Joint Mathematics Meetings

New Orleans, LA

January 6–9 2011

January 2011 Prizes and Awards

4:25 P.M., Friday,

January 7, 2011

Program

Opening Remarks
George E. Andrews, President
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

David P. Robbins Prize
Mathematical Association of America

Bôcher Memorial Prize
American Mathematical Society

Levi L. Conant Prize
American Mathematical Society

Leonard Eisenbud Prize for Mathematics and Physics
American Mathematical Society

Ruth Lyttle Satter Prize in Mathematics
American Mathematical Society

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

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

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

Communications Award
Joint Policy Board for Mathematics

Chauvenet 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

Joseph L. Doob Prize
American Mathematical Society

Frank Nelson Cole Prize in Number Theory
American Mathematical Society

Leroy P. Steele Prize for Mathematical Exposition
American Mathematical Society

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

Leroy P. Steele Prize for Lifetime Achievement
American Mathematical Society

Closing Remarks
David Bressoud, President
Mathematical Association of America

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 in order 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

Erica Flapan

Erica Flapan, Lingurn H. Burkhead Professor of Mathematics at Pomona College, has been teaching at the collegiate level for more than 25 years, nearly all of them at Pomona. Professor Flapan's outstanding teaching was recognized earlier with awards before her Ph.D. and as a postdoctoral fellow, and also more recently as the recipient of the 2005 Irving Foundation Distinguished Faculty Fellowship for mentoring students of color at Pomona, and the 2010 Southern California–Nevada Section Award for Distinguished College or University Teaching. She is best known for her dynamic, energetic classes that foster the participation of all students in the room. Students at all levels and with a variety of disciplinary interests have benefited from Flapan's interest and excellence in teaching. For example, she was co–principal investigator for a grant to bridge mathematics and chemistry at Pomona; this helped to fund the creation of an Advanced Problem Solving course designed to give aspiring chemistry students needed mathematical strengthening as well as three other projects from the beginning of the chemistry curriculum to the end. Her work in connecting mathematics and chemistry is further illustrated by her widely acclaimed book *When Topology Meets Chemistry: A Topological Look at Molecular Chirality* (Cambridge University Press and the Mathematical Association of America, 2000).

Professor Flapan's influence goes far beyond the classrooms of Pomona to include teaching in several summer programs aimed at broadening the interest in advanced mathematics among high school and undergraduate students and encouraging them to pursue graduate degrees. According to program organizers, Erica Flapan has been extraordinarily successful at engaging students in the Mills Summer Math Institute, the Carleton College Summer Mathematics Program for Women, the Canada/USA Mathcamp, and the Park City Mathematics Institute Undergraduate Program. She is known for her dedication to the mathematical growth of her students and for her impact in their mathematical lives and careers. Her colleagues and students say that she serves both as a formal and informal advisor to many students; she is known as a tireless advocate and strong voice in support of diversity.

It is a pleasure for the Mathematical Association of America to recognize Professor Erica Flapan with the Haimo Award for her outstanding leadership and work related to the teaching of mathematics and the mentoring of students in whatever context she meets them.

Biographical Note

Erica Flapan, the Lingurn H. Burkhead Professor of Mathematics at Pomona College, received her B.A. from Hamilton College in 1977 and her Ph.D. from the University of Wisconsin at Madison in 1983. Before coming to Pomona College, she was a G. C. Evans Instructor at Rice University and a visiting assistant professor at the University of California at Santa Barbara. Her research interests are in low dimensional topology and its applications to chemistry and molecular biology. She wrote *When Topology Meets Chemistry*, for upper level undergraduates, and she has recently co-authored a book (together with James Pommersheim and Tim Marks) entitled *Number Theory: A Lively Introduction with Proofs, Applications, and Stories* (John Wiley & Sons, 2010) for students who have not yet been exposed to proofs.

Response from Erica Flapan

I am deeply honored to receive the Haimo Award and touched to have been nominated by former students who are now mathematicians themselves at impressive places like Mount Holyoke College, Imperial College London, Carleton College, and the Rand Corporation, among other places. I am lucky to have had bright, motivated students like these who have inspired me year after year to strive to be a better teacher. In addition, I am grateful to the Pomona College Mathematics Department for giving me unusual freedom to explore different teaching methods and course content as well as to create new courses. I also want to thank Deanna Haunsperger and Stephen Kennedy at Carleton College for designing and flawlessly directing the Summer Mathematics Program for Women, where I have taught regularly and have become a part of a dynamic community that mentors and encourages talented young women to become mathematicians. Finally, I want to thank my husband, Francis Bonahon, who listens tirelessly to my stories about teaching and to our daughter, Laure Flapan, who never lets me forget the student perspective.

Citation

Karen Rhea

Karen Rhea has been a faculty member in colleges and universities for about 30 years, the last decade at the University of Michigan. In 1998, while a professor at the University of Southern Mississippi, she was awarded the MAA Louisiana-Mississippi Section's Award for Distinguished College or University Teaching of Mathematics.

At the University of Michigan, Karen is director of the Introductory Program, which serves about 4500 students annually in pre-calculus and the first year of calculus and is widely viewed as one of the most successful programs of its scope in the country. Karen's work with the Introductory Program helps to address the problem of creating and maintaining an environment in which each of thousands of individual students with different instructors can be inspired to do their best work. One of the most important parts of her work is running, at the beginning of each academic year, an intense training week for all new instructors for the Introductory Program. She, along with many seasoned teachers, works to produce confident, prepared, and effective teachers. Recognizing that effective teaching is not "one size fits all", Karen is praised for helping instructors find their own voice. Maintaining an open door policy, she continues to work with these instructors, offering them advice and guidance and mentoring them long after they leave the program. Since many of the instructors she works with go on to become faculty elsewhere, her influence on mathematics instruction is much broader than just in her own classes at Michigan; she also inspires others to teach well.

Her students praise her also, saying that her enthusiasm and eagerness to teach make class interesting and that she presents the material as clearly as possible. Karen Rhea has contributed to the general development of the calculus curriculum and to the discourse on how to teach calculus effectively through her work with the Harvard Calculus Consortium. Not only has her work made significant contributions to the content of the introductory courses at Michigan, her work has contributed to the development of a calculus curriculum that aims to get students actively involved in their own learning throughout the country.

It is a pleasure for the Mathematical Association of America to recognize Professor Karen Rhea for her outstanding work in teaching, her contributions to changes in the calculus curriculum nationally, and her work inspiring and developing other outstanding teachers.

Biographical Note

Karen Rhea is Lecturer IV and Director of the Freshman/Sophomore Program at the University of Michigan. Prior to moving to Ann Arbor, she was a lecturer at the University of Southern Mississippi. She has been a member of the Calculus Consortium since its inception and has, along with members of the Consortium, been influential in changes that have taken place in calculus instruction for over two decades. She has given numerous talks and workshops, has served on the MAA Committee on Professional Development, and was recently appointed to the Committee on the Teaching of Undergraduate Mathematics. She was awarded the 2010 Matthews Undergraduate Teaching Award at the University of Michigan and nominated by the University for the Carnegie Professor of the Year Award. She looks forward to retiring soon but never intends to give up her interest in working with others. She aspires to soon become a doula.

Response from Karen Rhea

I am grateful for the sage advice, upon returning to college as an adult student, that college is for education and not training for a job. I am grateful to Gary Walls for encouraging me to pursue a graduate degree. I am most exceptionally grateful for the opportunity to know and work with the members of the Calculus Consortium—a most creative, supportive, and inspirational team. Through that association I was invited to go to the University of Michigan. There I was most fortunate to be mentored by Pat Shure, Al Taylor, and others and to step into an already established and successful program. I am thankful for the incredible collegiality and support of the faculty at the University of Michigan and for the opportunity that I have had to work with many undergraduates and with graduate students and postdocs as they embark on their careers. I am very honored to join the ranks of Haimo winners. Thanks (so very much!) to the many friends and colleagues who have supported me for this award and throughout my career.

Citation

Zvezdelina Stankova

Zvezdelina Stankova's goals in teaching are to develop students' ability to do independent thinking, no matter what the level of the student, from the middle and high school students in the Math Circles she works with through the senior undergraduate mathematics majors of Mills College and the University of California, Berkeley. In each of these arenas, she has been extraordinarily successful.

As a full time faculty member at Mills College, Stankova has also taught one course per year at the University of California, Berkeley for eleven years, and, in 1998, she founded the Berkeley Math Circle, a weekly program for 50 Bay Area middle and high school students. She has been the Berkeley Math Circle's director and a frequent lecturer since the beginning. In addition, she has been directly involved in the creation of Math Circles in seven more cities in the U.S. and Canada and has contributed to the creation of Circles in twelve other cities. It is fair to say that Zvezda is a major contributor to the success of Math Circle development throughout the United States, through her speaking, through the book (which she co-edited) *A Decade of the Berkeley Math Circle* (American Mathematical Society, 2008), and through the Berkeley Math Circle website.

Stankova, with Paul Zeitz and Hugo Rossi, cofounded the Bay Area Mathematical Olympiad, an annual competition among 250 students from 45 schools in the Bay Area. Several of these students have gone on to be members of the U.S.A. Mathematical Olympiad team. Professor Stankova has been actively involved in the U.S. participation in the International Mathematical Olympiad, including being an instructor in the training camps of the USAMO. Professor Stankova's students at every level are enthusiastic about her teaching and mentoring, indicating her classes are challenging and fun. Students rave about her teaching ability, her enthusiasm for mathematics, and her capacity to dramatically change their attitudes toward mathematics and their perceptions of their own mathematical abilities.

It is a pleasure for the Mathematical Association of America to recognize Professor Zvezdelina Stankova with the Haimo Award for her outstanding work in teaching, mentoring, and inspiring students at all levels, and in leading the development of Math Circles, and promoting participation in mathematics competitions.

Biographical Note

Zvezdelina Stankova is the Rice Professor at Mills College. She was drawn to mathematics through her Math Circle in Bulgaria, consequently earning silver medals at the International Mathematical Olympiads. Zvezda completed a B.A./M.A. degree at Bryn Mawr in 1992. Her first math research in combinatorics at the REU in Duluth contributed to the Alice Schafer Prize in 1993. In 1997 Zvezda received her Ph.D. from Harvard in algebraic geometry and high school teaching certificates in Massachusetts and California. In 1998 Zvezda founded the Berkeley Math Circle (BMC). Her pioneering work inspired dozens of new circles throughout the U.S. and abroad. She trained the USA national team for six years, including 2001 when half of the team members were from BMC. Zvezda co-edited *A Decade of the Berkeley Math Circle—the American Experience* in 2008. Her passion to communicate mathematics was recognized through the first Henry Alder Award in 2004.

Response from Zvezdelina Stankova

I have heard of the great teachers of mathematics who have won the Haimo Award, including Joseph Gallian, my first research advisor at the REU in Duluth, who taught me anything from LaTeX to driving a car; Rhonda Hughes, my undergraduate advisor at Bryn Mawr, who recognized the seeds of teaching talent and inspired me to begin graduate studies in mathematics; Deborah Hughes-Hallett, my teaching mentor at Harvard, who looked after me while I completed the teaching certificate program; and Paul Zeitz, who supported the Berkeley Math Circle with exhilarating sessions for students and adults of all ages and backgrounds. Three more people who deserve recognition as great teachers of mathematics are Paul Melvin, my MA thesis advisor at Bryn Mawr; Joseph Harris, my algebraic geometry advisor at Harvard; and Steven Givant, my colleague from Mills College, without whom I cannot imagine mathematics or teaching mathematics at Mills. I have been very lucky to have these people with me. They remain dear friends and mentors, always. To them I dedicate this incredibly high honor of being among the Haimo Award winners. Thank you!

Euler Book Prize

The Euler Book Prize is given to the author of an outstanding book about mathematics. Mathematical monographs at the undergraduate level, histories, biographies, and anthologies are among the types of books eligible for the Prize. They are judged on clarity of exposition and the degree to which they have had or show promise of having a positive impact on the public's view of mathematics in the United States and Canada.

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

Timothy Gowers

The Princeton Companion to Mathematics, Princeton University Press, 2008.

The Princeton Companion to Mathematics is the kind of book that comes along only rarely—a vast compendium of mathematical information in the form of essays by experts on a wide variety of fields, in most cases bringing the reader up to date on developments in recent decades in a way that nonexperts can understand and appreciate. The Committee recommending this award realizes that it is the work of many: Professor Gowers and his two associate editors (June Barrow-Green and Imre Leader) as well as 133 distinguished contributors, a list that includes George Andrews, Sir Michael Atiyah, Béla Bollobás, Alain Connes, Ingrid Daubechies, Persi Diaconis, Jordan Ellenberg, Andrew Granville, János Kollár, Peter D. Lax, Barry Mazur, Dusa McDuff, Karen Hunger Parshall, Carl Pomerance, Peter Sarnak, and Terence Tao, to name but a few. Gowers singles out two of the many contributors for special recognition for their especially valuable help both in writing text and in editing work by others: Jordan Ellenberg and Terence Tao. The Committee, in recommending the award, singled out Professor Gowers because of his extraordinary achievement in putting this whole volume together (over 1000 pages of text) and also for writing a beautiful 76-page introduction as well as 68 of the 288 individual entries.

The organization is thematic, with sections on the origins of modern mathematics, mathematical concepts, the various branches of the subject, the big problems, biographical essays, and, though the subjects are mainly confined to what we call "pure" mathematics, a section on the influence of mathematics on other fields.

That the level of exposition in this volume is so impressive will come as no surprise to anyone familiar with Professor Gowers' superb but diminutive volume (a sharp contrast in length at roughly 150 pages), *Mathematics: A Very Short Introduction* (Oxford University Press, 2002). Both books display an exceptional talent for mathematical exposition.

The *Companion* has something for everyone who has any interest in mathematics. Many sections can be read with great benefit and considerable pleasure by mathematical amateurs and students. Overwhelmed as we are in the twenty-first century by the enormous size of mathematics, the professional mathematician can benefit from finding out what colleagues are doing in branches of mathematics that did not exist when many of us were in school. Anyone who wonders about "mirror symmetry," "quantum groups," "vertex operator algebras," "automorphic forms," or "Ricci flow," topics referred to in the current mathematical literature or even in the newspapers, can find help here.

Gowers in his preface points out that in deciding what to include he "simply aims to present for the reader a large and representative sample of the ideas that mathematicians are grappling with at the beginning of the twenty-first century, and to do so in as attractive and accessible a way as possible." The book, he is quick to add, is not an encyclopedia and "does not have a serious online competitor: rather than competing with the existing Web sites, it complements them."

Biographical Note

Timothy Gowers was born in England in 1963. His parents were musicians, and music featured prominently in his early life, particularly between 1973 and 1976 when he was a chorister in the famous choir at King's College Cambridge. However, his love of mathematics won out, and after five years at Eton College, he returned to Cambridge to read mathematics at Trinity College.

