Joint Mathematics Meetings
January 5–8, 2007
New Orleans

January 2007 Prizes and Awards

4:25 P.M., Saturday, January 6, 2007

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

Jennifer Quinn

Jennifer Quinn has a contagious enthusiasm that draws students to mathematics. The joy she takes in all things mathematical is reflected in her classes, her presentations, her publications, her videos and her on-line materials. Her class assignments often include nonstandard activities, such as creating time line entries for historic math events, or acting out scenes from the book *Proofs and Refutations*. One student created a children's story about prime numbers and another produced a video documentary about students' perceptions of math. A student who had her for six classes says, "I hope to become a teacher after finishing my master's degree and I would be thrilled if I were able to come anywhere close to being as great a teacher as she is."

Jenny developed a variety of courses at Occidental College. Working with members of the physics department and funded by an NSF grant, she helped develop a combined yearlong course in calculus and mechanics. She also developed a course on "Mathematics as a Liberal Art" which included computer discussions, writing assignments, and other means to draw technophobes into the course. Her upper-division course on graph theory had students collect and attempt open problems in the field. This led to a joint publication with one of the undergraduates in the course. One project that grew out of her History of Mathematics course was a mathematics game show called "The Number Years." It was a huge hit at the winter Joint Mathematics Meetings in 2000.

Jenny is invited to give talks on mathematics to wide and varied audiences, from middle school students to senior citizens. In addition to being the co-editor of *Math Horizons*, she has written a variety of expository and research articles. Her MAA book, *Proofs That Really Count: The Art of Combinatorial Proof*, co-authored with Arthur Benjamin, won the 2006 Beckenbach Book Prize.

Her excellence has been recognized in other ways as well. In 2001, she received the Southern California MAA Distinguished Teaching Award. In fall 2005, she was the recipient of the Sterling Prize from Occidental College, awarded to only one professor at the College per year, based on professional achievement, excellence in teaching and service to the College.

Jenny was also the on-camera talent for a series of videos that accompany the Tussy and Gustafson elementary and intermediate algebra texts published by Brooks/Cole. To quote from one of her producers, "She always seems to be sharing a wonderfully complex secret, taking what might seem repetitive and monotonous on the page and transforming it into something meaningful, even fascinating. She has an uncanny ability to *connect* with the people she works with and teaches. And that connection is somehow able to lift people to a higher level, and show them a series of wonderful new things."

We are delighted to award Jennifer Quinn the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Jennifer Quinn earned her BA, MS, and PhD from Williams College, the University of Illinois at Chicago, and the University of Wisconsin, respectively. For the past thirteen years she has been affiliated with Occidental College, rising to the rank of full professor and serving as department chair. Jenny is currently the executive director of the Association for Women in Mathematics and continues her work as co-editor of *Math Horizons*. She lives in Tacoma, Washington, where she occasionally teaches at the University of Puget Sound and Pacific Lutheran University. Someday she hopes to return to a permanent academic position, but for now she remains open to all possibilities and is eager to continue on life's journey.

Response from Jennifer Quinn

What an incredible distinction! The impact of past and current Haimo winners is extremely impressive, and I am honored to be included in their celebrated circle.

As mathematicians, we ponder and appreciate the beauty of our chosen subject. For me, teaching is my opportunity to reveal that beauty to others. It is a privilege, and my students are a constant source of energy, inspiration, and action.

I have been fortunate in my life and career having had encouraging teachers, an amazing thesis advisor, supportive colleagues, harmonious co-authors, a loving family, and dynamic students. I'd like to thank each and every one of you. You know who you are.

Citation
Michael Starbird

Michael Starbird's goal is to help his students unleash the creativity within them. He doesn't just teach them mathematics. He teaches them how to discover and appreciate mathematics for themselves.

Mike has had an impact on dramatic numbers of students. In addition to the thousands of students he has taught at the University of Texas over his 32 years there, his teaching videos, which appear in the *Great Courses* series offered by The Teaching Company, have reached out to countless others. His expository work and his workshops have touched many more students either directly or through the teachers who have learned from him.

Mike's teaching excellence is well documented by about a dozen teaching awards, including the Excellence Award from the Eyes of Texas (twice), the Dad's Association Centennial Teaching Fellowship, the President's Associates Teaching Excellence Award, the Jean Holloway Award for Teaching Excellence, the Chad Oliver Plan II Teaching Award, the Friar Society Centennial Teaching Fellowship, awarded to only one of the 2,700 faculty at the University of Texas per year, and the Minnie Stevens Piper Professorship, awarded to ten faculty in any field per year at any college or university in the state of Texas.

Students love his courses: "I am sad that it is over. This has been the best math course I've taken since I have been here." "Dr. Starbird is uber-awesome." "Dr. Starbird single-handedly reversed my previous hatred for all things math related. I would literally leave class smiling and excited to tell others the interesting math facts I learned."

Mike is also in great demand as a speaker and workshop leader. He served as associate dean at the University of Texas in the 1990's. Since 2000 he has delivered over 60 invited addresses in a wide spectrum of venues. He has presented workshops for a variety of programs, including the MAA, Project NExT, PREP, PMET, MER and the NSF Chautauqua program.

With Edward Burger, he co-authored the "Math for Non-Majors" textbook *The Heart of Mathematics, An Invitation to Effective Thinking*. Appearing in 2000, this book allows math phobic students to discover the beauty and fun of mathematics. It was awarded the Robert W. Hamilton Book Award in 2002, and it has been adopted at over 200 colleges and universities. The expository mathematics book *Coincidences, Chaos, and All That Math Jazz: Making Light of Weighty Ideas*, also co-authored with Edward Burger, appeared in 2005.

Dr. Starbird is creative, articulate, indefatigable, and an eloquent communicator and promoter of mathematics. We are pleased to present him with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Michael Starbird is a University Distinguished Teaching Professor at the University of Texas at Austin. He is a member of the university's Academy of Distinguished Teachers. He has received more than a dozen teaching awards, including several that are awarded to only one professor annually and including the Texas statewide Piper Professorship. In 1989 Starbird was the Recreational Sports Super Racquets Champion.

Starbird wrote, with co-author Edward B. Burger, the award-winning textbook *The Heart of Mathematics: An Invitation to Effective Thinking* and, for the public, *Coincidences, Chaos, and All That Math Jazz: Making Light of Weighty Ideas*. His Teaching Company video courses in calculus, statistics, and probability annually reach thousands of people in the general public. He has given dozens of presentations to students and the public, plus more than twenty MAA and NSF minicourses and workshops for teachers. He served as a member-at-large of the AMS Council, on the MAA's Committee on the Undergraduate Program in Mathematics (CUPM), the AMS's Committee on Education, and the Mathematicians and Education Reform Board.

Response from Michael Starbird

I love to see people discover the joy of thinking. Mathematics is brimming with the potential for exciting people with intrigue and fascination. One of the great satisfactions in life for me has been to awaken curiosity and independent thinking in people. I love to bring an unsuspecting person to the very brink of the hill and watch as they clamber up and gasp in awe of previously unimagined vistas. The mathematical way of thought opens doors. It liberates people to dare to think through challenges that they previously viewed as beyond their power. I love the challenge of bringing authentic understanding of significant ideas in mathematics to people who are not necessarily mathematically oriented. Those deep ideas inevitably have meaning beyond the math and make a real difference in real lives. I very much appreciate this award from the Mathematical Association of America, because it recognizes the work that I value most. Thank you.

Citation

Gilbert Strang

Over the last 44 years at the Massachusetts Institute of Technology (MIT), Gilbert Strang has influenced tremendous numbers of students, both at MIT and around the world. His approaches to teaching linear algebra and mathematics for engineers have changed the way we all approach these subjects.

In 1970, Gil began teaching the linear algebra course at MIT. He realized the subject was not simply for mathematics majors and so he included a variety of engineering applications. Students loved his lecturing style and appreciated the material he included. Enrollments steadily grew. In 1976, Gil published *Linear Algebra and Its Applications*, his textbook based on that course. This book sparked a revolution in the way linear algebra was taught and has influenced a multitude of books that have come out since then. Rather than utilizing a theorem-proof format, the book was written in a conversational tone and included many practical applications. In 1993, he published a successor, *Introduction to Linear Algebra*. Every year since 1981, more than 300 students out of an MIT class of 1000 take his course.

In the 1980's Gil began to think about how mathematics was taught to engineers. Recognizing the impact of computers, he believed that students would be better served by a deep understanding of the mathematical methods underlying numerical methods. In 1984, he introduced a new course on mathematical methods for engineers. Since then, enrollments for that course at MIT have grown from 40 a year to 100 a year. In 1986, he published *Introduction to Applied Mathematics*, a textbook for that course. MIT's Graduate Student Council recognized his work on that course with a teaching award in 2003. Additional texts that he has co-authored include *An Analysis of the Finite Element Method* and *Wavelets and Filter Banks*.

In 2001, MIT began implementing a program of "Open Courseware" which made available course materials and lectures on-line for any students who wish to view them. There are now over 500 courses that have been made available in this way. From among these courses, Gil's linear algebra course ranks first among mathematics courses in popularity and 16th among all courses available. Calculus is the second most popular mathematics course followed by Gil's "Mathematical Methods for Engineers" and "Wavelets and Filter Banks" in the third and fourth slot.

In 1977, Gil received the MAA's Chauvenet Prize for an article that appeared in the *Bulletin of the American Mathematical Society*. In 2006, he was the recipient of the MAA Northeastern Section Teaching Award. In addition, Gil is a prolific researcher and has supervised 20 PhD dissertations and five master's students.

Gil has a deep love of mathematics and a profound understanding of how mathematics is used in the sciences and engineering. He has applied these qualities to reshape the way we teach mathematics. For all he has done, we are pleased to award him the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Gilbert Strang was an undergraduate at MIT and a Rhodes Scholar at Balliol College, Oxford. Since receiving his doctorate from the University of California, Los Angeles, he has taught at MIT. He was chosen for the von Neumann Medal of the U.S. Association for Computational Mechanics and the first Su Buchin Prize from the International Congress of Industrial and Applied Mathematics. He is a Fellow of the American Academy of Arts and Sciences and an Honorary Fellow of Balliol College.

After writing a monograph with George Fix on the finite element method, he has published six textbooks: *Introduction to Linear Algebra; Linear Algebra and Its Applications; Introduction to Applied Mathematics; Calculus; Wavelets and Filter Banks* with Truong Nguyen; and *Linear Algebra, Geodesy, and GPS* with Kai Borre.

Gilbert Strang served as president of SIAM during 1999 and 2000. He was chair of the U.S. National Committee on Mathematics for 2003–2004. His homepage is math.mit.edu/~gs, and his courses are on ocw.mit.edu.

Response from Gilbert Strang

We are so lucky to share the responsibility of teaching mathematics. Our society is a group of friends, helping each other and helping our students. We see new ways to teach, in class and even on the Internet. In my case the subject has been linear algebra—I felt we could do more. We can show the importance of mathematics as well as its beauty, and for linear algebra that importance just keeps growing. I thank teachers everywhere, in all grades and all subjects, for encouraging students to think and to grow.

Euler Book Prize

The Euler Book Prize shall be given to the author or authors of an outstanding book about mathematics. Mathematical monographs at the undergraduate level, histories, biographies, works of mathematical fiction, and anthologies shall be among those types of books eligible for the prize. They shall be 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. A textbook, though not normally eligible for this award, could be recognized if the Committee on the Euler Book Prize is convinced that it is innovative, distinctive, well written, and very likely to have a long-standing impact on mathematics.

The prize was established in 2005 and will be 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

John Derbyshire

Prime Obsession: Bernhard Riemann and the Greatest Unsolved Problem in Mathematics, Joseph Henry Press (National Academies Press), 2003.

Mathematical sagas don't get much better than this, the story of the Riemann Hypothesis, close to 150 years old and referred to by the author of this book as "the great white whale of mathematical research." And the cast is stellar: Euler, Gauss, Dirichlet, Chebyshev, Riemann, and, more recently, Hilbert, Hadamard, Landau, Hardy, Littlewood, Pólya, Siegel, Selberg, Dyson, Deligne, Montgomery, Connes, and Odlyzko, among others. It's a century and a half of stories, all about a problem—the distribution of the primes—that is fiendishly difficult and a conjecture that, if proved, would have profound consequences.

Many great and famous unsolved problems that took decades or centuries to solve (Fermat's Last Theorem, the four color problem, for example) or that remain to be solved (Goldbach's conjecture, the twin prime conjecture) are easy to explain to the lay public. The Riemann Hypothesis is definitely not one of these and writing about it is a special challenge, a task that John Derbyshire accomplishes most successfully in recounting the story of the pursuit of this most elusive mathematical beast. The chapters for the most part alternate between historical or biographical essays and explanations of the mathematics, all done in an appealing conversational style. Thus, the book covers the rich history of the problem and conveys to the non-specialist reader the reasons the problem is interesting and important, not only in mathematics but possibly in physics. It is the eighth of Hilbert's 23 problems from 1900, providing an agenda for mathematicians in the 20th century. It now becomes the fourth of the Clay Institute's Millennium Problems that give us an agenda for the 21st century. The saga goes on.

Biographical Note

John Derbyshire was born June 3, 1945, in Northampton, England. He received a bachelor's degree in mathematics at the University College, London, where he studied under C. A. Rogers, Klaus Roth, and Theodor Estermann. Until the late 1990s Derbyshire was a developer of mainframe computer systems for large corporations in Britain, the USA, and the Far East. In 1996 he began to supplement his career with writing, and since 2001 writing has become his full-time occupation. Derbyshire writes books (two novels, two pop-math books), commentaries, book reviews, and the like for magazines, both print and online. He is a naturalized U.S. citizen, is married with two children, and lives in Long Island, New York.

