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

John B. Garnett

An important development in harmonic analysis was the discovery, by C. Fefferman and E. Stein, in the early seventies, that the space of functions of bounded mean oscillation (BMO) can be realized as the limit of the Hardy spaces H^p as p tends to infinity. A crucial link in their proof is the use of "Carleson measure"—a quadratic norm condition introduced by Carleson in his famous proof of the "Corona" problem in complex analysis. In his book *Bounded analytic functions* (Pure and Applied Mathematics, 96, Academic Press, Inc. [Harcourt Brace Jovanovich, Publishers], New York-London, 1981, xvi + 467 pp.), Garnett brings together these far-reaching ideas by adopting the techniques of singular integrals of the Calderón-Zygmund school and combining them with techniques in complex analysis. The book, which covers a wide range of beautiful topics in analysis, is extremely well organized and well written, with elegant, detailed proofs.

The book has educated a whole generation of mathematicians with backgrounds in complex analysis and function algebras. It has had a great impact on the early careers of many leading analysts and has been widely adopted as a textbook for graduate courses and learning seminars in both the U.S. and abroad.

Biographical Note

John B. Garnett was born in Seattle in 1940. He received a B.A. degree from the University of Notre Dame in 1962 and a Ph.D. degree in Mathematics from the University of Washington in 1966. His thesis advisor at Washington was Irving Glicksberg.

In 1968, following a two-year appointment as C.L.E. Moore Instructor at MIT, Garnett became Assistant Professor at UCLA, where he has worked ever since. At UCLA, Garnett was promoted to tenure in 1970 and to Professor in 1974. In 1989, he received the UCLA Distinguished Teaching Award primarily for his work with Ph.D. students, and from 1995 to 1997 he served as Department Chairman.

Garnett's research focuses on complex analysis and harmonic analysis. He has held visiting positions at Institut Mittag-Leffler, University of Paris-Sud, ETH Zurich, Yale, IHES, and CRM Barcelona. He gave invited lectures to the AMS in 1979 and to the ICM in 1986.

Response from Professor Garnett

I am honored to receive the Steele Prize for the book *Bounded Analytic Functions*. It is especially satisfying because the Prize had previously been awarded for some of the classic books in analysis, by L. Ahlfors, Y. Katznelson, W. Rudin, and E. M. Stein, from which I first learned much mathematics and to which I still return frequently.

I wrote *Bounded Analytic Functions* around 1980 to explain an intricate subject that was rapidly growing in surprising ways, to teach students techniques in their simplest cases, and to argue that the subject, which had become an offshoot of abstract mathematics, was better understood using the concrete methods of harmonic analysis and geometric function theory. I want to thank several mathematicians: L. Carleson, C. Fefferman, K. Hoffman, and D. Sarason, whose ideas prompted the development of the subject, and S.-Y. A. Chang, P. Jones, D. Marshall, and the late T. Wolff, whose exciting new results at the time were some of the book's highlights.

Encouragement is critical to the younger mathematician, and from that time I owe much to my mentors I. Glicksberg, K. Hoffman, and L. Carleson, and to my contemporaries T. W. Gamelin, P. Koosis, and N. Varopoulos. I also want to thank the young mathematicians who over the years have told me that they learned from the book.

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.

Citation

Judith Victor Grabiner

Professor Grabiner enjoys an international reputation as a scholar of the history of mathematics. Her teaching career spans 35 years, with most of that at California State University, Dominguez Hills and (since 1985) Pitzer College.

She is universally praised for the depth and range of her knowledge of mathematical history and is famous for giving talks that are knowledgeable, witty, charming, beautifully organized and hold the interest of both the trained mathematician and the "I hate math" undergraduate. She is a sought-after speaker, and has given invited addresses at four national MAA meetings, the 1986 ICM, the ICE, the AAAS, and several national and international societies for the History and Philosophy of Mathematics.

At Pitzer, in addition to teaching calculus and other "standard" courses to rave reviews, she has designed two unique courses for non-mathematicians. Using original sources, one of these teaches Euclidean geometry and elementary probability and statistics, the two types of mathematics that she claims have most influenced Western thought. Another, "Mathematics in Many Cultures," studies combinatorics and probability in different cultural settings. She has inspired a large number of college students to be aware of mathematics in a new way, and has performed a signal service by making the subject accessible to the population at large through popular lectures such as "Algebra as a Multicultural Artifact" and "Just the Facts: Fighting Back Against the Misuse of Statistics."

Her publications have been singularly honored. She has won three Carl B. Allendoerfer and two Lester R. Ford Awards for her articles in *Mathematics Magazine* and the *American Mathematical Monthly*. "Who Gave You the Epsilon?," the most translated and reprinted of these, was a spin-off from her well-received book, *The Origins of Cauchy's Rigorous Calculus.*

For her extraordinary scholarship in the history of mathematics, her remarkable teaching, and her compelling exposition to every audience, it is a great pleasure to award Judith Victor Grabiner the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Judith Victor Grabiner, the Flora Sanborn Pitzer Professor of Mathematics at Pitzer College in Claremont, California, received her B. S. in Mathematics from the University of Chicago, and her M. A. and Ph. D. in the History of Science from Harvard University. Author of books on Lagrange and on Cauchy and their rigorization of the calculus, she has won MAA prizes for several articles, including "Who Gave You the Epsilon?" and "The Centrality of Mathematics in the History of Western Thought." She taught for fourteen years at California State University, Dominguez Hills, before coming to Pitzer. She continues her research, currently on Colin Maclaurin and his place in eighteenth-century Scottish society, and finds that it enhances her teaching to study mathematics in its social context.

Response from Professor Grabiner

I thank the students in my classes at Pitzer College, especially those from "Mathematics in Many Cultures" and from "Mathematics, Philosophy, and the 'Real World'", for the inspiration and ideas they have provided me. They've sustained my faith that everybody can understand and appreciate mathematics and its infinite uses, and the honor belongs to them. I also thank Professor Emerita Barbara Beechler, my colleague Jim Hoste, and the Pitzer family for their support over so many years—and, of course, the MAA for its journals, its meetings, and its many services to mathematics, mathematicians, and teachers of mathematics.

Citation

Paul Zeitz

Paul Zeitz's passion for problem solving permeates his teaching. "Charismatic" is the best descriptor of his teaching style. A teacher at the University of San Francisco since completing his Ph.D. at U.C. Berkeley in 1992, he has been teaching and participating in mathematical contests since he was captain of the Math Team at Stuyvestant High School. In 1974 he took first place in the USAMO and was a member of the first US team to compete in the IMO.

Although he did not major in mathematics at Harvard, Zeitz taught high school mathematics for six years after graduation. This experience, as well as his talent and enthusiasm for mathematical competitions, led him to be recruited to write problems for the Committee on the American Mathematics Competitions. Since 1985, he has composed and edited problems for the AHSME, AIME, and USAMO; he served on the Problems Committee for the 2001 International Math Olympiad. Recently he was appointed assistant editor of the problems column for *Mathematics Magazine.*

The Bay Area is rich in mathematical competition activities, many founded by Zeitz: The Bay Area Math Competition Friends, The Bay Area Math Meet, The Bay Area Mathematical Olympiad. He teaches classes on Sunday afternoons in the Berkeley Math Circle, has coached Bay Area teams for national contests, and initiated summer workshops for high school teachers on how to maintain math clubs and teach problem solving. His book *The Art and Craft of Problem Solving* not only discusses interesting problems and their solutions, but gives guidance for students who need to learn the tricks of problem solving and who want to develop systematically their own natural talents.

Professor Zeitz's role as coach for mathematics competitions continues in the classroom as he encourages group learning and gives challenging communal take-home exams. His humor and intensity keep class participation high, and his patience and skill in communicating at every level encourage students of all abilities.

