 2000. He has held visiting professorships at the Kalvi Institute for Theoretical Physics (KITP) in Santa Barbara, California, and at the IAS. The Inspire HEP database lists 170 papers co-authored by Professor Moore on physical mathematics, with an emphasis on geometrical structures in physics. Most notably he has worked on rational conformal field theories (with applications to condensed matter physics), two-dimensional quantum gravity and matrix models, topological field theories, string dualities and D-branes, applications of K-theory to string theory, connections between number theory and supersymmetric black holes, and the properties of BPS states of supersymmetric theories with an emphasis in recent years on their wall-crossing properties and relations to hyperkähler geometry. He is a member of the American Physical Society, the American Mathematical Society, the American Academy of Arts and Sciences, and a general member of the Aspen Center for Physics.

Response from Gregory W. Moore

I am deeply honored, and not a little surprised, to be the sole recipient of the 2014 Leonard Eisenbud Prize for Mathematics and Physics. First and foremost I would like to thank my collaborators, Frederik Denef, Emanuel Diaconescu, Davide Gaiotto, and Andrew Neitzke, for their essential insights and enthusiasm for what turned out to be a very fruitful line of enquiry. I was the senior author only in years—not infrequently it was my collaborators who were leading the charge.

Since the AMS has requested a response to this award, I will use the opportunity to sketch my viewpoint on how the work mentioned in the citation fits into a broader context and then to conclude even more broadly with some thoughts on the place of physical mathematics in the contemporary relation of the mathematical and physical sciences.

A central theme of the work in the citation is the behavior of four-dimensional theories with $N = 2$ supersymmetry. The 1994 breakthrough of Nathan Seiberg and Edward Witten amply demonstrated that quantum field theories with extended supersymmetry constitute a Goldilocks class of theories which are special enough to admit exact nontrivial results on their dynamics but general enough to exhibit a host of nontrivial phenomena in quantum field theory. The promise of the Seiberg–Witten breakthrough is two-fold: First, one can make exact statements about how the massless particles in the theory interact at low energies. Second, one can make exact statements about the spectrum of the Hamiltonian for a subsector of the Hilbert space of states called the "BPS subspace." One of the key features of these theories is that the vacuum state is not unique, but rather it is parametrized by a manifold (which carries a special Kähler metric). Thus, an example of the first kind of result is an exact description of the strength of Coulomb's law as a function of the vacuum parameters.

I would guesstimate that there have been well over ten-thousand physicist years devoted to the intense investigation of four-dimensional $N = 2$ field theories. Nevertheless, the full promise of the Seiberg–Witten breakthrough has not yet been fully realized. Regarding the first kind of result, important and nontrivial insights continue to be uncovered up to the present day in the works of Nikita Nekrasov, Samson Shatashvili, Vasily Pestun, Edward Witten, and a host of others revealing relations to integrable systems and many other things. The papers mentioned in the citation address the second kind of result: deepening our understanding of how to compute the so-called BPS spectrum for ever larger classes of $N = 2$ theories. The key theme in these papers is that, as a function of vacuum parameters, the BPS spectrum can be discontinuous across real codimension 1 loci in the space of vacuum parameters. An important point is that there exists a very beautiful formula which expresses how this spectrum changes. Since a real codimension 1 locus is a wall, the formula is known as a *wall-crossing formula*. The history of this formula is far too complicated to be explained here, but I will note that it began with a formula of Sergio Cecotti and Cumrun Vafa for the decays of solitons in two-dimensional quantum field theories, and, in addition to my work done in collaboration with Denef, Diaconescu, Gaiotto, and Neitzke, essential insights and breakthroughs were made in the context of pure mathematics—and motivated by pure mathematics—by Maxim Kontsevich and Yan Soibelman and separately by Dominic Joyce and Yinan Song in their work on generalized Donaldson–Thomas invariants for Calabi–Yau categories. Research into BPS states continues to be a very active subject.

As indicated in the citation, the investigations into the BPS spectrum have led to a wide variety of unexpected and rich connections to many branches of pure mathematics. Like a beautiful flower which continues to unfold and dazzle, the deeper the probe, the richer the emergent mathematics. In addition to the relations of four-dimensional $N = 2$ theories to hyperkähler geometry, cluster algebras, cluster varieties, and integrable systems, several other remarkable links to subjects in pure mathematics have been discovered by many mathematicians and physicists in the past several years. The full list is too long to mention here, but some prominent examples include deep relations to geometric representation theory and nontrivial connections with modular tensor categories and two-dimensional conformal field theory.

In view of the extraordinary richness of the field, one might well wonder if there is some simplifying and unifying viewpoint on all the above connections. Indeed, the following is widely believed by many mathematicians and physicists: A striking prediction of string theory from the mid-1990s (in the hands of Edward Witten, Andrew Strominger, and Nathan Seiberg) is that there is a class of six-dimensional interacting conformal quantum field theories known as the (2,0)-*theories*. Many of the beautiful connections alluded to above can be traced to the very existence of these theories. On the other hand, these six-dimensional theories have not yet been fully formulated in any systematic way. There is no analog of a statement for nonabelian gauge theory, such as "Make sense of the path integral over connections on a principal bundle weighted by the Yang–Mills action." Indeed the very mention of the (2,0)-theories is greeted by some scientists with an indulgent smile. But many of us take them seriously. An important problem for the future is a deeper understanding and formulation of these theories.

For reviews giving a more extensive explanation of these matters, the reader could consult my review talk at Strings2011 in Uppsala, Sweden, my review talk at the 2012 International Congress on Mathematics and Physics in Aalborg, Denmark, or my 2012 Felix Klein lectures delivered in Bonn, Germany. They are all available on my home page. I would like to stress that there are several viewpoints on this vibrant subject held by several other mathematicians and physicists which are equally if not more valid. For a good example, see the review by Yuji Tachikawa, available on his homepage.

Looking further to the future, we should not forget that the very existence of the (2,0)-theory is but a corollary of the existence of string theory. Work on the fundamental principles underlying string theory has noticeably waned—it seems the community is currently gathering more "data" in the form of examples and solid mathematical truths—but ultimately physical mathematics must return to this grand question.

Finally, I would like to comment on physical mathematics more broadly since the very purpose of the Leonard Eisenbud Prize is to encourage work "that brings mathematics and physics closer together." I think the emergent and very lively field of physical mathematics fits this criterion brilliantly. The use of this term in contrast to the more traditional "mathematical physics" by myself and others is not meant to detract from the magnificent subject of mathematical physics but rather to delineate a smaller subfield characterized by a very distinctive set of questions, goals, and techniques. The questions and goals are often motivated, on the physics side, by quantum gravity, string theory, and supersymmetry, and, on the mathematics side, often involve deep relations to topology, geometry, and even analytic number theory in addition to the more traditional relations of physics to algebra, group theory, and analysis. This is a subject which has not been without its critics. Perhaps the most forceful criticism is that of Arthur Jaffe and Frank Quinn.[1] While these criticisms were very ably answered by Michael Atiyah et al.[2] and William Thurston,[3] the issues raised by Jaffe and Quinn are not without merit and we would do well not to forget them. Nevertheless, given the wide spectrum of astonishing results achieved in physical mathematics in the period since this debate erupted, the overwhelming preponderance of evidence is that the subject has great depth and validity. It is likely to remain an important beacon for progress in mathematics for some time to come.

[1] *Bull. Amer. Math. Soc.* (N.S.) 29 (1993) no. 1, 1–13; arXiv:math/9307227 [math.HO].

[2] *Bull. Amer. Math. Soc*. (N.S.) 30 (1994) no. 2, 178–207; arXiv:math/9404229 [math.HO].

[3] *Bull. Amer. Math. Soc.* (N.S.) 30 (1994) no. 2, 161–177; arXiv:math/9404236 [math.HO].

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics

In 1991 the Mathematical Association of America instituted the Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics to honor college or university teachers who have been widely recognized as extraordinarily successful and whose teaching effectiveness has been shown to have had influence beyond their own institutions. Deborah Tepper Haimo was President of the Association, 1991–1992.

Citation

Carl Lee

An outstanding teacher who has made substantial contributions to student learning at all university levels, Carl Lee has developed and taught innovative general education courses and has inspired mathematics majors with upper-level undergraduate courses. He has supervised Ph.D. students and has mentored faculty colleagues. He is a leader at improving mathematics education throughout the state of Kentucky and across the United States.

Professor Lee's students commend him for his impeccable lectures, for brilliantly crafted examples that illustrate subtleties and connections among branches of mathematics, and for devising assignments that challenge and enlighten students. Professor Lee has developed and taught a successful and popular general education course at the University of Kentucky entitled "Introduction to Contemporary Mathematics." He also taught a freshman seminar course that introduced students from across the university to his research area of polyhedra. Students in this course impressively demonstrated their understanding and careful thinking about the topic by creating striking visual images of polyhedra.

Professor Lee has also inspired mathematics majors with his upper-level course offerings and independent studies. At the graduate level, Professor Lee has supervised the Ph.D. dissertations of thirteen students, most of whom now hold faculty positions at a variety of institutions and credit Professor Lee with their enthusiasm for and commitment to teaching mathematics effectively.

Professor Lee's efforts at preparing pre-service and in-service teachers of mathematics are remarkable. Much of his time and talent at the University of Kentucky has been invested in developing, teaching, and disseminating courses in geometry and in mathematical problem-solving for prospective teachers of middle school mathematics. Moreover, Professor Lee has been a driving force throughout

Kentucky and the Appalachian region for improving mathematics and science education at K–12 levels. He has served as a principal contributor on several large, multi-institution funded projects that have fundamentally and profoundly influenced the teaching and learning of mathematics for tens of thousands of students across the Appalachian region.

Biographical Note

Carl Lee grew up in an extended family of academics. One of his earliest memories of his love of mathematics was in second grade when his mother taught him how to multiply with a slide rule. As he grew older, he devoured his father's recreational math books, encountering flexagons, polyhedra, stitchings of conic sections, and many more lifelong friends. Gardner, Steinhaus, Ball and Coxeter, and Cundy and Rollett were his silent mentors who complemented his wonderful public school teachers in Baltimore County. He couldn't find the polyhedra in college (Yale), but learned where they were lurking in graduate school (Cornell, 1981, Applied Mathematics), and now he surrounds himself (sometimes physically) with higher-dimensional ones. He was welcomed by the Department of Mathematics at the University of Kentucky in 1980, where he has found a supportive environment for his interests in discovering, teaching, learning, and playing with mathematics. He was an IBM Postdoctoral Research Fellow, an Alexander von Humboldt Fellow, a recipient of a Provost's Outstanding Teaching Award, and is presently a Chellgren Endowed Professor, continuing investigations into polyhedral and discrete geometry, while engaged in mathematics education and outreach projects.

Response from Carl Lee

I am deeply grateful for this honor and very appreciative of my colleagues who felt that I was worthy enough to make the effort to nominate me. I was born into a family enthusiastic about learning and teaching. I was raised in a faith community (Bahá'í) in which the role of the teacher is explicitly honored. I have been blessed with the constant encouragement and support of my parents and family, and was from a very young age exposed to a significant amount of mathematical learning in informal contexts. It is no exaggeration to state that my public school teachers in Baltimore County were fabulous. Entering college with the firm intention of pursuing a career that included teaching at some level, I benefited from seeing mathematics taught by internationally renowned figures. Reflecting on my graduate experience at Cornell, I will ever remain impressed by and thankful for my doctoral advisor, Lou Billera, who epitomized wisdom, foresight, encouragement, and patience in his nurturing guidance. My wife, Sarah, and my children, Gwenyth and Daniel, offered and continue to offer constant, sacrificial support for my career, especially when coping with my absences or being moved from place to place, and words cannot adequately express my gratitude and love for them. There are so many colleagues, current and past students, and friends who enrich, deepen, and extend my understanding of what contributes to effective teaching in both formal and informal settings that I know I still have far to go. But the journey has been rewarding, and I continue to look forward to what is yet to come.