Response from John Derbyshire

Since *Prime Obsession* came out, I have received a steady trickle of mail from strangers offering 20-page proofs of the truth or falsehood of the Riemann Hypothesis. I explain patiently, and truthfully, to these people that I am not a mathematician, only a freelance writer with a degree in mathematics. As such, to find myself elevated, if only briefly, into the company of real mathematicians—men and women whose work I admire from afar—is an honor I did not expect and for which I hardly know how to express my gratitude. I shall treasure this prize. I thank the MAA Board of Governors with all my heart for selecting my book. It is, for me, a wonderful bonus that the prize is named after Leonhard Euler, a great favorite of mine among past mathematicians, as the affectionate portrait of him in *Prime Obsession* shows. Thank you.

Chauvenet Prize

The Chauvenet Prize is awarded at the Annual Meeting of the Association to the author of an outstanding expository article on a mathematical topic by a member of the Association. 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

Andrew J. Simoson

"The Gravity of Hades," *Mathematics Magazine*, Vol. 75, No. 5, December 2002, pp. 335–350.

The central question of this paper, "Is the acceleration due to gravity stronger or weaker as we descend into the Earth?," relates to celestial mechanics. The author answers this question for several models of the Earth's structure that have been proposed over the centuries. The article is accessible to undergraduates who have had multivariable calculus and who are familiar with Newton's law of gravitational force, even for students who are not yet in tune with abstract mathematics.

The paper is both amusing (how often does a paper in mathematics touch on Hades?) and learned. It is beautifully written and expertly illustrated with passages from Ovid, Dante, and Milton. The whole story started in the classroom when the author was discussing how gravity changes as one rises above the Earth's surface and wondered aloud about the reciprocal question. After a few minutes listening to his braver students reasoning aloud, he says that he realized that he himself did not know how gravity changes with depth.

The paper concludes with an analysis of a body falling through a classically envisioned hole through the Earth. This is all well and good, under reasonable assumptions such as "no resistance." But doesn't the rotation of the Earth have an impact? Yes, and because of it, a free-falling object would keep bumping into the wall of the hole. The author addresses this problem in a subsequent article, "Falling down a Hole through the Earth," also published in *Mathematics Magazine*, Vol. 77, No. 3, June 2004, 171–189. Here he determines how the classical hole should be redesigned to take the Earth's rotation into account. Assuming a linear gravitational field within the Earth, he finds that the pebble would follow a path that would miss the center by over 300 kilometers! As in the first article, different models give different answers.

The MAA is happy to direct this delightful paper to the attention of the mathematical community, including students who have just finished the calculus sequence, and we are happy to recognize Professor Simoson with the 2007 Chauvenet Prize.

Biographical Note

Andrew J. Simoson received a PhD in mathematics in 1979 under Dr. Leonard Asimow at the University of Wyoming, where he worked on extensions of separation theorems in infinite-dimensional spaces. Since then he has been chairman of the mathematics department at King College in Bristol, Tennessee, except for two Fulbright sabbatical years at the University of Botswana and the University of Dar es Salaam. He has the good fortune to have an MAA book just off the presses, *Hesiod's Anvil: Falling and Spinning through Heaven and Earth,* the thirtieth volume in the Dolciani series. Its second chapter is a version of "The Gravity of Hades."

Response from Andrew J. Simoson

By way of responding to the honor of this award, let me thank some people. Thanks to students for thinking aloud in brainstorming sessions. Thanks to editors for considering unsolicited manuscripts. In submitting mine, I was afraid that upon scanning "The Gravity of Hades" title, the editor would dismiss it as crank material. Thanks to referees for giving of their time and expertise. For example, in evaluating a sequel submission, one referee kindly pointed out to me that the first few pages of the *Principia* contain the same conclusions as mine. I was only 320 years behind Newton. Finally, thanks to the readers for deeming this article as having significant merit.

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 recognizes and encourages outstanding mathematical research by undergraduate students. It was endowed by Mrs. Frank Morgan of Allentown, Pennsylvania.

Citation

Daniel Kane

Daniel Kane is majoring in both mathematics and physics at the Massachusetts Institute of Technology (MIT) and expects to receive his bachelor's degree in June 2007. At this early stage of his mathematical career, Daniel has already established a research record that would be the envy of many professional mathematicians. Indeed, he has authored or co-authored ten articles that have appeared or will soon appear (have been accepted) in research journals including the *Proceedings of the American Mathematical Society*, *The Ramanujan Journal*, the *Journal of Number Theory*, *Foundations of Computer Science*, and *Integers: The Electronic Journal of Combinatorial Number Theory*. In addition, he has six other research papers that have been submitted or are in preparation for a total of sixteen research papers! The specifics of his research are too long to detail, but we mention that it has been in fields as diverse as number theory, computer science, ergodic theory, combinatorics, computational geometry and game theory.

Mr. Kane's mathematical talent is captured well in some of the comments/summaries contained in the letters supporting his nomination for the prize:

- "Daniel's first paper improves on a famous *Annals of Mathematics* paper by Paul Erdös."
- "He proved an open conjecture stated by a well-known number theorist several years before. It [Kane's paper] was written while Daniel was in 12th grade."
- "He is by far the sharpest and most productive math undergraduate I have come in contact with in my five years [at MIT]."

In addition to all of his mathematical research, Daniel is also a three-time Putnam Fellow and two-time International Mathematical Olympiad (IMO) Gold Medalist.

Biographical Note

Daniel Kane was born in Madison, Wisconsin, to professors of mathematics and of biochemistry. His schooling began at Wingra, a private school unusual in its noncompetitive policies and open classrooms. When it became clear (about third grade) that he was ready for high school math, Daniel was allowed to do more advanced math assigned by his parents. Due to this head start, he was ready to begin taking university classes at the beginning of high school. After graduating, Daniel went to MIT to study mathematics and physics.

Daniel first learned about mathematical problem solving through the University of Wisconsin's Van Vleck Talent Search. This training helped immensely when he took the USAMO in seventh grade, qualifying for the MOP, which he continued to attend for the duration of high school, earning two IMO gold medals.

Daniel became interested in research near the end of high school, when he did work on modular forms under the supervision of Ken Ono. In college his opportunities for research expanded greatly, including the summer programs at Williams College and University of Minnesota-Duluth, class projects, and competitions.

Response from Daniel Kane

In receiving this award I would like to extend my thanks to all of those who helped make it possible. Most importantly, I would like to thank my parents for giving me such a good environment to grow up in and in particular my dad for teaching me and helping me to develop my love of mathematics. Thanks are also due to those who helped me get started learning mathematical problem-solving skills, such as Marty Isaacs, who ran the Van Vleck Talent Search, and Titu Andreescu and the other MOP instructors. I would like to thank those that helped supervise parts of my research, namely, Ken Ono, Joe Gallian, Cesar Silva, and Erik Demaine. Lastly, I would like to thank my many teachers over the years who have provided me with the knowledge base to be able to conduct interesting research in so many areas.

Levi L. Conant Prize

This prize was established in 2000 in honor of Levi L. Conant and recognizes the best expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years.

Citation

Jeffrey Weeks

The Conant Prize in 2007 is awarded to Jeffrey Weeks for his article "The Poincaré Dodecahedral Space and the Mystery of the Missing Fluctuations". In this article, together with an earlier one "Measuring the Space of the Universe" co-authored with Neil Cornish, Weeks explains how extremely sensitive measurements of microwave radiation across the sky provide information about the origins and shape of the universe.

After giving some physical background, Weeks summarizes the evidence for and against a universe that locally looks like a spherical, Euclidean or hyperbolic 3-manifold. He then considers spherical universes in more detail, emphasizing the role of symmetry groups and making a case for a model based on the Poincaré dodecahedral space. Throughout the paper, he makes this material accessible by using analogies with more familiar structures in one and two dimensions. He gives a particularly elegant exposition of the free symmetry groups of the 3-sphere via an extension of rotation groups of the 2-sphere.

Most accounts of the development of physical theories are presented after the dust has settled and the experimental evidence has convinced most scientists. Weeks has explained the mathematics behind models whose validity cosmologists debate while waiting for more experimental evidence. Whether or not the dodecahedral model turns out to be consistent with future observations remains to be seen. In either case, Weeks has given a rare glimpse into the role of mathematics in the development and testing of physical theories.

Biographical Note

Jeff Weeks fell in love with geometry in twelfth grade when he read *Flatland*. While an undergraduate at Dartmouth College, he bounced back and forth between math and physics, eventually settling on math. He went on to study 3-manifolds under Bill Thurston at Princeton, but maintained his interest in physics on the sly. After a few years teaching at Stockton State College and Ithaca College, Jeff resigned to be a full-time dad for a few years. From there he fell into the life of a freelance mathematician, at first part-time, then full-time. He has enjoyed extensive work with the Geometry Center and the NSF, as well as smaller gigs for science museums and teaching at Middlebury College. In 1999 a telephone call from the MacArthur Foundation brought five years of work with zero administrative overhead. The timing couldn't have been better: 1999–2004 was an intense period for cosmic topology, as well as the time to finish the unit Exploring the Shape of Space for middle schools and high schools. Jeff currently splits his time between puzzling over the microwave background and writing Macintosh versions of his geometry and topology software. Always working out of a home office, this year "home" is in Genoa, Italy, where his wife is doing sabbatical research. He regrets that, because of the great distance, he cannot attend the Joint Meetings in person.

Response from Jeffrey Weeks

Mathematics, physics, and astronomy share a deep common history. It's been a pleasure working in this tradition, and I'm particularly pleased that *Notices* readers enjoyed hearing one small piece of the ongoing story. As for the cosmic microwave background, new satellite data (WMAP 2006) and more detailed analysis (carefully excluding a neighborhood of the galactic plane) find the large-scale fluctuations to be even weaker than previously thought, implying that we're seeing something real and not just a statistical fluke. Nontrivial cosmic topology could account for the weakness, but so far no rigorous evidence exists for this or any other explanation. Mother Nature is keeping us guessing.

E. H. Moore Research Article Prize

This prize was established in 2002 in honor of E. H. Moore. Among other activities, Moore founded the Chicago branch of the American Mathematical Society, served as the Society's sixth president (1901–1902), delivered the Colloquium Lectures in 1906, and founded and nurtured the *Transactions of the AMS*. The prize will be awarded every three years beginning in 2004 for an outstanding research article to have appeared in one of the AMS primary research journals (namely, *Journal of the AMS, Proceedings of the AMS*, *Transactions of the AMS*, *Memoirs of the AMS, Mathematics of Computation*, *Electronic Journal of Conformal Geometry and Dynamics*, and *Electronic Journal of Representation Theory*) during the six calendar years ending a full year before the meeting at which the prize is awarded.

Citation

Ivan Shestakov and Ualbai Umirbaev

In two groundbreaking papers published in the *Journal of the American Mathematical Society* ("Poisson brackets and two-generated subalgebras of rings of polynomials," *J. Amer. Math. Soc.* 17 (2004), no. 1, 181–196; and "The tame and the wild automorphisms of polynomial rings in three variables," *J. Amer. Math. Soc.* 17 (2004), no. 1, 197–227), Ivan Shestakov and Ualbai Umirbaev develop powerful new techniques to address the structure of automorphism groups of polynomial algebras. Their dramatic results include a proof of the longstanding Nagata Conjecture, establishing the existence of a wild automorphism of a polynomial algebra in three variables.

Of particular importance is their novel use of Poisson structures and their universal quantizations to obtain a criterion of tameness. This innovation is already resulting in further major applications.

Biographical Note

Ivan Shestakov

Ivan Shestakov was born on August 13, 1947, in the Irkutsk region, Russia. After graduating from the Physical-Mathematical School in Novosibirsk, he entered Novosibirsk University in 1965. There he obtained his first results in algebra under the guidance of Professors K. Zhevlakov and A. Shirshov. His master's thesis, "On a Class of Non-commutative Jordan Rings", was awarded the Medal of the Academy of Sciences of USSR for students.

In 1970 Shestakov graduated from Novosibirsk University and entered the Sobolev Institute of Mathematics as a researcher. In 1973 he received his PhD from Novosibirsk University, and in 1978 he earned the Doctor of Sciences from Sobolev

Institute of Mathematics for the work "Free Alternative Algebras". In 1978 the book *Rings That Are Nearly Associative*, written by Shestakov jointly with K. Zhevlakov, A. Slinko, and A. Shirshov, was published. In 1974 Shestakov became a professor at Novosibirk State University. Since 1999 he has held the position of full professor at the University of Sao Paulo.

Shestakov's interests lie in ring theory and combinatorial algebra. He has focused on the structure and representations of nonassociative algebras and superalgebras, PI-algebras, free algebras and their automorphisms.

Response from Ivan Shestakov

It is a great honor for me to receive the E. H. Moore Research Article Prize, and I would like to thank the AMS and the selection committee for awarding me this prize. I am especially happy to share it with my former student Ualbai Umirbaev. During my mathematical career, I experienced help and support from my friends and colleagues in different countries. I would also like to use this opportunity to thank all of them, especially my colleagues from the Sobolev Institute of Mathematics, where I grew up as a mathematician, and from the University of Sao Paulo, where I have been working during the last years.

Biographical Note

Ualbai Umirbaev

Ualbai Umirbaev was born in Turtkul, Shymkent region, Kazakhstan, in 1960. He studied mathematics at Novosibirsk State University. He got his PhD in mathematics from Sobolev Institute of Mathematics of the Siberian branch of the Soviet Academy of Sciences with Ivan Shestakov in 1986, and from the same institute got his Doctor of Science degree in 1995.