This brought him into contact with Béla Bollobás, who was to become his research supervisor. His early research was in the geometry of Banach spaces. He solved several old problems in the area, some posed by Banach himself. More recently, he has worked in additive combinatorics: his new proof of Szemerédi's theorem has been particularly influential. In 1996 he was awarded a European Mathematical Society prize, which was followed in 1998 by a Fields Medal. He is married and has four[1] children.

Response from Timothy Gowers

For a long time I have felt that there was a gap in the market for mathematics books that are much less formal than textbooks and monographs, but aimed at an audience that already knows a substantial amount of mathematics. *The Princeton Companion to Mathematics* was an attempt to do something about this. I am honoured and delighted that the effort that went into the book has been rewarded with the 2011 Euler Book Award, and in a more general way I am also very

[1] By the time this comes out, the number of children will, if all goes well, be five.

pleased that the committee has chosen to recognise a book that demands more of the reader than most popular mathematics books.

The Princeton Companion to Mathematics was very much a collective undertaking. It could not have been finished without the hard work of June Barrow-Green and Imre Leader, my associate editors, and without the work of the large number of contributors, who were willing not just to send us their contributions, but also to cooperate in a long editing process. The editors also received huge support from Sam Clark of T&T Productions, who converted the authors' files into a unified format and did a large amount of copyediting. We also received just the right balance of pressure and encouragement from Anne Saverese, the reference editor at Princeton University Press.

The response to the book has been very positive, which suggests to me that the gap in the market that I thought I had identified was real. I hope that people are not just buying the book but also reading it, and that one of its central aims, to improve communication amongst mathematicians by helping them to understand what other mathematicians are doing, is to some extent being fulfilled.

DAVID P. ROBBINS PRIZE

In 2005, the family of David P. Robbins gave the Mathematical Association of America funds sufficient to support a prize honoring the author or authors of a paper reporting on novel research in algebra, combinatorics, or discrete mathematics. The prize of $5000 is awarded every third year. David Robbins spent most of his career on the research staff at the Institute for Defense Analyses Center for Communications Research (IDA-CCR) in Princeton. He exhibited extraordinary creativity and brilliance in his classified work, while also finding time to make major contributions in combinatorics, notably to the proof of the MacDonald Conjecture and to the discovery of conjectural relationships between plane partitions and alternating sign matrices.

Citation

Mike Paterson, Yuval Peres, Mikkel Thorup, Peter Winkler, and Uri Zwick

The Mathematical Association of America proudly awards the 2011 David P. Robbins Prize to Mike Paterson, Yuval Peres, Mikkel Thorup, Peter Winkler, and Uri Zwick for their innovative work on two papers:

"Overhang," American Mathematical Monthly 116, January 2009;
"Maximum Overhang," American Mathematical Monthly 116, December 2009.

The two papers together solve, to within a constant factor, the classic problem of stacking blocks on a table to achieve the maximum possible overhang, i.e., reaching out the furthest horizontal distance from the edge of the table. The January paper was written by Paterson and Zwick, and the December paper was written by all five people named above.

The January paper proves the surprising result that n blocks can be (cunningly) stacked using suitable counterbalancing to achieve an overhang proportional to n^$^{(1/3)}$. (Many people have assumed that the overhang of about log n, given by the standard calculus exercise, is optimal.)

The December paper gave a complementary argument showing that an overhang proportional to n^$^{(1/3)}$ is, in fact, the largest possible for any balanced stack.

The papers describe an impressive result in discrete mathematics; the problem is easily understood and the arguments, despite their depth, are easily accessible to any motivated undergraduate.

Biographical Notes

Mike Paterson is emeritus professor of Computer Science at Warwick University in the UK and is a Fellow of the Royal Society. His B.Sc. and Ph.D. in mathematics are from Cambridge University. Paterson started his teaching career at Massachusetts Institute of Technology and continued at Warwick where he has remained for nearly forty years. He was president of the Trinity Mathematical Society as a student, and of the European Association for Theoretical Computer Science somewhat later. He co-invented Sprouts with John Conway and received the Dijkstra Award in Distributed Computing. His interests have been mainly in algorithmic complexity, beginning from his early years at MIT, but have extended broadly within that area to include distributed algorithms, algorithmic game theory and, of course, the work recognised by this award.

Yuval Peres is currently the manager of the Theory Group at Microsoft Research, Redmond, and is also affiliated with the University of Washington and the University of California, Berkeley. Yuval received his Ph.D. from the Hebrew University, Jerusalem in 1990. He has taught at Stanford, at Yale, and in Jerusalem, and was a Professor at UC Berkeley until 2006. He is a recipient of the Rollo Davidson and Loeve prizes and was an invited speaker at the International Congress of Mathematicians in Beijing, 2002. Yuval works on random walks, Brownian motion, mixing of Markov chains, Hausdorff dimension, percolation, random spanning trees, point processes and random analytic functions. His favorite quote is from his son Alon, who was overheard at age 6 asking a friend: "Leo, do you have a religion? You know, a religion, like Christian, or Jewish, or Mathematics....?"

Mikkel Thorup has a D.Phil. from Oxford University, 1993. From 1993 to 1998 he was at the University of Copenhagen. Since then he has been at AT&T Labs - Research. He is also a Fellow of the ACM and a member of the Royal Danish Academy of Sciences and Letters. His main work is in algorithms and data structures and he is the editor of this area for the Journal of the ACM. One of his best-known results is a linear-time algorithm for the single-source shortest paths problem in undirected graphs. Mikkel prefers to seek his mathematical inspiration in nature, combining the quest with his hobbies of bird watching and mushroom picking.

Peter Winkler is Professor of Mathematics and Computer Science and the Albert Bradley Third Century Professor in the Sciences, at Dartmouth College. Winkler's mathematical research is primarily in combinatorics, probability, statistical physics and the theory of computing. He holds a dozen patents in cryptology, holography, distributed computing, optical networking, and marine navigation; he is the author of two collections of mathematical puzzles, a portfolio of compositions for ragtime piano, and (just published) a book on cryptologic methods in the game of bridge.

Uri Zwick is a professor of Computer Science at Tel Aviv University, Israel. He received his B.Sc. in Computer Science from the Technion, Israel Institute of Technology, and his M.Sc. and PhD in Computer Science from Tel Aviv University. His main research interests are: algorithms and complexity, combinatorial optimization, mathematical games, and recreational mathematics. Zwick spent two years as a PostDoc at Warwick University after completing his Ph.D. and has been collaborating with Mike Paterson ever since.

Joint Response from Mike Paterson, Yuval Peres, Mikkel Thorup, Peter Winkler, and Uri Zwick

The overhang problem and its classical solution have been known to most of us from our student days. Indeed one of us had a 1964 "publication" on a generalization of the problem. We were fortunate to realize a few years ago that the classic problem might have a non-classic solution. Since then, from a castle in Germany through MSRI in Berkeley to a beach in Tel Aviv, we have shared lots of fun and some sweat to settle this question. Two of us got as far as the construction achieving the cube root overhang, but then got stuck for some years in trying to match this with an upper bound. The added octane of three further co-authors achieved this complementary goal. The final result astonished us initially and we have enjoyed communicating this astonishment to others in talks and publications. We were happy to have been able to disseminate our results in two papers in the American Mathematical Monthly in order to reach a wide audience. A particular pleasure came from the outstanding support of the editor Dan Velleman. His continued interest and close attention to the details and presentation helped us immensely in the final stages of both papers. We gratefully acknowledge the help and encouragement we have received from so many people for this work and are delighted to have been chosen for 2011 David P. Robbins Prize.

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 1909–1910. 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

Assaf Naor

The Bôcher Prize is awarded to Assaf Naor for introducing new invariants of metric spaces and for applying his new understanding of the distortion between various metric structures to theoretical computer science, especially in the papers "On metric Ramsey type phenomena" (with Yair Bartal, Nathan Linial, and Manor Mendel, *Annals of Math. (2)* 162 (2005) no. 2, 643–709); "Metric cotype" (with Manor Mendel, *Annals of Math. (2)* 168 (2008), no. 1, 247–298); and "Euclidean distortion and the sparsest cut" (with Sanjeev Arora and James R. Lee, *J. Amer. Math. Soc.* 21 (2008), no. 1, 1–21). The prize also recognizes Naor's remarkable work with J. Cheeger and B. Kleiner on a lower bound in the Sparsest Cut Problem. The bound follows from a quantitative version of Cheeger and Kleiner's beautiful differentiation theorem for Lipschitz functions with values in L^1, which was itself motivated by this application, as envisioned by Naor and J. R. Lee.

Biographical Note

Assaf Naor was born in Rehovot, Israel, on May 7, 1975. He received his Ph.D. from the Hebrew University in Jerusalem under the direction of Joram Lindenstrauss. He was a postdoctoral researcher at the Theory Group of Microsoft Research in Redmond, Washington, from 2002 to 2004, and a researcher at the Theory Group from 2004 to 2006. Since 2006 he has been a faculty member at the Courant Institute of Mathematical Sciences of New York University, where he is a professor of mathematics and an associated faculty member in computer science. He received the Bergmann Memorial Award (2007), the European Mathematical Society Prize (2008), the Packard Fellowship (2008), the Salem Prize (2008), and he was an invited speaker at the International Congress of Mathematicians (2010). Naor's research is focused on analysis and metric geometry and their interactions with approximation algorithms, combinatorics, and probability.

Response from Assaf Naor

I am immensely grateful for the Bôcher Memorial Prize. Above all, I wish to thank my collaborators, especially Manor Mendel, with whom a decade-long collaboration and friendship has resulted in exciting, sometimes unexpected, discoveries. I thank my advisor Joram Lindenstrauss for his inspiration and encouragement. I am also grateful to Gideon Schechtman for being my unofficial advisor, collaborator, and friend, and for the mentoring and friendship of Keith Ball.

In 1964 Lindenstrauss published a seminal paper entitled "On nonlinear projections in Banach spaces". This paper contains results showing that Banach spaces exhibit unexpected rigidity phenomena: the existence of certain nonlinear mappings that are *quantitatively continuous* (e.g., uniformly continuous or Lipschitz) implies that certain linear properties are preserved. Subsequent work of Enflo on Hilbert's fifth problem in infinite dimensions and then a beautiful 1976 theorem of Ribe ushered in a new era in metric geometry.

Ribe's theorem in particular showed that local linear properties of Banach spaces are preserved under uniform homeomorphisms and can thus be conceivably formulated in a way that involves only distance computations, ignoring entirely the linear structure. Of course, if this could be done, one could then investigate which metric spaces have these properties, even if the geometric spaces in question have nothing to do with linear spaces (e.g., Riemannian manifolds, graphs, or discrete groups). Since at roughly the same time a deep theory of quantitative local linear invariants of Banach spaces was flourishing, this raised the possibility that this powerful linear theory could be applied in much greater generality to geometric problems that are ubiquitous in mathematics. Undoubtedly many mathematicians noticed the great potential here, but to the best of my knowledge this program was first formulated in writing by Bourgain in 1986.

The 1980s witnessed a remarkable surge of activity in this area, yielding several theorems on general metric spaces that are inspired by previously known linear results: these include metric space versions of the theory of Rademacher type, a nonlinear Dvoretzky theorem, extension theorems for Lipschitz functions, as well as important results such as Bourgain's embedding theorem and Bourgain's metrical characterization of superreflexivity. Key players in this 1980s "golden age" include Ball, Bourgain, Gromov, Johnson, Lindenstrauss, Milman, Pisier, Schechtman, and Talagrand.

One reason that might explain why the 1980s golden age ended is that there were several stubborn problems that led to an incomplete theory, and one needed new definitions of concepts, such as a notion of Rademacher cotype for metric spaces, in order to proceed. One of the papers that is mentioned in the citation formulated a definition of *metric cotype* and proved several accompanying theorems and applications showing that it is a satisfactory notion of cotype for metric spaces. This work was a result of years of intensive effort and required insights that involve geometry, combinatorics, and harmonic analysis.

The quantitative structural theory of metric spaces also received renewed impetus due to the important 1995 paper of Linial, London, and Rabinovich that exhibited the usefulness of these problems (specifically Bourgain's embedding theorem) to the design of efficient approximation algorithms for NP-hard problems. The general theme here is that a natural way to understand the structure of a metric space is by representing it as faithfully as possible as points in a well understood normed space, or as a superposition of simpler structures such as trees. The relevance of such problems to computer science ranges from "obvious" to roundabout and surprising: many algorithmic tasks, such as nearest neighbor search and clustering, are by definition questions on metric spaces, while metric structures sometimes appear in problems that do not have a priori geometry in them, such as the structures that arise from continuous relaxations of combinatorial optimization problems. This general philosophy of embedding theory is responsible for many important approximation algorithms and data structures. The work contained in the two other papers that are mentioned in the citation has been partially inspired by these applications: sharp nonlinear Dvoretzky theorems are applied to online algorithms and data structures; and new embedding methods manage to asymptotically determine (up to lower order terms) the most non-Euclidean finite subset of L^1 (completing the 1969 work of Enflo), and at the same time they yield the best known approximation algorithm for the Sparsest Cut Problem with general demands. The methods behind these results are in essence multiscale analysis, combined with a variety of probabilistic techniques.

The quantitative structure theory of metric spaces is flourishing, with important new results appearing frequently. New algorithmic applications are constantly being discovered, and deep connections are being made with harmonic analysis, group theory, and geometric measure theory. There is still a lot that we do not know in the original program that is motivated by Ribe's theorem, including missing metric invariants that have yet to be defined. Experience shows that future progress will be difficult but fruitful, and the fact that many talented mathematicians and computer scientists are working in this field suggests that exciting developments are yet to come. I view the Bôcher Memorial Prize as a recognition of the achievements of this field and as an encouragement to the many researchers who developed the theory thus far to continue their efforts to uncover the hidden structure of metric spaces.

Citation
Gunther Uhlmann

The Bôcher Prize is awarded to Gunther Uhlmann for his fundamental work on inverse problems and in particular for the solution to the Calderón problem in the papers "The Calderón problem with partial data" (with Carlos E. Kenig and Johannes Söstrand, *Annals of Math. (2)* 165 (2007) no. 2, 567–591) and "The Calderón problem with partial data in two dimensions" (with Oleg Yu. Imanuvilov and Masahiro Yamamoto, *J. Amer Math. Soc.* 23 (2010), no. 3, 655–691).

The prize also recognizes Uhlmann's incisive work on boundary rigidity with L. Pestov and with P. Stepanov and on nonuniqueness (also known as cloaking) with A. Greenleaf, Y. Kurylev, and M. Lassas.