In recognition of Paul Zeitz's enthusiastic classroom teaching and his fostering of problem solving in many venues, we are delighted to honor him with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Paul Zeitz received a Ph.D. in 1992 at the University of California, Berkeley. He has been at the University of San Francisco since then, and is now associate professor and chair of the mathematics department. Before graduate school, he taught high school mathematics in San Francisco and Colorado. He also had flings with history (his undergraduate major), journalism, and geology before finally settling down with mathematics.

His wife, Cathy Petrick, is a park ranger, and he has had the good fortune to spend many summers and several winters in Yellowstone National Park. Paul and Cathy have two children, who, like their parents, love the outdoors.

Response from Professor Zeitz

I am deeply honored to receive this award, and truly humbled by the peers that the selection committee has placed me with. I would like to thank all of my students, and the institutions that have supported my work, particularly the University of San Francisco, the MAA, and MSRI. I would also like to thank the two people who have helped me the most in my career: Deborah Hughes Hallett and Tristan Needham. Deb gave me my first teaching job, wrote my first letter of recommendation, and thereafter, never failed to be in the right place at the right time for me. Tristan, my friend, mentor, colleague, and dean, has always supported and encouraged me, and has taught me much about the real meaning of mathematics.

Citation

Ranjan Roy

The Beloit College student who wrote "Ranjan is God!" in large letters across her course evaluation form was indulging in hyperbole, but the sentiment reflects the enthusiasm and enormous respect students have for Ranjan Roy.

Professor Roy teaches mathematics as a body of ideas of great depth and beauty, and as a way of thinking which can improve the lives of all who study it. He has read systematically the original works of Newton, Euler, Gauss, Jacobi, and Ramanujan, and uses his deep familiarity with their creative methods to show students that mathematics can be lived. He has an uncanny ability to find ways to connect mathematics to individual students' lives. He teaches, using mathematics as his example, that the key to successful thinking in any discipline is to master a few important ideas deeply and reason from those ideas to solve new problems. "Ranjan is the kind of teacher who changes your life," say many students. Professor Roy was Beloit College's Teacher of the Year in 1986 and again in 2000.

Professor Roy is also a creative mathematician and a nationally-known expositor of mathematics. His *American Mathematical Monthly* article "Binomial identities and hypergeometric series" taught the larger mathematical community how experts use hypergeometric series to prove binomial identities. "The discovery of the series for pi by Leibniz, Gregory and Nilakantha" in *Mathematics Magazine* won the Carl B. Allendoerfer Prize for mathematical exposition. His recent book, *Special Functions*, is enriched by a deep sense of history and hundreds of challenging problems.

For his extraordinary devotion to students, his success in making mathematical ideas and thought come alive for them, and his exceptional exposition for the wider mathematical community, it is most fitting to honor Ranjan Roy with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Ranjan Roy received his B.S. (1967) and M.S. (1969) from the Indian Institute of Technology and Ph.D. (1973) from SUNY Stony Brook. He taught at Punjab University, India and SUNY at Plattsburgh before coming to Beloit in 1982. His research interests include differential equations in the complex domain, history of mathematics, Fuchsian groups, and fluid mechanics. In collaboration with George Andrews and Richard Askey, he wrote *Special Functions,* published by Cambridge University Press. He is currently writing a book on the history of mathematics.

Response from Professor Roy

I am very honored to receive the Haimo Award and to have been nominated by a colleague whom I greatly respect, Phil Straffin. A large number of people have played a role in my development as a teacher, including my parents, family, colleagues, and students. I thank them all and I thank the MAA. I feel I am still learning to teach and I take this award as encouragement to continue to teach and study mathematics.

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

Nicholas Katz and Peter Sarnak

The Levi L. Conant Award in 2003 is granted to Nicholas Katz and Peter Sarnak for their expository paper "Zeroes of zeta functions and symmetry," *Bulletin of the AMS* **36** 1–26 (1999). "Zeroes of zeta functions and symmetry" is a model of high-level exposition. Katz and Sarnak do justice to their beautiful topic, a rich mix of intensive numerical exploration, conjectures, and theorems. The theorems take us deep into Weil-Deligne territory, but the authors manage, with well-chosen, concrete examples, to keep the general mathematical reader on the trail. In this paper, obviously a labor of love, the authors' enthusiasm and wonderment are inescapable and contagious.

Biographical Note

Nicholas Katz

Nicholas M. Katz was born in Baltimore, Maryland in 1943. He received his B.A. from Johns Hopkins University in 1964 and his Ph.D. from Princeton University in 1966, under the direction of Bernard Dwork, who had a profound influence on his entire mathematical life. He has been at Princeton University ever since. In 1968-69, he was awarded a NATO Postdoctoral Fellowship, which allowed him to spend his first year at I.H.E.S. There he came under the enduring spell of Pierre Deligne and Alexander Grothendieck. He returned to I.H.E.S. incessantly over the years to come. On later visits, he was able to learn from Ofer Gabber, the fourth of his mathematical heroes. He has held Sloan and Guggenheim Fellowships, been a Japan Society for the Promotion of Science Fellow, and several times has had the privilege of being a Visiting Professor at Orsay, and an Ordway Visiting Professor at the University of Minnesota.

Biographical Note

Peter Sarnak

Peter Sarnak was born on December 18, 1953, in Johannesburg, South Africa. He received his Ph.D. from Stanford University (1980).

Sarnak began his academic career at the Courant Institute of Mathematical Sciences, advancing from assistant professor (1980–1983) to associate professor (1983). He moved to Stanford University as a professor of mathematics

(1987–1991). Since 1991 he has been a professor of mathematics at Princeton University. At Princeton he has also served as the H. Fine Professor (1995–1996) and as department chair (1996–1999). He was a professor at the Courant Institute (2001–2002).

Sarnak was a Sloan Fellow (1983–1985) and a Presidential Young Investigator (1985–1990). He was a fellow at Hebrew University's Institute of Advanced Studies (1987–1988), the Sherman Fairchild Distinguished Scholar at the California Institute of Technology (1989), and a member at the Institute for Advanced Study (1999–2002).

He has published extensively in his areas of research interest, which include number theory and cusp forms.

Response from Professors Katz and Sarnak

It is a both a great honor and a great pleasure for us to receive the Levi L. Conant Award in 2003 for our article "Zeroes of zeta functions and symmetry". We are very pleased to be complimented on our exposition. We are also particularly gratified that our article and the ideas put forth in it have stimulated some very interesting work by others. Some of this work provides partial evidence for our conjectures, which we find reassuring. Even more exciting to us is that much of this work, both analytical and numerical, goes way beyond what we had envisioned, and establishes the use of random matrix models as a powerful predictor of what should be true in some very classical questions concerning Dirichlet L-functions and the Riemann zeta function.

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 annual 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 Emerita from Wellesley College), who has contributed a great deal to women in mathematics throughout her career. The criteria for selection includes, but is 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 Thirteenth Annual Alice T. Schafer Prize to **Kate Gruher**, University of Chicago.

Additionally, five outstanding young women, all senior mathematics majors, were recognized at the conclusion of the AWM Panel on Wednesday, January 15, 2003. AWM was pleased to recognize **Wei Ho**, Harvard University and **Josephine T. Yu**, University of California, Davis who were selected as **runners-up** in the Schafer Prize competition. AWM was further pleased to recognize three outstanding women who received **honorable mention** in the Schafer Prize competition: **Elizabeth E. Thoren**, University of Alabama in Huntsville; **Annalee H. Wiswell**, Scripps College; and **Kathryn M. Zuhr**, Mount Holyoke College. Citations on the Runners-up and Honorable Mention recipients are available from the AWM.

Citation
Kate Gruher

Kate Gruher is a senior at the University of Chicago. She excelled in the Honors Calculus, Honors Algebra, and Honors Analysis sequences. During the summer after her sophomore year, she participated in the ergodic theory group of the SMALL REU at Williams College.