Citation

Gavin LaRose

Gavin LaRose is an exceptional and passionate teacher who instills in students a desire to study and learn mathematics. He is also an instructional technology guru who provides invaluable help to his colleagues for using technology effectively in teaching mathematics. Professor LaRose is as committed to teaching as to mathematics itself, leading him to inspire colleagues at his own institution and across the country to improve their teaching of undergraduate mathematics.

Student after student from Professor LaRose's classes attest with admiration to his excitement about mathematics, his enthusiasm for teaching, and his commitment to helping students succeed in learning mathematics. Moving testimonials about Professor LaRose's inspiring teaching come not only from his students majoring in mathematics but also from students in a variety of fields that make use of mathematics. Many of these students commend Professor LaRose's enthusiasm with stimulating their excitement about mathematics.

Colleagues point out that Professor LaRose has a large and positive impact not only on his own students but on virtually all undergraduates at the University of Michigan by virtue of his work with instructional technology. For example, nearly all students take an online mathematics placement exam developed and maintained by Professor LaRose that plays an important role in students' orientation and advising experiences. Students also experience Professor LaRose's handiwork with instructional technology as they interact with online assessment tools and with review/tutorial modules that he not only created but continually maintains and improves. His colleagues say that they hope to retire before Professor LaRose does, because his instructional technology tools are so important in their teaching and so effortless to use. Moreover, and most tellingly, his colleagues point out that Professor LaRose devotes so much of his time and talent to developing these tools for one reason only: to help students learn.

Another important contribution of Professor LaRose, both at his own institution and nationally, concerns preparing and mentoring instructors of undergraduate mathematics. He is involved with all aspects of his department's extensive training and mentoring program for new faculty, offering insights and support that benefit instructors and course coordinators to the ultimate benefit of all of their students. This mentoring activity extends far beyond the University of Michigan, as Professor LaRose has served on the MAA Project NExT (New Experiences in Teaching) leadership team in various capacities, most recently as Associate Director. In this role Professor LaRose conveyed information and ideas to a new generation of college professors about how to teach undergraduate mathematics effectively.

Biographical Note

Gavin LaRose is jointly appointed as a lecturer and instructional technology manager in the Department of Mathematics at the University of Michigan. He received his B.A. from Grinnell College and his Ph.D. from Northwestern University, where he worked in the applied mathematics program. He worked at Nebraska Wesleyan University for six years before moving to Michigan. His research interests are in the mathematical modeling of real world systems and, informally, in understanding the impact of pedagogical strategies (and technological tools) on student learning. Among a handful of other publications, he is a co-author of the book *Writing Projects for Mathematics Courses* (*Crushed Clowns and Coffee to Go*). He was a Project NExT Fellow in 1994–95 and served as an Associate Co-Director and subsequently Associate Director of Project NExT between 1997 and 2012.

Response from Gavin LaRose

Being given recognition for doing well those things that are important to us is perhaps the highest honor that we can hope to receive. It is therefore with great thanks that I accept this award. The accomplishments of the recipients of the Haimo Award, and of the very many other outstanding teachers in our profession who are deserving of this recognition, are truly remarkable and inspire me to work to live up to their example.

We have the good fortune to work in a profession in which we are able to work with colleagues whose enthusiasm and support enable us to be better at our work of teaching than we would ever be alone. This is certainly the case for me, and I thank specifically my colleagues at the University of Michigan and the Project NExT team(s) of Jim Leitzel, Chris Stevens, Judith Covington, Aparna Higgins, and Joe Gallian. I can't say that I've stood on the shoulders of giants, but I have been surrounded by them and they have picked me up. I thank also the MAA for standing out among professional organizations in its recognition of the importance of good teaching and community.

Citation

Andrew Bennett

Andrew Bennett excels in the teaching of mathematics, in the broadest sense and at all levels: K–12, undergraduate, graduate, and post-doctoral. His teaching prowess is not limited by classroom walls, and his influence on teaching and learning extends far beyond the considerable impact on students at Kansas State University.

Professor Bennett is an outstanding teacher who has taught and left his mark on nearly every course in the undergraduate mathematics curriculum at Kansas State, from elementary service courses to specialized courses for mathematics majors. He has been a pioneer and driving force in the use of technology in mathematics classrooms at Kansas State and beyond. At his home institution he has successfully developed web-based and online homework systems for a variety of mathematics courses, initiated a Studio College Algebra course that emphasizes hands-on activities and computer work and which has shown improved retention rates compared to traditional offerings, and introduced computer lab components into courses in differential equations back in the 1980s when such innovations had few precedents. At the regional and national levels he has organized conferences, sessions, and panel discussions that have helped to shed light on how mathematicians can use technology as an effective teaching tool.

Six undergraduate students who went on to receive Goldwater Scholarships conducted research under Professor Bennett's supervision. He has also advised master's and Ph.D. students in diverse areas, such as harmonic analysis, probability theory, and mathematics education. Professor Bennett has also served as a mentor for ten post-doctoral fellows.

As Founder and Director of the Center for Quantitative Education at Kansas State, Professor Bennett has improved instruction across campus by using data mining techniques to study how students interact with online homework systems to gain insight into student learning. Professor Bennett is one of the first in the world to use such sophisticated methodology to study and improve student learning, research for which he has been recognized with substantial grant funding.

Professor Bennett has also led remarkable outreach efforts aimed at improving K–12 education in mathematics. These include conducting workshops for K–8 teachers, funded by the U.S. Department of Education, that involve teachers taking challenging mathematical content courses that model effective pedagogy while also taking a mathematical pedagogy course that considers how to incorporate such content in the classroom.

Biographical Note

Andrew Bennett earned a B.S. in mathematics from Colorado State University in 1981 and received his Ph.D. in mathematics from Princeton University in 1985. After a post-doctoral appointment at the University of Texas at Austin, he came to Kansas State University in 1988 where he has been ever since. He has received over $19 million in extramural funding for work with teachers, faculty, students, and research in mathematics and science education. He was the founding director of the Center for Quantitative Education at Kansas State University and is currently serving as head of the mathematics department. He has served a term on the MAA Board of Governors and has also served as chair of the MAA Subcommittee on Curriculum Renewal and the First Two Years (CRAFTY). He has been married to his high-school sweetheart for 31 years, and they have two children, a daughter (A.B. in math from Chicago) and a son (B.S. in math from Michigan). His hobbies include ballroom dance and sleeping in front of sports on TV.

Response from Andrew Bennett

I am delighted and honored by this award. I have learned so much about teaching and learning from my own teachers, colleagues, and students through the years that I cannot possibly thank you all adequately. While I always cared about teaching, my work with the effective use of technology developed almost by accident but led to many interesting adventures as different technological tools became available over my career. I was blessed to have a department head who supported my choice of research topics. I have had colleagues in mathematics and in other disciplines, both at KSU and the many contacts I've made through the MAA, who have sharpened my ideas about teaching and learning. My students have been willing participants in many new approaches, and they have taught me as much as I have taught them. I especially want to thank my family. My father was an outstanding teacher and taught me to work with my students. My brother Curt, who won this award three years ago, has always been ready to provide insight (plus sibling rivalry is a wonderful goad to improvement). And my wife and children have kept me sane and provided a foundation on which to build my life and work.

Euler Book Prize

The Euler Book Prize is awarded annually to the author of an outstanding book about mathematics. The Prize is intended to recognize authors of exceptionally well-written books with a positive impact on the public's view of mathematics and to encourage the writing of such books.

The Euler Prize, established in 2005, is given every year at a national meeting of the Association, beginning in 2007, the 300th anniversary of the birth of Leonhard Euler. This award also honors Virginia and Paul Halmos, whose generosity made the award possible.

Citation

Steven Strogatz

The Joy of x: A Guided Tour of Math, from One to Infinity, Houghton Mifflin Harcourt, Boston, 2012.

From the one-sentence chapter descriptions in the Table of Contents to the extensive endnotes with comments and guidance for further reading (many on the internet), *The Joy of x* is a masterpiece of expository writing.

The book is directed to the millions of readers who claim they never really understood what the mathematics they studied was all about, for whom math was a series of techniques to be mastered for no apparent reason. In succinct chapters the book revisits grade-school arithmetic, high-school algebra and geometry, and selected topics from undergraduate mathematics. Professor Strogatz writes, "Instead of worrying about the details of these subjects, we have the luxury of concentrating on their most beautiful, important, and far-reaching ideas." This explains the book in a nutshell: to show that these subjects have a beautiful side, a playful side, a mysterious side, and a practical side even in our present-day cyberculture.

But there is so much more to this book, making it highly recommended for every mathematician. The forty-five pages of Notes at the end of the book offer mathematical arguments and sketches of proofs, fresh ideas and interesting anecdotes, and annotated references to online and printed resources, including relevant articles and books published by the Mathematical Association of America. Pedagogically, the book is a model of how mathematics can be presented to a general audience in an appealing and humanizing way. Each chapter begins with an anecdote or story that connects with the reader and rivets attention. The focus is on the ideas, their simplicity, power, and universality. We are impelled to think, but also to feel, to appreciate, to understand, to connect, to relate, to play, to enjoy.

One of the most pleasant aspects of reading the book is the feeling that you're connecting with a real person. Professor Strogatz doesn't take himself too seriously, he exhibits a sense of humor, and empathizes with students suffering from information/technique overload. Throughout the book he demonstrates the value of visual thinking, common sense, and making educated guesses over trying to remember anxiety-producing prescriptions for solving problems. This lesson alone makes the book invaluable.

In addition to the school mathematics previously mentioned, the book offers overviews of other subjects of contemporary interest: statistics, probability, Markov chains, number theory, group theory, topology, differential geometry, infinite series, infinity. These topics are introduced and presented in the same compelling manner: relevant, personal, important, far-reaching, fun. *The Joy of x* is a joy to read.

Biographical Notes

Steven Strogatz is the Jacob Gould Schurman Professor of Applied Mathematics at Cornell University. He studied at Princeton, Cambridge, and Harvard and taught at MIT before moving to Cornell in 1994. His research interests include nonlinear dynamics and complex networks applied to physics, biology, and social science. He also blogs about math for the *New York Times* and has been a frequent guest on *RadioLab*. A SIAM Fellow and member of the American Academy of Arts and Sciences, he received the JPBM Communications Award in 2007. He is the author of *Nonlinear Dynamics and Chaos, Sync*, and *The Calculus of Friendship*. His latest book is *The Joy of x*.