In 1986–1995 Umirbaev taught at Kazakh State University, Almaty, first as an assistant professor, then as a senior lecturer, and then as an associate professor. In 1995 he moved to the South-Kazakhstan State University in Shymkent as a full professor and chair of informatics. In 2001 Umirbaev moved to the Eurasian National University in the new capital, Astana, where he became a professor and chair of algebra and geometry. His main research interests are in the areas of combinatorial algebra, subalgebras and automorphisms of free algebras, and affine algebraic geometry.

Response from Ualbai Umirbaev

I am deeply honored to have been chosen to receive the 2007 E. H. Moore Research Article Prize together with Ivan Shestakov. It is very interesting to recall that I met the Nagata automorphism for the first time in a survey by Vladimir Popov in 1989. It was really an amazing and concrete problem! Later I studied two very interesting papers related to the Nagata automorphism: by Hyman Bass in 1984 on nontriangular actions and by Martha Smith in 1989 on stably tame automorphisms. I was studying subalgebras of free algebras with a view towards algorithmic problems. Since then I have related these investigations with the study of automorphisms of free algebras. I am very glad that the two cited papers were published in the *Journal of the American Mathematical Society*.

I am very glad that the committee recognized the significance of these results. Many challenging problems of affine algebraic geometry and combinatorial algebra are still open. I hope that the recognition by the Moore Prize will spur further activity in this area.

I would like to thank my friends, colleagues, and collaboraters with whom discussions of mathematics were very important and useful. Also I would like to thank my father, Utmakhanbet Umirbaev (1922–2001), who was a teacher of mathematics, thanks to whom I started to study math.

David P. Robbins Prize

This prize was established in 2005 in memory of David P. Robbins by members of his family. Robbins, who died in 2003, received his PhD in 1970 from MIT. He was a long-time member of the Institute for Defense Analysis Center for Communications Research and a prolific mathematician whose work (much of it classified) was in discrete mathematics. The prize is for a paper with the following characteristics: it shall report on novel research in algebra, combinatorics, or discrete mathematics and shall have a significant experimental component; and it shall be on a topic which is broadly accessible and shall provide a simple statement of the problem and clear exposition of the work. This prize was first awarded in 2007.

Citation

Thomas C. Hales and Samuel P. Ferguson

This Robbins Prize is presented to Thomas C. Hales and Samuel P. Ferguson for the paper: Thomas C. Hales, "A proof of the Kepler conjecture," *Ann. Math.* 162 (2005), 1065–1185. Section 5 of this paper is jointly authored with Samuel P. Ferguson.

The Kepler conjecture asserts that the densest three dimensional sphere packing is attained by the cannonball packing. This 400-year-old problem, going back to Kepler in 1611, was mentioned as part of Hilbert's 18th problem. The proof of this result is a landmark achievement.

These two authors used experimental methods to formulate a local density inequality that would both establish the result and be provable by a computation of feasible length. Laszlo Fejes Tóth suggested in the 1950's that it might be possible to prove Kepler's conjecture by establishing a local inequality that would simultaneously be maximized at every sphere center in the cannonball packing. Local inequalities at a single sphere center can in principle be proved by maximizing a nonlinear function over a compact set, but in practice the resulting problems are too large to be computationally feasible. One of the contributions of this work was to find a way to obtain a computationally feasible problem. In the early 1990's Hales began an approach to formulating suitable local density inequalities that combined information from both the Voronoi and Delaunay triangulations associated to the sphere centers. A very delicate balance is needed between their contributions to obtain a suitable inequality, which was arrived at by computer experiments. Although Samuel Ferguson is credited only with one section of the cited paper, he made essential contributions on the theoretical and experimental side, in formulating the local density inequality used and in proving the most difficult special case of it.

The cited paper elegantly describes the main theoretical structure of the proof. It formulates a novel and complicated local density inequality and shows that its proof would establish Kepler's conjecture. The proof of the local inequality reduces to a very large nonlinear optimization problem of minimizing a function over a compact region consisting of many connected components of high dimension. The authors introduce decomposition methods that simplify the optimization. The optimization is checked analytically in neighborhoods of the two global minima, and after many reductions the remainder is checked by computer; there are thousands of cases. The cited paper presents an extensive road map of this proof and includes motivation for the truth of the given local inequality. A more detailed version appears in six papers published in *Discrete and Computational Geometry* 36 (2006), 5–265, four authored by T. C. Hales, one by S. P. Ferguson alone, and one joint paper which formulates the precise local inequality.

Some controversy has surrounded this proof, with its large computer component, concerning its reliable checkability by humans. Addressing this issue, Hales has an ongoing project, called the "Flyspeck" project, whose object is to construct a "second-generation" proof which is entirely checkable by computer in a formal logic system.

Biographical Note

Thomas C. Hales

Thomas C. Hales received his master's degree from Stanford in the School of Engineering and his PhD from Princeton in mathematics in 1986 under Robert Langlands. He has held positions at Harvard, the University of Chicago, and the University of Michigan. He is currently the Andrew Mellon Professor of Mathematics at the University of Pittsburgh.

His honors include the Chauvenet Prize (2003) of the MAA and the Moore Prize (2004) for applications of interval analysis. His research interests include representation theory, motivic integration, discrete geometry, and formal proof theory.

Response from Thomas C. Hales

It is an honor to be a recipient of the David P. Robbins Prize. Without the fundamental contributions of my collaborator, Samuel P. Ferguson, the Kepler conjecture would still be unsolved. He made essential contributions to the formulation of the local density inequality and to the computer algorithms that were used. He solved the most difficult case that arises in the proof. I am proud to share the prize with him.

The solution to the Kepler conjecture relies on fundamental advances by many researchers in several domains. It is a pleasure to acknowledge the many researchers who developed algorithms that permit the rapid solution of large-scale linear programs, those who developed the tools of interval computations, and L. Fejes Tóth, who had the original vision about how the Kepler conjecture might be solved by computer. Finally, I wish to thank my colleagues in the formal theorem-proving community for elevating computer proofs to unprecedented levels of mathematical rigor.

Biographical Note

Samuel P. Ferguson

Samuel Ferguson earned a BS in mathematics at Brigham Young University in 1991. A Research Experience for Undergraduates (REU) program at the College of William and Mary provided support for his interest in pursuing graduate studies in mathematics. He earned his PhD in 1997 at the University of Michigan, working with Tom Hales, and is currently employed by the National Security Agency.

Response from Samuel P. Ferguson

I am honored to have been selected for this award. Having met David Robbins and being familiar with some of his remarkable work make this award all the more meaningful. I wish to express my gratitude to everyone who has helped me along the way, from my parents and siblings to teachers, mentors, and friends. Thank you.

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 five years.

Citation

Claire Voisin

The Ruth Lyttle Satter Prize is awarded to Claire Voisin of the Institut de Mathématiques de Jussieu for her deep contributions to algebraic geometry, and in particular for her recent solutions to two long-standing open problems. Voisin solved the Kodaira problem in her paper "On the homotopy types of compact Kähler and complex projective manifolds," *Invent. Math.* 157 (2004), no. 2, 329–343. There she shows that in every dimension greater than three, there exist compact Kähler manifolds not homotopy equivalent to any smooth projective variety. This problem has been open since the 1950's when Kodaira proved that every compact Kähler surface is diffeomorphic to (and hence homotopy equivalent to) some projective algebraic variety. Her idea is to start with the fact that certain endomorphisms can prevent a complex torus from being realized as a projective variety, and then to construct Kähler manifolds whose Albanese tori must carry such endomorphisms for homological reasons. In a completely different direction, Voisin also solves Green's Conjecture in her papers "Green's canonical syzygy conjecture for generic curves of odd genus," *Compos. Math.* 141 (2005), no. 5, 1163–1190, and "Green's generic syzygy conjecture for curves of even genus lying on a *K3* surface," *J. Eur. Math. Soc.* 4 (2002), no. 4, 363–404.

A century ago, Hilbert saw that syzygies (relations among relations) were important invariants of varieties in projective space, and in the early 1980's, Mark Green conjectured that the syzygies of a general curve canonically embedded in projective space should be as simple as possible. This conjecture attracted a huge amount of effort by algebraic geometers over twenty years before finally being settled by Voisin. Her idea is to work with curves on a suitable *K3* surface, where she executes deep calculations with vector bundles (at least in even genus) that lead to the required vanishing theorems.

Biographical Note

Claire Voisin defended her thesis in 1986 under the supervision of Arnaud Beauville, then entered the CNRS as chargée de recherche in 1986. She has since pursued her career in this institution, occasionally teaching graduate courses, but mainly doing research and advising students. Voisin has been awarded a few prizes, including the EMS Prize in 1992, the Servant Prize (1996) and the Sophie Germain Prize (2003) of the French Academy of Sciences, and the silver medal of the CNRS in 2006. She was invited to the Zurich ICM in 1994.

Response from Claire Voisin

I am deeply honored to have been chosen to receive the 2007 Ruth Lyttle Satter Prize. I feel of course very encouraged by this recognition of my work. I would like to thank the members of the prize committee for selecting me. I am also very grateful to my institution, the CNRS, which made it possible for me to do research in the best conditions.

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

In 1990, the Executive Committee of the Association for Women in Mathematics (AWM) established the Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman. The prize is named for former AWM president and one of its founding members, Alice T. Schafer (professor emeritus from Wellesley College), who has contributed a great deal to women in mathematics throughout her career. The criteria for selection include, but are not limited to, the quality of the nominees' performance in mathematics courses and special programs, an exhibition of real interest in mathematics, the ability to do independent work, and, if applicable, performance in mathematical competitions.

AWM is pleased to present the seventeenth annual Alice T. Schafer Prize to **Ana Caraiani**, Princeton University.

Additionally, the accomplishments of three outstanding young women, all senior mathematics majors, were recognized on Friday, January 5, 2007. AWM was pleased to honor **Tamara Broderick**, Princeton University, and **Yaim Cooper,** Massachusetts Institute of Technology, as the **runners-up** and **Alyson Deines**, Kansas State University, as the **honorable mention** recipient in the Schafer Prize competition. Their citations are available from the AWM.

Citation

Ana Caraiani

Ana Caraiani is a senior at Princeton University, and she is already conducting professional-level mathematical research. In the summers of 2005 and 2006, Caraiani participated in the REU program at the University of Minnesota at Duluth. She worked independently on a project on semigroups of rational numbers related to the 3x + 1 problem. Her work on this problem is highly praised. The resulting paper, "On wild semigroups," introduces new ideas that exhibit significant ingenuity.

Caraiani's coursework at Princeton has been remarkable. She has done very well in extremely difficult classes and is noted for her independence and mathematical sophistication. One professor has said that her work "made you think that it was a professional mathematician who was answering the problems." Another professor rates her among the top undergraduate mathematics majors in fifty years at Princeton.

Caraiani has won the William Lowell Putnam competition twice, scoring among the top five competitors in both her freshman and sophomore years, and is the only woman ever to have done so. The Princeton math department awarded her the Class of 1861 Prize her sophomore year and the Andrew H. Brown prize for outstanding juniors. She is expected to become a major mathematical figure and a world class research mathematician.

Response from Ana Caraiani

I am extremely honored to receive the Alice T. Schafer Prize and to be recognized along with so many distinguished women in mathematics. I would like to thank the Association for Women in Mathematics for inspiring women to excel in math. This award has certainly encouraged me to aim higher and to set new standards for my work in the hope that I would live up to the expectations associated with such an honor.

I would not have made it this far without the support of many people over the last several years. I would first like to thank my math teacher, Liana Manu, for nurturing my interest in math before and throughout high school. I am also very grateful to Joe Gallian for inviting me to his REU in Duluth, finding the best-suited problem for me, and believing in my abilities even more than I did. The Princeton math department has provided the best environment I could have asked for in which to learn math. I am especially grateful to Robert Gunning for introducing me to an amazing new field and letting me share in his enthusiasm for its elegance. I would like to extend my deepest thanks to Andrew Wiles for entrusting me with a senior thesis problem and for all of his support and guidance in approaching it. I am also indebted to John Conway for suggesting an exciting problem for my junior paper and to William Browder for a challenging yet rewarding reading course. There are many other professors at Princeton whose excellent teaching and encouragement have been indispensable, and I thank them all.

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

Virginia McShane Warfield

In recognition of her wide range of contributions to mathematics education at all levels, the Association for Women in Mathematics (AWM) presents the Louise Hay Award to Virginia McShane Warfield of the Department of Mathematics at the University of Washington.

Virginia Warfield received her doctorate from Brown University in 1971 under the direction of Wendell Fleming and continued to contribute to the field of stochastic analysis for several years. At the same time she became increasingly absorbed by problems of mathematics education through her work with Project SEED, a highly regarded mathematics program whose goal was to promote sense-making mathematical activities for fourth- through sixth-grade students.

Her work with Project SEED led to her becoming the leader of the University of Washington mathematics department's entry-level mathematics courses, which she restructured in ways that have stood the test of time and which she continues to oversee. Eventually, teacher preparation and enhancement, both of K–12 teachers and mathematics graduate students, became a major focus of her activity. She significantly revised the courses for future elementary teachers and has served as a mentor for graduate students throughout her years at the university.

From 1994 to 2001, she was project director for "Preparing Future Faculty" in which, among other things, she arranged for graduate students to spend time at local community or four-year colleges, took them to conferences on educational issues, and arranged conferences with guest speakers. She also began a series of "brown bag lunches" for faculty and graduate students to talk over issues related to their teaching, and since 1994 she has posted electronic newsletters based on those discussions. A letter written jointly by eight recent students states: "Her vision of education and her sense of optimistic possibility have encouraged us to reflect upon our development as teachers of mathematics and to seek ways in which we might contribute to a stronger, more effective mathematics education. Most important, though, is our recognition that Ginger has been instrumental in fostering a supportive and exciting environment in which to investigate and explore the many dimensions of mathematics education."