A paper she co-authored on power weak mixing will appear in the *New York Journal of Mathematics*, for which her "work was crucial" and for which she "provided many of the new ideas." In the summer of 2002, she participated in the highly exclusive Director's Summer Program at the National Security Agency (NSA), at which she contributed "the constructions of families of new examples" which "may improve the efficiency of an algorithm important to NSA." In addition to her classes and research, Kate has graded and run problem sessions for calculus, assisted with New Student Orientation, and worked as a counselor with the University of Chicago's middle-school Young Scholars Program.

Her nominators say that "Kate has a very special talent for mathematical research and for explaining mathematics to others," and that "she is a true scholar … she … has the right aptitude to make a serious long-term contribution to mathematics."

Response from Kate Gruher

I feel greatly honored to receive the AWM's Alice T. Schafer Prize. The AWM provides incredibly important support to women in early stages of their careers as mathematicians and I believe that their vision will help many young women achieve their goals. I feel greatly encouraged in my ambitions by the AWM's support and belief in my abilities. I would like to thank the mathematics department at the University of Chicago for nurturing my love of math, and my classmates and co-researchers for showing me beauty in our work. I would especially like to thank Professor Peter May for nominating me and advising me in many decisions; Professor Paul Sally for his advice and wonderful teaching; and Professor Kevin Corlette for encouraging me to continue studying math at the beginning of my undergraduate career. I would also like to thank Professor Cesar Silva and Dr. Elisabeth Pyle for making my summer research projects interesting and successful. Your support and teachings have helped me realize just how exhilarating math can be.

Chauvenet Prize

The Chauvenet Prize for expository writing, first awarded in 1925 to Gilbert Bliss of the University of Chicago, is given for an outstanding expository article on a mathematical topic by a member of the Association. 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.

Citation

Thomas C. Hales

"Cannonballs and Honeycombs", *Notices of the AMS*, April 2000, vol. 47, no. 4, 440–449.

The classical sphere packing conjecture, also known as the Kepler Conjecture, asserts that the natural cannonball arrangement gives the maximum density packing of the Euclidean 3-dimensional space with congruent solid balls. The problem evaded solution for almost 400 years, until Thomas C. Hales, the author of this article, gave a difficult, computer-aided, yet ingenious proof. Another old problem tackled by Hales and described in the article, the Honeycomb Conjecture, is of equally appealing geometric character: Any partition of the plane into regions of equal area has perimeter at least that of the regular hexagonal honeycomb tiling.

"Cannonballs and Honeycombs" is an extremely worthy recipient of the Chauvenet Prize. It has humor, history, talks about real people, presents significant mathematics, and has handholds throughout the article so you can keep finding good things even if you choose not to follow all the details as you go. The writing is delightful. It connects us to famous scientists of the past and to nature, it talks about the resolution of a centuries-old conjecture, it points out philosophical issues about mathematics and rigor, and it describes intriguing, understandable open questions that have an interesting history, thereby situating us in the flow of history and the challenges of the future.

Biographical Note

Thomas Hales received his Ph.D. in 1986 from Princeton University, where he studied under Robert P. Langlands. He has held research or teaching positions at MSRI, Harvard University, the Institute for Advanced Study, the University of Chicago, and the University of Michigan. His research interests include discrete geometry and the representations of reductive groups. Thomas Hales is currently Andrew Mellon Professor of Mathematics at the University of Pittsburgh.

Response from Professor Hales

It is a great honor to receive the Chauvenet Prize. The paper "Cannonballs and Honeycombs" grew out of a lecture sponsored by the undergraduate math club at the University of Michigan. The club launched an aggressive advertising campaign weeks before the lecture. The campaign promised an event, but I had never delivered anything more than a talk. Rather than face the crowd's scorn, I prepared like never before. I am delighted to be honored in this way for those efforts.

This lecture was significant to me in another way. It was the contemplation of the similarities between cannonballs and honeycombs in preparation for this lecture that opened a line of thought that led to a solution of the Honeycomb Conjecture a few months later.

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

Abigail Thompson

The Ruth Lyttle Satter Prize is awarded to Abigail Thompson for her outstanding work in 3-dimensional topology. As a consequence of her work, the concept of thin position, first introduced by Gabai for the study of knots in the 3-sphere, has emerged as a major tool for attacking some of the fundamental problems in the study of 3-manifolds. Her paper "Thin position and the recognition problem for S^3", *Math. Res. Lett.* **1** (1994), 613–630, used the idea of thin position to reinterpret Rubenstein's solution to the recognition problem of the 3-sphere in a startling way. Her papers with Martin Scharlemann, "Thin position for 3-manifolds", *Geometric Topology* (Haifa, 1992), 231–238, Contemp. Math. 164, Amer. Math. Soc., Providence, RI, 1994, and "Thin position and Heegaard splittings of the 3-sphere", *J. Differential Geom.* **39** (1994), 343–357, provide remarkable applications of thin position to Heegaard splittings of 3-manifolds. Her 1997 paper "Thin position and bridge number for knots in the 3-sphere", *Topology* **36** (1997), 505–507, gives a completely unexpected connection in the case of knots in 3-spheres between thin position and the much more classical notion of bridge position.

Biographical Note

Abigail Thompson was born on June 30, 1958 in Norwalk, Connecticut. She received her B.A. from Wellesley College in 1979 and her Ph.D. from Rutgers University in 1986. She held a Lady Davis Fellowship at Hebrew University (1986–87), a UC President's Postdoctoral Fellowship at UC Berkeley (1987–88), an NSF Postdoctoral Fellowship (1988–91), and a Sloan Foundation Fellowship (1991–93). In 1990–91 and 2000–2001 she was a member of the Institute for Advanced Study. Since 1988 she has been on the faculty at the University of California at Davis. She is the Director of the California State Summer School in Mathematics and Science at UC Davis, a month-long residential program for talented high school students. Her current research concerns structures of 3-dimensional manifolds. She is married and has three children.

Response from Professor Thompson

I am very grateful to the AMS and the Satter Prize committee for awarding me this prize. I have been supported and encouraged throughout my career by many mathematicians, especially Ann Stehney, Bill Menasco and Rob Kirby. I am also deeply indebted to my long-time collaborator, Marty Scharlemann. The Satter prize is particularly meaningful to me because Joan Birman, whose generosity funded the prize, has been a great inspiration to me in my field.

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. Undergraduates are working on problems of current research interest, proving theorems, writing up results for publication, and giving talks on their work. There is undergraduate research today at the highest standards of professional excellence. The prize was endowed by Mrs. Frank Morgan and also carries the name of her late husband.

Citation

Joshua Greene

The winner of the 2002 Morgan Prize for Outstanding Research by an Undergraduate is Joshua Greene for his work in combinatorics. His prize is based on his paper "A new short proof of Kneser's conjecture" which is to appear in the *American Mathematical Monthly*, and his undergraduate senior thesis "Kneser's conjecture and its generalizations".

Discrete mathematics has often been enriched by the interplay of topology and combinatorics. One such example is Lovász's classic 1978 proof of Kneser's conjecture which states that if the k -element subsets of an n-element set are partitioned into $n - 2k + 1$ classes, then one of the classes must contain a pair of disjoint subsets. Greene gave a beautiful new short proof without using Gale's theorem on the distribution of points on a sphere. His proof is a gem that is widely admired and has already been included in a forthcoming book by Matousek. In his senior thesis, Greene addresses further associated combinatorial questions and has already provided two new simplified proofs of Schrijver's theorem on chromatic-critical subgraphs of Kneser graphs. His insight in topological combinatorics bypasses traditional technical difficulties in this area, and experts predict that his method will become the standard approach in this rapidly developing area of mathematics.

The committee was impressed by the depth and quality of Greene's research, and by his command of a large body of topology, geometry, and combinatorics required for his work. The quality of his research papers, the enthusiastic letters from his mentors, and the response to his work from many researchers all confirm the outstanding nature of his research.

The committee is proud to award the 2002 Frank and Brennie Morgan Prize to Joshua Greene.