Response from Steven Strogatz

I feel so honored and humbled to receive the 2014 Euler Book Prize from the MAA. It means the world to me that my colleagues appreciate my attempt to help the wider public see what our subject is all about and why we love it so much. Thanks to David Shipley for inviting me to write the *New York Times* series that grew into this book; to my editors Amanda Cook and Eamon Dolan, who shaped and improved *The Joy of x* with their keen advice; to Paul Ginsparg, Jon Kleinberg, Andy Ruina, and Tim Novikoff, who read each of the chapters and did their best to debug them; to all my high school teachers, especially Jane Archibald, Bob DiCurcio, Don Joffray, Richard Johnson, and Grant Wiggins, for their inspiring lessons and dedication; to my parents, for their love and for letting me follow my heart and become a math teacher; and to my colleagues, students, friends, and family for all their support and generosity.

Chauvenet Prize

The Chauvenet Prize is awarded to the author of an outstanding expository article on a mathematical topic. First awarded in 1925, the Prize is named for William Chauvenet, a professor of mathematics at the United States Naval Academy. It was established through a gift in 1925 from J. L. Coolidge, then MAA President. Winners of the Chauvenet Prize are among the most distinguished of mathematical expositors.

Citation

Ravi Vakil

"The Mathematics of Doodling," *American Mathematical Monthly*, 118 (2011), no. 2, 116–129.

Vakil takes us on an engrossing mathematical journey initiated by this simple exercise. Along the way we learn about the radius r neighborhood $Nr(X)$ of a set X in the plane and how $Nr(X)$ becomes more disk-like as r increases. We see how the perimeter of $Nr(X)$ is related to the area of X, first when X is a convex polygon, then when X is any convex set, then when X is arbitrary. We see how the winding number and the Euler characteristic account for the changes in the resulting formulas. We move to three dimensions and encounter Hilbert's Third Problem and the Dehn invariant, and to n dimensions and meet other dissection invariants. Finally, our tour culminates in a brief visit to the moduli space of curves. Vakil's elegant yet ever-friendly exposition provides a wonderful framework for this clinic in conjecture, proof, and generalization. The article is an enticing illustration of how mathematical curiosity can lead us from gentle musings to sophisticated, interconnected, and deep ideas.

Biographical Notes

Ravi Vakil is professor of mathematics and the Packard University Fellow at Stanford University. He is an algebraic geometer whose work touches on topology, string theory, applied mathematics, combinatorics, number theory, and more. He was a four-time Putnam Fellow while at the University of Toronto. He received his Ph.D. from Harvard, and taught at Princeton and MIT before moving to Stanford. He has received the Dean's Award for Distinguished Teaching, the American Mathematical Society Centennial Fellowship, the Terman Fellowship, a Sloan Research Fellowship, the NSF CAREER grant, and the Presidential Early Career Award for Scientists and Engineers. He has also received the Coxeter–James Prize from the Canadian Mathematical Society and the André–Aisenstadt Prize. He was the 2009 Hedrick Lecturer at MathFest, and is currently an MAA Pólya Lecturer. He is a director of the entity running the website mathoverflow, and the director of a potential new school in San Francisco called the "Proof School." He works extensively with talented younger mathematicians at all levels, from high school through recent Ph.D.s.

Response from Ravi Vakil

I am deeply grateful to the MAA for this honor. I am humbled to see among the previous winners the names of many mathematicians I greatly admire, both for their intellect and mathematical accomplishments, and for their ability to communicate the essence of what we do to a broad audience and not just a small circle of experts. If we truly believe that mathematics is central to human knowledge, providing a subtle and powerful language with which to understand the universe, then we should feel compelled to evangelize. A willingness to speak to others does not contradict valuing work on deep problems that require years of effort even to understand. While we speak to experts in precise language, we should feel comfortable using metaphor when speaking to a broader audience in the hopes of communicating deeper truths about how mathematics works.

This particular article has been gestating in my head for a long time, beginning with a sense of wonder at the age of five. I learned the marvelous facts therein from friends, students, teachers, colleagues—unfortunately too many to recognize here. A central joy of being a mathematician is being a part of a conversation begun centuries ago.

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman

In 1990, the Executive Committee of the Association for Women in Mathematics (AWM) established the Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman. The prize honors Alice T. Schafer (1915–2009), one of the founders of AWM and its second president, who contributed greatly to women in mathematics throughout her career. The criteria for selection include, but are not limited to, the quality of the nominees' performance in mathematics courses and special programs, an exhibition of real interest in mathematics, the ability to do independent work, and, if applicable, performance in mathematical competitions.

AWM is pleased to present the twenty-fourth annual Alice T. Schafer Prize to **Sarah Peluse**, University of Chicago.

Additionally, the accomplishments of three outstanding young women were recognized on Wednesday, January 15, 2014. AWM was pleased to honor **Morgan Opie**, University of Massachusetts, Amherst, as **runner-up** for the 2014 Schafer prize competition. **Shiyu (Jing Jing) Li**, University of California, Berkeley, and **Jesse Zhang**, Massachusetts Institute of Technology, were recognized as **honorable mention** recipients in the Schafer prize competition. Their citations are available from the AWM.

Citation

Sarah Peluse

Sarah Peluse is a senior mathematics major at the University of Chicago. She is hailed by the faculty there as one of the "top 5 undergraduates in 49 years." Peluse transferred to the University of Chicago in 2011 from Lake Forest College, and has gone on to take a rigorous curriculum of advanced mathematics courses. In one reading course, she gave a "seminar-quality presentation at the board" each week, skillfully fielding questions on extensions and applications of the material and discussing current research. She is currently working as a research assistant to a faculty member in the area of model theory.

Peluse attended an REU at Williams College; her work there resulted in a talk and poster at the Joint Mathematical Meetings in 2012. She also attended an REU in number theory at Emory University in 2012 and 2013 and was recognized as a "true star." At Emory, she worked on problems concerning lacunary q-series, irreducible representations of $SU(n)$ which have prime power degree, and zeros of Eichler integrals of cusp forms. This work has resulted in one published article and others submitted for publication.

Peluse is described as having impressive creativity and the capability to obtain deep understanding of sophisticated material on her own. Peluse's recommendation letters praise not only her "impressive talent" but also her motivation, saying that she is a "ferocious worker" who "has a drive … only observed in a few top people." She is viewed as a "future superstar."

Response from Sarah Peluse

I am greatly honored to be selected as the winner of the 2014 Alice T. Schafer Prize. First, I'd like to thank Jan Robinson, my middle school math teacher, for sparking my love for math and putting up with me when I'd sneak out of my other classes to talk to her about it. I want to thank every math professor I've taken a course with at Lake Forest College and the University of Chicago for contributing to my education. In particular, I want to thank Ed Packel and Dave Yuen for encouraging me to pursue math at a higher level and providing outlets to do and discuss math outside of my courses at Lake Forest. I'm exceedingly grateful to Paul Sally for convincing me to come to the University of Chicago, for his ample advice and encouragement, for always looking out for my best interests, and for his always engaging and challenging classes. I'd also like to thank Maryanthe Malliaris for many good mathematical discussions and for pointing out to me interesting talks and papers. I'm thankful for my experiences at the wonderful REUs I attended at Williams College and Emory University. I would especially like to thank Ken Ono for being a fantastic and tireless advisor who is generous with advice, for creating an amazing environment to do math in at the Emory REU, and for suggesting interesting problems to work on. Finally, I want to thank my family, my friends, and my teammates for their love and support.

Louise Hay Award for Contributions to Mathematics Education

In 1990, the Executive Committee of the Association for Women in Mathematics (AWM) established the Louise Hay Award for Contributions to Mathematics Education. The purpose of this award is to recognize outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense. While Louise Hay was widely recognized for her contributions to mathematical logic and for her strong leadership as head of the Department of Mathematics, Statistics, and Computer Science at The University of Illinois at Chicago, her devotion to students and her lifelong commitment to nurturing the talent of young women and men secure her reputation as a consummate educator. The annual presentation of this award is intended to highlight the importance of mathematics education and to evoke the memory of all that Hay exemplified as a teacher, scholar, administrator, and human being.

Citation

Sybilla Beckmann

The 2014 Louise Hay Award for Contributions to Mathematics Education is presented to Sybilla Beckmann, Josiah Meigs Distinguished Teaching Professor of Mathematics at the University of Georgia, in recognition of her vision, persistence, and leadership in enhancing the teaching and learning of mathematics in this country and beyond. Her work is based on her insight that sustainable improvement in mathematics education can only occur when the mathematical culture in the schools and the universities is "built on respect for the innate mathematical abilities that are the birthright of every student." She has worked to energize every link of this chain, from the daily challenges that teachers face in their classrooms to the highest levels of the national discussions of K–12 education.

Sybilla has made substantial contributions to Galois theory. She began her career as a Gibbs Instructor at Yale University and has been at the University of Georgia since 1988. More bravely, she taught sixth grade for a year and volunteered at another elementary school where she "started a math revolution." Her redesigned mathematics courses for prospective elementary teachers led to her highly regarded and widely adopted textbook, and she created the Mathematicians Educating Future Teachers program. She was a writer of the NCTM's *Curriculum Focal Points for PreKindergarten through Grade Eight* and two supplemental books. She played a significant role in writing the Common Core State Standards in Mathematics and was the lead writer on the elementary grades for *The Mathematical Education of Teachers II*.

Response from Sybilla Beckmann

As a longtime member of AWM, I am thrilled and deeply honored to receive this award. I hope I can use it to draw attention to the need for all of us who teach math—at any level—to join together to make the mathematics teaching community a strong, vibrant, and intellectually engaging one. We need to think together about mathematics teaching, and to vet, use, and build on the best ideas about it. We need to own our profession and take pride in it.

Louise Hay said "that sources of inspiration and opportunities to change your life can come unexpectedly and should not be ignored; and that you should not neglect the dictates of your own career, taking some risks if necessary," words with which I wholeheartedly agree. It is still a surprise to me that mathematics education has become my passion. I am so grateful to so many people for helping me pursue this passion. My wonderful family has put up with all the time and intensity I devote to my work. My extraordinary Department of Mathematics at the University of Georgia has given me unfailing support, even as I have chosen a path quite different from the usual one in a math department. My colleagues in mathematics education at the University of Georgia and across the country have welcomed me, worked with me, and taught me so much. But especially, thank you to AWM—a uniquely positive, personal, and encouraging organization—for this special honor.

M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics

This award is named for M. Gweneth Humphreys (1911–2006). Professor Humphreys graduated with honors in mathematics from the University of British Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her Ph.D. at age 23 from The University of Chicago in 1935. She taught mathematics to women for her entire career, first at Mount St. Scholastica College, then for several years at Sophie Newcomb College, and finally for over thirty years at Randolph-Macon Woman's College. This award, funded by contributions from her former students and colleagues at Randolph-Macon Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

Citation

William Yslas Vélez

The Association for Women in Mathematics is pleased to present its fourth annual M. Gweneth Humphreys Award to Professor William Yslas Vélez of the Department of Mathematics at the University of Arizona.

Dr. Vélez is legendary for his ability to encourage women to study mathematics and pursue mathematical careers. Particularly impressive is his success in instilling confidence in first generation and minority students who are often struggling to overcome expectations based on culture and gender. At an early stage, Dr. Vélez identifies and recruits students he believes would benefit from taking more math courses. Numerous women describe how he met with them their first days on campus and got them thinking about degree and career paths. Others gratefully express how he completely changed their academic horizon when he pulled them aside and urged them to consider graduate studies in mathematics. Many appreciate how he listened carefully to their interests and guided them to attain well-matched research experiences. He challenges his students to step out of their comfort zones so they can achieve greater success. One former student writes: "I catch myself encouraging others to obtain an education and specifically that they should consider a degree in mathematics… I have experienced firsthand how much impact one person alone can have on a student's academic and professional life, and I hope to be to other students what Dr. Vélez was to me."