Biographical Note

Gunther Uhlmann was born in Quillota, Chile, in 1952. He studied mathematics as an undergraduate at the Universidad de Chile in Santiago, gaining his *Licenciatura* degree in 1973. He continued his studies at MIT where he received a Ph.D. in 1976 under the direction of Victor Guillemin. He held postdoctoral positions at MIT, Harvard, and the Courant Institute. In 1980 he became assistant professor at MIT and then moved in 1985 to the University of Washington where he was appointed Walker Family Endowed Professor in 2006. Since 2010 he also holds the Endowed Excellence in Teaching Chair at the University of California, Irvine.

Uhlmann received a Sloan Research Fellowship in 1984 and a Guggenheim Fellowship in 2001. Also in 2001 he was elected a Corresponding Member of the Chilean Academy of Sciences. He is a Fellow of the Institute of Physics since 2004. He was elected to the American Academy of Arts and Sciences in 2009 and as a SIAM Fellow in 2010. He was an Invited Speaker at ICM in Berlin in 1998 and a Plenary Speaker at ICIAM in Zurich in 2007. He was named a Highly Cited Researcher by ISI in 2004.

Response from Gunther Uhlmann.

I am greatly honored by being named a corecipient of the 2011 Bôcher Memorial Prize. I would like to start by thanking the collaborators who are named in the citation; it was a great pleasure to work with them. I would also like to acknowledge my many other collaborators and my graduate students and postdocs who have enriched my life both professionally and personally.

Many people were very influential in my career. Warren Ambrose made it possible for me to go to graduate school at MIT, and he was a continuous source of support and encouragement, especially in my early years in the U.S. Herbert Clemens also helped me to come to the U.S., and he has been an example to emulate in my life. My advisor Victor Guillemin taught me so much—he has a contagious enthusiasm for mathematics. Richard Melrose shared with me many times his great insight, and he has been a true friend. I met Alberto Calderón during my graduate studies at MIT; he is my mathematical hero, such an original mathematician. The year I was at Courant, I had the great fortune of meeting Louis Nirenberg. He taught me many things in mathematics and is the kindest person I have ever met—a wonderful role model for anybody to follow. I also treasured the friendship I started with Cathleen Morawetz during my stay at Courant.

Most of all I have had the unwavering support of my family, Carolina, Anita, and Eric. Without them this would not have been possible. Carolina would have been so proud. This prize is for her.

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

David Vogan

The Levi L. Conant Prize for 2011 is awarded to David Vogan for his article, "The character table for E_8" (*Notices Amer. Math. Soc.* 54 (2007), no. 9, 1122–1134).

The Lie group E_8 was discovered in 1887 by Wilhelm Killing in the course of his project to determine all of the simple real Lie groups, whose theory had been initiated shortly beforehand by Sophus Lie. This project was completed in the 1890s by Élie Cartan. However, E_8 remained in many ways an "unknown" known Lie group or, at least, a poorly understood one. It has no clear connection to classical geometry, and its smallest faithful linear representation is the 248-dimensional adjoint representation on its own Lie algebra. The mist has cleared slowly in the course of the twentieth century through the efforts of Weyl, Tits, Harish-Chandra, and many others. Yet many open questions remain.

Vogan's article reports on a recently completed project to determine the set of irreducible unitary representations of the split real Lie group of type E_8. These representations are described by giving a character table. Naively, a character is the trace of a representation and is constant on the conjugacy classes of the group. This makes sense for finite groups and even for compact groups, but it requires some deep mathematics to give even a coherent meaning to the phrase "character table of split E_8". Part of Vogan's achievement is to provide the reader a good understanding of what that means, as clarified by the theorems of Harish-Chandra, Langlands, and Knapp and Zuckerman, culminating in the fact that the necessary data is encoded in a finite set of integer matrices. Vogan's next accomplishment is to give the reader insight into how these integer matrices can be computed. The answer begins with an algorithm of Kazhdan and Lusztig for computing intersection homology inductively. Next the story shifts to the challenge of converting this algorithm into a computer program. Obstacles here include the problem of storing 6 billion polynomials with about 120 billion coefficients, many of them extremely large. A clever idea of Noam Elkies—using the Chinese Remainder Theorem—helps save the day.

Vogan describes this work with great verve, as a saga of wildly oscillating emotions. He closes by affording us some inkling of the insights afforded by this mass of data, as well as the ongoing goals of the project. In conclusion, he pays touching tribute to the many brilliant mathematicians who have brought their disparate skills and insights so fruitfully to bear on this problem.

Biographical Note

David Vogan graduated from the University of Chicago in 1974 and earned a Ph.D. under Bertram Kostant at MIT in 1976. He joined the MIT faculty in 1979 and served as department head from 1999 to 2004. Since 1996 he has been a Fellow of the American Academy of Arts and Sciences. His research concerns infinite-dimensional representations of Lie groups; it has been carried out with too many collaborators to remember, although it is always a pleasure to try. He gave an invited address to the International Congress of Mathematicians in Berkeley in 1986 and the Hermann Weyl Memorial Lectures at the Institute for Advanced Study in the same year.

Response from David Vogan

I am honored and gratified to receive this recognition, which is for work done by many wonderful mathematicians and dear friends. First among these is Fokko du Cloux, who never allowed any trace of imprecision or sloppy thinking. Our conversations were usually meant to be about my explaining something to him, but most often they ended with his explaining that I did not yet really understand.

I am grateful also to all of the great teachers from whose (perfect) examples I learned (imperfectly) to explain mathematics: Richard Beals and Paul Sally at the University of Chicago, Sigurdur Helgason and Bertram Kostant at MIT, and Armand Borel and Anthony Knapp after I was supposed to be done with being a student.

I am grateful to Dan Barbasch, who for more than thirty years has always known just a bit more than me about the problems we both study; he has never hesitated to share that knowledge with anyone who asks.

Finally, I am grateful to Jeff Adams, whose mathematical vision and leadership is the heart of the collaboration whose work I wrote about. He is the best herder of cats I have ever met.

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 2003–2004.

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

Herbert Spohn

The Eisenbud Prize for 2011 is awarded to Herbert Spohn for his group of works on stochastic growth processes:

1. "Exact height distribution for the KPZ equation with narrow wedge initial condition" (with T. Sasamoto, *Nuclear Phys. B* 834 (2010), no. 3, 523–542).

2. "One-dimensional Kardar-Parisi-Zhang equation: An exact solution and its universality" (with T. Sasamoto, *Phys. Rev. Lett.* 104, 230602 (2010)).

3. "Scaling limit for the space-time covariance of the stationary totally asymmetric simple exclusion process" (with P. L. Ferrari, *Comm. Math. Phys.* 265 (2006), no. 1, 1–44).

We also cite, outside the six-year window,

4. "Scale invariance of the PNG droplet and the Airy process" (with M. Prähofer, *J. Statist. Phys.* 108 (2002), no. 5–6, 1071–1106).

Stochastically growing interfaces is a subject of intense study in both probability theory and nonequilibrium statistical physics. Three of the most widely studied models that describe the height of a growing interface, $h = h(x,t)$, are (1) the asymmetric simple exclusion process (ASEP), an interacting particle system introduced by F. Spitzer some forty years ago; (2) the polynuclear growth model (PNG); and (3) the KPZ equation, a formal nonlinear stochastic PDE for the height function h.[1] The main question is to describe the asymptotic properties of the height function h.

In early work with M. Prähofer on the PNG model, Spohn identified the underlying process that is expected to describe the fluctuations of h for a large class of growth models; this process they called the *Airy process*. With work with P. Ferrari, Spohn established that in the scaling limit the PNG model and a special case of ASEP have the same scaling function for their covariance. This established what physicists call KPZ universality for these two discrete models. In recent work with T. Sasamoto, Spohn gave both meaning to solutions of the KPZ equation and found the one-point distribution of the height function. As strange as it sounds, Sasamoto and Spohn showed that the KPZ equation lies in the KPZ universality class! We remark that this last work was also done independently by G. Amir, I. Corwin, and J. Quastel. We note that many of the predictions of Spohn and others are now being experimentally tested (and verified) in the laboratory.[2]

There are many questions left to answer regarding the Airy process and its universality, but what is clear is that the work of Herbert Spohn has opened up many new lines of research in mathematics and physics.

Biographical Note

Herbert Spohn is professor for mathematical physics at Zentrum Mathematik of the Technische Universität München (TUM). Spohn was born in 1946 at Tübingen, Germany, grandson of the mathematician Konrad Knopp. He earned his *Vordiplom* in physics at the Technische Universität Stuttgart in 1969 and his *Diplom* and Ph.D. in physics at the Ludwig-Maximilians-Universität (LMU) München. After postdoc years at Yeshiva, Princeton, Rutgers, Leuven, and an extended stay at the IHES, Paris, in 1982 he joined the statistical physics group at LMU, headed by Herbert Wagner, as associate professor for solid state physics. In 1998 he switched faculty and became professor for applied probability in conjunction with statistical physics at TUM.

Spohn received the 1993 Max-Planck Research Award, jointly with Joel Lebowitz, and the 2011 Dannie Heineman Prize for Mathematical Physics. He headed the International Association of Mathematical Physics.

[1]The KPZ equation was introduced in the mid-1980s by M. Kardar, G. Parisi, and Y.-C. Zhang

[2]K. Takeuchi and M. Sano, "Universal fluctuations of growing interfaces: Evidence in turbulent liquid crystals" (*Phys. Rev. Lett.* 104, 230601 (2010)).

Response from Herbert Spohn

I am deeply honored to receive the 2011 Leonard Eisenbud Prize for Mathematics and Physics. I view this as an appreciation of the work of so many physicists and mathematicians on exact solutions for growth models in the KPZ universality class.

On the macroscopic scale, matter is commonly organized in equilibrium phases, which in themselves are spatially homogeneous. Distinct phases are separated by a layer typically a few atomic spacings wide. Just think of a water droplet in contact with its vapor. Such interfaces are of basic scientific and technological interest. In particular one wants to know how they change in the course of time. The corresponding evolution equations have been studied widely in mathematics. To mention only one prominent example of interface motion: for a droplet immersed in three-space, the local interface velocity is taken to be proportional to the local mean curvature, hence the dynamics is motion by mean curvature. The droplet shrinks, but it also may pinch off into two or several pieces.

On the mesoscopic scale, still large compared to atomic spacings, one observes fluctuations on top of the large scale motion. The PDE for the motion turns into a stochastic PDE of some sort. From a statistical physics perspective the interest shifts to shape fluctuations, with the hope to discover universal (i.e., to a large extent model independent) statistical laws. Roughly speaking, this is the main focus of our research with one twist. We consider an interface which borders a stable against an unstable phase. This imbalance drives the interface motion. In a widely cited paper of 1986, Kardar, Parisi, and Zhang proposed a stochastic PDE to model this particular interface evolution.

In 1999 Baik, Deift, and Johansson studied the length of the longest increasing subsequence of a random permutation with the startling result that the fluctuations are governed by the Tracy-Widom distribution, discovered before as the fluctuations of the largest eigenvalue of a GUE random matrix in the limit of large N. Shortly later, Johansson noted a related mathematical structure for the single step growth model with wedge initial data (*alias* totally asymmetric simple exclusion process with step initial conditions). We realized that random permutations are isomorphic to a driven interface model, the polynuclear growth model, and, based on the work of Baik and Rains, we proved that, while the scaling exponent is always 1/3, the precise statistical fluctuations depend on initial conditions. This feature was not at all anticipated but is beautifully confirmed by the recent experiments of Takeuchi and Sano. The novel advance concerns the KPZ equation in one dimension. Arguably, we obtained for the first time an exact time-dependent solution of a nonlinear stochastic PDE. In the long time limit one finds the same probability distributions as for the stochastic lattice growth models, supporting universality.

The analysis of one-dimensional stochastic growth models in the KPZ class borders at domains which before were considered to be fairly distinct: random matrix theory, Dyson's Brownian motion, statistical mechanics of line ensembles, directed polymers in a random medium, combinatorics of tilings, representation theory and Schur functions, integrable models and Bethe ansatz, interacting stochastic particle systems. Such crossroads have often been the source of further advances.

I would like to use the occasion to thank Joachim Krug, Michael Prähofer, Patrik Ferrari, and Tomohiro Sasamoto. Their deep insights and unfailing encouragement were instrumental for achieving our results.

Ruth Lyttle Satter Prize in Mathematics

The Satter Prize was established in 1990 using funds donated by Joan S. Birman in memory of her sister, Ruth Lyttle Satter, to honor Satter's commitment to research and to encourage women in science. The prize is awarded every two years to recognize an outstanding contribution to mathematics research by a woman in the previous six years.

Citation

Amie Wilkinson

The Ruth Lyttle Satter Prize in Mathematics is awarded to Amie Wilkinson for her remarkable contributions to the field of ergodic theory of partially hyperbolic dynamical systems.

Wilkinson and Burns provided a clean and applicable solution to a longstanding problem in stability of partially hyperbolic systems in the paper:

> "On the ergodicity of partially hyperbolic systems" (with K. Burns, *Annals of Math. (2)* 171 (2010), no. 1, 451–489).

The study of hyperbolic systems began in the 1960s by Smale, Anosov, and Sinai; this work was built upon earlier achievements of Morse, Hedlund, and Hopf. The recent papers of Wilkinson, joint with Burns, give what is considered by experts to be the optimal result that unifies much of the deep work done by mathematicians during the intervening decades to weaken the strong hypothesis of hyperbolicity in order to be widely applicable, while retaining the fundamentals of the associated dynamical behavior.

Wilkinson has played a central role in the recent major developments in many related areas as well, including making some fundamental advances in understanding generic behavior of C^1 diffeomorphisms. In addition to the outstanding work with Burns, Wilkinson works with many co-authors such as Avila, Bonatti, Crovisier, Masur, and Viana with whom she has published many significant results. A problem on the centralizers of diffeomorphisms was stated by Smale more than forty years ago and is included in his list of problems for the 21st century; the solution in the C^1 case was provided by Wilkinson in a series of papers with Bonatti and Crovisier.

Biographical Note

Amie Wilkinson grew up in Evanston, Illinois, received her A.B. from Harvard in 1989 and Ph.D. from Berkeley in 1995 under the direction of Charles Pugh. After serving one year as a Benjamin Peirce Instructor at Harvard, she moved to Northwestern in 1996 where she was promoted to full professor in 2005. She was the recipient of an NSF Postdoctoral Fellowship and has given AMS Invited Addresses in Salt Lake City (2002), Rio de Janeiro (2007) and at the 2010 Joint Meetings in San Francisco. She was also an invited speaker in the Dynamical Systems session at the 2010 ICM in Hyderabad. She lives in Chicago with her husband Benson Farb and their two children.

Response from Amie Wilkinson

This is an unexpected honor for which I am very grateful. As a woman in math, I have certainly faced some challenges: shaking the sense of being an outsider, coping with occasional sexism, and balancing career and family. These difficulties were ameliorated by the support and encouragement of numerous individuals and institutions, beginning with my parents, who thought it delightful that their older daughter loved math and science (and art and cooking). Early guidance from math teachers, especially John Benson at Evanston High School, was invaluable. The people in the Math Department at Northwestern University demonstrated their faith in me early on and never wavered in their support. Northwestern protected my research time early on, was flexible in assigning duties later, and promoted me in a timely fashion. Some of this was a gamble on Northwestern's part, one that other departments might still be hesitant to make.