In the broader community she was instrumental in creating Washington Teachers of Teachers of Mathematics (WAToToM), at which members of departments of mathematics and mathematics education from around the state get together for a weekend of conversation and idea-sharing. Vaughn Foster-Grahler of Evergreen State College wrote that "it has been her leadership that has kept [WAToToM] a vibrant and integral component of math education in Washington State. . . Ginger is a tireless advocate for strengthening the level of preparation of K–12 math teachers and supporting the types of pedagogies that lead to success for all students."

During the past ten years she has played a leading role in three major NSF-funded teacher enhancement projects: Creating a Community of Mathematics Learners, Extending the Community of Mathematics Learners, and Graduate Teaching Fellows in K–12 Education (GK–12), all of which partner University of Washington faculty and graduate students with in-service teachers of mathematics. Warfield is described as a master in integrating various levels of math learners—creating relationships between grade school teachers and mathematicians—and as having special concern for students from economically disadvantaged backgrounds and underrepresented groups. At one GK–12 elementary school the percentage of students who passed the state mathematics standard rose in two years from under 10% to about 55%, which is above the state average. Currently, she is Co-PI of a new project, Teaching for the Environment: Active Mathematics on the Olympic Peninsula. In discussing the impact of her work, Selim Tuncel, chair of the University of Washington mathematics department, praised "her commitment to improving mathematics education at all educational levels, her clear vision of the key elements for achieving this goal, her gentle persistence, and her ability to work effectively within a research department as well as in collaboration with the K–16 education communities."

Warfield has also made significant contributions to mathematics education research through her collaboration with the French mathematician Guy Brousseau, a pioneer in the "didactics of mathematics," the scientific study of issues in mathematics teaching and learning. This collaboration has led to publication of several articles, translation and co-editorship of a book, and, most recently, a monograph about Brousseau's work and the nature of didactics.

Among her many professional activities, Warfield has been a member of the National Faculty (by election), of Sigma Xi, of the Association pour Recherche en Didactiques des Mathématiques, and of the Mathematical Association of America's committees on Professional Development and Mathematical Education of Teachers. For the Association for Women in Mathematics she has served in several capacities: Chair of the Education Committee, Member of the Association Review Group for the revision of the NCTM Standards, Member-at-large of the Executive Committee, and Education Column Editor for the AWM Newsletter.

To describe her work, Janet P. Ray, professor emeritus from the Seattle Central Community College, wrote: "It would be difficult to overstate the contributions Ginger has made to mathematics education. Whether through the organizations she has founded, the events she's sponsored, or the connections she's forged, Ginger's work has had a huge impact. She has also made a difference in more subtle, though no less profound, ways—through example and through innumerable small acts of kindness."

AWM is proud to honor Virginia M. Warfield for her contributions to education through her teaching, graduate student training and mentoring, work on the didactics of mathematics, and outreach and collaborations with K–16 communities.

Response from Virginia McShane Warfield

I am deeply honored and very much moved by this award. With it, the AWM has spoken very directly to the concerns and issues that have been most basic in my mathematical life and has told me that some, at least, of my decisions have had the impact I hoped for.

My first efforts to articulate my gratitude left me somewhat overwhelmed. It started with my parents and siblings, whose lives and conversations made it clear that the only reasonable thing for an adult to be was a mathematician and that of course I could be one. Less explicit was the message that the only reasonable person to marry was a mathematician, but I picked it up anyway and did that. His enduring support both of my mathematics and of my growing interest in issues of education set me firmly on the route I wound up traveling. After his death, the confidence and trust of our three children not only kept me from falling apart but also made it possible for me to gain momentum in the direction we had set for me and sustain it through many solo years. And in the past few years, my new husband has given me a new kind of support by providing the perspective of a pediatrician and the interest of a lifelong learner.

That didn't extend far enough, though, because an essential ingredient has been the support I have had from my department: a succession of chairs who were sometimes nonplussed by my suggestions but never nonsupportive, and a collection of colleagues whose help ranged from cheering on the sidelines to being right there in the midst of projects. I valued every one of those forms of help.

And that still wasn't far enough, because my interests have led me off campus and out of Seattle and out of the U.S., and everywhere I have found helpful and wonderful people.

As I said, that line of thinking became overwhelming, so I decided to be a little more focused. What one person or set of people made me veer away from the image I had grown up with of sitting around proving theorems and giving erudite lectures? The answer was clear: Bill Johntz and the 1971–72 fourth grade at Colman Elementary School. Project SEED was Bill's brainchild, and it is what took a whole bunch of university mathematicians into inner-city elementary schools to teach algebra by group discovery. I got to visit all the Seattle classes, and I also got to choose which one I taught. Never one for halfway measures, I chose the class with the lowest scores in the city on standardized tests and watched them soak up exponents and variables and linear equations. There's no way after that year that anyone could tell me that low-scoring children lacked intellectual capacity. Nor could I be told that elementary school teachers have an easy job. And never since that time has there been any doubt in my mind that the people who have the most influence on the future of mathematics are the elementary school teachers—a career-shaping conviction indeed!

So I thank that whole cloud of people, and I thank the AWM. I promise that this award and what I have learned about Louise Hay herself will inspire me to keep going in as many of the directions you cited as I possibly can!

Norbert Wiener Prize in Applied Mathematics

This prize was established in 1967 in honor of Professor Norbert Wiener and was endowed by a fund from the Department of Mathematics of the Massachusetts Institute of Technology. The prize is awarded for an outstanding contribution to "applied mathematics in the highest and broadest sense." The award is made jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics. The recipient must be a member of one of these societies and a resident of the United States, Canada, or Mexico.

Citation

Craig Tracy and Harold Widom

Craig Tracy and Harold Widom have done deep and original work on Random Matrix Theory, a subject which has remarkable applications across the scientific spectrum from the scattering of neutrons off large nuclei to the behavior of the zeros of the Riemann Zeta-function.

The contributions of Tracy and Widom center around a connection between a class of Fredholm determinants associated with random matrix ensembles on the one hand, and Painlevé functions on the other. Most notably, they have introduced a new class of distributions, the so-called Tracy-Widom distributions, which have a universal character, and which have applications, in particular, to Ulam's longest increasing subsequence problem in combinatorics, tiling problems, the airline boarding problem of Bachmat et al., various random walker and statistical mechanical growth models in the KPZ class, and principal component analysis in statistics when the number of variables is comparable to the sample size.

The Committee also recognizes the earlier work of Craig Tracy with Wu, McCoy and Barouch, in which Painlevé functions appeared for the first time in exactly solvable statistical mechanical models. In addition, the Committee recognizes the seminal contributions of Harold Widom to the asymptotic analysis of Toeplitz determinants and their various operator theoretic generalizations.

Biographical Note

Craig Tracy

Craig Arnold Tracy was born in England on September 9, 1945, the son of Eileen Arnold, a British subject, and Robert C. Tracy, an American serving in the U.S. Army. After immigrating to the United States as an infant, Tracy grew up in Missouri, where he attended the University of Missouri at Columbia, graduating in 1967 as an O. M. Stewart Fellow with a BS in physics. He began his graduate studies as a Woodrow Wilson Fellow at SUNY at Stony Brook, where he wrote his doctoral dissertation under the supervision of Barry M. McCoy. After postdoctoral positions at the University of Rochester (1973–75) and the C. N. Yang Institute for Theoretical Physics (1975–78), Tracy was at Dartmouth College for six years before joining UC Davis in 1984. He is currently Distinguished Professor of Mathematics at UC Davis. In 2002 Tracy was awarded, jointly with Harold Widom, SIAM's George Pólya Prize. He is a member of the American Academy of Arts and Sciences. Tracy has two daughters and three grandchildren. He is married to Barbara Nelson, and they reside in Sonoma, California.

Biographical Note
Harold Widom

Harold Widom is professor emeritus at the University of California, Santa Cruz. He grew up in New York City, where he attended Stuyvesant High School and the City College of New York. He did his graduate work at the University of Chicago, receiving his PhD under the supervision of Irving Kaplansky. His first academic position was at Cornell University, where, inspired by Mark Kac, he turned his attention to the study of Toeplitz and Wiener-Hopf operators. This influenced much of his subsequent research and led ultimately to his work (largely in collaboration with Craig Tracy) in integrable systems and random matrix theory.

He is a member of the American Academy of Arts and Sciences and in 2002 received, jointly with Tracy, the George Pólya Prize of the Society for Industrial and Applied Mathematics. He is an associate editor of *Asymptotic Analysis*; *Journal of Integral Equations and Applications*; *Mathematical Physics, Analysis and Geometry*; and an honorary editor of *Integral Equations and Operator Theory*.

Response from Craig Tracy and Harold Widom

We are honored to be named the recipients of the 2007 AMS-SIAM Norbert Wiener Prize in Applied Mathematics. We thank the members of the selection committee for their consideration and in particular for their recognition of our field of random matrix theory and integrable systems. Underlying much of our own research have been Wiener-Hopf operators and Wiener processes, so it is especially gratifying to receive this prize, named for Norbert Wiener. We thank AMS and SIAM for this honor.

One of us (Tracy) would like to acknowledge the support, early in his career, from Barry M. McCoy, J. Laurie Snell, Tai Tsun Wu, and Chen Ning Yang. We both express our appreciation of Estelle L. Basor, with whom we wrote our first joint paper on random matrices.

And we thank the diverse group of researchers in random matrix theory and integrable systems for making this an exciting field in which to work.

Joint Policy Board for Mathematics Communications Award

The Joint Policy Board for Mathematics (JPBM) established its Communications Award in 1988 to reward and encourage journalists and mathematicians who, on a sustained basis, bring mathematical ideas and information to nonmathematical audiences. The award recognizes a significant contribution or accumulated contributions to the public understanding of mathematics, and it is meant to reward lifetime achievement. JPBM represents the American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

Citation

Steven H. Strogatz

The 2007 JPBM Communications Award is given to Steven H. Strogatz, Professor of Theoretical and Applied Mechanics and Director of the Center for Applied Mathematics at Cornell University.

Steve works in applied mathematics, particularly on dynamical systems that synchronize themselves. He has written popular books on the subject, given popular lectures, and has written op-ed pieces for the *New York Times*, such as "How the Blackout Came to Life," (*New York Times*, August 25, 2003). Promotions for his popular book "Sync: The Emerging Science of Spontaneous Order" included public presentations with well-known figures like the actor Alan Alda. Examples of his influence as a speaker include his interviews, such as with Edge.org.

His seminal research on human sleep and circadian rhythms, scroll waves, coupled oscillators, synchronous fireflies, Josephson junctions, and small-world networks has been featured in *Nature*, *Science, Scientific American*, the *New York Times*, *US News and World Report*, *The New Yorker*, *Discover*, *American Scientist*, *Science News*, *Newsweek*, *Die Zeit*, and *London's Daily Telegraph*, and broadcast on BBC Radio, National Public Radio, CBS News, and numerous other mass media outlets.

In this instance, the JPBM recognizes a person from within the mathematical sciences community who made a consistent effort to reach out to a wider audience. Strogatz has made significant contact with the wider scientific community. The style of "Sync" and its sales indicate that it is intended for and has reached an even wider audience. The volume of this work is impressive, but the quality and breadth are spectacular as well.

Biographical Note

After receiving his bachelor's degree in mathematics from Princeton in 1980, Strogatz spent two years as a Marshall Scholar at Cambridge University. He did his doctoral work in applied mathematics at Harvard and then stayed for three years as a National Science Foundation postdoctoral fellow. From 1989 to 1994, Strogatz taught in the Department of Mathematics at MIT. He has received awards for both his teaching and his research, including MIT's highest teaching prize, the E. M. Baker Award for Excellence in Undergraduate Teaching, and a Presidential Young Investigator Award from the National Science Foundation. Strogatz joined the Cornell faculty in 1994. He is a member of the Society for Industrial and Applied Mathematics and the Society for Mathematical Biology.

Strogatz has broad interests in applied mathematics. At the start of his career, he focused on questions arising in mathematical biology, including the geometry of supercoiled DNA, the dynamics of the human sleep-wake cycle, the topology of three-dimensional chemical waves, and the collective behavior of biological oscillators, such as swarms of synchronously flashing fireflies. In the 1990's his work turned toward nonlinear dynamics and chaos applied to physics and engineering. Several of these projects were concerned with large systems of coupled oscillators, such as arrays of lasers and superconducting Josephson junctions. In each case the research involved close collaborations with experimentalists. Currently, he has been exploring with his students a variety of complex networks in both the natural and social sciences, using ideas from graph theory, statistical physics, and nonlinear dynamics.

Response from Steven H. Strogatz

I am thrilled and humbled to receive the JPBM Communications Award. Thank you for this wonderful honor.

My dad was a quiet man, not prone to giving advice or speechifying, so when he did express himself in this way, it was memorable. He once told me that a truly lucky person is one who could feel excited about going to work each day.

Teaching mathematics is what I love. There's so much to be delighted by: the logic and power of the subject, its colorful history, its stunning results. But what inspires me most is its interconnectedness: not just the links within mathematics itself, but also its connections to everything in the world around us, from the beating of our hearts to the aggravating density waves of rush-hour traffic. I've tried to convey the pervasiveness of mathematics in my communications with the public and feel very grateful to be recognized by the JPBM for these efforts.

Certificates of Meritorious Service

The Certificate of Meritorious Service is presented 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

Marilyn Repsher, Florida Section

The Florida Section of the Mathematical Association of America is pleased to recognize Marilyn L. Repsher from Jacksonville University as a 2007 recipient of the MAA Certificate of Meritorious Service.