The AWM is proud to honor William Yslas Vélez's outstanding achievements in inspiring undergraduate women to discover and pursue their passion for mathematics.

Response from William Yslas Vélez

I am honored to receive the 2014 M. Gweneth Humphreys Award from the AWM. I am extremely grateful to my colleagues and friends, Debra Hughes-Hallett and Laurie Varecka, for taking the initiative to nominate me for this recognition and to contact the many women with whom I had the pleasure of working over these many years. As I near retirement, the letters that I received from these women are a treasure of wonderful memories.

The small amount of success that I have had in motivating students to pursue mathematical studies has much to do with the culture that I grew up in. The Mexican-American culture and family that nurtured me and that I embraced provided me with an important outlook. From the deserts of Arizona-Sonora, a mother whispered to her children, "*Lo único que les puedo dejar es una buena educación*" (My inheritance to you is a good education). My brothers and I took this to heart. Though our career paths were all different, we each shared this inheritance with others. This small breath of hope, whispered so long ago, reverberates still. I am privileged to be the conduit through which my mother has spoken to so many women.

Joint Policy Board for Mathematics Communications Award

This award was established by the Joint Policy Board for Mathematics (JPBM) in 1988 to reward and encourage communicators who, on a sustained basis, bring mathematical ideas and information to nonmathematical audiences. Both mathematicians and nonmathematicians are eligible. Currently, the award is made annually. JPBM represents the American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

Citation

Danica McKellar

The 2014 JPBM Communications Award is presented to Danica McKellar, an actress (*Wonder Years*, *West Wing*), a published mathematician (while earning her bachelor's degree in mathematics at UCLA), an advocate for mathematics education, and a *New York Times* best-selling author (http://www.danicamckellar.com/). Her books, blog, and public appearances have encouraged countless middle and high school students, especially girls, to be more interested in mathematics.

Her books include *Math Doesn't Suck: How to Survive Middle-School Math Without Losing Your Mind or Breaking a Nail* (2007), *Kiss My Math: Showing Pre-Algebra Who's Boss* (2008), *Hot x: Algebra Exposed* (2010), and *Girls Get Curves: Geometry Takes Shape* (2012). Their brilliant presentation of mathematical concepts in ways that relate to young girls have attracted a huge audience that includes both boys and girls. The first three books made the *New York Times* Best Sellers list. Links to all of their webpages are found at http://www.danicamckellar.com/math-books/. Her blog *Math & More*, also found on her website, reaches out to the same audience with mathematical puzzles, links to her appearances at book signings and broadcast promotions. Over the past seven years she may have inspired more young people to embrace mathematics than anyone else.

Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student

The Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student recognizes and encourages outstanding mathematical research by undergraduate students. It was endowed by Mrs. Frank Morgan of Allentown, Pennsylvania.

Citation

Eric Larson

Eric Larson is awarded the 2014 AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research by an Undergraduate Student for his truly exceptional record of research. He has so far authored or co-authored eight papers, two as sole author, two with Dmitry Vaintrob, three with Larry Rolen, and one with David Jordan. His papers have appeared in a wide spectrum of research journals, including *Advances in Geometry*, *Bulletin of the London Mathematical Society*, *Forum Mathematicum*, the *Journal of Noncommutative Geometry*, and *Proceedings of the American Mathematical Society*.

Eric began his research work while still in high school, working in the REU program at Penn State University under Sergei Tabachnikov and then at the Research Science Institute at MIT under Pavel Etinghof. In 2010, after his first year at Harvard, Eric participated in Ken Ono's REU program at the University of Wisconsin. This led to his collaboration with Dmitry Vaintrob. Eric continued in Ono's REU, now at Emory University, in 2011 and again in 2013. His work in this program resulted in five papers. In 2012, Eric received a summer research fellowship to work with Joe Harris at Harvard, producing another paper.

In addition to his stellar research work, Eric also won the Intel Science Talent Search first place prize, took second place in the Siemens competition that same year, and won a gold medal at the International Math Olympiad, all while still a high school student. He was also on Harvard's winning Putnam team in 2011 and a Putnam Fellow in 2012. Eric is one of the most accomplished students of mathematics that the mathematics community has ever seen. In the words of Ken Ono, "Eric is a phenomenon."

Biographical Note

Eric Larson is a graduate student at MIT in mathematics. He is from Eugene, Oregon, where, while in elementary school, he discovered his love of mathematics after seeing Euclid's proof of the infinitude of primes. Eric received his bachelor's degree in mathematics from Harvard University, with a secondary in physics. His research interests are concentrated in algebraic geometry and number theory. Currently, he is working on a couple of projects related to the geometry of general curves in projective space.

Response from Eric Larson

I am honored to receive the 2014 Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student, and would like to warmly thank AMS, MAA, and SIAM.

I am also grateful to the many people that have helped me get here. Especially, I would like to thank my research mentors Ken Ono, Joe Harris, and David Zureick-Brown, as well as my family and friends for their support and encouragement.

Joseph L. Doob Prize

This prize was established in 2003 by the American Mathematical Society to recognize a single, relatively recent, outstanding research book that makes a seminal contribution to the research literature, reflects the highest standards of research exposition, and promises to have a deep and long-term impact in its area. The book must have been published within the six calendar years preceding the year in which it is nominated. Books may be nominated by members of the Society, by members of the selection committee, by members of AMS editorial committees, or by publishers. The prize is awarded every three years.

The prize (originally called the Book Prize) was endowed in 2005 by Paul and Virginia Halmos and renamed in honor of Joseph L. Doob. Paul Halmos (1916–2006) was Doob's first Ph.D. student. Doob received his Ph.D. from Harvard in 1932 and three years later joined the faculty at the University of Illinois, where he remained until his retirement in 1978. He worked in probability theory and measure theory, served as AMS president in 1963–1964, and received the AMS Steele Prize in 1984 "for his fundamental work in establishing probability as a branch of mathematics." Doob passed away on June 7, 2004, at the age of ninety-four.

Citation

Cédric Villani

Optimal Transport: Old and New. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], 338. Springer-Verlag, Berlin, 2009.

In 1975 the mathematicians Leonid V. Kantorovich and Tjalling C. Koopmans received the Nobel Prize in Economics "for their contributions to the theory of optimum allocation of resources." Subsequent research on optimal transport has revealed remarkable connections with such varied areas of mathematics as dynamical systems, geometry, and partial differential equations—and also with applications ranging from fluid mechanics to meteorology to cosmology.

This book represents a profound rethinking of the subject of optimal transport by one of its leading contributors. The overarching themes are existence, uniqueness, regularity, and stability of optimal transport; and the investigation of Riemannian geometry via optimal transport. Many results appear here in book form for the first time, often in sharper versions than have previously been published. The scope of the volume is breathtaking: the panorama of topics from dynamics, probability, and geometry includes Moser's technique for coupling smooth positive probability measures, Caffarelli's log-concave perturbation theorem, Kantorovich duality, the Wasserstein distance between probability measures, Mather's shortening lemma, the Ma–Trudinger–Wang tensor, a priori estimates for solutions of the Monge–Ampère equation, the Bochner–Weitzenböck–Lichnerowicz formula, the Brunn–Minkowski inequality in nonnegatively curved Riemannian manifolds, the Bakry–Émery theorem, Lichnerowicz's spectral gap inequality, Talagrand inequalities, the measured Gromov–Hausdorff topology, and Ricci curvature bounds on metric spaces.

A pedagogical masterpiece, the book effectively communicates deep ideas while remaining relatively self-contained. Engaging historical and bibliographical commentaries further enliven the exposition. J. L. Doob was known for the loving care that he lavished on his books, especially *Classical Potential Theory and Its Probabilistic Counterpart* (like *Optimal Transport*, published in the Springer Grundlehren series). Cédric Villani's readers will recognize a worthy heir to Doob's legacy of outstanding mathematical research exposition.

Biographical Notes

Born in 1973 in France, Cédric Villani studied mathematics in École Normale Supérieure in Paris, from 1992 to 1996, and spent four more years as assistant professor there. In 1998 he defended his Ph.D. on the mathematical theory of the Boltzmann equation. Besides his advisor Pierre-Louis Lions (Paris, France), he was much influenced by Yann Brenier (Nice, France), Eric Carlen (Rutgers, USA) and Michel Ledoux (Toulouse, France).

From 2000 to 2010 he was professor at École Normale Supérieure de Lyon and now at the Université de Lyon. He occupied visiting professor positions in Atlanta, Berkeley, and Princeton. Since 2009 he is director of the Institut Henri Poincaré in Paris; this 80-year-old national institute, dedicated to welcoming visiting researchers, is at the very heart of French mathematics.

His work has won him many national and international prizes, in particular the Fields Medal, usually regarded as the most prestigious award in mathematics, which was given to him at the 2010 International Congress of Mathematicians in Hyderabad by the President of India. His book *Théorème vivant* [Broché, 2012] retraces the genesis of the development of the theorem of Landau damping, the subject for which he was awarded the Fields Medal. Since then he has served as a spokesperson for the French mathematical community in media and political circles.

His main research interests are in kinetic theory (Boltzmann and Vlasov equations and their variants) and optimal transport and its applications, a field in which he wrote the two reference books, *Topics in Optimal Transportation* (2003); *Optimal Transport, Old and New* (2008).

Response from Cédric Villani

Books are immaterial children, born out of an intense intellectual experience. Often they acquire a living on their own and impose themselves to you.
I never experienced this feeling better than when composing *Optimal Transport,*

old and new, which was part of my life for three years. I had initially planned this book to be a 100-page long summer school proceeding, and in the end it was a 1000-page long reference book. This quick growth and change of ambition was the book's decision, not mine. The state of obsession which I arrived at while working on it is almost unparalleled in my personal history. After it was finished, I would often open it at a random page and read it, like a father proudly contemplating his newborn. Fortunately it was not only to his father's taste, since the book has been doing well and became a classical reference in the field of optimal transport. That it is rewarded with the Doob Prize is a great honor for me; I especially like the reference to Doob, who had the same care for details and presentation as I try to have—always thinking hard about the best way to present and convey messages to the readers' minds, without sacrificing the rigor the least. But this prize is also for me a mere joy, and the occasion to commemorate what I consider as one of the happy events in my life.

Leroy P. Steele Prize for Seminal Contribution to Research

The Leroy P. Steele Prizes were established in 1970 in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein and are endowed under the terms of a bequest from Leroy P. Steele. Prizes are awarded in up to three categories and each is awarded annually. The following citation describes the award for Seminal Contribution to Research.

Citation

Luis A. Caffarelli, Robert Kohn, and Louis Nirenberg

The 2014 Leroy P. Steele Prize for Seminal Contribution to Research is awarded to Luis A. Caffarelli, Robert Kohn, and Louis Nirenberg for their paper "Partial Regularity for Suitable Weak Solutions of the Navier–Stokes Equation," *Comm. Pure Appl. Math.* 35 (1982), no. 6, 771–831. This paper was and remains a landmark in the understanding of the behavior of solutions to the Navier–Stokes equations and has been a source of inspiration for a generation of mathematicians.