I have been educated over the years by a string of amazing mentors and collaborators, including those mentioned in the citation. Charles Pugh, Mike Shub, Keith Burns and Christian Bonatti have played a special role; together, they have taught me how to think, dream, and write mathematics. From early on, Lai-Sang Young (the 1993 Satter Prize winner) has been a role model; her work in dynamics and clarity of exposition have always set the standard. The joint project with Keith Burns mentioned in the citation was an immensely satisfying collaboration. Whenever I think that the intricacies of partially hyperbolic dynamics have been largely revealed, a new phenomenon arises to delight and inspire.

I also thank my husband Benson, my best friend, mathematical companion, and muse (who occasionally lets me be his muse as well), and my children Beatrice and Felix, who have forced me to take a break from mathematics when I needed it the most.

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

Patricia Campbell

In recognition of her leadership and contributions in research, teaching, and service to mathematics education, the Association for Women in Mathematics (AWM) presents the twenty-first annual Louise Hay Award for Contributions to Mathematics Education to Professor Patricia Campbell of the Department of Curriculum and Instruction at the University of Maryland, College Park. Throughout her career, Dr. Campbell has engaged and challenged her students, university colleagues, professional colleagues, school administrators, and classroom teachers to advance the teaching of mathematics.

As a leader in the field of mathematics education, Dr. Campbell is esteemed especially for her contributions to the teaching and learning of mathematics in urban settings and for working in schools that serve predominately minority populations from low-income backgrounds.

Dr. Campbell has worked in schools to improve student learning for two decades. From 1989–1997, she led Project IMPACT, a professional development effort that demonstrated the feasibility of school-wide mathematics reform, supplementing summer professional development with in-school mathematics specialists in order to increase achievement in schools with predominately minority populations. In 1996, after hearing about Dr. Campbell's work at an NSF Conference, Dr. Andrea Bowden, Supervisor of Science, Mathematics and Health Education for the Baltimore City School System, invited Dr. Campbell to collaborate in developing the MARS Project (Mathematics: Application and Reasoning Skills).

This systemic effort addressed a complex set of problems besetting Baltimore's public schools, targeting poor student achievement through system-wide teacher development in mathematics. With Dr. Campbell as the Principal Investigator, the MARS Project was awarded a five million dollar grant through the NSF Local Systemic Initiative program.

In her letter of support for Dr. Campbell's nomination for the Louise Hay Award, Dr. Bowden wrote, "The MARS program began as a professional development effort, but quickly grew to encompass a complete revamping of elementary mathematics. This included policy changes, reallocation of fiscal resources, development of K–5 curriculum and assessment aligned to state and national standards, implementation of an effective instructional model, training of mathematics instructional support teachers based in schools, and the adoption of a textbook and resources that supported MARS. ... Between 1996 and 2001, 3,355 teachers from 105 elementary schools participated in quality professional development of 10 to 100 hours with 1,508 teachers completing over 60 hours. Nearly 68,000 K–5 students in Baltimore City Schools used the new and engaging MARS elementary curriculum. Between 1998 and 2001, Baltimore City elementary students showed dramatic increases in scores in all grades on CTBS [California Test of Basic Skills] with students in classes of the most highly trained teachers exhibiting the most gain. ... For the first time in nearly 20 years, urban children in Baltimore City were at or near national norms in mathematics! ... It is difficult to capture the magnitude and to do justice to Dr. Campbell's incredible devotion of time, energy, expertise, and commitment."

Through Dr. Campbell's current research, she continues to pursue her efforts to ensure quality education for all children. As part of the research component of The Mid-Atlantic Center for Mathematics Teaching and Learning, Dr. Campbell leads a research project that is poised to assess the impact of Grade 4–8 teachers' knowledge of mathematics and mathematics pedagogy on student achievement. Her current work in the area of mathematics leadership at the elementary level builds on her prior efforts and her evaluation of the work and role of elementary mathematics specialists and will contribute significantly to the research in this area.

Dr. Campbell is active in national organizations serving the profession and speaks widely to disseminate the findings of her research. In the letter from Francis (Skip) Fennell, Past President of the National Council of Teachers of Mathematics (NCTM), Professor Fennell highlighted some of Dr. Campbell's activities on the national level. "She was elected to and served as a member of the NCTM's Board of Directors from 1996–1999, she directed the Council's Research Catalyst Conference, and served as a member of the Editorial Panel for the 2007 Yearbook entitled *The Learning of Mathematics*. She has also served on the Council's task force on Teaching and Learning Mathematics in Poor Communities. Dr. Campbell served as Co-Chair of the Executive Board of the American Educational Research Association's Special Interest Group on Research in Mathematics Education. In this role she was instrumental in the planning and staging of NCTM's Research Presession."

Dr. Campbell's service to public and national organizations has not diminished her service to the university. She is an active and highly respected member of her department, the College of Education, and the university. As a teacher, mentor, and colleague, Dr. Campbell has gained the appreciation of her students and colleagues for her commitment, skill, and energy for the cause of mathematics education and for challenging them to think more deeply about the tough issues they must confront. She has served in various capacities on both the College Park Campus Senate and the College of Education Senate. She understands the importance of senior faculty mentoring new colleagues and participating in the deliberations about curriculum, programs, and policy. Over the course of her career Dr. Campbell has been the advisor for 11 students who have completed the doctorate and 49 students who have completed a master's degree. Currently she serves as an advisor to six doctoral students and five master's students.

It is a very great pleasure to honor Dr. Patricia Campbell with the 2011 Louise Hay Award for her career achievements—as a teacher, researcher, and in service to the mathematics education community—in furthering the cause of mathematics education on behalf of *all* elementary school students.

Response from Patricia Campbell

I must admit that I was more than a little surprised when I learned that I was to receive the Louise Hay Award from the Association for Women in Mathematics. I am especially honored to accept this recognition from an association committed to enhancing equity in opportunity and treatment in the mathematical sciences at all levels. As a high school and undergraduate student, I never experienced bias because of my gender. Instead I benefited from skilled and thoughtful teachers who patiently answered all the questions that a naïve student from a town of 122 people could ask and who introduced me to this intriguing field where a miserable memory for names and dates did not matter because you could always connect ideas and figure things out. And, while I was aware that there were many more males than females in my graduate mathematics and statistics courses, by then I had decided that that did not matter either. The key was simply to work hard and to keep asking lots of questions.

While in graduate school, I found that what intrigued me most were not questions addressing the content and nature of mathematics, but rather mathematics teaching and the interplay between mathematics teaching and learning. As my research in mathematics education progressed, I became more conscious of the fact that I was one of the lucky ones. My rural upbringing had not hindered me, in part because two amazing high school teachers had prepared me for college mathematics and in part because my parents were adamant that their children would go to college, even though it meant that any future grandchildren would probably not be raised near them. But too many students are not lucky. They endure persistent inequities in schooling and in support, as evidenced by the disparities in educational outcomes that plague students in urban and poorly resourced communities. And so, over time, I joined with colleagues to seek funding to pursue a simple-to-state idea: What would happen if we applied what we think we know from research addressing the teaching and learning of mathematics to the reality of public schooling, investigating the impact of systemic efforts to stimulate and support change with existing teachers in urban settings?

While I have written and spoken about this work, it is not only mine. Project IMPACT benefited from the insightful and persistent efforts of Tom Rowan, Honi Bamberger, Brenda Hammond, Josie Robles, Anna Suarez, and Patricia Cartland Noble. The MARS Project would have collapsed multiple times if not for the skill and knowledge of Andrea Bowden, Melva Greene, Marilyn Strutchens, Sheila Evans, Joyce Wheeler, Jeannette Davis, and Florencetine Jasmin. These individuals and too many others to name worked tirelessly to intercede with administrators and to forge collaborations with teachers in order to advance a single intent: expecting and supporting children's efforts to make sense of mathematics. I have been fortunate to learn from and to work with these dedicated educators.

While these efforts to impact student achievement were successful, they also highlighted how little we apply of what we do know and how much we do not know. We do not understand what aspects of teachers' mathematical content knowledge really matter when it comes to advancing student understanding and achievement, as well as what knowledge of mathematical pedagogy a teacher needs to draw on when teaching. We know very little about how to support preservice and in-service teachers' efforts to develop accessible and usable knowledge about mathematics and mathematics teaching and learning, knowledge teachers call upon when they teach. This work is underway, and much of it involves mathematics education researchers who are collaborating with mathematicians and with school district mathematics supervisors.

On behalf of those whose passion for mathematics fuels their collaboration across their differing disciplinary perspectives, as well as those who accomplished so much in Project IMPACT and the MARS Project, I gratefully accept this award with much appreciation.

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. This prize honors Alice T. Schafer (1915–2009), one of the founders of AWM and its second president, who contributed greatly to the advancement of 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-first annual Alice T. Schafer Prize to **Sherry Gong**, Harvard University.

Additionally, the accomplishments of four outstanding young women, all senior mathematics majors, were recognized on Thursday, January 6, 2011. AWM was pleased to honor **Ruthi Hortsch**, University of Michigan, as **runner-up** for the 2011 Schafer Prize competition. **Jie Geng**, University of California, Berkeley, **Yinghui Wang**, Massachusetts Institute of Technology, and **Fan Wei**, Massachusetts Institute of Technology, were recognized as **honorable mention** recipients in the Schafer Prize competition. Their citations are available from the AWM.

Citation

Sherry Gong

Sherry Gong is a senior at Harvard University where her performance in her classes has been outstanding. She began with Harvard's famous problem solving class, in which she achieved a score above 100, and since her sophomore year has taken numerous graduate mathematics courses, earning A's in all of them. Whether in a class or independently mastering background for a research project, her recommenders were universally amazed by her ability to master sophisticated mathematics rapidly.

Gong has been involved in four different research projects and is the author or co-author of three papers. She spent summer 2008 at the Duluth REU researching cyclotomic polynomials; her paper was published in the *Journal of Number Theory*. In 2009 she worked with a group at MIT that did research on computing the dimension of the space of characters of the Lie algebra of Hamiltonian vector fields on a symplectic vector space; their work will be published shortly. She and an economist have published a paper in *Integers* on congruence conditions characterizing primes. Most recently she did research on periodic cyclic cohomology of group algebras of torsion free groups at Vanderbilt.

As a high school student, Gong medaled repeatedly in the International Mathematical Olympiad, winning a gold medal in 2007. After entering college, she returned to the Mathematical Olympiad Summer Program as a grader and also served as a grader for the Mathematical Olympiad of Central America and the Caribbean. In 2010 Gong served as one of the coaches for the USA team for the Girls' Mathematical Olympiad in China. Five of the eight girls on the team won gold medals, and the head coach describes Gong as "a young lady with a great heart, thoughtful and gentle," who pushed the students with "acute mathematical insights and inspiring personality."

Gong's mentors describe a remarkable young mathematician, exceptionally talented and original, with one commenting she is already "comparable to some of the best mathematical minds I know."

Response from Sherry Gong

I am deeply honored to be selected to receive the Alice T. Schafer Prize. I would like to thank the AWM for inspiring and encouraging women in mathematics.
I am grateful to many people who have brought me to this stage mathematically. Thank you to Zuming Feng, for teaching, guiding and encouraging me throughout my high school years; to Dennis Gaitsgory, who has been an amazing teacher and adviser; to Guoliang Yu and Pavel Etingof for guiding me in undergraduate research and sharing with me their penetrating mathematical insights; and in particular, to Joe Gallian who introduced me to the world of mathematical research through his wonderful REU program. I would like to thank the Harvard and MIT mathematics departments for the wisdom and guidance they have shared with me.

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

Rhonda Hughes

In recognition of her outstanding mentoring of undergraduate women in mathematics, the Association for Women in Mathematics (AWM) presents the first M. Gweneth Humphreys Award to Rhonda J. Hughes, Helen Herrmann Professor of Mathematics at Bryn Mawr College.

Hughes' nomination letters describe success stories arising from her efforts to develop students' mathematical skills and self-confidence. She is a dedicated and motivating teacher at all undergraduate levels, from basic calculus to advanced PDEs. She ably identifies research topics that match the students' interests and abilities.

The selection committee marveled at the daring of Hughes' approach. It is relatively easy—worthwhile but easy—to encourage an undergraduate arriving at college who has a solid record of accomplishment in mathematics and an eagerness to learn more. However, our committee took particular note of the risk-taking involved, to say nothing of the hard work, in Hughes' encouragement of students whose potential had previously gone unnoticed, even by the students themselves. The results bear witness to the strength of Hughes' belief in her students, to the force of her personality, and to the contagious quality of her enthusiasm for mathematics.

Particularly stunning are the accounts of students who began college convinced they were "bad at mathematics", but who were charmed by Hughes into taking calculus with her: the calculus course goes at least ok, so they take more mathematics, still not convinced of their own abilities but warming to the subject. The students end up majoring in mathematics, doing a research project, and proceeding to graduate programs and careers in mathematics. The overall numbers are striking, and the mathematics program at Bryn Mawr has flourished in the time Hughes has been there, with large increases in majors.

Leslie Cheng, now Hughes' colleague and departmental chair, gives a striking account of her own odyssey under Hughes' guidance. Cheng writes, "I was told (in high school) that I would be successful in life as long as I avoided math at all costs." Fast-forward several years. Cheng writes, "She continues to mentor, support, encourage, inspire, and challenge me, and I am still learning from her."

Hughes has brought her knowledge concerning the encouragement of young women in mathematics to the national level. She has served AWM in many ways including as president in 1987–88. She has also served often as organizer, panelist and speaker in activities aimed at increasing the participation of women and minorities in mathematics.

After having identified the challenges that some young women face, especially minority women, Hughes began programs to help negotiate crucial transitions, the first one being from undergraduate course work to the math major. In 1998, she and Professor Sylvia Bozeman of Spelman College created the on-going EDGE program, which addresses with marked success the transition from college to graduate school.

The AWM is pleased to honor Rhonda Hughes for her prodigious achievements and unwavering efforts over decades in the mentoring of undergraduate women in mathematics, in particular in attracting them into the study of mathematics and in guiding them through crucial transitions in their mathematical careers.

Response from Rhonda Hughes

I am deeply honored to be the first recipient of the M. Gweneth Humphreys Award for Mentoring given by the AWM. Dr. Humphreys received a Ph.D. from the University of Chicago at a time when women mathematicians were far more rare than they are now. Her work at Randolph-Macon Woman's College inspired generations of students, and I am humbled to be awarded this honor in her name. Moreover, AWM has been a vital part of my mathematical life since my early years in graduate school, and it is particularly gratifying to be honored by the organization that has inspired, informed, and supported my career in mathematics.