Dr. Repsher has a long and distinguished history of service to the Florida Section and to the national mathematical community. She served the section as governor from 2001–2004, as president from 1990–1992, as vice-president for programs from 1987–1989 and as vice-president for four-year colleges from 1980–1982. She received the section's Distinguished Service Award in 1998.

Dr. Repsher received her PhD from Columbia University and her master's degree from The Catholic University of America in Washington DC. In 1978, Dr. Repsher was recognized as Jacksonville University's Professor of the Year. In 2001, she was recognized as Jacksonville University's Woman of the Year. In 1999, Dr. Repsher was named U.S. Professor of the Year (Master's Universities and Colleges division) by The Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education. Dr. Repsher is a Carnegie Scholar in the 2000 cohort of the Carnegie Academy for the Scholarship of Teaching and Learning.

For her exemplary performance, spanning a period of three decades, in service to her faculty colleagues throughout the state, the Florida Section is pleased that the MAA Certificate of Meritorious Service goes to Marilyn L. Repsher.

Response from Marilyn Repsher

There are many people in the Florida Section and around the country who have brought me to this point. I am proud to be a member of our outstanding Florida Section. The meetings and activities of the section have reached mathematics faculty in public and private colleges, two- and four-year institutions, and secondary schools throughout the state. On the national level, MAA publications and meetings have enriched my work and energized my teaching and research. I am grateful too for the support and inspiration from my colleagues and students at Jacksonville University. Thank you for this honor.

Citation

Sister Jo Ann Fellin, Kansas Section

Sister Jo Ann Fellin, OSB, received her PhD from the University of Illinois in 1970. She then became an assistant professor at Mount Saint Scholastica College in Atchison, Kansas, which merged the next year with Benedictine College. She spent the rest of her career at Benedictine, with sabbaticals at Illinois and Notre Dame, and received Benedictine's Distinguished Educator Award in 1998. She worked throughout her career to support young mathematicians, especially women. She has given many talks to school groups and teachers, and worked with a variety of organizations, especially the MAA. She has made several presentations at sectional and national MAA meetings, served on numerous committees, hosted the Kansas section meeting twice, served a term as section governor, and is the only person in the last 50 years to serve two terms as section chairperson. She was the unanimous choice for the Certificate of Meritorious Service from the Kansas Section.

Response from Sister Jo Ann Fellin

Gratitude fills my heart as I accept this Certificate of Meritorious Service from the Mathematical Association of America. I am grateful first to my Kansas Section colleagues not only for nominating me but more so for their friendship over the years. Teaching in a small undergraduate institution makes broad association with other mathematicians important and rewarding. I am grateful to the national organization for the wonderful opportunities it has provided me. Sharing with colleagues across the nation and participating in various minicourses has benefited me greatly as a person and in my teaching. I especially appreciate the many women I have met and worked with while coordinating the Kansas City Region of WAM (Women and Mathematics). Finally, I am grateful to Benedictine College for the support it provided me for professional development through attendance at MAA meetings. May the Mathematical Association of America continue its great work in promoting excellence in teaching and learning.

Citation

Jerrold W. Grossman, Michigan Section

The Michigan Section of the Mathematical Association of America is pleased to nominate Jerrold W. Grossman, Professor of Mathematics, Oakland University, for the MAA Certificate of Meritorious Service. We gratefully acknowledge the many contributions he has made over the years both to our section and to the larger mathematical community.

Jerry has a long history of service to the Michigan Section. He was a member of the Michigan Mathematics Prize Competition Exam Committee and the Michigan MAA Teaching Excellence Award Committee (after receiving the Section's 1994 Teaching Excellence Award), director of the High School Visiting Lecture Program, newsletter editor, and section governor. As governor, Jerry was responsible for revising our section bylaws.

Jerry has also served the larger mathematics community through his work on the MAA *American Mathematical Monthly* problems editorial panel, on the Dolciani series editorial board, as an AP Calculus Exam reader, as a problems consultant to the AMC and AIME national high school mathematics competitions, and as a member of the NCTM's Educational Materials Committee. Jerry also created and maintains the website for The Erdös Number Project.

At Oakland University, Jerry has served in many roles, including as an elected member of the University Senate, College of Arts and Sciences Assembly, College Executive Committee, Senate Steering Committee, Faculty Re-employment and Promotion Committee, College of Arts and Sciences Committee on Appointment and Promotion, Secondary Education Council and its Steering Committee. Jerry has been an associate chair and coordinator of undergraduate programs for the Department of Mathematics and Statistics. In addition to being active in the AAUP at the university level, Jerry has also served at the state level as a member of Committee W (on the status of women in the profession).

Response from Jerrold W. Grossman

With so many hard-working members leading and serving the Michigan Section of the MAA, I am surprised, delighted, and gratified to be singled out for this award. The best thing about participating in MAA activities is the opportunity to interact with dedicated, dynamic, innovative, and talented colleagues in so many different arenas, such as contests with their intriguing problems, discussions of teaching at all levels, MAA's wonderful books and journals, and meeting sessions devoted to mathematics itself. Little did I realize when I joined the organization over forty years ago as a high school student that it would bring so much pleasure and serve as an anchor for my professional career. Thank you for this honor.

Citation

Donna Beers, Northeastern Section

Donna Beers has long been generous and gracious in offering her time, talents and infectious enthusiasm to the Mathematical Association of America through both the Northeastern Section and the national organization. She is well known and highly regarded by mathematicians and mathematics educators throughout the broader mathematics community. It is no surprise to many that the MAA would seize this opportunity to recognize and honor Donna through this MAA Certificate for Meritorious Service.

Her contributions to our association are numerous and varied. Donna served as section vice chairperson from 1992–1993, chairperson from 1993–1995, and past chairperson from 1995–1997. She served as section governor from 2000–2003. Throughout the period of her leadership the section continued to prosper by offering varied and interesting programs that were well received by the membership. Donna has often been an invited speaker at section meetings, from the 1970s to the present, where she offered her insights into a variety of mathematical and educational topics. In 2003 she gave the invited presentation for students at the MAA-AMS Joint Mathematics Meetings in Baltimore. In addition, she has given many contributed papers at both section and national meetings. Further, she has served on and chaired numerous NES/MAA committees, including several program committees for section meetings. She is a current or former member of the MAA editorial boards of the *American Mathematical Monthly*, *Mathematics Magazine*, the Dolciani Mathematical Expositions, and *FOCUS/MAA Online*. She served on the steering committee of the MAA PREP Workshop, *Leading the Academic Department: A Workshop for Chairs of a Mathematical Sciences Department*. At present, she serves on the MAA Investment Committee, the Chauvenet Prize Committee, and the editorial board of the Anneli Lax New Mathematical Library.

Donna is professor and past chair of the Department of Mathematics and Computer Science at Simmons College, where she has been since 1986. Her scholarly interests include preparation of teachers, undergraduate research, and abelian groups. She served as director of the Honors Program, and created a very successful interdisciplinary Honors seminar on patterns. She also served as director and principal investigator of the Verizon Scholars Program, a mentoring and outreach program with TechBoston, a department of the Boston Public Schools, for high school women interested in Web design and programming. Donna initiated the Simmons College Student Chapter of the MAA. Members of the Simmons Chapter have delivered papers at the annual Hudson River Undergraduate Mathematics Conference as well as regional and national meetings of the MAA. She has just completed a term as Visiting Mathematician at the MAA.

For her hard work and continuing commitment to the advancement of mathematics, the MAA and the Northeastern Section are pleased to award Donna Beers this Certificate for Meritorious Service.

Response from Donna Beers

I am very honored to receive this award. I sincerely thank my colleagues in the Northeastern Section for their steadfast support, encouragement, and friendship. I deeply appreciate the Mathematical Association of America, whose programs, publications, and people have enriched my life and contributed enormously to my growth and development as a professional. Thank you so much.

Citation

Janet Heine Barnett, Rocky Mountain Section

Janet Heine Barnett completed her PhD in Mathematics in 1990 at the University of Colorado, Boulder, and subsequently joined the Department of Mathematics at Colorado State University, Pueblo. She became a member of the Rocky Mountain Section of the MAA as a graduate student in 1988, and since then has been creative, diligent, and tireless in her work to fulfill the section's mission to "promote excellence in mathematics education, especially at the collegiate level." In her many years of service, Janet has been the heart of our section. She has been an excellent role model, getting people involved in section activities and ensuring that our section flourished and will continue to do so.

Janet served the section as chair for two years, secretary/treasurer for six years, liaison coordinator for eight years, CCTM representative for two years, newsletter editor for four years, book sales coordinator for seven years, and program chair for the 1995 meeting and our upcoming 2007 meeting. She also organized various sessions at our section meetings and at MathFest. Nationally, she was the Rocky Mountain governor for three years, was a member of the *ad hoc* Committee on Advising for two years and of the Committee on Department Liaisons Program for five years, and is currently a member of the Committee on Minicourses. It is with great pleasure and gratitude that the MAA awards Janet Heine Barnett the Certificate of Meritorious Service.

Response from Janet Heine Barnett

Early in my professional career, it was my good fortune to be welcomed into the MAA Rocky Mountain Section by the inspiring individuals who make our section such a vibrant organization. Since then, my time as a section member and officer has given me many wonderful opportunities for growth, laughter, friendship, and learning. I thank the section and its membership not only for these opportunities but for the honor of this Certificate of Meritorious Service and the faith in my abilities that it represents.

Citation

Stuart Anderson, Texas Section

Stuart Anderson, professor at Texas A&M University-Commerce, has served the Texas Section for nine years as the secretary-treasurer. This position involves enough for two people, but Stuart always was ready and prepared. During these years he was indeed the backbone of the section.

Dr. Anderson's commitment to service throughout the mathematical community is outstanding. He often gives talks on mathematical subjects to area high schools. In addition, many faculty and others on campus and in the broader community are very familiar with Dr. Anderson's speaking prowess—he is often sought after for speaking engagements, both on and off campus. His deadpan demeanor and dry wit are appreciated by all who are fortunate to hear him speak. He has been the keynote speaker for a meeting of the Texas Project NExT meeting in November 2002 (on the "Mathematical Mark Twain"), and gave professional development presentations to well over 50 Garland ISD math teachers in both 2001 and 2000. While it may well be perceived that he is spontaneously humorous, he prepares those talks and speeches with much care, and his classroom preparation is just as thoughtful, meticulous, and methodical, day-in day-out: class after class, year after year.

Stuart is always willing to jump in when needed. He regularly attended section officers meetings at the January meeting, as well as MathFest. It is an honor to award Dr. Stuart Anderson of the Texas Section the MAA Meritorious Service Award.

Response from Stuart Anderson

When a person becomes involved in MAA work, there is no intent of ever receiving a Certificate of Meritorious Service. Luckily, I never heard of the award until becoming fairly involved in the organization. That early ignorance helped to sweeten the surprise and did nothing to harm the sincere gratitude I feel at this point. Realizing the impressive contributions of previous recipients of this citation is a powerful dose of humility. My association with the MAA has involved work that was worthwhile and invigorating, and done with such pleasant and talented people. It has always been a joy. To receive an award for having so much fun makes me feel quite lucky. So with all my emotions of surprise, gratitude, humility, and good fortune, I sincerely thank my colleagues from the Texas Section and all the good people of the MAA for this high honor.

Beckenbach Book Prize

The Beckenbach Book Prize, established in 1986, is the successor to the MAA Book Prize, which was established in 1982. It is named for the late Edwin Beckenbach, a long-time leader in the publications program of the Association and a well-known professor of mathematics at the University of California at Los Angeles. This prize is awarded to an author of a distinguished, innovative book published by the MAA. The award is not given on a regularly scheduled basis, but is given only when a book appears that is judged to be truly outstanding.

Citation

William P. Berlinghoff and Fernando Q. Gouvêa

Math through the Ages: A Gentle History for Teachers and Others, The Mathematical Association of America & Oxton House Publishers, 2004.

Math through the Ages: A Gentle History for Teachers and Others consists of twenty-five short historical sketches of important topics in general mathematics and a 54-page mathematical "history in a large nutshell." The graceful writing in William P. Berlinghoff and Fernando Q. Gouvêa's short expanded edition has the great advantage of being appealingly readable to a wide audience ranging from secondary school and liberal arts students through the mathematical community's educators and practitioners. For each of the important concepts it treats, a carefully chosen sketch concisely brings together in a single unified chapter its many centuries of development. Selections begin with the development of notation and numerical concepts, continuing on through modern topics such as set theory, game theory, statistics and computing. Its careful organization succinctly brings together historical concepts that a teacher would most need to know and what a student might most likely want to pursue further. Along with the thoughtful inclusion of cross-references, accessible exercises and student projects, the book concludes with a valuable discussion of historical books and websites for further reading, concluding with an extensive bibliography. The beautiful writing makes it difficult for a reader to put the book down, and it is inviting to jump from one historical sketch to another. The Beckenbach Book Prize Committee recommends that the MAA commend the authors and the joint publisher (Oxton House Publishers) for this enjoyable and useful book.

Biographical Note

William P. Berlinghoff

William P. Berlinghoff earned his BS from Holy Cross, MA from Boston College, and PhD from Wesleyan University, where he specialized in abelian group theory. Recently retired from college teaching after more than forty years, he has been a full-time faculty member at The College of Saint Rose, a tenured professor at Southern Connecticut State University, and most recently a Visiting Professor at Colby College. He is the author or co-author of five college textbooks and a senior writer of *MATH Connections*, an NSF-supported, NCTM Standards-based core curriculum for high school students. He and his wife, Phyllis Fischer, currently live in Farmington, Maine, where they own and manage Oxton House, a small educational publishing company. Once a week or so, folksinger Bill Berlinghoff can be found entertaining with his guitar and banjo at a nearby restaurant or coffeehouse.