The Navier–Stokes equations are fundamental to the mathematical understanding of fluid dynamics. The pioneering works of Leray and later Hopf established the existence, globally in time, of the Leray–Hopf *weak* solutions. The arguments of Leray and Hopf left open the possibility that these weak solutions fail to be smooth at a rather sparse closed set of times (of finite 1/2-Hausdorff dimension in time) where uniqueness can potentially be lost.

The work of Caffarelli, Kohn, and Nirenberg was a huge leap forward on this notoriously difficult problem. Building on work of V. Scheffer, Caffarelli, Kohn, and Nirenberg greatly improved Scheffer's results and earlier work of others on the Navier–Stokes equation. They proved the existence of so-called *suitable* weak solutions as well as their partial regularity. They obtain constraints on the size of the singular set in space and time. The singular set has zero measure with respect to a natural one-dimensional Hausdorff measure defined using a parabolic notion of distance. One important consequence is that any two singular points can be separated by a space-time cylinder on the boundaries of which the solution is regular.

The paper has been a kind of textbook for a whole generation of Navier–Stokes researchers motivating many of the later developments and simplifications. Though a solution to the global existence of smooth solutions of the Cauchy problems remains open and is now one of the Clay Millennium Problems, the partial regularity theorem of Caffarelli, Kohn, and Nirenberg remains among sharpest results in this direction.

Biographical Notes

Luis A. Caffarelli obtained his Masters of Science (1969) and Ph.D. (1972) at the University of Buenos Aires. Since 1996, he has held the Sid Richardson Chair in Mathematics at the University of Texas at Austin. Some of his most significant contributions are the regularity of free boundary problems and solutions to nonlinear elliptic partial differential equations, optimal transportation theory, and, more recently, results in the theory of homogenization.

In 1991 he was elected to the National Academy of Sciences. He received the Bôcher Memorial Prize in 1984. He also received the prestigious 2005 Rolf Schock Prize in Mathematics of the Royal Swedish Academy of Sciences, the 2009 Leroy P. Steele Prize for Lifetime Achievement in Mathematics, and the 2012 Wolf Prize.

Robert Vita Kohn graduated from Harvard University in 1974. He got his M.Sc. at the University of Warwick in 1975 then went to Princeton, where he got his Ph.D. in 1979 under the guidance of Fred Almgren. From 1979–81 he was a visiting member at New York University's Courant Institute of Mathematical Sciences, supported by an NSF Mathematical Sciences Postdoctoral Fellowship. In 1981 he joined the faculty of the Courant Institute, and he has remained there since. He has been professor of mathematics at NYU since 1988.

Besides the Navier–Stokes equations, he has worked on many PDE problems, including electric impedance tomography, relaxation of variational problems, blowup of semilinear heat equations, and homogenization. In recent years much of his research has addressed problems from materials science, with particular emphasis on energy-driven pattern formation. His recognitions include an Alfred P. Sloan Foundation Fellowship (1984–86) and SIAM's Ralph E. Kleinman Prize (1999). He was a Plenary Speaker at ICM 2006 Madrid and an Invited Speaker at ICIAM 2007, and he is both a Fellow of the American Mathematical Society and a SIAM Fellow.

Louis Nirenberg, professor emeritus at Courant Institute, New York University, received his B.Sc. at McGill University in 1945 and his Ph.D. at New York University in 1949. His entire professional career has been at NYU. His research interests are in mathematical analysis, in particular, partial differential equations, complex analysis, differential geometry, and fluid flow. He also has a deep interest in music and cinema.

Joint Response from Luis A. Caffarelli, Robert Kohn, and Louis Nirenberg

It is a great honor to receive this award. The Navier–Stokes equation was originally proposed to describe incompressible viscous flows in moderate regimes. Its study has led over the years to many fundamental and challenging problems, which have motivated the development of deep ideas in many areas of analysis and applied mathematics. Any work on it relies strongly on the deep contributions of many who came before.

In this regard, we particularly want to thank and recognize Vladimir Scheffer for his fundamental contributions to this area. Scheffer was the first to apply partial regularity methods to three-dimensional Navier–Stokes—asking, around 1976, what can be said about the size of the singular set. His papers on partial regularity drew our attention to the problem, and his ideas were crucial to our analysis.

Many of the central issues concerning Navier–Stokes are still open. Deep work continues to be motivated by challenges such as the regularity and uniqueness of solutions, the relationship to turbulence, and the Euler equations, etc.

We did this work at a time when the three of us were at the Courant Institute, benefitting from its wonderful atmosphere. We would like to thank our colleagues at the time for their support.

Finally, we thank the Steele Prize Committee and the American Mathematical Society for choosing us for this award.

Leroy P. Steele Prize for Mathematical Exposition

The Leroy P. Steele Prizes were established in 1970 in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein, and are endowed under the terms of a bequest from Leroy P. Steele. Prizes are awarded in up to three categories and each is awarded annually. The following citation describes the award for Mathematical Exposition.

Citation

Dmitri Y. Burago, Yuri D. Burago, and Sergei V. Ivanov

The 2014 Leroy P. Steele Prize for Mathematical Exposition is awarded to Dmitri Y. Burago, Yuri D. Burago, and Sergei A. Ivanov for the book *A Course in Metric Geometry* (Graduate Studies in Mathematics, 33, American Mathematical Society, Providence, RI, 2001) in recognition of excellence in exposition and promotion of fruitful ideas in geometry.

The publishing of this book made available to the mathematical community the emerging ideas and methods of synthetic geometry, initiated by Alexandrov and Gromov. These ideas provided a completely new approach to differential geometry replacing the traditional heavy analytic machinery by a description based on easily accessible, simple geometric axioms that have an immediate appeal to geometric intuition.

An influential contribution through the years, this book provided fundamental tools in connection with geodesically convex spaces, optimal transportation in Alexandrov spaces with curvature bounded below, and has been widely referred to recently in connection to the solution of the Geometrization Conjecture.

This book has clearly left a visible imprint on the landscape of today's geometry. It provides great help to orient students in the introductory studies of synthetic methods and to guide young geometers in their research.

Biographical Notes

Dmitri (Dima) Burago, a Distinguished Professor at The Pennsylvania State University, received his degree from Leningrad (now St. Petersburg) State University. He moved to the U.S. about twenty years ago. Before that, he was doing lots of crazy things: mathematics, whitewater kayaking, a small zoo at home, kick-boxing, and much more. He was teaching school kids and is very proud of his students. He had fantastic teachers, and all he has done in his life is due to their input. In the U.S., he continues doing strange things, including mathematics, Russian literature, painting, and of course, teaching. He has received a prize of the St. Petersburg Mathematical Society and has a Faculty Medal from Penn State. He spoke at the 1998 ICM in Berlin.

Yuri Burago was born in St. Petersburg (formerly Leningrad), Russia, in 1936. He graduated from St. Petersburg State University in 1959 and received his Ph.D. in 1961. His advisers were A. D. Alexandrov and V. A. Zalgaller. Yuri Burago defended his doctoral thesis (the second degree in Russia) in 1969. From 1962 to the present he has been the head of the geometry and topology laboratory. Further, he is a full professor (half-position) at St. Petersburg State University. Among Yuri Burago's students are Sergei Buyalo, Grisha Perelman, and Anton Petrunin. Yuri Burago worked in a variety of areas of geometry that include so-called 2-manifolds of bounded curvature, irregular surfaces in Euclidean spaces, Riemannian geometry in the large, Alexandrov spaces, and even theory of functions in irregular domains. He wrote several books, including *Introduction to Riemannian Geometry* (only in Russian) and *Geometric Inequalities*, both jointly with Victor Zalgaller.

Sergei Ivanov was born in Saint Petersburg, Russia, in 1972. He received his Ph.D. from St. Petersburg State University in 1996. He spent most of his scientific career at St. Petersburg Department of Steklov Mathematical Institute, where he is currently a principal research fellow. He combines this position with teaching at the Mathematics and Mechanics Department of St. Petersburg State University. He was an invited speaker at the ICM (Hyderabad 2010) and was elected as a corresponding member of the Russian Academy of Sciences in 2011.

Response from Dima Burago, Yuri Burago, and Sergei Ivanov

We are honored and grateful. There are many other books that deserve the prize, so the fact that we are selected makes us humble and speechless.

It took us more than three years to complete the work, and it would take forever without support and encouragement from our colleagues and AMS editors. We are grateful to all the colleagues who supported us and to the people who taught us.

We ourselves represent three generations of Russian geometric tradition: Dmitri's first and primary teacher was Yuri, and in his turn Dmitri taught Sergei.

Our aim when writing the book was to try to bridge the gap between students and the existing literature on the subject. In particular, we kept in mind some of Gromov's works as "bridge destinations." We are happy to know that the book turned out to be useful to many students and researchers.

The list of people without whom this work would be impossible is perhaps too long for this response, especially since there are three of us. We just want to thank all of them!

Leroy P. Steele Prize for Lifetime Achievement

The Leroy P. Steele Prizes were established in 1970 in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein and are endowed under the terms of a bequest from Leroy P. Steele. Prizes are awarded in up to three categories and each is awarded annually. The following citation describes the award for Lifetime Achievement.

Citation

Phillip A. Griffiths

The 2014 Leroy Steele Prize for Lifetime Achievement is awarded to Phillip A. Griffiths for his contributions to our fundamental knowledge in mathematics, particularly algebraic geometry, differential geometry, and differential equations.

It would not be possible in the space of this column in any reasonable length to give a detailed description of all of the areas in which Phillip A. Griffiths has made essential and fundamental contributions in mathematics.

Griffiths' work in algebraic geometry has inspired at least two generations of leading mathematicians working in this area, and it will undoubtedly continue to do so long into the future. In differential geometry and differential equations, too, Griffiths has made many fundamental contributions. While his initial interest in these subjects was partly due to their immediate utility in algebraic and complex geometry and partly due to the influence of his postdoctoral mentor, Shiing-shen Chern, Griffiths developed a style and research program that were all his own and that have proved extraordinarily fertile.

Beginning with his beautiful 1974 article, "On Cartan's method of Lie groups and moving frames as applied to uniqueness and existence questions in differential geometry" (*Duke Math. J.* 41 (1974), 775–814), he brought to bear classical techniques on a variety of problems in real and complex geometry and laid out a program of applications to period mappings, Nevanlinna theory, integral geometry, and transcendental methods in algebraic geometry. This bore fruit in many papers over the years, particularly his 1978 paper with Chern, "Abel's theorem and webs" (*Jahresber. Deutsch. Math.-Verein.* 80 (1978), no. 1–2, 13–110), which presaged many of the recent developments in the recently active area of web geometry, and his 1979 paper with Joseph Harris, "Algebraic geometry and local differential geometry" (*Ann. Sci. École Norm. Sup.* (*4*) 12 (1979), no. 3, 355–452).

His discovery of and investigations into what are now called the Griffiths infinitesimal period relations on period domains, which are of fundamental importance in moduli problems in algebraic geometry, stimulated his interest in overdetermined systems of differential equations. As a consequence, he led a revitalization of this subject in the 1980s in the form of exterior differential systems. Griffiths applied exterior differential systems to a number of different problems, not just in algebraic or complex differential geometry, but also to attack deep problems in modern differential geometry: rigidity of isometric embeddings in the overdetermined case and local existence of smooth solutions in the determined case in dimension 3, drawing deep results in hyperbolic PDEs (in collaborations with Berger, Bryant, and Yang); geometric formulations of integrability in the calculus of variations and in the geometry of Lax pairs; and treatises on the geometry of conservation laws and variational problems in elliptic, hyperbolic, and parabolic PDEs and exterior differential systems. All of these areas are currently seeing important developments that were stimulated by his work.