Biographical Note

Josh Greene was born and raised in the sprawling suburbs of Columbia, Maryland. After early unsuccessful attempts to become an artist and pro hockey player, Josh took up an interest in science and mathematics during high school. Beginning in his junior year, he studied astrophysics under the guidance of Dr. Jay Norris at NASA / Goddard Space Flight Center, and was named a Finalist in the 1998 Westinghouse Science Talent Search for his work there. In the summer of 1998, Josh was a student at the Hampshire College Summer Studies in Mathematics, which sparked his interest in combinatorics, and he returned to teach at the program in 1999 and 2002. He matriculated at Harvey Mudd College in 1998, where he enjoyed a broad education and learning from a dedicated, enthusiastic faculty, graduating with distinction in mathematics in 2002. During college, Josh also participated in the Budapest Semesters in Mathematics, Joseph Gallian's Research Experience for Undergraduates in Duluth, Minnesota, and the Director's Summer Program. Each program uniquely shaped his research experience and current interests, which include discrete mathematics, number theory, and topology. Josh is currently building houses with Habitat for Humanity in Appalachia through the Americorps service program, and he plans to enter the University of Chicago next fall to pursue a doctorate in mathematics. When he is not studying or communicating mathematics, Josh enjoys hockey, Frisbee, nature, and trying to determine the meaning of life.

Response from Joshua Greene

I am deeply honored by this distinction. My sincerest thanks extend to Mrs. Frank Morgan for endowing this prize, and to the AMS, MAA, and SIAM for sponsoring it and awarding it to me this year. I owe this honor to everyone who has contributed to my research experience in college. Amongst these many people, I specifically thank Joseph Gallian for supervising my work at the Duluth REU; to Liz Pyle, for overseeing my work at the Director's Summer Program; to András Gyárfás, whose combinatorics course inspired a substantial portion of my research; to Art Benjamin, Weiqing Gu, and Mike Moody, for their ongoing support; and, moreover, to my advisor Francis Su, for his tireless encouragement and guidance in all matters mathematical and otherwise. Finally, I thank my friends, Kate, and my family for all of their tremendous support.

Joint Policy Board for Mathematics Communications Award

The Joint Policy Board for Mathematics Communications Award was established in 1988 to reward and encourage journalists and other communicators who, on a sustained basis, bring accurate mathematical information to nonmathematical audiences. Any person is eligible as long as that person's work communicates primarily with nonmathematical audiences. The award recognizes a significant contribution or accumulated contributions to public understanding of mathematics. It is a lifetime award.

Citation

Robert Osserman

The 2003 JPBM Communications Award is given to Robert Osserman, Professor Emeritus at Stanford University and Special Projects Director at the Mathematical Sciences Research Institute in Berkeley.

For many years, Bob Osserman has been an erudite spokesman for mathematics, communicating its charm and excitement to thousands of people from all walks of life.

His slim volume *Poetry of the Universe* has been described as "artful and beguiling," introducing readers to the inherent beauty and power of mathematical thinking. It has appeared in more than ten languages. But he has communicated with the public in a more unconventional style as well, through his open conversations and dialogues with playwrights and writers from Tom Stoppard to Steve Martin. These informal and relaxed interviews give mathematical and lay audiences alike an understanding of mathematics through its connections to media and literature. The interviews make mathematics part of our modern culture.

Bob Osserman believes in making mathematics accessible to the general public. He has done more than explain mathematics, however. He has made "mathematics appreciation" more than the title of a course—Bob Osserman has changed people's attitudes towards the subject.

Biographical Note

Robert Osserman was born and grew up in New York City. He attended the Bronx High School of Science and New York University before being drafted into the Army. He then received his M.A. and Ph.D. from Harvard, with breaks to study in Zurich and Paris.

His research work has all had a geometric slant, starting with geometric function theory and Riemann surfaces, then to differential geometry, the complex variable and PDE approaches to minimal surfaces, isoperimetric inequalities, and a brief foray into ergodic theory. He has had a broad array of co-authors in this work, including former students Blaine Lawson, Robert Gulliver, and David Hoffman, as well as Henry Landau, S.-S. Chern, Halsey Royden, Max Schiffer, Robert Finn, Richard Schoen, Peter Sarnak, and Min Ru.

He taught at Stanford University from 1955 to 1994, with years off as a visitor to Harvard University, a Fulbright Lecturer at Paris, a Guggenheim Fellow at the University of Warwick, the Head of the Mathematics Branch of the Office of Naval Research, and a visiting member of the Courant Institute. At Stanford, he received the Dean's Award for Teaching and the Mellon Professorship for Interdisciplinary Studies. He also received the Lester R. Ford Award from the MAA for excellence in expository writing. Since 1990 he has been associated with the Mathematical Sciences Research Institute, first as deputy director, and then as special projects director.

Response from Professor Osserman

My main concerns throughout most of my career were teaching and research, and along with the usual related duties of academic life, these pretty well filled up the available time. However, the urge to expose a broader public to some of the most beautiful and interesting parts of mathematics was clearly always there. Already as a graduate student I succeeded in attracting an audience of some 300 to a talk on Gödel's undecidability theorem by pairing it with a performance by fellow student Tom Lehrer.

Over the years, I made occasional forays in a similar direction, talking to high school students, alumni groups, and others. A course on mathematics, science and technology designed for a non-technical (and even technophobic) audience led to my writing a book on geometry and cosmology in which I tried to offer something of interest to everyone, from those with no mathematical background all the way to the professional mathematician. One of my main goals was to make the presentation not only accessible, but also accurate, since I had found so much misinformation in many "popular" presentations of science and mathematics.

After retiring from teaching in 1994 and trading in my position as deputy director of MSRI for that of special projects director in 1995, I finally had the freedom to think more deeply about how to reach those parts of the general public who would normally stay far away from anything billed as "mathematics."

The time and place could not have been more propitious. Bill Thurston, who was MSRI director at the time, and David Eisenbud, who took over in 1997, were both fully supportive of this goal, as have been the relevant MSRI governing bodies. I owe them all great thanks, as I do the many staff members at MSRI during these years, who brought enormous talent and energy to our public events.

I further owe a debt to the mysterious Zeitgeist that just at this time was turning the interest of the general public toward mathematics through a series of books, plays, and movies. They provided the perfect vehicle to attract an audience whose main interest may have been in theater, film, or literature.

Most of all I am grateful to those authors who wrote the books, plays, and screenplays, then agreed to participate in our public events and engage in a broad-ranging dialog, including the mathematical angles about which they often felt not very sure: Tom Stoppard (ARCADIA), David Auburn (PROOF), Michael Frayn (COPENHAGEN), Sylvia Nasar (A BEAUTIFUL MIND), and Steve Martin (THE PLEASURE OF MY COMPANY) in particular.

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, limited this year to the field of logic.

Citation

Michael Morley

Michael Morley's paper "Categoricity in Power" (*Transactions of the AMS* **114** (1965) 514–538) set in motion an extensive development of pure model theory by proving the first deep theorem in this subject and introducing in the process completely new tools to analyze theories (sets of firstorder axioms) and their models.

When does a theory have (up to isomorphism) a unique model? An early result in mathematical logic is that, for basic cardinality reasons, a theory never has a unique infinite model. The next question is: when does a theory have exactly one model of some specified infinite cardinality? An important example is the theory of algebraically closed fields of any given characteristic, which has a unique model in EVERY uncountable cardinality. Answering a question of Łoś, Morley proved that a countable theory which is categorical (has a unique model) in one uncountable cardinality, is categorical in every uncountable cardinality.

Morley used most of the then-existing model theory, but what makes his paper seminal are its new techniques, which involve a systematic study of Stone spaces of Boolean algebras of definable sets, called type spaces. For the theories under consideration, these type spaces admit a Cantor-Bendixson analysis, yielding the key notions of Morley rank and ω-stability. This property of ω-stability of a theory was the first of many to follow that are of intrinsic nature, that is, invariant under biinterpretability.