Response from William P. Berlinghoff

Math through the Ages began with a hallway conversation at Colby College about six years ago. For me, it is the culmination of many years of trying to transmit a sense of the humanity and charm of mathematics to elementary and high school teachers and, through them, to their students. It was an enjoyable, instructive, sometimes humbling collaboration, with Fernando's meticulous scholarship counterbalancing my enthusiasm for simplicity. As we worked through our disagreements over ideas, passages, and even single words, the blend of our different perspectives took us beyond where either of us could easily have gone alone. Then the vision and encouragement of Don Albers, to whom we are especially grateful, challenged us to extend the original text by adding many pages of questions and projects, resulting in the richer Expanded Edition. I am delighted that the MAA has chosen to honor this book with the Beckenbach Book Prize.

Biographical Note

Fernando Q. Gouvêa

Fernando Q. Gouvêa was born in Brazil and received his BA and MA in mathematics at the University of São Paulo. He then went to Harvard for his PhD. After some years teaching in São Paulo and in Canada, he settled down in Waterville, Maine, to teach at Colby College, where he is now the Carter Professor of Mathematics. Number theory was Gouvêa's first love; his work in that field deals mostly with the p-adic theory of modular forms and its connections to Galois representations. Since the mid 1990's, when he took part in the MAA's Institute on the History of Mathematics and Its Use in Teaching, he has developed a growing interest in the history of mathematics, especially the history of algebra and number theory. In addition to *Math through the Ages*, Gouvêa has written two research monographs, *Arithmetic of p-adic Modular Forms* and *Arithmetic of Diagonal Hypersurfaces over Finite Fields* (with Noriko Yui), and the undergraduate textbook *p-adic Numbers: An Introduction*. Gouvêa is the editor of *FOCUS*, the news magazine of the MAA, and of *FOCUS Online*. In addition, he runs the MAA's online book review and books database, *MAA Reviews*, which is part of the MAA's Mathematics Digital Library. He is fond of describing himself as "Christian, orthodox, Brazilian, American, conservative, husband, father, member of a Lutheran church, Sunday school teacher, choir director, editor, author, dog owner, bibliophile, wine geek, adoptive Mainer, historian wannabe, and the proud possessor of a graying scraggly beard."

Response from Fernando Q. Gouvêa

When Bill Berlinghoff suggested that we write a collection of short accounts of the history of common topics in the school mathematics curriculum, I had no idea how much fun it would be to actually do it. Collaborating with Bill was a great experience: we argued about the history, delved into original sources, and complained about—and improved upon—each other's sentences. Bill's understanding of our potential audience played a crucial role in toning down my tendency towards the highfalutin. When we undertook to add problems and projects for the Expanded Edition, one of my major goals was to come up with ideas that would impress Bill, and he, I think, did the same. We think it worked! I am pleased and excited with the resulting book, and I am delighted that the Beckenbach Prize Committee felt the same way.

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

The Gung and Hu Award for Distinguished Service to Mathematics, first presented in 1990, is the endowed successor to the Association's Award for Distinguished Service to Mathematics, first presented in 1962. This award is intended to be the most prestigious award for service offered by the Association. It honors distinguished contributions to mathematics and mathematical education, in one particular aspect or many, and in a short period or over a career. The initial endowment was contributed by husband and wife Dr. Charles Y. Hu and Yueh-Gin Gung. It is worth noting that Dr. Hu and Yueh-Gin Gung were not mathematicians, but rather a professor of geography at the University of Maryland and a librarian at the University of Chicago, respectively. They contributed generously to our discipline 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

Lee Lorch

Lee Lorch's mathematical research has been in the areas of analysis, differential equations, and special functions. His teaching positions have included the City College of New York, Pennsylvania State University, Fisk University, Philander Smith College, the University of Alberta, Howard University, Royal Institute of Technology (Stockholm) and Aarhus University. He was at York University from 1968 until retirement in 1985 and remains active in the mathematical community.

His scholarship has been recognized by election to Fellowship in the Royal Society of Canada; appointment to committees of the Research Council of Canada; election to the Councils of the American Mathematical Society, the Canadian Mathematical Society, and the Royal Society of Canada; and by many invitations to lecture.

Lee Lorch is a remarkable teacher of mathematics and an inspiration to his students. Among those he guided were Etta Falconer, Gloria Hewitt, Vivienne Malone Mayes, and Charles Costley. He has recruited into graduate work and mathematical careers many students who would not have otherwise considered such a path. [See V. Mayes, *American Mathematical Monthly*, 1976, pp. 708–711; and P. Kenschaft, *Change Is Possible*, American Mathematical Society, 2005.]

During the early organization of the Association for Women in Mathematics, Lee gave sage advice about the value of inclusiveness in supporting effective advocacy. He is responsible for the appearance of the preposition "for" in place of the initially proposed "of" in the name of the AWM.

Throughout his career he has been a vocal advocate and energetic worker for human rights and educational opportunities. His interventions, especially in the 1950's, led to changes in the policies and practices of the AMS and the MAA that ensured that all mathematicians could participate in the official events of these organizations. While his actions have not solved all the problems he addressed, surely his energy has contributed to much progress.

As an example, we cite events surrounding a meeting in 1951 held in Nashville. Lee Lorch, the chair of the mathematics department at Fisk University, and three Black colleagues, Evelyn Boyd (now Granville), Walter Brown, and H. M. Holloway, came to the meeting and were able to attend the scientific sessions. However, the organizer for the closing banquet refused to honor the reservations of these four mathematicians. (Letters in *Science*, August 10, 1951, pp. 161–162, spell out the details). Lorch and his colleagues wrote to the governing bodies of the AMS and MAA seeking bylaws against discrimination. Bylaws were not changed, but non-discriminatory policies were established and have been strictly observed since then.

For his life-long contributions to mathematics, his continued dedication to inclusiveness, equity, and human rights for mathematicians, and especially his profound influence on the lives of minority and women mathematicians who have benefited from his efforts, the MAA presents this Yueh-Gin Gung and Charles Y. Hu Award for Distinguished Service to Mathematics to Lee Lorch.

Biographical Note

Lee Lorch, FRSC, is professor emeritus at York University in Toronto. Born in New York, his undergraduate studies were at Cornell. He holds a PhD from the University of Cincinnati, mentored by Otto Szasz.

While in the U.S. Army during the war and shortly before going overseas, he married Grace Lonergan, a Boston school teacher. She was dismissed for committing matrimony and became the first Boston teacher to contest that policy, but lost. A plaque commemorating her pioneering struggle and celebrating her subsequent civil rights activities now adorns the entrance to a Boston public school. Their participation in the struggle against housing discrimination cost Lorch two jobs in quick succession. Moving south, their efforts to speed the end of segregation in public education, as mandated by the Supreme Court (1954), cost Lorch the last two posts he was able to obtain in the U.S. He was summoned before the House Committee on Un-American Activities and cited for "contempt" for refusing to say whether he had ever been a member of the Communist Party. He was acquitted. Grace Lorch was called before the Senate Subcommittee on Internal Security, where she also refused to answer political questions. Years later, Lorch received honorary degrees from two of the institutions that had dismissed him. In 1959 the couple moved to Canada. Both have received awards for their civil rights contributions.

Response from Lee Lorch

While this award honors me, it gives me even greater satisfaction that, by making it, the MAA emphasizes its support for equity.

There are all too many proofs that this fight is far from over. One surrounds us here: Katrina and post-Katrina New Orleans. Why was New Orleans left so vulnerable? Why was flood control, so urgently and obviously needed, set aside? Its low-lying areas, overwhelmingly African-American, seedbeds of world famous African-American music, are ruined, their residents scattered and disheartened, their communities in peril of dissolution.

Even the AMS homepage tells us only of Tulane—not of the several afflicted HBCUs. Perhaps no one in these institutions has submitted a report. Maybe they do not feel really part of the mathematical community. Why not? What is being done about it?

"The struggle continues." Happily, this award is a sign of which side the MAA is on.

Thank you. Thank you very much!

Oswald Veblen Prize in Geometry

This prize was established in 1961 in memory of Professor Oswald Veblen through a fund contributed by former students and colleagues. The fund was later doubled by the widow of Professor Veblen. The prize is awarded for research in geometry or topology that has appeared during the past six years in a recognized North American journal.

Citation

Peter Ozsváth and Zoltán Szabó

The 2007 Veblen Prize in Geometry is awarded to Peter Ozsváth and Zoltán Szabó in recognition of the contributions they have made to 3- and 4-dimensional topology through their Heegaard Floer homology theory.

Ozsváth and Szabó have developed this theory in a highly influential series of over 20 papers produced in the last five years, and in doing so have generated a remarkable amount of activity in 3- and 4-dimensional topology. Specifically, they are cited for their papers:

"Holomorphic disks and topological invariants for closed three-manifolds," *Ann. of Math.* (2) 159 (2004), 1027–1158.

"Holomorphic disks and three-manifold invariants: properties and applications," *Ann. of Math.* (2) 159 (2004), 1159–1245.

"Holomorphic disks and genus bounds," *Geometry and Topology* 8 (2004), 311–334.

The Heegaard Floer homology of a 3-manifold plays a role, in the context of the Seiberg-Witten invariants of 4-manifolds, analogous to that played by Lagrangian Floer homology in the context of the Donaldson invariants. There is also a version for knots, whose Euler characteristic is the Alexander polynomial. It detects the genus of a knot and also whether or not a knot is fibered. The combinatorial nature of these invariants has led to many deep applications in 3-dimensional topology. Among these are results about Dehn surgery on knots, such as the Dehn surgery characterization of the unknot, strong restrictions on lens space and other Seifert fiber space surgeries, and dramatic new results on unknotting numbers. Ozsváth and Szabó have used Heegaard Floer homology to define a contact structure invariant, which has led to new results in 3-dimensional contact topology. They have also defined a new concordance invariant of knots, which gives a lower bound on the 4-ball genus. The 4-dimensional version of Heegaard Floer homology has enabled them to give gauge-theory-free proofs of many of the results in 4-dimensional topology obtained in the last decade using Donaldson and Seiberg-Witten theory, such as the Thom Conjecture on the minimal genus of a smooth representative of the homology class of a curve of degree d in $\mathbf{C}P^2$ and the Milnor Conjecture on the unknotting number of a torus knot.

Biographical Note

Peter Ozsváth

Peter Ozsváth was born on October 20, 1967, in Dallas, Texas. He received his BS from Stanford University (1989) and his PhD from Princeton University (1994) under the direction of John W. Morgan. He has held postdoctoral positions at Caltech, the Max-Plank-Institut, MSRI, and the Institute for Advanced Study. He held faculty positions at Princeton University, Michigan State University, and UC Berkeley. He has been on the faculty at Columbia University since 2002.

Ozsváth has received a National Science Foundation Postdoctoral Fellowship and an Alfred P. Sloan Research Fellowship. His invited lectures include an Abraham Robinson Lecture at Yale University (2003), a William H. Roever Lecture at Washington University in St. Louis (2004), a Kuwait Foundation Lecture at Cambridge University (2006), and a lecture in the topology section of the International Congress of Mathematicians (2006).

Response from Peter Ozsváth

I am greatly honored to be a co-recipient of the Oswald Veblen Prize, along with my long-time collaborator Zoltán Szabó, and also Peter Kronheimer and Tomasz Mrowka, whose work has always been a profound source of inspiration for me.

Heegaard Floer homology grew out of our efforts to understand gauge theory from a more combinatorial point of view. The mathematical starting point was Yang-Mills theory and then Seiberg-Witten theory, which started with the work of S. K. Donaldson, A. Floer, and C. H. Taubes. But we have also been fortunate to be able to draw on the work of many interlocking neighboring fields, including contact and symplectic geometry, where at various times the work of Y. Eliashberg and E. Giroux provided answers to fundamental questions, and also 3-manifold topology, where the questions raised by C. Gordon serve as a guiding light and the work of D. Gabai provides powerful tools which fit very neatly into the context of Floer homology.

I would like to thank my family and friends for their support throughout the years, and I also owe a great debt of gratitude to my teachers, co-authors, and students. In particular, I thank Zoltán for those many caffeinated mathematical sessions. I also thank my thesis advisor, J. W. Morgan, for introducing me to gauge theory and T. S. Mrowka, to whom I have turned many times for insight and advice. I would also like to thank R. Fintushel, R. Kirby, and R. Stern for helping to make the field so pleasant socially and so rich mathematically. I am deeply grateful to my undergraduate teachers P. J. Cohen, R. L. Cohen, R. J. Milgram and fellow student D. B. Karagueuzian for introducing me to mathematics. I would also like to thank my more recent collaborators C. Manolescu, S. Sarkar, A. Stipsicz, D. P. Thurston, and my former students E. Grigsby,

M. Hedden, P. Sepanski, and the many additional members of the Columbia mathematics department who are constantly bringing new insights to an exciting and ever-developing field.

Biographical Note

Zoltán Szabó

Zoltán Szabó was born in Budapest, Hungary, in 1965. He did his undergraduate studies at Eötvös Loránd University in Budapest and his graduate studies at Rutgers University with John Morgan and Ted Petrie. He has been working at Princeton University since graduating in 1994 and also spent a year at the University of Michigan in 1999–2000. He has been a professor at Princeton University since 2002. He has received a Sloan Research Fellowship and a Packard Fellowship. He was an invited lecturer at the 2006 International Congress of Mathematicians in Madrid and a plenary speaker at the 2004 European Congress of Mathematics in Stockholm. Szabó's main research interests are smooth 4-manifolds, 3-manifolds, knots, Heegaard Floer homology, symplectic geometry and gauge theory.