When I began to teach, I knew I wanted to make students feel good about themselves; I wanted to convince students that they could succeed in mathematics. Bryn Mawr College provided me with the ideal environment to do this, and I am delighted and proud of all those students who chose to pursue the field that has given me so much joy. I wish to thank AWM and the Selection Committee for recognizing me with this great honor.

American Mathematical Society
Mathematical Association of America
Society for Industrial and Applied Mathematics

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

Maria Monks

Maria Monks is the winner of the 2011 Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. The award is based on her impressive work in combinatorics and number theory, which has appeared in *Advances in Applied Mathematics, Proceedings of the AMS, Electronic Journal of Combinatorics, Discrete Mathematics,* and *Journal of Combinatorial Theory, Series A*.

One of her recommenders wrote, "Although Maria has just finished her Bachelor's degree, her accomplishments are what you might expect from someone in the second year of a postdoctoral position." Another wrote that her work "reveals a broad knowledge of relevant methods as well as startling insight, and it is in the mainstream of a really 'hot' area."

Monks is a Churchill Scholar, Goldwater Scholar, Hertz Fellow, and an NSF Graduate Research Fellowship recipient. She received the Alice T. Schafer Prize for Women in Mathematics in 2009, and a Morgan Prize Honorable Mention in 2010. She is also an NCAA All-American cross-country runner. She graduated from MIT in 2010.

Biographical Note

Maria Monks grew up in Hazleton, Pennsylvania, with her parents and two brothers. Her interest in mathematics began in elementary school, when her father, Ken Monks, began to home-school her in mathematics. In middle school and high school, she became involved in mathematical problem-solving through her MATHCOUNTS team, the Lehigh Valley ARML team, and the Math Olympiad Summer Program. She also began mathematical research as a high school student, writing a paper on the $3x+1$ conjecture and co-authoring another on a conjecture of Erdős and Straus.

As an undergraduate, Maria participated in the Duluth mathematics REU under the direction of Joe Gallian, and she worked with Richard Stanley and Mia Minnes at MIT, writing a total of five more research papers over the course of her undergraduate career. She also discovered her passion for teaching in college; she was a coach of the 2008 USA team for the Girls' Math Olympiad in China and became involved in local educational programs, such as Girls' Angle and Idea Math. She is a dedicated distance runner, earning All-American honors at the NCAA Cross-Country National Championships during her last year as a varsity athlete at MIT.

Maria is currently in a one-year Masters' program in mathematics at University of Cambridge. She will pursue a Ph.D. at the University of California, Berkeley in the fall, where she plans to study combinatorics.

Response from Maria Monks

I am very honored to have been named the winner of the 2011 Frank and Brennie Morgan Prize, and I thank the AMS, MAA, and SIAM Morgan Prize Committee for selecting me for this award.

I would like to thank the people who have had the most impact on my mathematical education thus far. I thank Joe Gallian for nominating me for this prize and for serving as a wonderful advisor at the Duluth REU. I also express my gratitude to Ken Ono, Richard Stanley, and Mia Minnes for their help, advice, and mentorship in various research projects. Finally, I thank my father, Ken Monks, and the rest of my family for providing a wonderful environment in which to grow up and for fostering my interest in mathematics.

Citation for Honorable Mention

Michael Viscardi

The Morgan Prize Committee is pleased to award Honorable Mention for the 2011 Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student to Michael Viscardi.

The award recognizes in particular his impressive senior thesis, "Alternate Compactifications of the Moduli Space of Genus One Maps." Concerning his thesis, one recommender wrote, "If this were a doctoral thesis, it would secure an entry-level position for him at one of the top departments in the country." In addition to his mathematical talents, Viscardi is an accomplished pianist and violinist.

Biographical Note

Michael graduated *summa cum laude* from Harvard in 2010, where he was awarded the Thomas T. Hoopes Prize for Outstanding Research or Scholarly Work by a Senior and the David Mumford Mathematics Prize. He is currently finishing the Harvard/New England Conservatory 5-year A.B./M.M. joint program in violin performance, and will begin his Ph.D. in mathematics at MIT this fall.

Response from Michael Viscardi

I want to thank my adviser, Professor Joe Harris, for his invaluable guidance, support, and humor throughout the course of this research.

Citation for Honorable Mention

Yufei Zhao

The Morgan Prize Committee is pleased to award Honorable Mention for the 2011 Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student to Yufei Zhao.

The award recognizes his excellent work in combinatorics and number theory. One of his recommenders wrote, "Zhao is extraordinarily strong at research, functioning more like an established mathematician than an undergraduate." Zhao is a three-time Putnam Fellow and the recipient of a Gates Cambridge Scholarship. He graduated from MIT in 2010.

Biographical Note

Yufei Zhao was born in Wuhan, China, and moved to Toronto at the age of eleven. In high school, Yufei developed his interest in mathematics through competitions. He competed for the Canadian team three times at the International Mathematics Olympiad, where he received a gold medal, and he also subsequently coached the team as a Deputy Leader. As an undergraduate at MIT, Yufei studied mathematics and computer science, and he worked with Richard Stanley and Michel Goemans on various problems in combinatorics. In the summer of 2009, Yufei attended the Duluth REU directed by Joe Gallian and spent a very productive summer working on problems in additive combinatorics and graph theory. After graduating from MIT, Yufei did a summer internship at Microsoft Research New England working with Henry Cohn on theoretical problems in coding theory. Yufei is currently studying at the University of Cambridge pursuing a one-year Master of Advanced Study in Mathematics. Afterward he plans to return to MIT to start his Ph.D. in mathematics.

Response from Yufei Zhao

I am very honored to receive this recognition, and I would like to thank AMS, MAA, and SIAM for selecting me for this award. I would like to express my gratitude to my parents for their constant support. I am indebted to all my teachers and mentors for educating me and furthering my interests in mathematics. There are too many of them to list, but in particular, I am grateful to Joe Gallian for running an incredible REU program and to Richard Stanley, Michel Goemans, and Henry Cohn for being wonderful mentors and taking the time to supervise me on various projects. And finally, I thank my friends and classmates for creating a wonderfully supportive environment for doing mathematics.

JOINT POLICY BOARD FOR MATHEMATICS

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

Nicolas Falacci and Cheryl Heuton

The 2011 JPBM Communications Award is awarded to Nicolas Falacci and Cheryl Heuton for their positive portrayal of the power and fun of mathematics through their hit TV series, *Numb3rs*.

Nicolas Falacci and Cheryl Heuton created the extraordinary TV series *Numb3rs*, featuring an FBI agent and his brother, a mathematical genius. Through its six-season run on CBS, the series featured the use of mathematical thinking and modeling to solve crimes. *Numb3rs* provided the general public with a glimpse of the mathematical world, its depth and its power, in a way that connected with a broad spectrum of viewers. With creativity and cleverness, their work, which includes over 100 episodes, made its fans aware of the ubiquity of mathematics in their daily lives.

[Falacci and Heuton have been recognized by the National Science Board with its Public Service Award, and they are the recipients of the Carl Sagan Public Understanding of Science Award.]

Biographical Note for Nicolas Falacci and Cheryl Heuton

Nicolas Falacci was born 1959 in Hyannis, Massachusetts. He attended the undergraduate film program at New York University's Tisch School of the Arts and received his B.F.A. in 1981. He sold his first feature length screenplay in 1989 to Columbia Pictures and producer Joel Silver. He continued writing film projects for various studios and producers, mostly in the science fiction genre.

That same year, while pursuing his favorite pastime of rock climbing in the Los Angeles area, he met Cheryl Heuton. Within a couple years, the two of them moved to New York City, married, and began writing together.

Cheryl Heuton was born 1957 in Whittier, California. She grew up in the north San Diego area and attended the University of California, San Diego. She worked as a reporter for local weekly newspapers, then went on to become an editorial writer for the *Los Angeles Herald-Examiner* and later the *Long Beach Press Telegram*. She was nominated for a Pulitzer Prize for her series of articles about the mentally ill homeless.

As a writing team, Cheryl and Nick sold their first feature script to Warner Brothers, then went on to write film projects for New Line, MGM, Imagine, Sony, and HBO.

In 2003, they pitched CBS Television an idea for a television series centered around a mathematician. Production on *Numb3rs* began in 2004 and the show debuted on CBS in January 2005. A ratings success, *Numb3rs* was renewed for a total of six seasons. During those six years, Cheryl and Nick worked on the show as executive producers. Each season they wrote and supervised numerous episodes.

In early 2010, Nick directed the 119th and final episode of *Numb3rs*. The show continues to be broadcast in syndication in the U.S. and in numerous foreign countries, including the United Kingdom, Germany, Sweden, Australia, Japan, and Brazil.

Response from Nick Falacci and Cheryl Heuton

While we pursued a career in film and television writing, we both have a life-long passion and interest in science. I, specifically, arrived at NYU intent on achieving a double major in film and … physics. Once I was informed of the required work load, especially the number of math classes I would have to take, I abandoned my scientific aspirations on the spot and focused my energy on filmmaking.

Cheryl and I discovered our shared love of science on our first date, when we realized we were both tremendous fans of James Burke's "The Day the Universe Changed." Though we never discussed a specific intention to write about scientists, we found ourselves naturally inclined to create characters with backgrounds in engineering, math, and science. One of our feature scripts was based on the true story of the Glomar Explorer, an amazing engineering feat by the Navy to salvage a Russian submarine three miles beneath the surface of the ocean. We developed a network television series about the extraordinary crash and accident analysts at the National Transportation Safety Board.

It was probably only a matter of time before Cheryl and I would be drawn to the world of mathematics and mathematicians. Both long-time skeptics, we were fascinated by the rigorous rational thinking of mathematicians. We were continually and delightedly surprised by the seemingly endless capacity of mathematics to help mankind understand the nature of the world and fuel the development of technology. With the help of the writing of various authors like John Allen

Paulos, we discovered the unique way that mathematicians view the world. The more we explored and researched the topic, the more we were convinced that television audiences would find mathematicians as fascinating as we did.

Noting the popularity of crime dramas, specifically the ones based on forensic sciences, we felt that this type of storytelling could provide the opportunity to contrast and collide the thinking that goes on within a criminal investigation by police detectives with the extreme deductive reasoning of a mathematician. Our research led us to the real life collision of math and police work: Kim Rossmo, a Canadian mathematician, homicide detective and more importantly, one of the pioneers of geographic profiling.

The notion of a mathematician solving major crime investigations was a reality. We had a strong suspicion that a lot of other people would be as fascinated by this unexpected, yet exciting confluence of disciplines as we were.

We are extremely honored to have been selected to receive the JPBM Communications Award. Neither of us, obviously, are mathematicians and neither of us pursued our careers with any plan to popularize mathematics on network television. So much of what brought *Numb3rs* to fruition was, as mathematicians or cosmologists might say, a happy coincidence.

By creating *Numb3rs*, we have experienced two extremely rewarding accomplishments: the excitement of creating a successful television drama and the profound satisfaction of introducing an audience of 10 to 12 million viewers each week to the elegance and power of mathematics and its direct impact on our daily lives.

We wish to acknowledge our utmost gratitude and appreciation for the people at CBS who believed in the show from the very beginning; the other *Numb3rs* writers who took on the daunting task of incorporating mathematics into a crime procedural drama week in, week out; our entire production staff who embraced the notion and premise of the show; our enthusiastic researchers, and our extraordinarily talented consultants who helped us navigate the world of mathematics; and, of course, Caltech, for its vigorous and wholehearted support of the show and for making us welcome on their campus.

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

Bjorn Poonen

"Undecidability in number theory," *Notices Amer. Math. Soc.*, 55 (2008), no. 3, 344–350.

"Does the equation $x^3 + y^3 + z^3 = 29$ have a solution in integers? Yes: (3, 1, 1), for instance. How about $x^3 + y^3 + z^3 = 30$? Again yes, although this was not known until 1999: the smallest solution is (–283059965, –2218888517, 2220422932). And how about $x^3 + y^3 + z^3 = 33$? This is an unsolved problem."

Hilbert's tenth problem (in his famous list of twenty-three problems posed in 1900) asks if there is an algorithm to decide whether, for a given polynomial $p(x_1,\dots, x_n)$ in n variables with integer coefficients, there exist integers $a_1,\dots, a_n$ such that $p(a_1,\dots, a_n) = 0$. Although a proof that no such algorithm exists was found in 1970, "Hilbert's tenth," with its many ramifications and generalizations, continues to stimulate mathematicians today. For example, it is known that there is no algorithm to decide the existence of integer solutions to integer-coefficient polynomial equations in eleven variables, but what about just two variables? We don't know yet.

Poonen's masterful exposition strikes a perfect balance between technicality (for the experts) and accessibility (for the rest of us). His story involves Turing machines, quantum computers, Diophantine sets, undecidability, prime-producing polynomials, and the Riemann hypothesis. It is a treat to find such a diversity of ideas wrapped up neatly into a single fascinating package.

Biographical Note

Bjorn Poonen is the Claude Shannon Professor of Mathematics at MIT. He received an A.B. in mathematics and physics from Harvard in 1989, and a Ph.D. in mathematics at the University of California, Berkeley in 1994. After postdoctoral positions at MSRI and Princeton University, he served on the faculty at UC Berkeley until 2008, when he moved to MIT. Poonen's research focuses on number theory and algebraic geometry, but occasionally he has worked also in combinatorics, probability, and computer science. Poonen is the founding managing editor of *Algebra & Number Theory*. He has received the Packard, Rosenbaum, and Sloan fellowships as well as a Miller Professorship. Earlier, he was a four-time Putnam Competition winner, and the unique perfect scorer out of 385,000 participants in the 1985 American High School Mathematics Exam. At MIT, Poonen serves as Graduate Co-Chair. Finally, twelve mathematicians have completed a Ph.D. under his guidance.

Response from Bjorn Poonen

I am thrilled to receive the Chauvenet Prize, especially since it comes from the MAA, with its long history of supporting the communication of mathematics. When I was young, I read MAA New Mathematical Library books, participated in MAA student competitions, and submitted problems and solutions to MAA journals. I hope that all those involved with the MAA are aware what a difference their efforts are making for the development of mathematicians in the long term.

I view the prize as being not just for my article, but for the subject of Hilbert's tenth problem as a whole. Indeed, my exposition borrows from earlier expositions, and if it is interesting, it is largely because of the wonderful solution of the original problem and the ongoing research on its extensions. I thank Allyn Jackson for encouraging me to write my article, and the other staff at the *Notices* for help in preparing it.

Finally, it is still not known whether there are integer solutions to $x^3 + y^3 + z^3 = 33$, so if you have any ideas...

Certificates for Meritorious Service

These 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. At each January meeting of the Association, honorees from several Sections are recognized.