Morley's work set the stage for studying the difficult problem of the possible isomorphism types of models of a given theory. This was pursued with great success by Shelah who vastly generalized Morley's methods. Also, the recognition grew that categoricity properties and notions like Morley rank and ω-stability, are intimately tied to underlying combinatorial geometries (Baldwin-Lachlan, Zil'ber). In combination with the fact that an infinite field with uncountably categorical theory has to be algebraically closed (Macintyre), this led to the geometric orientation of current model theory. In the last ten years, the development started by Morley enabled remarkable applications by Hrushovski and others to questions of diophantine character, with impact on areas such as differential and difference algebra.

Biographical Note

Michael Morley was born in Youngstown, Ohio in 1930. In 1951 he received a B.S. degree in Mathematics from Case Institute of Technology and began graduate work at the University of Chicago. There was a five-and-one-half year hiatus (1955–61) in his graduate education, during which he worked as a mathematician at The Laboratories for Applied Sciences of the University of Chicago. After returning to graduate school he received his Ph.D. from the University of Chicago in 1962, though the last year of his graduate work was done at the University of California at Berkeley.

He was an Instructor for one year at Berkeley, an Assistant Professor for three years at the University of Wisconsin, and joined the Cornell faculty in 1966. He was Associate Chairman and Director of Undergraduate Studies for the Mathematics Department at Cornell from 1984–95. He achieved emeritus status at the end of 2002.

He served as President of the Association for Symbolic Logic from 1986–89.

Response from Professor Morley

I am grateful for this award. By definition, a paper is judged *seminal* because of work that follows it. Therefore I am aware that I am being honored in large part for the work of other people.

This paper was written just over forty years ago. At that time most mathematicians considered mathematical logic as philosophically very interesting but mathematically not very deep. (After all, some of the work was done by Professors of Philosophy.) There was some justification for this attitude. However, in the early 60's, several papers appeared that obtained spectacular results by applying non-trivial mathematics to logic. This attracted many of the best young mathematicians to mathematical logic. Today there is a large body of mathematically deep and lovely work in logic. One worries that we may have lost some of the philosophical significance.

The paper was my doctoral dissertation written under the supervision of Professor Robert Vaught. Bob Vaught died last Spring. I must express the gratitude that I, and indeed many of his students, felt towards Robert Vaught, not just for his mathematical direction but for his great personal kindness and generosity of spirit. He was a fine mathematician and a truly good man.

Citation
Ronald Jensen

Ronald Jensen's paper, "The fine structure of the constructible hierarchy" (*Annals of Mathematical Logic* **4** (1972) 229–308), has been of seminal importance for two different directions of research in contemporary set theory: the inner model program and the use of combinatorial principles of the sort that Jensen established for the constructible universe.

The inner model program, one of the most active parts of set theory nowadays, has as its goals the understanding of very large cardinals and their use to measure the consistency strength of assertions about much smaller sets. A central ingredient of this program is to build, for a given large cardinal axiom, a model of set theory that either is just barely large enough to contain that type of cardinal or is just barely too small to contain it. The fine structure techniques introduced in Jensen's paper are the foundation of the more recent work of Mitchell, Steel, Jensen himself, and others constructing such models. The paradigm, initiated by Jensen, for relating large cardinals to combinatorial properties of smaller sets is first to show that the desired properties hold in these inner models and then to show that, if they failed to hold in the universe of all sets, then that universe and the inner model would differ so strongly that a large cardinal that is barely missing from the inner model would be present in the universe. The paper cited here contains the first steps in this direction, establishing for the first time combinatorial properties of an inner model, in this case Gödel's constructible sets, that go far beyond Gödel's proof of the generalized continuum hypothesis in this model.

The second direction initiated by Jensen's paper involves applying these combinatorial principles to problems arising in other parts of mathematics. The principle $\diamond$, which Jensen proved to hold in the constructible universe, has been particularly useful in such applications. A good example is Shelah's solution of the Whitehead problem in abelian group theory; half of the solution was to show that a positive answer to the problem follows from $\diamond$. By now, $\diamond$ has become part of the standard tool kit of several branches of mathematics, ranging from general topology to module theory.

Biographical Note

Ronald Jensen received his Ph.D. in 1964 from the University of Bonn. He continued his research at Bonn as a scientific assistant (1964–1969).

From 1969 until 1973 Jensen was a professor of mathematics at the University of Oslo. During this period he held concurrent positions at Rockefeller University (1969–1971) and the University of California, Berkeley (1971–1973). At the University of Bonn he was awarded the Humboldt Prize (1974–1975) and served as a professor of mathematics (1976–1978). He was a visiting fellow at Oxford University's Wolfson College (1978–1979), a professor of mathematics at the

University of Freiburg (1979–1981), and a senior research fellow at Oxford University's All Souls College (1981–1994). He moved to Humboldt University of Berlin, where he was a professor of mathematics (1994–2001).

His areas of research interest include set theory.

Response from Professor Jensen

I feel deeply honored that, on the basis of my paper, "The fine structure of the constructible hierarchy", I was chosen to share the Steele Prize for seminal research with Michael Morley. I came to set theory in the wake of Cohen's discovery of the forcing method, together with a group of other young mathematicians such as Bob Solovay, Tony Martin, and Jack Silver, all of whom influenced my work. It was an exciting time. Much of the work centered on independence proofs using Cohen's method, but the research on the consequences of strong existence axioms, such as large cardinals and determinacy, was also beginning. The theory of inner models—in particular Goedel's model L—was comparatively underdeveloped. After discovering that the axiom $V = L$ settles Souslin's problem, I began developing a body of methods, now known as "fine structure theory", for investigating the structure L. Much of this work was done in 1969–71 at the Rockefeller University and the University of Oslo. The above mentioned paper was subsequently written at Berkeley. In the ensuing years it became apparent that these methods were also applicable to larger inner models in which strong existence axioms are realized. The most important breakthrough in this direction was made by John Steel. He and Hugh Woodin have applied the methods widely. This work is being extended by a very capable group of younger mathematicians, such as Itay Neeman, Ernest Schimmerling, and Martin Zeman. I feel privileged to have worked in such gifted company.

Certificates of Meritorious Service

The Certificates of Meritorious Service are 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 roughly six Sections are recognized.

Citation

Larry J. Morley, Illinois Section (ISMMA)

Dr. Larry J. Morley became a member of the Mathematical Association of America in 1965 while a graduate student at the University of Illinois and has been a continuous and active member of the MAA to the present time. In 1988 he was elected to a three-year term on the Board of Directors of the ISMAA as a director representing public universities. He subsequently served on many of the standing committees of ISMAA including the Teacher Education Committee, the Nominating Committee, the Audit Committee, and the Awards Committee. Dr. Morley was elected to the position of Chair of the Illinois Section in 1991.

Dr. Morley was honored by the Illinois Section with the 1997 Section Award for Distinguished Service. He was elected to a three-year term as Governor of the Section in the spring of 1998. Consistent with his special interest in undergraduate students, he was appointed to serve as a member of the National Committee on Student Chapters, which has now become the Committee on Undergraduate Student Activities and Chapters (CUSAC). A main focus of his work as a member of CUSAC was to give attention to issues and concerns of local student chapters. He considers the greatest achievement of the committee during his tenure to be improving the programming for undergraduate students at national MAA meetings with the result that undergraduate student attendance has increased dramatically.

During the last three years, Dr. Morley has organized and helped present sessions on “assessment of student learning in mathematics” and “the future of college algebra” at annual ISMAA meetings. He is currently Chair of an *ad hoc* Committee on College Algebra and is working to initiate new articulation strategies and cooperation between school and colleges in liaison with the Board of Directors of the ISMAA.