Phillip Griffiths' teaching career and research leadership, well measured by the numbers of mentored individuals who have gone on to stellar careers in mathematics and other disciplines, is simply astounding. His expository gifts and his nurturing of mathematical talent have not been reserved for his students alone. Not only has he been generous with his time, he has written many classic expository papers and books, such as *Principles of Algebraic Geometry* with Joseph Harris, that have remained in print and inspired students of the subject since the 1960s.

A further fundamental characteristic of Phillip Griffiths is his extensive support of mathematics, both personally at the level of research and education and nationally and internationally through committees and boards he has chaired or served on. He has carried on a remarkable research career while serving eight years as Duke University's provost, and twelve years as the director of the Institute for Advanced Study, and he currently chairs the Science Initiative Group, whose mission is assisting the development of mathematical training centers in the developing world. His example of service and leadership has inspired many in the mathematics community to emulate him in some degree, and our mathematical world is much the richer for it.

The Leroy P. Steele Prize for Lifetime Achievement is a further recognition to his dedication, generosity, and inspired leadership that surely fits the 50th anniversary of his receiving his Ph.D. from Princeton.

Biographical Note

Phillip A. Griffiths is Professor Emeritus in the School of Mathematics at the Institute for Advanced Study, where he was the director from 1991–2003 and a professor from 2004–09. He was previously Provost of Duke University. He has taught mathematics at Duke, Harvard, Princeton, and UC Berkeley.

Dr. Griffiths was born in 1938 in Raleigh, North Carolina, and received his Bachelor of Science from Wake Forest University in 1959 and his Ph.D. from Princeton University in 1962. He was a Miller Fellow at UC Berkeley from 1962–64 and again in 1976.

He is a member of the National Academy of Sciences and the American Philosophical Society and a foreign associate of the Accademia Nazionale dei Lincei, The World Academy of Sciences (TWAS), and the Indian Academy of Sciences. Dr. Griffiths was Chair of the Board on Mathematical Sciences at the National Research Council from 1986–91, a member of the National Science Board from 1991–96, Chair of the Committee on Science, Engineering and Public Policy at NAS/NAE/IOM from 1992–99, Chair of the Program Committee for the International Congress of Mathematicians from 1995–98, Secretary of the International Mathematical Union from 1999–06, and Co-Chair of the Carnegie–IAS Commission on Mathematics and Science Education from 2007–09. He received the Steele Prize for his paper "Periods of integrals on algebraic manifolds" (*Bull. Amer. Math. Soc.* 7 (1970), 228–296) and more recently the Wolf and Brouwer Prizes.

Dr. Griffiths chairs the Science Initiative Group, an international team of scientists dedicated to building science and engineering capacity in developing countries through innovative programs, including the Millennium Science Initiative (MSI) and the Regional Initiative in Science and Education in Africa (RISE).

Response from Phillip A. Griffiths

It is a wonderful honor to receive the Leroy P. Steele Prize for Lifetime Achievement. I credit my high school math teacher, Lottie Wilson at the Georgia Military Academy, for sparking my interest in and love for mathematics. From my thesis advisor at Princeton University, Don Spencer, and my postdoctoral mentor at UC Berkeley, S. S. Chern, I learned how to think about math. From my students, collaborators and colleagues I have received far more than I could possibly have given. Finally, my wife, Taffy, our four children, and my colleagues in other activities have encouraged me to do what I love and have put up with a frequently distracted mathematician. To all of the above, and to the AMS and the selection committee for this award, I owe my deepest gratitude.

Beckenbach Book Prize

The Beckenbach Book Prize, established in 1986, is the successor to the MAA Book Prize established in 1982. It is named for the late Edwin Beckenbach, a long-time leader in the publications program of the Association and a well-known professor of mathematics at the University of California at Los Angeles. The prize is intended to recognize the author(s) of a distinguished, innovative book published by the MAA and to encourage the writing of such books. The award is not given on a regularly scheduled basis. To be considered for the Beckenbach Prize a book must have been published during the five years preceding the award.

Citation

Judith Grabiner

A Historian Looks Back: The Calculus as Algebra and Selected Writings, MAA Spectrum, 2010.

The title of this book is both a tautology and a fitting description of its contents. Historians, by definition, look back. They survey, describe, and interpret that which has come before. In her introductory remarks, Grabiner reminds us of this as she writes, "Mathematics is incredibly rich and mathematicians have been unpredictably ingenious. Therefore the history of mathematics is not rationally reconstructible. It must be the subject of empirical investigation."

Such investigation lies at the heart of this book. But the title also suggests that Grabiner, in giving us a selection of prior writings, is looking back across a distinguished career of mathematical exposition. The book begins with an extended treatment of Lagrange's endeavor to reduce the calculus to algebra. Grabiner argues that he thereby advanced the journey toward rigor in analysis in work that, if not ultimately successful, contributed to Cauchy's triumph a generation later.

In subsequent articles, she examines the ideas of Descartes, Maclaurin, and others, even as she describes the evolution of such mathematical concepts as the limit and the derivative. Because so many pieces are available in this single volume, the reader can discover fascinating interconnections across the history of mathematics. Throughout, Grabiner's scholarship is first rate, and she moves the story along in a fashion that is as informative as it is engaging. And those who know the author's broad interests will not be surprised to encounter Leonardo da Vinci, David Hume, and Walt Whitman—among many others—on the pages of this remarkable book.

In the end, an accomplished historian of mathematics and a gifted expositor has looked back, and all of us should be grateful that she did.

Biographical Note

Judith V. Grabiner is the Flora Sanborn Pitzer Professor of Mathematics at Pitzer College, one of the Claremont Colleges in California. She is the author of *The Origins of Cauchy's Rigorous Calculus* (MIT Press, 1981), *The Calculus as Algebra: J.-L. Lagrange*, 1736–1813 (Garland Press, 1990), and the Beckenbach Prize volume *A Historian Looks Back*: *The Calculus as Algebra and Selected Writings* (MAA Spectrum Books, 2010). She also is the author of a Teaching Company DVD course called "Mathematics, Philosophy, and the 'Real World.'" Professor Grabiner was recently named to the first class of Fellows of the American Mathematical Society. Besides having written many articles about the history of mathematics and history of science, and having won several Lester Ford and Allendoerfer awards from the Mathematical Association of America, she received the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching from the MAA in 2003.

Response from Judith Grabiner

I am grateful to the prize committee for recommending me for this honor and for this lovely citation.

Since this book does look back over much of my career, I should do so here as well. First, let me acknowledge my debt to the educational philosophy of the University of Chicago, where I learned the importance of careful reading and robust questioning of original texts, and where I had the chance to learn mathematics from wonderful teachers like Saunders Mac Lane, Antoni Zygmund, Irving Ezra Segal, Hyman Bass, and Paul Halmos. Then, in graduate school, my thesis advisors, I. Bernard Cohen and Dirk Struik, helped me take it all to another level.

Let me praise, as well as thank, the Mathematical Association of America for so many things besides this Prize: for its support of excellence in teaching and writing mathematics, for its outstanding publications, and for its sponsorship of so many mathematical activities. I thank Jerry Alexanderson and Don Albers for getting me to produce this book, and my husband Sandy Grabiner for his mathematical insight and his constant encouragement. I am grateful to the Pitzer family for the generous research support that comes with the Flora Sanborn Pitzer professorship at Pitzer College.

And above all, I thank my students. They've taught me most of what I know about being clear and presenting material in ways that interest others beside myself, and their questions and insights bode well for the intellectual future of our profession and of the wider society.

David P. Robbins Prize

This prize was established in memory of David P. Robbins by members of his family. Robbins, who died in 2003, received his Ph.D. in 1970 from MIT. He was a long-time member of the Institute for Defense Analysis Center for Communication Research and a prolific mathematician whose work (much of it classified) was in discrete mathematics. The Prize is for a paper that reports on novel research in algebra, combinatorics or discrete mathematics, has a significant experimental component, and is on a topic which is broadly accessible. The paper shall provide a simple statement of the problem and clear exposition of the work. This Prize is awarded every three years.

Citation

Frederick V. Henle and James M. Henle

"Squaring the plane," *American Mathematical Monthly*, 115 (2008), no. 1, 3–12.

The problem is simple. You are supplied with infinitely many square tiles, but they all have different sizes, in fact there is exactly one n-by-n square for each positive integer n. Your task is to use these squares to tile the plane, no overlaps or gaps allowed, and you must use all of the squares. A traditional tiling uses many congruent copies of the same tile or a few tiles. Now, no two tiles are alike.

Inspired by a paper of William Tutte in 1950 showing that a square can be tiled by finitely many different smaller squares, Solomon Golomb (recent winner of the U.S. National Medal of Science) posed the question in 1975 on whether the plane can be tiled with the integer squares. Shortly after, it was picked up by Martin Gardner in his *Scientific American* column, and several partial results appeared in the intervening years.

With only meager progress, some began to think such a tiling was not possible. But it is.

This delightful article gives a complete description of a tiling of the plane using one square of each integral side. The argument itself does not bring in any "big guns" to settle the problem; rather it uses "big ingenuity," which is always preferable. As such, the paper is completely accessible to undergraduates. The article closes with a number of intriguing open problems; we hope that this award will help call attention to them.

Biographical Notes

Frederick V. Henle received his baccalaureate from Harvard University in 1992 and his master's degree from Dartmouth College in 1997. He has taught mathematics and computer science at Mercersburg Academy, played in the first violin section of the Maryland Symphony Orchestra, and is now a lead developer at athenahealth, Inc. Work on this paper and subsequent papers with his father, Jim, has been both personally and professionally fulfilling, and an experience that he hopes one day to share with his children.

James M. Henle earned his baccalaureate degree from Dartmouth College in 1968 and his Ph.D. from MIT in 1976. Early in his career he taught at the University of the Philippines and at Burgundy Farm Country Day School, but for most of his professional life he has been a member of the faculty at Smith College.

Jim credits his mathematical awakening and development to his high school teacher Richard Jameson, to Dartmouth logician Donald Kreider, to his thesis advisor Gene Kleinberg, to his Smith colleagues Marjorie Senechal and Joe O'Rourke, to the columns of Martin Gardner, and most important, to his brother Michael Henle. Jim counts over two dozen collaborators on his research papers. The most frequent have been his academic siblings, Carlos Di Prisco, Arthur Apter, and Bill Zwicker; the most significant is his son, Fred.

Joint Response from Frederick and James Henle

It is a delight and a great honor to receive the 2014 David P. Robbins Prize. We feel fortunate to have stumbled upon such a problem and then to have stumbled on a solution. We only wish that others might take this work further and answer questions that have so far eluded us, most especially the question of squaring the half-plane.

Certificates for Meritorious Service

Certificates for Meritorious Service 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.

Citation

Lowell Beineke, Indiana Section

Dr. Lowell Beineke of Indiana University–Purdue University Fort Wayne (IPFW) has been one of Indiana Section's most committed leaders and has always been willing to lead the section and to support other individuals as they work for the section. In addition to his terms as Vice-Chair and Chair of the Section from 1986 through 1988, he has completed a term as the Section's Governor, holding that office from 1990 through 1993. Since then, he has continued to be an active participant in the Indiana Section.