Citation

Joseph Gallian, North Central Section

Joe Gallian is Distinguished Professor of Teaching and Professor of Mathematics at the University of Minnesota Duluth. He was one of the first recipients of the Mathematical Association of America's Haimo Award for Distinguished College or University Teaching in 1993, and he gave the first-ever invited address jointly sponsored by the MAA, the AMS, and *Pi Mu Epsilon*. He received the MAA Trevor Evans Award for Exposition, the MAA Allendoerfer Award for Exposition, and he toured the country as MAA Polya Lecturer in 1999–2000. Dr. Gallian's contributions to the MAA include invited addresses at 21 national meetings, 66 at MAA regional meetings, and over 200 talks around the country. He has presented 12 minicourses and 24 Project NExT workshops. He has been involved with Project NExT since its inception and has been its codirector since 1998. He was associate editor of the *Monthly* from 1992 until 2006 and of MAA-Online since the 1990s. He served as second vice president and as president of MAA.

The Mathematical Association of America is pleased to award Professor Joseph A. Gallian with a Certificate for Meritorious Service.

Biographical Note

Joe Gallian grew up near Pittsburgh, Pennsylvania, in the 1940s and 1950s. As a teenager his interests were sports and popular music, which have remained so to the present. Although he had no intention of going to college, he greatly enjoyed his high school mathematics classes. After graduating from high school he spent three years working in a factory and other odd jobs. He then decided to attend Slippery Rock University with the hope of becoming a high school mathematics teacher. Instead, an undergraduate math teacher inspired him to go to graduate school to become a math professor; he completed an M.A. at Kansas and a Ph.D. at Notre Dame. Gallian was fortunate to receive a position at the University of Minnesota Duluth in 1972, where he has been ever since. There he was given the freedom to pursue varied academic interests and professional service.

Response from Joseph Gallian

It is a great honor to be recommended by the North Central Section for a Meritorious Service Award. As a young professor at a school that was geographically isolated from the math community, the North Central Section gave me an opportunity to meet wonderful colleagues who were dedicated to serving the math community and encouraging new people in the profession. The NCS meetings served as my apprenticeship for giving presentations, serving on committees, and organizing events. The examples of service to the math community set by Lynn Steen, Joe Konhauser, Gerry Bergum, Wayne Roberts, Sylvan Burgstahler, and Sabra Anderson inspire me to this day.

Citation

John Hagood, Southwest Section

John Hagood has been contributing to Southwestern Section activities for over twenty years, and has been effective at recruiting others to help with this work—he is good at twisting arms. He chaired a Section meeting and in the process made a time-line "to-do" list which has proved very useful for later chairs. Other service includes developing and maintaining the Section website, being Section newsletter editor, and serving as Section governor.

He has always said "yes" when asked to serve on a committee, most recently in the summer of 2009 when he helped rewrite the Section bylaws. He has helped organize the Section's annual conference whenever it was held in Arizona. In many years he has solicited nominations for the Section's Distinguished Teaching Award, ensuring that we would always have qualified candidates. He received the Distinguished Teaching Award himself in 1999. John Hagood is always there when the Section needs him.

The Mathematical Association of America is pleased to award Professor John Hagood with the Certificate for Meritorious Service.

Biographical Note

John Hagood received a B.S. from New Mexico Institute of Mining and Technology and a Ph.D. with a thesis in probability from the University of Utah. He is currently a professor at Northern Arizona University where he has been since 1981, enjoying the climate (one snowstorm last winter piled up 53" of snow), the mountains, the canyons, and the people. His primary area of research is real analysis. A couple of his articles have appeared in the *American Mathematical Monthly* and the *College Mathematics Journal*. Throughout his career he has been involved in service, including a stint as department chair, terms as chair of university committees, and various positions in the Southwestern Section of the MAA. He is once again in department administration, this time as associate chair.

Response from John Hagood

It is an honor to receive the MAA's Meritorious Service Award, as well as a surprise. There are many other deserving individuals in the Southwestern Section, so it is humbling to be nominated and selected by my colleagues in the Section. I owe thanks to colleagues at Murray State University where I started my academic career, especially Donald Bennett and Wayne Bell, for nurturing me as a young mathematician and faculty member, and colleagues at Northern Arizona University, especially Everett Walter and Michael Ratliff, who encouraged me to become active in the MAA upon my arrival there. Throughout the years since then I have witnessed the tireless efforts of many in the Section and the Association who have influenced me and served as examples. Anything I have done for the Section and Association is a result of and a tribute to the excellence they demonstrated.

Citation

Allen Hibbard, Iowa Section

Allen Hibbard has been an active member of the Iowa Section of the MAA since he joined the Central College faculty 20 years ago. He has worked tirelessly to keep the Section moving forward on an even keel and is responsible for much of the behind-the scenes machinery that has made the jobs of the rest of the Section volunteers markedly easier. From 2004 to 2006, Al served the Iowa Section as its chair, and during that time he spearheaded a number of changes in the Section's bylaws and practices, including splitting the chair elect tasks (program and meeting arrangements) into two positions and creating a separate office of Section treasurer.

But Al's greatest contribution to the Iowa Section has been his work developing and improving the Section website. While the Section had a simple website for a number of years, Al completely restructured it, converting the Iowa Section website into a database-driven site and automating registration and session organization for Section meetings.

Al continues to serve as the Section's information director and webmaster. He is always there on the sidelines with a gentle reminder that a deadline is approaching or that a certain task needs attention.

The Mathematical Association of America is proud to present Professor Allen Hibbard with a Certificate for Meritorious Service

Biographical Note

Allen Hibbard grew up in central Minnesota and did his undergraduate work at nearby St. John's University. He obtained his Ph.D. from the University of Notre Dame in group theory. He is professor of mathematics at Central College in Pella, Iowa, where he is now in his twenty-second year.

In addition to enjoying teaching mathematics at Central College, Al soon became involved with the Iowa Section of the MAA and has been occupied in various capacities. He has been active in using technology (Mathematica in particular) to enhance the understanding of various mathematical subjects, with an emphasis on abstract algebra. This has resulted in three books, several articles, numerous presentations, and a freely available Mathematica package to facilitate working with algebraic structures. Al loves to play racquetball, run, bike, work on genealogy, and write programs. He enjoys traveling and activities with his family, consisting of wife Marcia, three children, and a grandchild.

Response from Allen Hibbard

I was very surprised and humbled to learn of this award. There are others who helped with the tasks for which I am credited, and to them I am thankful. I am deeply honored by this award. Thank you very much.

Citation

Joseph Malkevitch, Metro NY Section

Joseph Malkevitch has been a driving force for new ideas in U.S. mathematics instruction for over 35 years. His 1974 textbook with Walter Meyer, *Graphs, Models and Finite Mathematics* (Prentice Hall College Division), treated voting problems and other topics new to the liberal arts mathematics courses. He was a co-author and developer of a liberal arts text from the Consortium for Mathematics and Its Applications (COMAP), *For All Practical Purposes*, and a companion PBS telecourse, which were great successes. He has worked on other educational video projects for COMAP and has been a mathematics consultant to Children's Television Workshop, producer of *Sesame Street* and *The Electric Company*. He has been very active in the New York Academy of Sciences. In all these efforts, Joe's goal was to bring interesting mathematics to as wide an audience as possible. For three years he wrote monthly columns for the AMS's web-based Feature Column, and he continues to write Feature Columns and serve as a co-editor of the Feature Column. In addition, Joe has been active nationally and locally in the MAA, including recent service as the Metro NY Section governor and as chair of the MAD Subcommittee of CUPM.

The Mathematical Association of America is honored to award Professor Joseph Malkevitch a Certificate for Meritorious Service.

Biographical Note

Joseph Malkevitch was raised in New York City where he attended public schools, including Stuyvesant High School and Queens College. He received his doctorate in geometry at the University of Wisconsin (Madison), directed by Donald Crowe, solving questions inspired by Branko Grünbaum. He is now retired from a 40-year teaching career at York College of the City University of New York (CUNY) and CUNY's Graduate Center, having had four Ph.D. students. He is interested in curriculum reform and has worked on curriculum projects with Sol Garfunkel for COMAP, including editing its HIMAP Module series. He has co-authored several books/monographs, including *Graphs, Models and Finite Mathematics*, *The Mathematical Theory of Elections*, *Loads of Codes*, and *Codes Galore*. He helped to develop the video series and co-authored the book *For All Practical Purposes*. For several years he has written columns for AMS's web-based Feature Column. He is currently teaching part time at Teachers College and does work for Math For America.

Response from Joseph Malkevitch

Mathematics has many fewer fans than it deserves in light of the way it can enrich our minds, make possible our cell phones and HDTV, facilitate many medical advances, and improve ways of treating people fairly. It has been my good fortune to work with wonderful people such as Walter Meyer, Sol Garfunkel at COMAP, and my colleagues at Metro NY MAA to promote mathematics. I would like to thank my family, especially my wife, Nina Malkevitch, for sparing the time for me to promote my passion for mathematics.

Citation

Jenny McNulty, Pacific Northwest Section

Jenny McNulty has served the Pacific Northwest Section in a variety of important ways; most notably she was the founder of the Pacific Northwest Section (PNW) Project NExT during her time as Section chair from 1999 to 2001. Jenny has been the Section NExT director since its founding and has coordinated their programs at the Section meetings and managed the PNWNExT listserve. Jenny was the force behind the PNW Section having its own Project NExT before most other Sections. The program continues to flourish and is a major reason that the Section has renewed vitality; revival of the Section can be marked with the April 2001 meeting, planned under Jenny's tenure as Section chair. As evidence of Jenny's continued impact on the Section, during the banquet at the 2010 Section meeting, attendees were asked to raise their hands if they were involved with Project NExT activities, and half the people in the room raised their hands. Jenny McNulty is the reason for all those hands.

The Mathematical Association of America is proud to award Professor Jenny McNulty with a Certificate for Meritorious Service.

Biographical Note

Jenny McNulty is a professor at the University of Montana, located in the beautiful mountains of western Montana. She received a B.A. from Providence College, an M.A. from Stony Brook University and a Ph.D. from the University of North Carolina. Her love of mathematics was cultivated at an early age. She remembers making calendars in grade school in which the dates were expressed in a different base each month; the class favorite was base 11 and least favorite base 2. Jenny works in the area of matroid theory and directs research of both undergraduate and graduate students in this field. Her favorite part of academics is its changing nature. When not working, Jenny can be found playing ice hockey or exploring the outdoors with her two sons.

Response from Jenny McNulty

I am delighted and honored to be receiving this Certificate for Meritorious Service. Being involved with the Pacific Northwest Section, especially with the Section NExT, has been a fun and rewarding experience. It is hard to believe that the PNW Section NExT will hold its twelfth meeting this year and that the program has grown to such an extent.

My involvement with the PNW Section has provided me with the opportunity to meet and work with many talented, accomplished, and dedicated people. Our Section and its members are a bit unique. This uniqueness is seen in members' willingness to try new things, be it having our meeting in Alaska or trying new techniques in the classroom. I am thankful for the opportunity to work with such inspiring people. Thank you!

Citation

Gerald Porter, Eastern Pennsylvania and Delaware (EPaDel) Section

Jerry Porter has contributed to the Mathematical Association of America in many ways. Since first joining the Executive Board of the EPaDel Section in 1975 (it was then called the Philadelphia Section), he has spent decades in service to the MAA. At the national level Jerry served as governor of the EPaDel Section, two terms on the Finance Committee and two terms as treasurer; he was on the MAA Board of Governors for seventeen years and begins a new term at these meetings. During the years he served as treasurer he continued to give up weekends to attend the EPaDel Executive Committee meetings. He has served on more than fifty national committees and task forces. He is a ubiquitous presence at MAA meetings, both national and regional.

Jerry has given his expertise, including his considerable financial expertise as a member of the investment committee and as treasurer. His technical expertise led him to serve as the director of the Interactive Mathematics Text Project and as webmaster for EPaDel. His organizational expertise has come to the fore on the nominating and programming committees on which he has served and at Section meetings he has organized. His political expertise has served the MAA during his time on JPBM and the Science Policy Committee.

He has given his own vision. Jerry's commitment to the MAA is reflected in his endowment of a Public Lecture at national meetings and his sponsorship of the unique tiled lobby of the MAA headquarters.

Jerry's service and care for the organization go far beyond the lengthy list of formal leadership and projects. He has served as a mentor for many younger mathematicians, promoting their involvement in the MAA indirectly through his own example and directly through his encouragement and advice. Jerry's love of mathematics is expressed in his service at all levels—from national and sectional meetings to campuses and local gatherings of high school teachers.

For his dedication and many contributions, the Mathematical Association of America is pleased to present Professor Gerald Porter with a Certificate for Meritorious Service.

Biographical Note

Jerry Porter was an undergraduate at Princeton and a graduate student at Cornell. His thesis, on higher order Whitehead products in homotopy theory, is related to the recent interest in generalized moment-angle complexes and toric topology. After an instructorship at MIT he came to the University of Pennsylvania (Penn) where he has remained for the last forty-five years.

In 1966 he began teaching "computer calculus". The use of the computer to improve undergraduate learning in mathematics has been a constant theme in his life since then. He served as the first chair of the MAA Committee on Computers in Mathematics Education, as a director (with James White) of the Interactive Mathematics Text Project, and as a co-author (with Dave Hill) of *Inter-*

active Linear Algebra (Springer-Verlag, New York, 1996). At Penn, he served as associate dean for Computing for ten years, as chair of the Penn Faculty Senate, and as president of the Penn Emeritus Association.

He enjoys travel and photography. He has visited every state and over sixty-five foreign countries. He recently had a show of his photographs from the Sing-Sing in Papua New Guinea.

Response from Gerald Porter

In the 1970s David Rosen asked me to teach a topology course at Swarthmore. At the time Dave was the governor of the Philadelphia Section of the MAA, and he nominated me for a position on the Executive Committee of the Section. If I had not taught that course at Swarthmore, it is possible that I would not have become active in the MAA. I have a quote on my wall from Kundera that best describes what happened. Kundera writes, "An individual transforms a fortuitous occurrence ... into a motif, which then assumes a permanent position in the composition of the individual's life." The MAA has been an important part of my life. The friends that I made over the years, both in the EPaDel Section and nationally, have enriched my life. I still attend meetings both for the mathematics and, as importantly, for the opportunity to see dear friends. I dare not list them all here since I will surely leave someone out but they know who they are. The MAA is my extended family. Whatever efforts I have expended over the years have been paid back many times over by these friendships.

I am particularly moved by the kind words of the citation. The sections are the heart of the MAA. As a national officer, I always tried to inform my decisions by learning what was going on at the section level.

Last but not least, I must thank my wife, Judy, who not only tolerated the hours I spent on MAA activities but encouraged me to accept the various positions offered. Without her support I would not be standing here today accepting this award.