Dr. Morley earned B.S. (1962) and M.A. (1964) degrees in mathematics for secondary teacher certification at Northeast Missouri State Teachers College (now Truman State University). He earned the Ph.D. in 1969 with a dissertation in group theory and joined the faculty of Western Illinois University. At the time of his retirement in 1999 he was professor and chair of the Department of Mathematics. Morley has authored or co-authored five research papers published in major refereed journals.

In recognition of his leadership within the MAA and the ISMAA and his outstanding contributions to the community of teachers and learners of mathematics, it is a pleasure to award Dr. Larry J. Morley this Meritorious Service Award of the MAA.

Response from Professor Morley

I wish to thank the MAA, and especially my colleagues and friends from the Illinois Section, for this distinct honor. As I observe and reflect upon the diligent efforts and time commitments of so many dedicated and productive members of the MAA over the past several years, I feel deeply humbled but extremely pleased with this recognition. The personal contacts and resources of the MAA have been a tremendous source of encouragement and help to me both as a faculty member and a department chair. I truly cannot imagine being involved with undergraduate mathematics and not being a part of the Mathematical Association of America.

I want to recognize and thank my wife Ann for the extra family duties she has often been called upon to assume and the moral support and personal interest in my work that has helped to energize my professional pursuits. I would also like to acknowledge and express appreciation for the support I have received from Western Illinois University without which I would not have had the opportunity to be an active participant in the MAA.

Citation
Karin Chess, Kentucky Section

The Kentucky Section of the Mathematical Association of America is pleased to nominate Dr. Karin Chess, Associate Professor at Owensboro Community College, as the recipient of the Certificate of Meritorious Service for 2002.

After earning a Ph.D. in mathematics from the University of Kansas, Karin has held positions at the University of Wisconsin - Eau Claire, the University of Evansville, the University of Southern Indiana, and Owensboro Community College. A dedicated teacher, she has directed independent study courses in Calculus II and III, in addition to her regular 15-credit semester schedule at Owensboro Community College, when those courses did not have high enough enrollment to be offered as a regular class. A former student wrote the following in a recent E-mail message to Karin: “I think you are the best professor and teacher I ever had in my career. I think you had what it took for me to learn. Knowledge, wisdom and most important patience and understanding.”

Karin is a member of several professional organizations, some of which include the American Mathematical Association of Two-Year Colleges, the Kentucky Academy of Science, and the education association Phi Delta Kappa. She is also a member of the National Council of Teachers of Mathematics and was the workshop Support Chairman for the NCTM regional meetings in 1992 and in 2002. For over 25 years, Karin has been a member of the Mathematical Association of America. She is currently the Secretary/Treasurer of the Kentucky Section of the MAA, a position she has held for the past eight years. There are numerous duties that the Secretary/Treasurer must perform, and Karin has handled them well, with efficiency, accuracy, and courtesy. The Kentucky Section appreciates the many hours of hard work that she has contributed before, during, and after the annual meetings of the section and is proud to nominate her for the Certificate of Meritorious Service.

Response from Professor Chess

It requires the contributions of many to bring about the success of a worthwhile project. I have enjoyed working with talented people who recognize the value of the Mathematics Association of America and who are willing to labor to maintain it for the benefit of the mathematics community in Kentucky. It has been a privilege to work with them and a pleasure to get to know them. I am honored to receive the Certificate of Meritorious Service.

Citation

Alvin R. Tinsley, Missouri Section

The Missouri Section of the MAA is pleased to recognize Professor Alvin Tinsley of the Department of Mathematics and Computer Science at Central Missouri State University as its 2002 nominee for the Meritorious Service Award. Dr. Tinsley completed the B.S. in Education at Southwest Missouri State University, M.A. at Louisiana State University, and D.A. at the University of Northern Colorado. Al has compiled an exemplary record of service to the Mathematical Association of America at all levels.

In his department at Central Missouri State University, he co-founded and co-sponsored the MAA Student Chapter (1994–present) and served as the MAA Department Liaison (1991–1994).

Dr. Tinsley served as Section Vice-Chair/Chair/Past-Chair (1993–1996) and served on the Section Meeting Arrangements Committees in 1978, 1985, 1995, and 2000. He participated in the MAA High School Lectureship Program from 1977 to the present. For twenty-four years he served as the Missouri Director of the American High School Mathematics Examination. While Missouri Director, he instituted the Missouri State Governor's Award for the Missouri high school student who achieved the highest score on the examination. Al was a key player in the initiation of the annual Missouri Section 5K Run/Walk (1985) and the Section-sponsored Missouri Collegiate Mathematics Competition (1996). He participates annually in the 5K Run/Walk and assists with the writing and grading of the competition problems. Both of these events continue to be prominent features of the Missouri Section spring meeting.

At the national level, Dr. Tinsley served as the Missouri Section Governor (1997–2000), a member of the MAA Committee on American Mathematics Competitions (1988–1992), and a member of the Advisory Panel of the MAA Committee on American Mathematics Competitions (1990–1997).

For more than a quarter of a century, Al Tinsley has played a major role in shaping the Missouri Section and is most deserving of this Meritorious Service Award recognizing his commitment and leadership.

Response from Professor Tinsley

I am privileged to have been selected as a recipient of the MAA Meritorious Service Award, and I am grateful to my fellow members of the Missouri Section and to my colleagues in the Department of Mathematics and Computer Science at Central for providing the opportunities to be of service.

Citation

Lester H. Lange, Northern California Section

The Northern California Section of the MAA is pleased to recognize Lester H. Lange as the 2002 recipient of the Certificate of Meritorious Service, honoring his many contributions to the Section, to the Association and to the mathematical community at large. After his education at Berkeley, Valparaiso, Stanford, and Notre Dame, he spent essentially his entire academic career at San Jose State University, first as a faculty member from 1960 on, as department head between 1961 and 1970, and as dean of the School of Science between 1970 and 1988. In both of the latter assignments he was widely viewed as enormously successful in forming effective and cohesive academic units. He has received various honors—both Danforth and NSF faculty fellowships—and he is a fellow of the California Academy of Sciences. He is the author of a popular text in linear algebra. At least five of his papers have become parts of anthologies in algebra, geometry, applied mathematics, calculus, and linear algebra.

For the Northern California Section he served as section chair in 1966 and as section governor in 1970–72. He has addressed the Section at least four times and served on various committees, including those on the teaching awards and on the visiting lecturer program. At the national level, in addition to his service on the Board of Governors, he had been active in the publications program, having been a member of the Spectrum Editorial Board, the Anneli Lax New Mathematical Library Editorial Committee and, more recently, the Editorial Board for the Dolciani series. Further, he received from the MAA the Lester R. Ford Award in 1972 and the George Pólya Award in 1993, the latter very appropriate since he had studied with Pólya at Stanford and was a long-time admirer, friend and disciple of that great mathematician and teacher.

Since earning the status of emeritus at San Jose State, he has been active in promoting the Moss Landing Marine Laboratories on Monterey Bay. And he remains an active member of the Section, attending meetings regularly. For the many years of loyal service to the MAA and, in particular, to our Section, we are proud to award the Certificate of Meritorious Service to Dean Lester H. Lange.

Response from Professor Lange

That George Pólya became my teacher in 1948 and then became my close friend for the rest of his long life were supreme blessings I could not have dreamed up. Allow me to salute him here today yet again; he'd be very proud of me and he would make sure to say so—as he did about my teaching and writings. It is wonderful that our Association, too, "says so" to lucky and grateful people like me.

A bit of humor: In 1975, Pólya published a London paper that he dedicated to his friend Littlewood on his 90th birthday. He sent me a reprint on which he had written, "To the best dean south of Seattle. G. Pólya." Of course, that made me feel OK about being a dean, if you can believe it. It does make some of us wonder just who was up there in Seattle!

Thank you. Sincerely.

Citation

Luise-Charlotte Kappe, Seaway Section

The Seaway Section is pleased to nominate Dr. Luise-Charlotte Kappe for the Mathematical Association of America Certificate of Meritorious Service. With this award, we recognize her diverse contributions to the section as officer, committee member and chair, meeting host, and speaker.