At the national level, Lowell's service as Editor of the *College Mathematics Journal* has impacted both the MAA and the entire mathematics community. Lowell's hard work maintained the journal's high standards.

Lowell has served his department as a superbly effective classroom teacher, receiving the Indiana Section's Distinguished Teaching Award in 1997. The Section has recognized this many other times in the past by selecting him to be an invited speaker at the Section meetings. He has also been an MAA Visiting Lecturer, and published articles in both the *American Mathematical Monthly* and the *College Mathematics Journal*. Lowell has given invited addresses to MAA Section meetings across the country, and has served the MAA as a member of the Committee on Lester R. Ford Awards.

IPFW has named two awards after him: the L. W. Beineke Scholarship for undergraduate mathematics majors, and the L. W. Beineke Award for Outstanding Contributions to the Liberal Arts and Sciences, a service award for faculty in the College of Arts and Sciences.

Biographical Note

Lowell Beineke is the Schrey Professor of Mathematics at IPFW, where he has worked since earning his Ph.D. from the University of Michigan in 1965. His undergraduate study was at Purdue University. He is author of over a hundred papers in graph theory; the eighth book that he has edited with Robin Wilson appeared in 2012. He served as Editor of the *College Mathematics Journal* from 2004 to 2008 and on the editorial boards of the *Journal of Graph Theory* and the *International Journal of Graph Theory* for many years. He has presented papers and attended workshops in India, Japan, China, Thailand, South Africa, Zimbabwe, and Egypt, as well as a number of European countries. While on sabbatical at Oxford University, he has three times been a Visiting Scholar at Wolfson College.

Beineke has been the recipient of numerous honors, including being the first person to receive both the Distinguished Teaching and Distinguished Service Awards from the Indiana Section. He has received both the Outstanding Teaching and Outstanding Research Awards from IPFW, and has been admitted into Purdue University's *Book of Great Teachers*. In 2012, the College of Arts and Sciences at IPFW instituted an award for outstanding contributions to the arts and sciences in his name, and presented him with the first medal.

Response from Lowell Beineke

Some years ago, my major professor said to a small group of our friends, "You need to listen to Lowell even when he doesn't say anything." I feel that this is one of the times when I wouldn't mind if people knew what I meant without my having to say it. It is not easy, in fact it is impossible, for me to express in words my reaction to receiving this award. Nor can I begin to thank even a small fraction of those individuals who helped me into and through my career in mathematics.

Included in the group to whom I continue to be grateful is the professor at Purdue who, when I was a graduating senior, included me among those who were given membership in the MAA. My active involvement in the Indiana Section began early in my career at IPFW when my department head suggested that I give a talk at a Section meeting. Both the national organization and the Indiana Section have been an important part of my academic life, and I am indeed honored to be representing the members of the Indiana Section today.

Finally, I don't know that my wife, daughter, and son appreciate the view of my professor that I should be listened to even when I don't say anything. To compensate for those times when I may not have adequately expressed my gratitude, I thank them now for their continued support, including coming along to all those conferences. I gratefully accept this honor, which I think recognizes them along with my teachers, my colleagues and peers, and my students.

Citation

Stan Chadick, Louisiana-Mississippi Section

Dr. Stan Chadick served as a faculty member and administrator at Northwestern State University of Louisiana (NSU) and Louisiana School for Math, Science, and the Arts from 1969 to 2005. Two areas of emphasis for Chadick have been improving mathematics education and mentoring younger faculty members. He was an active and influential member of the Louisiana-Mississippi (LA/MS) Section throughout his career, serving the Section on various committees, as a departmental liaison, and as Section Governor.

As Department Head for NSU in 1978 and for many years afterward, Stan acted as the departmental liaison to the LA/MS Section. He understood the important role that liaisons could assume in guiding Section activities, maintaining ties between MAA and individual universities, and sharing and addressing concerns about the direction of our profession. As LA/MS Section Governor from 1998 to 2001, Chadick instituted the practice of having the governor meet with the liaisons during each annual Section meeting.

Dr. Chadick devoted much of his career to improving mathematics education at all levels, but especially at the K–12 level. He was program coordinator for more than ten Louisiana Systemic Initiative Program grants and acted as a consultant to several local school systems and universities. Other Louisiana universities asked for his input when implementing new technology into mathematics classes. Through his grant projects, Chadick involved several other members of the LA/MS Section in improving mathematics education by hiring them as content and pedagogy instructors for the K–12 grant participants. Some of those other faculty members have gone on to lead projects on their own aimed at improving K–12 mathematics education.

Stan believes that one of the greatest impacts a person can have in life is the influence on other people. He often co-authored papers and grant proposals with younger faculty members to encourage their involvement in the professional community and in MAA Section meetings. Whenever possible, he would invite MAA members from other universities to participate in his projects. As evidence of his influence on the current leaders of our Section, please note that the two immediate past winners of the Distinguished Teaching Award, Connie Campbell and Judith Covington, both mentioned the influence that Stan Chadick had on their lives and careers during their invited talks to the Section. Perhaps Chadick's greatest contributions to the Section and the mathematical community at large are yet to come through some of the younger faculty members whom he mentored.

Biographical Note

Stan R. Chadick received his B.S. from the University of Central Arkansas and his M.S. from the University of Arkansas. He received his Ph.D. in cluster set theory at the University of Tennessee under the direction of Tom Mathews. Stan taught for thirty-seven years at Northwestern State University in Natchitoches, Louisiana. During his tenure, he served as head of the mathematics department; director of the Scholars' College, a four-year honors program; and director of academics at the Louisiana School for Math, Science, and the Arts. Stan won three university-wide teaching awards, was co-author of a college algebra text, and writer and director of over fifteen grants with his wife, Kathleen. Since retirement Stan and Kathleen have continued to write and consult. In 2011 he was awarded professor emeritus. Stan and Kathleen are currently enjoying life and tutoring son and grandchildren in mathematics and science.

Response from Stan Chadick

I am satisfied at the end of a career that the reward from being a college professor of mathematics is enough. I never remember a day that I did look forward to going to work. Now, my colleagues in the LA/MS Section have selected me to receive this Meritorious Service Award. When I consider the talent in our

Section, I am honored and humbled at this selection. Every interaction with my colleagues in the Section was a learning experience. Thank you for all that you do.

Citation

Aparna Higgins, Ohio Section

Aparna Higgins is probably best known within the MAA for her work with Project NExT. She was a codirector of the program 1998–2009 and is currently the director. As such, she has influenced numerous early career mathematicians. Even before assuming a leadership role in Project NExT, Aparna served as a consultant and workshop presenter for early cohorts of Project NExT Fellows. Aparna has also served on numerous MAA committees, among them committees that select award winners, speakers for national meetings, and nominees for national offices. She has served on the Advisory Boards for *Math Horizons* and *Focus*, and as the chair of the Committee on Student Chapters. In the Ohio Section, Aparna has served as Section President, chair of a number of committees, and has helped with local arrangements at several Section meetings; she has given Ohio Project NExT Workshops. Aparna was recognized with the MAA's Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics in 2005. She was a presenter of an MAA minicourse on undergraduate research at JMM 1997 and then has been every year since 1999, many of these with Joe Gallian. Aparna has given many invited talks at various Section meetings, undergraduate conferences, and undergraduate summer research programs.

Biographical Note

Aparna Higgins received a B.Sc. from the University of Bombay and a Ph.D. from the University of Notre Dame in 1983. She has taught at the University of Dayton since 1984, except for a few leaves of absence. Aparna directed several undergraduate Honors theses (her most fulfilling professional experiences), and she codirected NSF-sponsored REUs in 1990–91. She has presented workshops on undergraduate research at MAA Section and national meetings (often with Joe Gallian) and at Project NExT Workshops. Aparna feels lucky to have been involved at early and crucial times in two wonderful programs of the MAA—Student Chapters and Project NExT. Aparna served on committees that created MAA Student Chapters and provided programming for undergraduate audiences at national meetings (1988–97), and she was invited by Chris Stevens to join the Project NExT leadership team in 1998. Aparna is married to Bill Higgins, with whom she enjoys attending meetings of the Ohio Section of the MAA.

Response from Aparna Higgins

I have had the good fortune of being connected to many mathematical communities, including the Ohio Section of the MAA, Project NExT, and proponents of undergraduate research in mathematics. It seems natural to help out in one's community, but one cannot do it alone. I thank all those in the Ohio Section who set a fine example for service, including the recently departed Leo Schneider, Dick Horwath, and Doug Faires. Joe Gallian has my thanks for partnering with me often to help other faculty discover the fulfillment in directing student research. I am grateful to Chris Stevens for bringing me into the Project NExT community and providing me with one of my most satisfying, challenging, and fun service activities. I thank the Ohio Section, and in particular, Barbara D'Ambrosia and Wiebke Diestelkamp, both Project NExT Fellows now serving in the governance of the Ohio Section, for nominating me for this award. I am grateful to the MAA for this Certificate of Meritorious Service and for providing me the opportunity to participate in the leadership of two wonderful programs of the MAA—Project NExT and student activities. I appreciate the University of Dayton's support of my sustained service to the MAA. I am grateful to my husband Bill for supporting my service activities.

Citation

Tina Straley, Southeastern Section

Tina Straley's service to the MAA and the Southeastern Section has spanned the gamut, from Departmental Liaison to MAA Executive Director. In all her roles, Tina has been an imaginative leader and a creative problem solver, able to blaze new pathways and to handle thorny issues.

In the early 1980s, Tina was the Departmental Representative at Kennesaw State University. She became the Section's Newsletter Editor in 1988, transforming a thin, primitive newsletter into a valuable Section resource, while also making substantial contributions on the Executive Committee. She and her department hosted the Section meeting at Kennesaw in 1992. In 1995, she was elected Chair-Elect (in the only contested election the Section has ever had), so she served a four-year hitch as Chair-Elect, Chair, and Past Chair. Tina was always prepared to carefully examine what we'd been doing and to look for ways to improve. She chaired many long meetings of the Executive Committee, successfully oversaw the Section meetings, and fostered a sense of excellence and commitment in all that we did. She modernized the Section's Bylaws and, among other improvements, split off the role of Program Chair as a separate responsibility. Also during her service as Chair, she initiated the state annual (dinner) meetings. Her abilities were recognized by the MAA Nominating Committee, and she was nominated as a candidate for MAA Vice-President in the 1990s.

Tina became MAA Executive Director in 2000 and returned to the Section meeting that spring as the Visiting National Officer/Speaker—her title was "The MAA at the Sunrise of the Century." She also received the Section's Distinguished Service Award at that meeting.

Even though we had loaned her to the national organization, she maintained her official Section affiliation in the Southeastern Section and returned each spring for our vibrant annual meeting. As Executive Director she championed the goals of the Association, carried out innumerable tasks, and guided the MAA through an important decade of change. Time and again she demonstrated her organizational capability and creativity and skill in conflict resolution. Her trademark has always been an ability to listen to a discussion, digest and sort out the key issues, and find a solution. The Executive Director essentially guides the ship and keeps the trains running on time (to mix some metaphors). This has been the highest-level MAA role that anyone from our Section has held. Even now, as she has retired from the Executive Director post, Tina still chairs an MAA committee and remains very active.