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 Yeuh-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 because, as they wrote, "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

Joseph Gallian

Joe Gallian's service to mathematics can be summarized through three kinds of activity: his work with REUs, his work with Project NExT, and his service to professional organizations and the mathematical community at large. He is one of the early proponents of undergraduates conducting mathematical research, and his REU at Duluth, which began in 1977, is widely regarded as the premier REU. Participants include some prominent mathematicians, whose careers this REU helped to shape, and Joe also helps the students through what can be a lengthy publication process. The quality of the work at Joe's REU is evidenced by the 150 papers by participants that grew out of their REU work; these papers have appeared in such journals as *Crelle's Journal*, *Journal of Algebra*, *Journal of Combinatorial Theory*, *Discrete Mathematics*, *Applied Discrete Mathematics*, *Annals of Discrete Mathematics*, and *Journal of Graph Theory*. The REU, along with Joe's continuing contact with its participants, makes an important contribution to developing the next generations of mathematicians. Joe is also an inspiration to a generation of mathematicians who involve students in high quality undergraduate research in mathematics. Not only is Joe successful with his own REU, but he is generous with his time and advice to help others to set up REUs. In 2002, Joe was recognized by the Council on Undergraduate Research (CUR) with their Fellow Award given to members who have demonstrated sustained excellence in research with undergraduates.

Joe has been involved with Project NExT since its first summer in 1994 when he gave the closing address; it was so extraordinarily successful that he has given the closing address at each subsequent workshop. Later (1998) when Joe became co-director of Project NExT, he assumed primary responsibility for many parts of the program, participated in developing the workshop program, and often drafted articles for *Focus* and reports to the Board of Governors. Joe's service to mathematics includes a variety of levels of work as illustrated with his Project NExT work. Not only does Joe participate in long-range planning and vision discussions, but he also does the small tasks that keep a program functioning successfully.

The two themes that run through Joe's service to mathematics are (a) encouraging young mathematicians and helping them to develop successful careers and (b) communicating mathematics to the widest possible audience. A standing ovation from the Pi Mu Epsilon Frame Lecture by Joe is an indication of his success with the last theme; this audience included high school students as well as professors, and all understood and were excited with Joe's talk. Joe also has success in communicating mathematics beyond the mathematical community. Articles about his work have appeared in twenty-five news outlets in the United States as well as in Europe and India; four of these were in *Science News* and one in *The New York Times*. In addition to this he has more than 100 articles in mathematical journals and other publications, including *Math Horizons*, *Macmillan Encyclopedia of Chemistry*, and the *Mathematical Intelligencer*. Joe Gallian was named by a Duluth newspaper as one of the "100 Great Duluthians of the 20th Century".

Joe has coordinated Mathematics Awareness Month twice and served on more than 40 national committees, chairing at least 10. He was a CUR Councilor for 11 years, serving as chair of the mathematics and computer science division for part of that time; he has served as associate editor for *Mathematics Magazine* and *American Mathematical Monthly*, and has been director or codirector of five conferences. Joe has refereed for 40 journals and is a reviewer for NSF, the Research Council of Canada, and the Australian Research Council.

Joe Gallian's many awards and honors demonstrate Joe's passion for his service to undergraduates, professional organizations, and the mathematical community. He has been honored with teaching awards from University of Minnesota Duluth, the Carnegie Foundation for the Advancement of Teaching, and the Mathematical Association of America (Haimo Award). Joe has received the MAA Trevor Evans and Carl B. Allendoerfer Awards and has been an MAA Polya Lecturer. Joe served as second vice president and then president of MAA. He is Distinguished Professor of Teaching and Professor of Mathematics at the University of Minnesota Duluth, where he was recognized in December 2009 with the Chancellor's Award for Distinguished Research.

The MAA is proud to present the 2011 Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics to Professor Joseph Gallian.

Biographical Note

Professor Gallian's biographical note is included with his Certificate for Meritorious Service.

Response from Joseph Gallian

I am humbled to receive the MAA Gung and Hu Award for Distinguished Service to Mathematics. I am in awe of the previous winners of this honor. Being a Gung and Hu Award recipient is like being elected to the Service to Mathematics Hall of Fame. Of course, people who receive individual awards are merely one of many who contributed to the accomplishments deemed as award worthy. In everything that I have done, I have been fortunate to have been helped by people with extraordinary ability and a great desire to serve others. There are too many to thank by name but they are my department heads and deans at the University of Minnesota Duluth who have enabled and encouraged me to serve the profession, the alumni from my REU who have come back as advisers and visitors to help me run my REU, the Project NExT leadership team, the people who diligently serve on MAA committees, and the MAA officers and staff over the years. The mathematics community is fortunate to have an organization like the MAA that provides such diverse and wonderful opportunities for people to serve the profession. I wish to thank the Gung and Hu selection committee for this honor.

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

Peter Kronheimer and Tomasz Mrowka

Monopoles and Three-Manifolds, Cambridge University Press, 2007.

The study of three- and four-dimensional manifolds has been transformed by the development of gauge theories adapted from mathematical physics. The appearance of gauge-theoretic invariants of four-manifolds led to Donaldson's discovery of pairs of four-manifolds that were homeomorphic but not diffeomorphic. For three-manifolds, a generalization of Morse theory introduced by Floer gave a home to the solutions of the Yang-Mills equations and their topological interpretations. In the 1990s Seiberg and Witten developed a more direct approach to the riches of gauge invariants. The book of Kronheimer and Mrowka presents an ambitious and thorough account of these ideas and their consequences.

The construction of instanton homology by Floer begins with Morse theory and the anti-self-dual Yang-Mills equation. Substituting the Seiberg-Witten equations leads to three variants of Floer homology that the authors develop and explain. To do this they need substantial foundations in analysis, geometry, and topology. Some of this material—including basic Morse theory for manifolds with boundary, sharper compactness results, and functoriality for Floer theory—appears with details for the first time in this book.

Three-manifolds are a rich source of geometric phenomena, including foliations, contact structures, surgery, and knots. The potency of the monopole techniques is demonstrated in the final two chapters of the book, in which calculations and further work are discussed and all of these phenomena are related to Seiberg-Witten-Floer theory. Future researchers interested in manifold theory will surely develop these tools further. Their apprenticeship will be the book of Kronheimer and Mrowka. The authors deserve the Doob Prize for the breadth and depth of their exposition as well as the care with which they make this rich and technical subject accessible.

Biographical Notes

Born in London, **Peter Kronheimer** was educated at the City of London School and Merton College, Oxford. He obtained his B.A. in 1984 and his D.Phil. in 1987 under the supervision of Michael Atiyah. After a year as a Junior Research Fellow at Balliol and two years at the Institute for Advanced Study, he returned to Merton as Fellow and Tutor in Mathematics. In 1995 he moved to Harvard, where he is now the William Caspar Graustein Professor of Mathematics. He is a recipient of the Förderpreis from the Mathematisches Forschungsinstitut, Oberwolfach, and the Whitehead Prize from the London Mathematical Society. He is a corecipient (with Tomasz Mrowka) of the Oswald Veblen Prize from the American Mathematical Society and was elected a Fellow of the Royal Society in 1997. Peter lives in Newton, Massachusetts, with his wife, Jenny, and two sons, Matthew and Jonathan.

Tomasz Mrowka was born in State College, Pennsylvania, and lived in Kalamazoo, Michigan, and Amherst, New York, while following his father's academic career. He was an undergraduate at MIT from 1979 to 1983. In 1983 he entered graduate school at University of California, Berkeley and studied with Clifford Taubes and Robion Kirby. Taubes moved to Harvard in 1985 and Mrowka went along from 1985 to 1988 as a visiting graduate student where he also studied with John Morgan. He received his Ph.D. from UC Berkeley in 1989. After graduate school he held postdoctoral positions at MSRI (1988–89), Stanford (1989–91) and Caltech (1991–92). He was promoted to full professor at Caltech in 1992 and remained on the faculty until 1996. He was a visiting professor at Harvard (spring of 1995) and at MIT (fall of 1995) before returning to MIT as a professor of mathematics in the fall of 1996. He was appointed to the Simons Professorship in 2007 and in 2010 the name of his chair changed to the Singer Professor of Mathematics.

Mrowka received the National Young Investigator Grant from the NSF in 1993 and was a Sloan Foundation Fellow from 1993 to 1995. In 2007 Kronheimer and Mrowka were jointly awarded the Veblen Prize in Geometry from the AMS. Mrowka is a Fellow of the American Academy of Arts and Sciences, class of 2007, and was awarded a Guggenheim Fellowship for the 2009 academic year. Mrowka works mainly on the analytic aspects of gauge theories and applications of gauge theory to problems in low dimensional topology.

Outside mathematics, Mrowka enjoys travel, good food, bicycling, swimming, hiking, and most of all spending time with his wife Gigliola Staffilani and twins Mario and Sofia.

Response from Peter Kronheimer and Tomasz Mrowka

We are honored and delighted to hear that we have been awarded the Joseph L. Doob Prize.

The book we wrote, *Monopoles and three-manifolds*, evolved out of our wish to better understand the construction of monopole Floer homology. At the time that we started writing it in the summer of 2000, we had been working for some time on a more ambitious project: we were trying to understand the Floer homology that would arise from the *non-abelian* monopole equations, with a view to using that understanding in a proof of the Property P conjecture for knots. While the substantial extra difficulties of the non-abelian case remained out of reach, we gradually realized that the usual (abelian) monopoles, though generally regarded as well understood in the folklore of the field, already had many aspects that had never been clearly treated in the literature. We embarked on writing some notes, with the aim of perhaps producing a short book on the subject. A year later, we had a manuscript of about 120 pages, and we reported to the National Science Foundation that the project was nearly complete. It remained "nearly complete" while continuing to grow over the next few years, until it had increased in size by a factor of six.

There were several reasons for this growth. One was that the scope of the project naturally increased as the field continued to develop. New applications of Floer homology were found; the work of Ozsváth and Szabó on Heegaard Floer homology revealed new structures that greatly influenced our approach to the exposition; and the calculation of several interesting examples came within reach. A second reason for the growth was that we were motivated to develop new approaches to several of the technical aspects of the theory (perturbations, gluing, and compactness results among others) in order to write a text that would be applicable to other similar problems in geometry. Many of the ideas and techniques that eventually emerged were not known to us when we began: examples include the extensive use of a blown-up space as a setting for gluing theorems and calculations for a type of coupled Morse theory that seems to be of independent interest. Finally, the book grew because we were determined not to rely on the assumed understanding that such things *could* be done, but instead to show, wherever possible, exactly *how* to do these things.

While the Property P conjecture was eventually proved by other means, we are particularly pleased that the results and calculations that went into the manuscript have seen real application. Particularly notable was the proof by Cliff Taubes of the Weinstein conjecture in dimension three, a result which motivated us in the push to the finish. We also hope that we have written a book whose self-contained treatment of several topics in geometric analysis will be useful to students in nearby fields.

We would like to thank our families for their love, support, patience, and understanding during the long writing process. Many thanks to all the mathematicians whose ideas are reflected in the book and to the staff at Cambridge University Press for working with us as we completed the manuscript. Finally, we thank the American Mathematical Society and the selection committee for recognizing our work in this way.

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

Chandrashekhar Khare and Jean-Pierre Wintenberger

The 2011 Frank Nelson Cole Prize in Number Theory is awarded to Chandrashekhar Khare and Jean-Pierre Wintenberger for their remarkable proof of Serre's modularity conjecture. In 1973 Jean-Pierre Serre made the audacious and influential conjecture that any irreducible two-dimensional representation of the absolute Galois group $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$ that is odd (in the sense that the determinant of complex conjugation is -1 and not $+1$) arises from modular forms. This conjecture has many extremely important consequences: it implies that all odd rank 2 motives over $\mathbb{Q}$ are modular, it implies the Artin conjecture for odd two-dimensional representations of $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$ and, as Gerhard Frey and Serre realized in the mid-1980s, it implies Fermat's Last Theorem. Serre's conjecture has inspired much extremely important work. In the 1990s Wiles used ideas relating to Serre's conjecture to prove Fermat's Last Theorem and much of the Shimura-Taniyama conjecture. However, Serre's conjecture and the modularity of all odd rank 2 motives over $\mathbb{Q}$ still seemed completely out of reach. Serre's conjecture is essentially a statement about insoluble Galois groups, which had not been seriously touched in any previous work. In 2004 Khare and Wintenberger stunned the community when for the first time they found a plausible, and extremely beautiful, strategy to attack Serre's conjecture. See their paper "On Serre's conjecture for 2-dimensional mod p representations of $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$" (*Annals of Math. (2)* 169 (2009) no. 1, 229–253). They continued to refine their strategy, while at the same time Mark Kisin made important and very original improvements to the modularity lifting theorems on which their strategy relies. Khare first proved the level one case of Serre's conjecture in his paper "Serre's modularity conjecture: the level one case" (*Duke Math. J.* 134 (2006), no. 3, 557–589), and then Khare and Wintenberger completed the full proof of Serre's conjecture in their papers "Serre's modularity conjecture (I) and (II)" (*Invent. Math.* 178 (2009), no. 3, 485–504 and 505–586).

Biographical Notes

Chandrashekhar Khare was born in Mumbai in 1967 and received his B.A. in Mathematics from the University of Cambridge in 1989, and his Ph.D. from Caltech in 1995, where he worked with Haruzo Hida at UCLA and Dinakar Ramakrishnan at Caltech. From 1995 he worked at the Tata Institute for Fundamental Research in Mumbai. In 2002 he joined the faculty at the University of Utah before moving in 2007 to his current position as professor in the mathematics department at UCLA. He received the 2007 Fermat Prize from the Institut Mathématique de Toulouse, was a Guggenheim Fellow in 2008, and received the Infosys Prize 2010 for Mathematical Sciences. He was an invited speaker in the Number Theory Section at the International Congress of Mathematicians held in Hyderabad, India, in August 2010.

Jean-Pierre Wintenberger was born in Neuilly-sur-Seine, near Paris, in 1954. He got his first thesis in 1978 and his *Thèse d'Etat* (*Habilitation*) in 1984 in Grenoble, under the supervision of Jean-Marc Fontaine. He held the position of researcher in CNRS from 1978 to 1991, first in Grenoble then in Orsay. He has been a professor in Université de Strasbourg since 1991. He is member of the Institut Universitaire de France since 2007, received in 2008 the Prix Thérèse Gautier from French Academy of Science, and was an invited speaker in the Number Theory Section at the International Congress of Mathematicians held in Hyderabad, India, in August 2010.

Response from Chandrashekhar Khare and Jean-Pierre Wintenberger

We are truly honored and very happy to be named as corecipients of the 2011 Cole Prize for Number Theory for our work on Serre's modularity conjecture. We thank the jury and AMS for this recognition of our work.

The conjecture is a beautifully simple and striking statement as summarised in the citation. At the time it was made, in the 1970s, it must have seemed inaccessible. The precision with which it was formulated by J.-P. Serre, and the wealth of consequences he drew from it, attracted the efforts of many people.