Dr. Kappe is a native of Germany, where she studied at the universities at Erlangen and Freiburg. She obtained her Ph.D. under Theodor Schneider in the area of transcendental numbers, and now works in group theory. In 1963, Luise and her husband Wolfgang immigrated to the U.S. They came to SUNY Binghamton in 1969, after five years at Ohio State.

Dr. Kappe served the section from 1994–2000 as First Vice-Chair, Chair-Elect, Chair, and Immediate Past-Chair. She has served on and chaired the Gehman Lecture Committee, has served on the Nominations Committee, and was a founding member of the Seaway NExT Advisory Committee. She helped host two meetings of the section at Binghamton, in 1993 and 2001. In addition, she is a frequent speaker at section meetings and at math clubs throughout the section, and recently gave the post-banquet talk at the section's 2002 spring meeting, "It's a Wonderful Life! Observations on a Career as a Mathematician." On the national level, Dr. Kappe is a member of the MAA's Committee on Graduate Students.

In addition to two sons, Dr. Kappe is very proud to have "raised" a dozen Ph.D. students. Her interest in helping graduate students become successful faculty members led her to apply for and receive an NSF grant in 1999 for the Preparing Future Faculty (PFF) program. It was at about this same time that Luise was instrumental in getting the section's Project NExT program up and running, and indeed for a couple of years the PFF and Seaway NExT participants met together at the section's spring meeting.

For her dedicated service and inspirational leadership, the Seaway Section, with the approval of the Board of Governors, is pleased that the MAA Certificate of Meritorious Service is presented to Dr. Luise-Charlotte Kappe.

Response from Professor Kappe

"As I am sure, you are aware…" was how Martha Siegel's letter started, announcing to me the Meritorious Service Award of the Seaway Section. No, it came as a complete surprise! When I saw the MAA envelope in my mailbox, I first thought it was another one of those letters, extolling the virtues of MAA membership and urging me to join. I feel deeply honored by this award and want to thank the MAA and its Seaway Section for giving me the opportunity to serve. As often in life, I made the right decision to become more active in the MAA for the wrong reason, which was recruiting graduate students. But in the over twenty years since then I realized that there was much more to it. The reasons are too numerous to list them individually, but among them are making friends with colleagues at other institutions and helping young faculty on their way through our Seaway NExT program. The grass roots approach of the MAA on the section level gives so many opportunities to serve. I am looking forward to continue tending to my "favorite grass roots", the graduate students, in helping them to get a successful start in their professional careers.

Citation
Fredric Tufte, Wisconsin Section

As he completes his term as Governor, the Wisconsin Section of the MAA has chosen Fredric Tufte to receive the Section Meritorious Service Award. Rick has been a member of the MAA for 5 decades beginning with his graduate school days at the University of Missouri. In 1966 he became a member of the Wisconsin Section. In addition to governor, he has served the section as chair-elect, chair, and the local site coordinator for section meetings. He was instrumental in establishing one of the first WI Section Project NExT chapters and has been a frequent speaker and session organizer at section meetings. He presently serves on the MAA Minicourse Committee.

Rick continually works on articulation efforts between high school and college and university mathematics teachers. He is particularly interested in issues concerning the transitions that students make. Rick is a member of the Board of Directors of the Wisconsin Mathematics Council, an affiliate of the NCTM, and has been appointed as a member of the UW System-Department of Public Instruction Committee on Articulation.

Rick has just finished his second term as chair of the Mathematics Department at UW-Platteville. He is most proud that the nine most recent hires into the department have participated in Project NExT at either the national or state level.

Response from Professor Tufte

My service to the MAA has been insignificant when compared to the wealth of support the MAA has provided me. The support provided by the MAA, with its quality publications and lively meetings has been a continual source of enlightenment, encouragement, and renewal. To be a member of my profession and of this organization has always brought me much joy and challenge and has always given me much satisfaction. I am extremely appreciative of this award, and of the recognition by the Wisconsin Section and the Board of Governors. I am also deeply humbled. The Wisconsin Section has so many outstanding members who are just as deserving of this award. Throughout the years these colleagues have served as my mentors, and I thank them.

American Mathematical Society

Society for Industrial and Applied Mathematics

The George David Birkhoff Prize in Applied Mathematics

This prize is awarded for an outstanding contribution to “applied mathematics in the highest and broadest sense”. From 1968–1998, the prize was normally awarded every five years. Beginning in 2003, the prize will be awarded every three years. The award is made jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics.

Citation
Charles Samuel Peskin

Charles Samuel Peskin has devoted much of his career to understanding the dynamics of the human heart. Blurring disciplinary boundaries, he has brought an extraordinarily broad range of expertise to bear on this problem: mathematical modeling, differential equations, numerical analysis, high performance computing, fluid dynamics, physiology, neuroscience, physics, and engineering. His primary tool for understanding the heart is computer simulation. In work spanning more than two decades, much of it with David McQueen, Peskin has developed a computer model that simulates blood circulation through the four chambers of the heart and in and out of the surrounding circulatory system along with the deformation of the cardiac muscle and the valves. This virtual heart enables experimentation in silico that would be impossible in vivo, and is of tremendous value to the study of normal heart function and a variety of pathologies, to plan interventions, and to design prosthetic devices.

Peskin’s computer simulations are based on the immersed boundary method, a unique numerical method he developed for the solution of dynamic fluid-structure interactions. This method, which is built on a novel approach to couple a fluid description in Eulerian coordinates to a solid description in Lagrangian coordinates, was originally designed to describe the flow of blood around cardiac valve surfaces. But it has found much wider use, allowing simulation of a variety of complex systems, such as the inner ear, swimming fish, locomoting microbes, flowing suspensions, and filaments flapping in soap films. The development and analysis of the immersed boundary method is an ongoing and active field of study.

While the heart is a large biological motor, much of Peskin’s recent research concerns biological motors at the smallest scales. Here too he brings innovative mathematical modeling and computational simulation to bear, exploring and explaining the microscopic machinery inside cells which harness Brownian motion for transport and motility.

A former MacArthur fellow, Charles Peskin is a member of the American Academy of Arts and Sciences, the National Academy of Sciences, and the Institute of Medicine.

Biographical Note

Charles S. Peskin was born in New York City in 1946. His mathematical education began at the Ethical Culture School, where arithmetic was done with sticks tied together, when possible, in bundles of ten to explain the decimal system. His father, an electrical engineer, was another early mathematical influence, teaching him the elements of algebra from the simple yet mysterious example $x + y = 10$, $x - y = 2$. At Morristown (New Jersey) High School, Peskin had an inspiring Mathematics teacher named Betty Wagner, who emphasized sketching graphs of functions, and who was kind about undone homework. There is a picture of Peskin in his high school yearbook standing in front of these words written in chalk on the blackboard: "Resolved: That Homework be Abolished."

Peskin studied Engineering and Applied Physics at Harvard (A.B., 1968). "Engineering at Harvard? Isn't that MIT?" was a common comment he heard at the time. He then entered the M.D.-Ph.D. program at the Albert Einstein College of Medicine, Bronx NY, but dropped out of the M.D. part of the program after completing a Ph.D. (1972) in Physiology, with a thesis entitled "Flow Patterns Around Heart Valves: A Digital Computer Method for Solving the Equations of Motion." This thesis was the beginning of the work that has now led to the Birkhoff Prize. Once he had decided not to go on to the M.D., Peskin nevertheless remained at the Albert Einstein College of Medicine for a year, studying pediatric cardiology and pulmonary medicine. During this time he developed an interest in the fetal circulation and congenital heart disease, and he has since done mathematical modeling in these areas.