Response from Zoltán Szabó

I am greatly honored to be named, along with Peter Kronheimer, Tom Mrowka and Peter Ozsváth, as a recipient of the Oswald Veblen Prize. The joint work with Peter Ozsváth which is noted here grew out of our attempts to understand Seiberg-Witten moduli spaces over 3-manifolds where the metric degenerates along a surface. This led to the construction of Heegaard Floer homology that involved both topological tools, such as Heegaard diagrams, and tools from symplectic geometry, such as holomorphic disks with Lagrangian boundary constraints. The time spent on investigating Heegaard Floer homology and its relationship with problems in low-dimensional topology was rather interesting. I am very glad that this effort was rewarded by the prize committee.

First of all I would like to thank my wife, Piroska, for her support over the years. I also owe a lot to my co-author, Peter Ozsváth, whose boundless energy made this work possible, and to my thesis advisor, John Morgan, who introduced me to the world of gauge theory.

Citation

Peter Kronheimer and Tomasz Mrowka

The 2007 Veblen Prize in Geometry is awarded to Peter Kronheimer and Tomasz Mrowka for their joint contributions to both 3- and 4-dimensional topology through the development of deep analytical techniques and applications. In particular the prize is awarded for their seminal papers:

"Embedded surfaces and the structure of Donaldson's polynomial invariants," *J. Differential Geom.* 41 (1995), no. 3, 573–734.

Since 1982, most of the progress in 4-dimensional differential topology has arisen from the applications of gauge theory pioneered by S. K. Donaldson. In particular, Donaldson's polynomial invariants have been used to prove a variety of results about the topology and geometry of 4-manifolds. This paper is one of the pinnacles of this development. It gives a conceptual framework and an organizing principle for some of the disparate observations and calculations of Donaldson invariants that had been made earlier, it reveals a deep structure encoded in the Donaldson invariants which is related to embedded surfaces in 4-manifolds, and it has been the point of departure and the motivating example for important further developments, most spectacularly for Witten's introduction of the so-called Seiberg-Witten invariants.

"The genus of embedded surfaces in the projective plane" (English summary), *Math. Res. Lett.* 1 (1994), no. 6, 797–808.

This paper proves the Thom conjecture, which claims that if C is a smooth holomorphic curve in $\mathbf{C}P^2$, and C' is a smoothly embedded oriented 2-manifold representing the same homology class as C, then the genus of C' satisfies $g(C') \geq g(C)$.

"Witten's conjecture and property P" (English summary), *Geom. Topol.* 8 (2004), 295–310 (electronic).

Here the authors use their earlier development of Seiberg-Witten monopole Floer homology to prove the Property P conjecture for knots. In other words, if $K \subset S^3$ is a nontrivial knot, and $K_{p/q}$ is the 3-manifold obtained by p/q Dehn surgery along K with $q \neq 0$, then $\pi_1(K_{p/q})$ must be nontrivial. The proof is a beautiful work of synthesis which draws upon advances made in the fields of gauge theory, symplectic and contact geometry, and foliations over the past twenty years.

Biographical Note
Peter Kronheimer

Born in London, Peter Kronheimer was educated at the City of London School and Merton College, Oxford. He obtained his BA in 1984 and his DPhil 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 William Caspar Graustein Professor of Mathematics. A recipient of the Förderpreis from the Mathematisches Forschungsinstitut, Oberwolfach, and a Whitehead Prize from the London Mathematical Society, he was elected a Fellow of the Royal Society in 1997.

Next to mathematics, his main pastime has often been music—the horn in particular, which he studied as a pupil of Ifor James. Peter Kronheimer lives in Newton, Massachusetts, with his wife, Jenny, and two sons, Matthew and Jonathan.

Biographical Note
Tomasz Mrowka

Tom Mrowka is a professor at the Massachusetts Institute of Technology. He received his undergraduate degree from MIT in 1983 and attended graduate school at UC Berkeley, receiving his PhD under the direction of Clifford H. Taubes in 1989. After graduate school he held postdoctoral positions at MSRI (1988–89), Stanford (1989–91) and Caltech (1991–92). He held a professorship at Caltech from 1992 until 1996 and was a visiting professor at Harvard (spring of 1995) and at MIT (fall of 1995) before returning to MIT permanently in the fall of 1996.

He received the National Young Investigator Grant of the NSF in 1993 and was Sloan Foundation Fellow from 1993 to 1995. He has given an invited lecture in the topology section of the 1994 ICM in Zurich, the Marston Morse lectures at the IAS in 1999, the Stanford Distinguished Visiting Lecture Series in 2000, the Joseph Fels Ritt Lectures at Columbia University in 2004 and the 23rd Friends of Mathematics Lecture at Kansas State University in 2005.

He works mainly on the analytic aspects of gauge theories and applications of gauge theory to problems in low-dimensional topology.

Response from Peter Kronheimer and Tomasz Mrowka

We are honored, surprised and delighted to be selected, together with Peter Ozsváth and Zoltán Szabó, as recipients of the Oswald Veblen Prize in Geometry.

The Thom conjecture and other related questions concerning the genus of embedded 2-manifolds in 4-manifolds are natural and central questions in 4-dimensional differential topology. After Simon Donaldson's work in gauge theory opened up this field, these problems became tempting targets for the newly available techniques. In the summer of 1989, we were both at MSRI and discussed the idea of using "singular instantons" to prove such conjectures. But it was not until two years later, when we spent a month together at Oberwolfach, that a proof began to emerge of a version of the Thom conjecture for embedded 2-manifolds in *K3* surfaces. This theorem and its proof filled our first two joint papers and provided the first truly sharp results for the genus problem.

In March 1993 we met at Columbia at the invitation of John Morgan. We understood that the singular instanton techniques that we had used for the genus problem should lead to universal relations among the values of Donaldson's polynomial invariants for 4-manifolds. At the time, calculating Donaldson's invariants in special cases was a challenging occupation. Although we could see how to prove relations, no coherent picture was emerging, and at the end of this visit Peter headed to LaGuardia with the forest still not visible for the trees. New York's "Blizzard of the Century" closed the airport, and we worked together for another day, during which we noticed that our relations implied a simple linear recurrence relation for certain values of Donaldson's invariants. This soon led to a beautiful structure theorem for the polynomial invariants in terms of "basic classes", intricately entwined with the genus question through an "adjunction inequality". These developments provided a proof of the Thom conjecture for a large class of algebraic surfaces, though the original version for the complex projective plane had to wait until 1994 and the introduction of the Seiberg-Witten equations.

While techniques from gauge theory revolutionized the field of 4-manifolds, providing answers to many important questions, these ideas had no comparable impact in 3-dimensional topology, where the questions and tools remained very different. Around 1986, Andreas Floer used Yang-Mills gauge theory to define his "instanton homology" groups for 3-manifolds. The Euler number of these homology groups recaptured an integer invariant introduced by Andrew Casson that had already been seen to imply results about surgery on 3-manifolds, including partial results in the direction of the Property P conjecture. It seems likely that Floer himself foresaw the possibility of using his homology theory to prove stronger results in the same direction; in particular, he established an "exact triangle" relating the Floer homology groups of the 3-manifolds obtained by three different surgeries on a knot. But a missing ingredient at this time was any very general result stating that these homology groups were not trivial.

In 1995 Yasha Eliashberg visited Harvard and lectured on his work with Bill Thurston on foliations and contact structures. It was apparent that these results could be combined with work of Cliff Taubes and Dave Gabai to give a nonvanishing theorem for a version of Floer's homology groups defined using the Seiberg-Witten equations and to show, for example, that these versions of Floer homology encode sharp information about the genus of embedded surfaces in 3-manifolds. This was the first strong indication that, by combining nonvanishing theorems with surgery exact triangles, one would be able to use Floer groups to obtain significant new results about Dehn surgery. This hope was eventually realized in our joint paper with the other co-recipients of this prize, Peter Ozsváth and Zoltán Szabó, on lens space surgeries and in the eventual resolution of the Property P conjecture using instanton homology. In the meantime, Ozsváth and Szabó's "Heegaard Floer theory" has transformed the field once again: it has led to a wealth of new results and open problems to attract a new generation of researchers.

Peter would like to thank his wife, Jenny, and all his family for their love and support, and his mathematical mentors, Michael Atiyah, Simon Donaldson and Dominic Welsh, for their guidance.

Tom thanks Gigliola, Mario and Sofia for the joy they bring. Tom also thanks his teachers Victor Guillemin, Richard Melrose, Raoul Bott, Stephen Smale, John Stallings and Rob Kirby for lighting up very different directions and ways of thinking at the beginning of his mathematical journey. Special thanks to his advisor, Cliff Taubes, and to John Morgan, whose confidence and interest at the beginning of his career were crucial.

Finally, we would both like to thank the American Mathematical Society for recognizing the field of gauge theory and low-dimensional topology with this year's Veblen Prize. We feel privileged to be chosen, together with our co-recipients, as representatives for an area of research that has seen so many exciting developments.

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. The following citation describes the award for Mathematical Exposition.

Citation

David Mumford

The Leroy P. Steele Prize for Mathematical Exposition is awarded to David Mumford in recognition of his beautiful expository accounts of a host of aspects of algebraic geometry. His "Red Book of Varieties and Schemes", which began life over forty years ago, introduced successive generations of beginning students to "modern" algebraic geometry and to how the "modern" theory clarifies classical problems. Students could then go on to his 1970 book "Abelian Varieties", where the whole theory is developed "without the crutch of the Jacobian", and which remains the definitive account of the subject. Here again the classical theory is beautifully intertwined with the modern theory, in a way which sharply illuminates both. Students who wanted to learn about the crutch of the Jacobian had to wait for his 1974 Michigan lectures "Curves and their Jacobians", now reprinted with the latest reedition of the "Red Book". Two years later saw the appearance of "Complex Projective Varieties". And the years 1983–1991 saw the appearance of his three volume "Tata Lectures on Theta Functions". In all of these books, there is constant interaction between modern methods and classical problems, leading the reader to a deeper appreciation of both. This modern-classical interaction also underlies, at the more abstruse level, his 1965 book "Geometric Invariant Theory" and his 1966 book "Lectures on Curves on an Algebraic Surface", a pair of books which provided many advanced readers their baptism by fire into the world of moduli spaces. All of these books are, and will remain for the foreseeable future, classics to which the reader returns over and over.

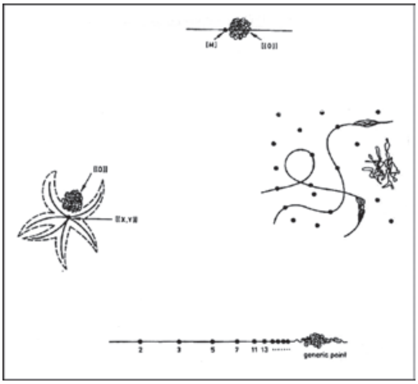
Biographical Note

David Mumford was born in Sussex, England, in 1937, but grew up in the U.S. from 1940 on. He went to Harvard as a freshman in 1953 and stayed there until 1996, working up through the ranks. He was awarded a Fields Medal in 1974, was chair of the Department of Mathematics in 1981–84, and became a member of the Division of Applied Sciences in 1985. In 1996 he moved to the Division of Applied Mathematics at Brown, joining its strong interdisciplinary program. He delivered the Gibbs Lecture entitled "The shape of objects in two and three dimensions" in 2003.

His research was in algebraic geometry from roughly 1960 to 1983. His focus was the construction and analysis of moduli spaces, especially that of curves and abelian varieties. From 1984 to the present his research has concerned the construction of mathematical models for the understanding of perception, a field called pattern theory by its founder, Ulf Grenander. His focus here has been the modeling of vision by computer and in the animal brain, especially statistical models.

Response from David Mumford

I am very honored by receiving this prize and also, as it is many years since I worked in algebraic geometry, very surprised to hear that people still read my books on the subject. The subject has grown in so many exciting and unexpected ways in the last few decades. It may be of some interest to recall what the state of that field was when I was a graduate student in the 1950s. Firstly, it was said that, between them, Zariski and Weil knew everything about the field and if neither of them knew some fact, it was probably wrong or unimportant. But one thing they were both struggling with was finding a language in which they could express both characteristic p geometry and the arithmetic structures which bound it with characteristic 0 yet retain the geometric intuition which had so often driven the field. When pressed, all of his students had seen Zariski draw a small lemniscate on the corner of the blackboard, away from the mass of algebraic formulas, to revive his geometric intuition. Then Grothendieck arrived on the scene and with a simplicity that was pure genius defined the concept "spec", saying that all prime ideals were to be treated as points. About this time, I was reading in Klein's history of nineteenth-century mathematics how Kronecker had started on the same road of integrating number theory and geometry: "*Es bietet sich da ein ungeheurer Ausblick auf ein rein theoretisches Gebiet.*" Well, that was what we grad students thought too!



But I loved pictures. I drew cartoons like those on the right in my "Red Book", showing how everyone probably thought about schemes. I was amused when a book on "Five Centuries of French Mathematics" asked to include these cartoons with the description: "*Par nature, la notion de schema est trop abstraite pour être reellement 'desinée'. Ces dessins sont dus à l'auteur d'un des rares livres de gèomètrie algébrique qui osa se lancer dans telle aventure.*" After all, it was the French who started impressionist painting, and isn't this just an impressionist scheme for rendering geometry?

The connections between traditional Italian algebraic geometry and Grothendieck's ideas continued to fascinate me. My book "Lectures on Curves on an Algebraic Surface" was written to show how wonderfully Grothendieck's ideas had completed one of the great quests of the Italian geometers. That was the problem of relating two ways of measuring the "irregularity" of an algebraic surface: Could you find algebraic but not linear families of divisors whose dimension was H^1 of the structure sheaf (they called it $p_a - p_g$)? Over the complex numbers, the theory of harmonic forms had come to the rescue and proved this, but they sought an algebraic proof. Grothendieck, by representing functors defined on arbitrary schemes, had *in passing* solved this. All you needed at the end was the simple fact that characteristic 0 group schemes were reduced and out it pops. What a triumph for the great abstraction with which he formulated mathematics.