Our work relies on the brilliant insights of many mathematicians. The celebrated work of A. Wiles in the 1990s provided a new tool, now called *modularity lifting*, with which to approach the conjecture. R. Taylor in the subsequent decade added several new insights, proving a potential version of Serre's conjecture which has had many strong consequences, some of which were used in our proof of the conjecture. As the citation mentions, the deeply original work of M. Kisin made the method of Wiles ever more versatile, and his work was crucially used in our proof. Another key development that is fundamental to our work is the version of modularity lifting theorems proved by C. Skinner and A. Wiles. Much of the work in this area is based on the pioneering work done in the 1970s and 1980s by J.-M. Fontaine, H. Hida, B. Mazur, K. Ribet, and J.-P. Serre on congruences between modular forms, and local and global Galois representations. To all these mathematicians we are very grateful.

Serre's conjecture once proved as a culmination of decades of work of many mathematicians, becomes a first step in linking linear, n-dimensional, finite characteristic representations of absolute Galois groups of number fields to automorphic forms.

Response from C. Khare

I am deeply grateful to my parents for the encouragement they gave me to indulge in a quixotic pursuit.

The institutions I have worked at—TIFR (Mumbai), University of Utah, and UCLA—have all provided very supportive environments at work. My wife, Rajanigandha, and my two children, Arushi and Vinayak, create a wonderful atmosphere at home. To all of them a heart-felt thanks!

Response from J.-P. Wintenberger

I have a thought for my parents who were scientists and transmitted to me their curiosity, interest, and passion for science and research.

I wish to thank mathematicians who particularly influenced me by their works and personalities: J.-M. Fontaine, my advisor, A. Brumer, J. Coates, L. Illusie, M. Raynaud, and J.-P. Serre.

I also wish to thank CNRS and Université de Strasbourg, who provided me the privilege of excellent conditions of work.

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

Henryk Iwaniec

Henryk Iwaniec is awarded the Steele Prize for Mathematical Exposition for his long record of excellent exposition, both in books and in classroom notes. He is particularly honored for the books *Introduction to the Spectral Theory of Automorphic Forms* (Revista Matemática Iberoamericana, Madrid, 1995) and *Topics in Classical Automorphic Forms* (Graduate Studies in Mathematics, 17, American Mathematical Society, Providence, RI, 1997).

These books give beautiful treatments of the theory of automorphic forms from the author's perspective of analytic number theory. They have become classics in the field and are now a fundamental resource for students. The two books are complementary, with the first presenting the nonholomorphic theory of Maass forms for GL(2), and the latter focusing on holomorphic modular forms.

Introduction to the Spectral Theory of Automorphic Forms begins with the basics of hyperbolic geometry and takes readers to the frontiers of research in analytic number theory. Many topics, such as the Kuznetsov formula and the spectral theory of Kloosterman sums, are covered for the first time in this book. It closes with a discussion of current research on the size of eigenfunctions on hyperbolic manifolds. By making these tools from automorphic forms widely accessible, this book has had a tremendous influence on the practice of analytic number theory.

Topics in Classical Automorphic Forms develops many standard topics in the theory of modular forms in a nontraditional way. Iwaniec's aim was "to venture into areas where different ideas and methods mix and interact." One stand-out part is the treatment of the theory of representation of quadratic forms and estimating sizes of Fourier coefficients of cusp forms. The breakthrough in the late 1980s in understanding representations by ternary quadratic forms originated with the seminal work of Iwaniec which is described beautifully here.

Biographical Note

Henryk Iwaniec graduated in 1971 from Warsaw University, got his Ph.D. the next year and became professor at the Institute of Mathematics of the Polish Academy of Sciences before leaving for the USA in 1983. After taking several visiting positions in the USA (including a long term appointment at the Institute for Advanced Study), in January 1987 he was offered a chair of New Jersey State Professor at Rutgers, the position he enjoys to this day.

Iwaniec's main interest is analytic number theory and automorphic forms. Prime numbers are his passion. His accomplishments were acknowledged by numerous invitations to give talks at conferences, including the International Congress of Mathematicians. Iwaniec is a member of the Polish Academy of Sciences, the American Academy of Arts and Sciences, the National Academy of Sciences, and the Polska Akademia Umiejetnosci.

Among several prizes Iwaniec received are the Jurzykowski Foundation Award (New York), Sierpinski Medal (Warsaw), Ostrowski Prize (Switzerland), and the Cole Prize in Number Theory (USA).

Iwaniec teaches graduate students and collaborates with researchers from various countries. In 2005 he was honored by receiving the *doctorate honoris causa* of Bordeaux University. In 2006 the Town Council of his native city made Iwaniec an Honorary Citizen of Elblag, a distinction he cherishes very proudly.

Response from Henryk Iwaniec

I thank the American Mathematical Society and the Committee of the Steele Prize for this award. I am very honored and happy. This is a very meaningful recognition for me because the citation is telling not only about my fascination in the subjects but also about my attention to educating new generation of researchers. Modern analytic number theory takes ideas from and gives back to the theory of automorphic forms new enhanced methods and results. While more arithmetical aspects of automorphic forms are covered relatively well in the literature, there is still not sufficient exposition of analytic aspects. Hopefully more books will be written by other specialists that will address similar topics from many different directions. These two books selected by the Committee for the award came out of my teaching graduate courses and giving presentations in workshops, so inevitably they contain some of my favorite ways of handling the problems. I am glad that my choices and writing style are well received. If indeed these works do have "influence on the practice of analytic number theory", I will be most happy.

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

Ingrid Daubechies

The Steele Prize for Seminal Contribution to Research is awarded to Ingrid Daubechies for her paper "Orthonormal bases of compactly supported wavelets" (*Comm. Pure Appl. Math.* 41 (1988), no. 7, 909–996). In this paper Daubechies constructs the very first examples of families of wavelets (rescalings of a single "mother wavelet") that are simultaneously smooth, orthonormal, and compactly supported; earlier examples of wavelets had two out of three of these properties, but not all three at once. The orthonormality makes them good as a basis to decompose arbitrary signals; the smoothness removes edge artifacts and makes wavelet series converge rapidly; and the compact support makes them viable for use in actual practical applications. The wavelets also came with a parameter that traded off their smoothness for the width of their support and amount of oscillation, making them flexible enough to be used in a variety of situations. As such, these wavelets (now known as *Daubechies wavelets*) became extremely popular in practical signal processing (for instance, they are used in the JPEG 2000 image compression scheme). Even nowadays, they are still the default, general-purpose wavelet family of choice to implement in any signal processing algorithm (although for specialized applications, sometimes a more tailored wavelet can be slightly superior).

At the time of this paper, wavelet theory was already a booming field, with hundreds of papers devoted to wavelet construction, efficient algorithms, etc. At present the field is more mature and settled, an effect to which Daubechies' paper significantly contributed, by largely "solving" the problem of the best wavelets to use in general (and also by giving order to the chaotic explosion of literature).

In his MathSciNet® review of the paper, Hans Feichtinger wrote, "Even before its publication, the paper had a remarkable impact within applied analysis, and great interest in wavelet theory has been shown from many sides. By the summer of 1989 there was already a software package available, running on PCs, which is based on the construction described in this note. This sheds some light on the speed with which new mathematical algorithms are brought to work these days and can serve to underline the importance of mathematical research to applied fields."

Biographical Note

Ingrid Daubechies received both her Bachelor's and Ph.D. degrees (in 1975 and 1980) from the Free University in Brussels, Belgium. She held a research position at the Free University until 1987. From 1987 to 1994 she was a member of the technical staff at AT&T Bell Laboratories, during which time she took leaves to spend six months (in 1990) at the University of Michigan, and two years (1991–93) at Rutgers University. She is now at the Mathematics Department and the Program in Applied and Computational Mathematics at Princeton University. Her research interests focus on the mathematical aspects of time-frequency analysis, in particular wavelets, as well as applications. In 1998 she was elected to be a member of the National Academy of Sciences and a Fellow of the Institute of Electrical and Electronics Engineers. The American Mathematical Society awarded her a Leroy P. Steele Prize for Mathematical Exposition in 1994 for her book *Ten Lectures on Wavelets*, as well as the 1997 Ruth Lyttle Satter Prize. From 1992 to 1997 she was a Fellow of the John D. and Catherine T. MacArthur Foundation. She is a member of the American Academy of Arts and Sciences, the American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics, and the Institute of Electrical and Electronics Engineers. In addition, Dr. Daubechies was elected in 2010 to serve as the next president of the International Mathematical Union.

Response

I am delighted and very grateful to receive this award, especially for this paper. In my work, I try to distill, from extensive contacts with scientists and engineers, challenging mathematical problems that nevertheless are still connected to the original question. When I am lucky, as was the case for this paper, the answer to the question or the results of the study are not only interesting mathematically but also translate into something new and useful for the application domain. I also would like to thank *Communications in Pure and Applied Mathematics*, where the paper appeared, for accepting to include those long tables of coefficients—its impact in engineering would not have been the same without the tables, at that time a standard feature of papers on filter constructions in signal analysis.

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

John Willard Milnor

The 2011 Steele Prize for Lifetime Achievement is awarded to John Willard Milnor.

Milnor stands out from the list of great mathematicians in terms of his overall achievements and his influence on mathematics in general, both through his work and through his excellent books. His discovery of 28 nondiffeomorphic smooth structures on the 7-dimensional sphere and his further work developing the surgery techniques for manifolds shaped the development of differential topology beginning in the 1950s. Another of his famous results from this period is a counterexample to the Hauptvermutung: an example of homeomorphic but not combinatorially equivalent complexes. This counterexample is a part of a general big picture of the relation between the topological, combinatorial, and smooth worlds developed by Milnor. Jointly with M. Kervaire, Milnor proved the first results showing that the topology of 4-dimensional manifolds is exceptional, by revealing obstructions for the realization of 2-dimensional spherical homology classes by smooth embedded 2-spheres. This is one of the founding results of 4-dimensional topology.

In this way Milnor opened several fields: singularity theory, algebraic K-theory, and the theory of quadratic forms. Although he did not invent these subjects, his work gave them completely new points of view. For instance, his work on isolated singularities of complex hypersurfaces presented a great new topological framework for studying singularities, and at the same time provided a rich new source of examples of manifolds with different extra structures. The concepts of Milnor fibers and Milnor number are today among the most important notions in the study of complex singularities.

The significance of Milnor's work goes much beyond his own spectacular results. He wrote several books (*Morse Theory* (Princeton University Press, Princeton, 1963), *Lectures on h-Cobordism Theorem* (Princeton University Press, Princeton, 1965), and *Characteristic Classes* (Princeton University Press, Princeton, 1974), among others) which became classical, and several generations of mathematicians have grown up learning beautiful mathematical ideas from these excellent books. Milnor's survey "Whitehead torsion" (*Bull. Amer. Math. Soc.* 72 (1966), no. 3, 358–426) provided an entry point for topologists to algebraic K-theory. This was followed by a number of Milnor's own important discoveries in algebraic K-theory and related areas: the congruence subgroup theorem, the computation of Whitehead groups, the introduction and study of the functor K_2 and higher K-functors, numerous contributions to the classical subject of quadratic forms and in particular his complete resolution of the theory of symmetric inner product spaces over a field of characteristic 2, just to name a few. Milnor's introduction of the growth function for a finitely presented group and his theorem that the fundamental group of a negatively curved Riemannian manifold has polynomial growth was the beginning of a spectacular development of the modern geometric group theory and eventually led to Gromov's hyperbolic group theory.

During the past thirty years, Milnor has been playing a prominent role in development of low-dimensional dynamics, real and complex. His pioneering work with Thurston on the kneading theory for interval maps laid down the combinatorial foundation for the interval dynamics putting it into the focus of intense research for decades. Milnor and Thurston's conjecture on the entropy monotonicity brought together real and complex dynamics in a deep way, prompting a firework of further advances. And of course, his book *Dynamics in One Complex Variable* (Friedr. Vieweg & Sohn, Braunschweig, 1999) immediately became the most popular gateway to this field.

The Steele Prize honors John Willard Milnor for all of these achievements.

Biographical Note

John Milnor was born in Orange, New Jersey, in 1931. He spent his undergraduate and graduate student years at Princeton, studying knot theory (then a very unfashionable field which has since become amazingly fashionable) under the supervision of Ralph Fox.

After many years at Princeton University and the Institute for Advanced Study, with shorter stays at UCLA and MIT, he has settled at Stony Brook University, where he is now codirector of the Institute for Mathematical Sciences. Over the years, he has wandered randomly from subject to subject, studying game theory, differential geometry, algebraic topology, differential topology, quadratic forms, and algebraic K-theory. For the past 25 years, his main focus has been on dynamical systems and particularly on low dimensional holomorphic dynamical systems. Among his current projects is the preparation of a book to be called *Dynamics, Introductory Lectures*.

Response from John Willard Milnor

It is a particular pleasure to receive an award for what one enjoys doing anyway. I have been very lucky to have had so many years to explore and enjoy some of the many highways and byways of mathematics, and I want to thank the three institutions that have supported and inspired me for most of the past 60 years: Princeton University, where I learned to love mathematics; the Institute for Advanced Study for many years of uninterrupted research; and Stony Brook University where I was able to reconnect with students and (to some extent) with teaching. I am very grateful to my many teachers, from Ralph Fox and Norman Steenrod long ago to Adrien Douady in more recent years; and I want to thank the family, friends, students, colleagues, and collaborators who have helped me over the years. Finally, my grateful thanks to the selection committee for this honor.

Summary of Awards

For AMS

Bôcher Memorial Prize: Asaf Naor, Gunther Uhlmann

Frank Nelson Cole Prize in Number Theory: Chandrashekhar Khare and Jean-Pierre Wintenberger

Levi L. Conant Prize: David Vogan

Joseph L. Doob Prize: Peter Kronheimer and Tomasz Mrowka

Leonard Eisenbud Prize for Mathematics and Physics: Herbert Spohn

Ruth Lyttle Satter Prize in Mathematics: Amie Wilkinson

Leroy P. Steele Prize for Lifetime Achievement: John Willard Milnor

Leroy P. Steele Prize for Mathematical Exposition: Henryk Iwaniec

Leroy P. Steele Prize for Seminal Contribution to Research: Ingrid Daubechies

For AMS-MAA-SIAM

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

For AWM

Louise Hay Award for Contributions to Mathematics Education: Patricia Campbell

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

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

For JPBM

Communications Award: Nicolas Falacci and Cheryl Heuton

For MAA

Certificates for Meritorious Service: Joseph Gallian, John Hagood, Allen Hibbard, Joseph Malkevitch, Jenny McNulty, Gerald Porter

Chauvenet Prize: Bjorn Poonen

Euler Book Prize: Timothy Gowers

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

David P. Robbins Prize: Mike Paterson, Yuval Peres, Mikkel Thorup, Peter Winkler, and Uri Zwick

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics: Erica Flapan, Karen Rhea, Zvezdelina Stankova

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