Biographical Note

Tina Straley spent the majority of her educational and professional life in the MAA Southeastern Section. She earned her B.S. and M.S. degrees at Georgia State University and her Ph.D. in combinatorics at Auburn University. She taught at Spelman College and at Auburn (postdoc) before joining the faculty of Kennesaw State University (KSU), where she stayed for twenty-six years, including a year at Emory University and two years in the Division of Undergraduate Education at the National Science Foundation. At KSU, Tina served as Mathematics Department Chair, Dean of Graduate Studies, and Associate Vice President for Scholarship. Tina served the Southeastern Section on many committees and as Newsletter Editor and Chair, and hosted a Section meeting. For the MAA, Tina was a member of committees spanning teaching, curriculum, meetings, and publications, including Editor of *MAA Notes* and co–Principal Investigator of an NSF grant to MAA called "Partnerships" (with other disciplines). Tina served MAA as Executive Director from January 2000 through December 2011. She is currently consulting for the Educational Advancement Foundation.

Response from Tina Straley

The strength of the MAA is in the Sections. They provide members a sense of comradeship in a professional family. Having visited most Sections, I have great appreciation and warm feelings for all of them, but my heart belongs to the Southeast Section. I am thankful for the many opportunities the Section afforded me to participate in the community of mathematicians; I am fortunate for all the friends I made and still have there; and I am honored by this award. I physically left the Section to serve as MAA Executive Director, but I returned for as many meetings as possible. Every time I came back home, my feelings of belonging to the Section were renewed. But I could no longer be the active member I had been. For this reason, I am touched by this award and the knowledge that the members of the Section have not forgotten me. I have never forgotten them.

I have so many happy memories. There was the day at the JMM when David Stone and I realized we had crossed into senior leadership when a member came up to us impressed to meet Stone and Straley, having seen our names on our badges. There was the Section Executive Committee meeting that was literally blown away by Hurricane Hugo. There were beer parties, low-country boils, restaurant adventures, meetings with famous mathematicians who visited us, and intense meetings of the Executive Committee that stretched late into the night. I fondly remember my mentors, especially John and M.F. Neff, Trevor Evans, and John Kenelly. I hope that I was an effective mentor to others who followed me and that they are mentors in their turn. To conclude, thank you to the MAA and especially to everyone who has ever been a member of the best Section of all, the Southeastern.

Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics

The Gung and Hu Award for Distinguished Service to Mathematics, first presented in 1990, is the endowed successor to the Association's Award for Distinguished Service to Mathematics, first presented in 1962. This award is intended to be the most prestigious award for service offered by the Association. It honors distinguished contributions to mathematics and mathematical education—in one particular aspect or many, and in a short period or over a career. The initial endowment was contributed by husband and wife, Dr. Charles Y. Hu and Yueh-Gin Gung. It is worth noting that Dr. Hu and Yueh-Gin Gung were not mathematicians, but rather a professor of geography at the University of Maryland and a librarian at the University of Chicago, respectively. They contributed generously to our discipline, writing, "We always have high regard and great respect for the intellectual agility and high quality of mind of mathematicians and consider mathematics as the most vital field of study in the technological age we are living in."

Citation

Joan Leitzel

The 2014 Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics is presented to Joan Leitzel for her far-sighted work of creating programs to decrease the need for remediation in colleges and for her leadership on the national level. Her distinguished career began at Ohio State University where she led visionary projects that formed parts of a coherent plan to reverse the need for remediation in Ohio.

By 1974, Ohio State, an open door university, had twice the enrollment in remedial mathematics that it had had ten years earlier. Joan, with Bert Waits and Frank Demana, attacked this problem by developing a curriculum for a remedial course that was not a repeat of the typical high school course. The course was centered around problem solving, while including computation and symbolic manipulation. They wanted students to be able to confront more realistic problems and explore situations numerically, relieving classes from focusing on arithmetic. All of this sounds rather routine now, but it certainly was not in 1974, when Joan, Bert, and Frank were designing their program. The projects were far ahead of their time in that they collected data and were evidence-based.

A second step in the program was teacher preparation. From 1976 to 1979, Joan was co-director (with James Schultz) of the NSF-funded project, *Testing Alternatives in the Mathematics Preparation of Elementary Teachers*. As part of this project, they organized three different course sequences for pre-service elementary teachers. They concluded that "highly integrated content-methods instruction provided no measurable advantage for students but that coordination of separate courses in content and methods served to improve students' performance in both." Another step was the early placement testing for high school juniors followed by an appropriate twelfth grade course to prepare for college mathematics. One problem revealed by early placement testing was that many high school juniors had very limited algebra skills and no appropriate course for them to take in their senior year. With funding from the Battelle Foundation, Joan and Frank undertook the project *A Numerical Problem Solving Course for Underprepared College-Intending Seniors*. The course they developed took a highly numerical approach to algebra and geometry and very successfully brought students up to competency at the level of intermediate algebra. A final step was the project, *A Numerical Problem Solving Approach to Variables and Functions in Pre-algebra for Grades 7 and 8* led by Joan, together with Frank Demana and Alan Osborn.

These early articulation programs provided instructional materials and served as models later copied by many universities that now have early placement testing for high school students and a more coordinated mathematical transition from high school to college. One final piece was the course, *Algebra for Adults*, developed by Joan, with Suzanne Damarin; data documented that the course was successful in preparing students for engineering calculus and business calculus.

Joan joined the Department of Mathematics at The Ohio State University in 1965, just after receiving her Ph.D. in mathematics from Indiana University. At Ohio State she served as both a faculty member and as associate provost. She received the Ohio State Distinguished Teaching Award (1982) and the Distinguished Service Award (2002). From 1990 to 1992, Joan served at the National Science Foundation as the division director for materials development, research, and informal science education. In 1992, Joan moved to the University of Nebraska-Lincoln where she served as Senior Vice Chancellor for Academic Affairs and Provost. From 1995 to 1998, Joan served as Vice-Chair and Chair of the Board of Directors of the American Association for Higher Education (AAHE). She also served on the governing board of the National Association of State Universities and Land Grant Colleges, and on the American Council of Education's Committee on Leadership and Institutional Effectiveness.

In 1996, Joan was appointed President of the University of New Hampshire. She served six years and, on April 19, 2002, was awarded the Charles Holmes Pettee Medal in recognition of her contributions to the University. During this period, the University experienced unprecedented change. She developed a new institutional strategic plan, worked tirelessly to raise the level of excellence in academic programs, implemented new and exemplary financial and fiscal management policies, guided the most ambitious capital campaign in University history, and coordinated key renovations and expansions of University facilities. The Joan and James Leitzel Center for Mathematics, Science, and Engineering Education was established in 2002 in honor of Joan and her late husband, James R. C. Leitzel.

From 2000 to 2004, Joan chaired the Mathematical Sciences Education Board of the National Research Council and in 2012, Joan completed a two-year term as Chair of the Conference Board of the Mathematical Sciences (CBMS).

Following retirement from the presidency at the University of New Hampshire, Joan returned to Ohio and plunged into administrative duties directly connected to mathematics. She worked with the Ohio Department of Education to design and launch their statewide Mathematics Initiative, which was an extension of her earlier work in Ohio to coordinate mathematics education across the levels of instruction. In 2005, the Ohio Resource Center thanked Joan for her vision that placed the state of Ohio at the forefront in moving mathematics education from a reliance on remediation to a focus on intervention. Joan continues to be a member of the Ohio Mathematics and Science Coalition. She chairs the Ohio Board of Regents' Mathematics Steering Committee and the national advisory board for Nebraska Math. She is a member of the national advisory board for the Association of Public and Land Grant Universities' Mathematics Teacher Education Partnership. In 2008–09, she returned to Ohio State for another year and led the restructuring of Arts and Sciences, which resulted in replacing five separate colleges with one large unified college.

A consistent theme of Joan's career has been finding creative ways to improve student learning of mathematics, including improvement of pre-college teaching. Her leadership skills led her to chair several key groups as well as to assume the presidency of the University of New Hampshire.

Biographical Note

Joan Leitzel was a professor of mathematics at Ohio State for twenty-five years and moved into administration as Associate Provost for Curriculum and Instruction. In 1990 she went to the National Science Foundation as a division director in the Directorate for Education and Human Resources, and then assumed the position of Senior Vice Chancellor for Academic Affairs and Provost at the University of Nebraska Lincoln. In 1996 she became President of the University of New Hampshire. She returned to Columbus in her retirement and served Ohio State one more year to lead the restructuring of Arts and Sciences.

Dr. Leitzel chaired the Mathematical Sciences Education Board at the National Research Council from 2000–04 and is immediate-past-chair of the Conference Board of the Mathematical Sciences. She has served on many MAA committees including the Strategic Planning and Design Committee in 2004–05 which she chaired. She worked with the Ohio Department of Education 2004–07 to design and launch their statewide Mathematics Initiative and has chaired the National Advisory Committee for NebraskaMATH since 2003. Her baccalaureate degree from Hanover College, her master's degree from Brown University, and her Ph.D. From Indiana University are all in the field of mathematics.

Response from Joan Leitzel

I am greatly honored—and very surprised—to receive the Gung and Hu Award from the MAA. Dr. Gung and Dr. Hu recognized that mathematics is the "most vital field of study" in the age we are living in. I surely agree and have always been grateful that I chose mathematics. Our field is filled with exceptionally talented, deeply committed individuals, and I have had the great privilege of working alongside many of them. I now realize that although we may have accomplished some notable things in the "service" area earlier in my career, today's problems are no easier and no less important than the ones we worked on then. So I am grateful for the range of new efforts now underway within the MAA and across the fields of mathematics and mathematics education, and I am excited to continue to be part of several of these. There are many, many people I would like to express my appreciation to, but that list is very long, so I will choose only one and express my great appreciation for the support, insights, and values I received from Jim Leitzel, who had an exceptional ability to find solutions to problems that might appear unsolvable to others and to see new ways to move ahead.

Summary of Awards

For AMS

Award for Distinguished Public Service: Philip Kutzko

Bôcher Memorial Prize: Simon Brendle

Levi L. Conant Prize: Alex Kontorovich

Joseph L. Doob Prize: Cédric Villani

Frank Nelson Cole Prize in Number Theory: Yitang Zhang, and Daniel Goldston, János Pintz, and Cem Y. Yildirim

Leonard Eisenbud Prize for Mathematics and Physics: Gregory W. Moore

Leroy P. Steele Prize for Lifetime Achievement: Phillip A. Griffiths

Leroy P. Steele Prize for Mathematical Exposition: Dmitri Y. Burago, Yuri D. Burago, and Sergei V. Ivanov

Leroy P. Steele Prize for Seminal Contribution to Research: Luis A. Caffarelli, Robert Kohn, and Louis Nirenberg

For AMS-MAA-SIAM

Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student: Eric Larson

For AWM

Louise Hay Award for Contributions to Mathematics Education: Sybilla Beckmann

M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics: William Yslas Vélez

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman: Sarah Peluse

For JPBM

Communications Award: Danica McKellar

For MAA

Beckenbach Book Prize: Judith Grabiner

Chauvenet Prize: Ravi Vakil

Euler Book Prize: Steven Strogatz

Certificates for Meritorious Service: Lowell Beineke, Stan Chadick, Aparna Higgins, and Tina Straley

David P. Robbins Prize: Frederick V. Henle and James M. Henle

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics: Carl Lee, Gavin LaRose, and Andrew Bennett

Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics: Joan Leitzel

Index of Award Recipients