One of the most moving sequels for me was that these books were translated into Russian—several of them by Manin himself—and reached what was then the isolated school of Russian algebraic geometers. I want to thank both Manin and my many co-authors—Ash, Bergman, Fogarty, Kempf, Kirwan, Knudsen, Nori, Norman, Ramanujam, Rapaport, Saint-Donat, and Tai—who have added wonderful material. Writing books is often a team effort, and working with all these collaborators has been a major stimulus for me. I am deeply grateful to them all and to the prize committee for this recognition.

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. The following citation describes the award for Seminal Contribution to Research.

Citation

Karen Uhlenbeck

The 2007 Steele Prize for a Seminal Contribution to Mathematical Research is awarded to Karen Uhlenbeck for her foundational contributions in analytic aspects of mathematical gauge theory. These results appeared in the two papers:

"Removable singularities in Yang-Mills fields," *Comm. Math. Phys.* 83 (1982), 11–29; and

"Connections with L^p bounds on curvature," *Comm. Math. Phys.* 83 (1982), 31–42.

Connections are local objects in differential geometry, just as functions are local. But there are two crucial differences. First, connections admit automorphisms, called gauge transformations. Thus there are several different local representations of a connection. Second, the basic elliptic equation on functions—the Laplace equation—is linear whereas its counterpart on connections—the Yang-Mills equation—is nonlinear and not even elliptic as it stands. Its nonellipticity is tied up with the existence of automorphisms. One of Uhlenbeck's fundamental results proves the existence of good local representatives for connections, called Coulomb gauges. The Yang-Mills equations become elliptic when restricted to Coulomb gauges, and so Uhlenbeck deduces many basic theorems: smoothness of solutions, compactness of solutions with bounds on the curvature, etc. Uhlenbeck also proves that solutions to the Yang-Mills equations defined on a punctured ball with suitable boundedness on the curvature extend over the puncture. (Compare the much easier Riemann removable singularities theorem in complex analysis.) These theorems and the techniques Uhlenbeck introduced to prove them are the analytic foundation underlying the many applications of gauge theory to geometry and topology. The most immediate was Donaldson's work in the 1980's on smooth structures on 4-manifolds through invariants of the anti-self-dual equations, a system of first order partial differential equations closely related to the Yang-Mills equations. Recall that Donaldson proved the existence of topological 4-manifolds which admit no smooth structure and topological 4-manifolds which admit inequivalent smooth structures. These equations have also advanced the theory of stable vector bundles in algebraic geometry. The analysis of various dimensional reductions of the anti-self-dual equations, the monopole and vortex equations, and other closely related equations of gauge theory begins with Uhlenbeck's theorems. More recently, these gauge theoretic ideas have yielded new insights in symplectic and contact geometry.

Biographical Note

Karen K. Uhlenbeck spent her early years in New Jersey, after which she attended the University of Michigan. She received her PhD in 1968 under the direction of Richard Palais at Brandeis University. She has held posts at MIT, Berkeley, the University of Illinois in both Champaign-Urbana and Chicago, and the University of Chicago. Since 1988 she has held the Sid W. Richardson Foundation Regents Chair in Mathematics at the University of Texas in Austin.

Karen Uhlenbeck is a Fellow of the National Academy of Sciences and the American Academy of Arts and Sciences. She received a MacArthur Prize Fellowship in 1983, the Commonwealth Award for Science and Technology in 1995, and the Presidential Medal of Science in 2000. Uhlenbeck is a co-founder of the IAS/Park City Mathematics Institute and the program for Women and Mathematics in Princeton.

Response from Karen Uhlenbeck

I thank the American Mathematical Society, its members, and the Steele Prize Committee for the honor and the award of the Steele Prize.

This honor confirms what I have been suspecting for quite some time. I am becoming an old mathematician, if I am not already there. It gives me cause to look back at my research and teaching. All in all, I have found great delight and pleasure in the pursuit of mathematics. Along the way I have made great friends and worked with a number of creative and interesting people. I have been saved from boredom, dourness and self-absorption. One cannot ask for more.

My mathematical career has intersected some exciting mathematical changes. My thesis, written under Richard Palais, was written in the thick of the days of "Global Analysis", a period in which the tools and methods of differential topology were applied to analysis problems. This fell into disfavor, but it must be admitted that these ideas are today taken as a matter of course as part of the subject of analysis. During my days as an analyst, I wrote a paper on the regularity of elliptic systems, which I still think is the hardest paper I ever wrote.

The next revolution was single-handedly sponsored and spearheaded by S.-T. Yau, who introduced techniques of analysis into the problems of topology, differential geometry and algebraic geometry. Mind you, S.-T. Yau was quite something in his younger days! I am quite proud of the paper I wrote with Jonathan Sachs on minimal spheres. Next we come to the introduction of gauge theory into topology, where I did the work which is cited in the award. I had started work on the analysis of gauge theory after hearing a lecture by Michael Atiyah on gauge theory at the University of Chicago and was fully prepared to understand the thesis of his student Simon Donaldson, which used the two papers cited in this award. The work of Donaldson and Cliff Taubes, whom I met when he was still a graduate student, was the start of a new era in four-manifold topology. Finally, due to what was now an addiction to intellectual excitement, I tried to follow the influence of physics on geometry which is associated with the name of Ed Witten. My work in integrable systems grew out of this connection with physics. This part of my career was not entirely successful. The more physics I learned, the less algebraic geometry I seemed to know.

Given that I started my academic career in the late sixties at the University of California, Berkeley, during the Vietnam War, where protests and tear gas were commonplace, it must be said that I rarely found mathematics and the academic life boring.

The accomplishments of which I am most proud are not exactly mathematical theorems. One does mathematics because one has to, and if it is appreciated, all the better! However, encouraged by my young and enthusiastic colleague Dan Freed, I became involved in educational issues. We were among the founders of the IAS/Park City Mathematics Institute. The original intent was to bring mathematics researchers, students and high school teachers together. This is now an ongoing institution with a yearly summer school overseen by the Institute for Advanced Study at Princeton. The Women and Mathematics Program at IAS is an outgrowth of the Park City Institute. Founded by my collaborator Chuu-Lian Terng and I, the original purpose was to encourage and prepare more women to take part in the Park City Summer School. It has now grown to a self-sufficient two-week yearly program sponsored by IAS. I watch with real delight the emergence of our graduates into prominence in the mathematics community.

Another outcome of this involvement with education is our Saturday Morning Math Group at the University of Texas. We started this in conjunction with the beginnings of Park City. It is now an ongoing program which our graduate students organize for local high school students. It is often cited and much boasted of by our university. Finally, I would like to boast further of my department at the University of Texas. During the years that I have held an endowed chair in this department, we have become one of the leading departments of mathematics, admittedly below the top ranked, but still quite respectable. Certainly this is due mostly to my colleagues, but I take a little credit. Our primary benefactor is also due some praise. We used to "thank Peter" after a particularly enjoyable colloquium talk and dinner, and I do again now.

Starting from my days in Berkeley, the issue of women has never been far from my thoughts. I have undergone wide swings of feeling and opinion on the matter. I remain quite disappointed at the number of women doing mathematics and in leadership positions. This is, to my mind, primarily due to the culture of the mathematical community as well as harsh societal pressures from outside. Changing the culture is a momentous task in comparison to the other minor accomplishments I have mentioned.

I want to end by thanking my thesis advisor, Richard Palais; my two present collaborators, Chuu-Lian Terng and Andrea Nahmod; my longtime friend and supporter, S.-T. Yau; my colleagues, particularly Dan Freed and Lorenzo Sadun; as well as all my collaborators, PhD students and assistants. My husband, Bob Williams, is due a share in this award.

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. The following citation describes the award for Lifetime Achievement.

Citation

Henry McKean

McKean launched his rich and magnificent mathematical career as an analytically oriented probabilist. After completing his thesis, which is motivated by, but makes essentially no explicit use of, probability theory, he began his collaboration with K. Itô. Together, he and Itô transformed Feller's analytic theory of one dimensional diffusions into probability theory, a heroic effort that is recorded in their famous treatise "Diffusion Processes and Their Sample Paths." After several years during which he delved into a variety of topics with probabilistic origins, spanning both Gaussian and Markov processes and including the first mathematically sound treatment of "American options," I. M. Singer deflected McKean's attention from probability and persuaded him to turn his powerful computational skills on a problem coming from Riemannian geometry. The resulting paper remains a milestone in the development of index theory.

After moving to the Courant Institute, McKean played a central role in the creation of the analytic ideas which underpin our understanding of the KdV and related non-linear evolution equations, and here again his computational prowess came to the fore. In recent years, McKean has returned to his probabilistic past, studying measures in pathspace, which are the "Gibbs" state for various, non-linear evolutions.

McKean has had profound influence on his own and succeeding generations of mathematicians. In addition to his papers and his book with Itô, he has authored several books that are simultaneously erudite and gems of mathematical exposition. Of particular importance is the little monograph in which he introduced Itô's theory of stochastic integration to a wide audience. As his long list of students attests, he has also had enormous impact on the careers of people who have been fortunate enough to study under his direction.

Biographical Note

Henry McKean was born in Wenham, MA, in 1930. He graduated from Dartmouth College (AB, 1952), spent a year at Cambridge (1952–53), then to Princeton (PhD, 1955). He worked at MIT (1958–66), at Rockefeller University

(1966–70), and since then at the Courant Institute, of which he was director 1988–92. In the year 1979–80 he was George Eastman Professor at Balliol College, Oxford. He is a member of the American Academy of Arts and Sciences and of the National Academy of Sciences, and Doctor Honoris Causa, University of Paris, 2002.

Introduced to probability by M. Kac (summer school, MIT, 1949), he continued in this subject for some 25 years with W. Feller (1953–56) and in a long collaboration with K. Itô (1952–65), including a visit to Kyoto (1957–58). In 1974 his interests shifted to Hamiltonian mechanics, in particular, to the application of infinite-genus projective curves to KdV, reported to the ICM, Helsinki, 1978, parallel to S. P. Novikoff's report on the same topic. Now he alternates between "KdV and all that" and his old affection for Brownian motion.

Response from Henry McKean

I have been lucky in my mathematical life. Now comes this new piece of luck, the Steele Prize, something I never imagined I might receive and am very grateful for. In school I really disliked mathematics, with its tiresome triangles and its unintelligible x, until I began to learn calculus from the amiable Dr. Conwell. Then I saw that you could do something with it and that was exciting. Besides, I was better at it than the other kids and I liked that *very* much. Coming to Dartmouth (not so much to learn anything particular, but to ski), I knew I liked mathematics pretty well but decided on it only little by little, thinking I might be an oceanographer. (A skiing accident helped concentrate my mind.) There I started to read P. Levy on Brownian motion, the first love of my mathematical life, and I worked on that and related things with Kac, Feller, Itô, and Levinson, who taught me so much, and not just in mathematics. This went on from 1949 to 1972 or so, when I began to look for something else to do.

One morning in 1974, Pierre van Moerbeke came and told me that KdV could be solved by an elliptic function, and being an amateur of these, I sat up, took notice, and made a 90-degree turn into Hamiltonian mechanics and the (to me) very surprising use of infinite-genus projective curves for solving mechanical problems with an infinite number of commuting constants of motion. This led to delightful collaborations with van Moerbeke, Trubowitz, Moser and Airault, Ercolani, and others, building on Peter Lax's deep understanding of the question and paralleling the work of S. P. Novikoff and his school. At the beginning we knew nothing of algebraic geometry. I remember a private seminar with Sarnak, Trubowitz, Varadhan, and others: how we would get the giggles at how little we understood—except for Sarnak, who was way ahead. Anyhow, a beautiful picture slowly emerged, though it is still a mystery to me what projective curves have to do with all those constants of motion. I mean, why is complex structure hidden there? I suppose it must come from the fact that the "n choose 2" system of vanishing brackets for n constants of motion is vastly overdetermined. But that is just one of the queer things about "KdV and all that".

Well then, I have been lucky in my teachers, in my collaborations, and in my students. A few of those last are named above. The others know who they are. My thanks to them all: to those still present and to those present only to memory, of whom I count myself merely the representative in the receipt of this generous prize.

Summary of Awards

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Levi L. Conant Prize: Jeffrey Weeks

E. H. Moore Research Article Prize: Ivan Shestakov and Ualbai Umirbaev

David P. Robbins Prize: Thomas C. Hales and Samuel P. Ferguson

Ruth Lyttle Satter Prize in Mathematics: Claire Voisin

Leroy P. Steele Prize for Lifetime Achievement: Henry McKean

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Leroy P. Steele Prize for Seminal Contribution to Research: Karen Uhlenbeck

Oswald Veblen Prize in Geometry: Peter Ozsváth and Zoltán Szabó; Peter Kronheimer and Tomasz Mrowka

For AMS-SIAM

Norbert Wiener Prize in Applied Mathematics: Craig Tracy and Harold Widom

For AMS-MAA-SIAM

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

For AWM

Louise Hay Award for Contributions to Mathematics Education: Virginia McShane Warfield

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

For JPBM

Communications Award: Steven H. Strogatz

For MAA

Beckenbach Book Prize: William P. Berlinghoff and Fernando Q. Gouvêa

Certificates of Meritorious Service: Marilyn Repsher, Sister Jo Ann Fellin, Jerrold W. Grossman, Donna Beers, Janet Heine Barnett, and Stuart Anderson

Chauvenet Prize: Andrew J. Simoson

Euler Book Prize: John Derbyshire

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

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics: Jennifer Quinn, Michael Starbird, and Gilbert Strang

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

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