In 1973, Peskin joined the faculty of the Courant Institute of Mathematical Sciences, New York University, where he has been ever since. He became a Professor of Mathematics in 1981 and received the additional title Professor of Neural Science in 1995. At NYU, Peskin teaches courses like "Mathematical Aspects of Heart Physiology," "Mathematical Aspects of Neurophysiology," "Partial Differential Equations in Biology," "Biomolecular Motors," and a freshman seminar on "Computer Simulation." He is the co-author (with Frank Hoppensteadt) of "Modeling and Simulation in Medicine and Biology, Second Edition" (Springer-Verlag, 2002). At New York University, Peskin has received the Sokol Faculty Award in the Sciences (1992) and the Great Teacher Award of the NYU Alumni Association (1999).

Peskin's other honors are the MacArthur Fellowship (1983–88), SIAM Prize in Numerical Analysis and Scientific Computing (1986), Gibbs Lecturer (1993), Cray Research Information Technology Leadership Award (joint with David M. McQueen, 1994), Sidney Fernbach Award (1994), Mayor's Award for Excellence in Science and Technology (1994), and von Neumann Lecturer (1999). He is a Fellow of the American Institute for Medical and Biological Engineering (since 1992), Fellow of the American Academy of Arts and Sciences (since 1994), Member of the National Academy of Sciences (since 1995), Fellow of the New York Academy of Sciences (since 1998), and Member of the Institute of Medicine (since 2000).

Response from Professor Peskin

It is a pleasure to accept the George David Birkhoff Prize of the Society for Industrial and Applied Mathematics and the American Mathematical Society. I am awed to be placed in the company of former winners such as Jurgen Moser, Fritz John, Marc Kac, Paul Garabedian, and S.R.S. Varadhan, whom I also count as colleagues and friends. Although some of them are no longer with us, their influence, both mathematical and personal, surely lives on. Some of that influence is encapsulated in particularly memorable remarks. I especially remember when Mark Kac greeted me in his booming voice: "Ah, Peskin, the man with the two-dimensional heart!" I think he would be pleased to see that I have now won this great honor in large part for a three-dimensional heart model. Then there is the famous remark of Fritz John (that he claims never to have said), that the rewards of Mathematics are the grudging admiration of a few friends. As the recipient of a reward of Mathematics today, I would like to thank the Mathematics community for welcoming me without proper credentials (my Ph.D. is in Physiology), and with no hint of grudging that I have ever detected, for honoring my research.

I would like to thank my father, Edward Peskin, and my thesis advisors, Edward Yellin and Alexandre Chorin, for starting me off on the road that has now led to the Birkhoff Prize. It was my father, an electrical engineer, who first suggested to me that it might be a good idea to apply mathematical methods to biological problems. It was Yellin, a mechanical engineer turned physiologist, who first introduced me to the fascinating dynamics of the heart and its valves. Around this time I had the incredible good luck to meet Alexandre Chorin, who invited me to his course on Fluid Mechanics at the Courant Institute. Chorin taught me his new Projection Method for incompressible flow, set me up with an office and an account on the CDC6600 (which we programmed with punch cards—I still recall the satisfying sounds of the keypunch and the relaxed mode of submitting a deck of cards to the computer and then going for a walk around Washington Square while awaiting the result), and introduced me to such inspiring characters as Peter Lax, Cathleen Morawetz, and Olof Widlund, each of whom has had a profound influence on my life and work.

My longterm colleagues in the research that is described in the Citation for the Birkhoff Prize are David McQueen (in the case of the heart) and George Oster (in the case of biological motors). Both deserve a large share of the credit. McQueen handles all of the details of heart model construction, conducts our computer experiments, and visualizes the results with custom software of his own design. My role is to think about the methodology and suggest changes as needed. In the case of biomolecular motors, I am particularly grateful to George Oster for introducing me to this exciting field. Most of the concepts in our joint work have been his. I have been happy to help him reduce some of these concepts to specific mathematical models and computer simulation programs, which we can then use to see whether the concepts are capable of explaining the observed behavior of the biomolecular motor.

I would like to conclude with a few words of explanation about the immersed boundary method. This is a numerical method for fluid-structure interaction that I originally introduced to study the flow patterns around heart valves. Heart valve leaflets are thin membranes that move passively in the flow of blood and yet have a profound influence on the fluid dynamics. Examples of this influence are that they stop the flow when the valve is closed, and that when the valve is open the leaflets shear the flowing blood to create vortices that then participate in efficient valve closure, as was first described by Leonardo da Vinci.

The standard way to model this situation would be to treat the valve leaflet as an elastic membrane obeying Newton's laws of motion with forces calculated in part from the elasticity of the membrane and in part by evaluating the fluid stress tensor on both sides of the membrane. Then the fluid equations would have to be supplemented by the constraint that the velocity of the fluid on either side of the membrane must agree with the instantaneously known velocity of the elastic membrane itself. There are two difficulties with this standard approach to the problem. First, the valve leaflet is incredibly thin and light, with hardly any mass per unit area. (Indeed, if the mass per unit area were zero, the dynamics of the valve would not be noticeably different.) Because of its small mass, the valve leaflet is super-sensitive to any imbalance in the forces acting upon it. The second challenge is the practical one of evaluating the fluid stress tensor on either side of the boundary. This seems difficult (or at least messy) to do numerically, unless the computational grid is aligned with the boundary. On the other hand, in a moving boundary problem, it both expensive and complicated to recompute the grid at every time step in order to achieve alignment.

In the immersed boundary method, the mass of the heart valve leaflet is idealized as zero. (Recent work shows how to handle immersed boundaries of nonzero mass, but I won't discuss that here.) This means that the sum of the elastic force and the fluid force on any part of the immersed boundary has to be zero. Once we know this, it becomes unnecessary to evaluate the fluid stress tensor at the boundary at all! We can find the force of any part of the boundary on the fluid by evaluating the elastic force on that part of the boundary. (Note the use of Newton's third law: the force of boundary on fluid is minus the force of fluid on boundary.) All we need is a method for transferring the elastic force from the immersed boundary to the fluid. On a Cartesian grid, this may be done by spreading each element of the boundary force out over nearby grid points. The particular way that this is done in the immersed boundary method involves a carefully constructed approximation to the Dirac delta function. This force-spreading operation defines a field of force on the Cartesian lattice that is used for the fluid computation. Then the fluid velocity is updated under the influence of that force field. The Navier-Stokes solver that updates the fluid velocity does not know about the geometry of the heart valve leaflet, it just works with a force field that happens to be zero everywhere except in the immediate neighborhood of the leaflet. Note that there is no constraint on the fluid velocity coming from the state of motion of the leaflet. On the contrary, since the mass of the leaflet is zero, the leaflet velocity is not a state variable of the problem. Indeed, the no-slip condition has been turned on its head: it is now the equation of motion of the leaflet instead of a constraint on the fluid. The local fluid velocity at a point of the leaflet is evaluated by interpolation from the Cartesian grid. The same approximate Delta function that was used to spread force can also be used to get an interpolation operator that is the adjoint (or transpose) of the force-spreading operator.

In summary, the immersed boundary method avoids many of the difficulties and pitfalls of the standard approach to fluid-structure interaction. By representing an immersed elastic boundary in terms of the forces applied by the immersed elastic boundary to the fluid, the immersed boundary method avoids any consideration of boundary geometry in the fluid computation, makes it unnecessary to evaluate the fluid stress tensor at the immersed elastic boundary, and makes it possible to simulate immersed elastic boundaries that are essentially massless, like the valve leaflets of the human heart.

Citation
John Norman Mather

John Mather is a mathematician of exceptional depth, power, and originality.

His earliest work included contributions to foliation theory in topology and to the theory of singularities for smooth and analytic maps on R^n where he provided the rigorous foundations of this theory. Among his main contributions is a stability result. Here stability of a map means that any nearby map is equivalent to it up to diffeomorphisms of the domain and target manifolds. While this is very difficult to check directly, Mather proved that infinitesimal stability, a condition that can often be verified constructively, implies stability, and he developed an algorithm for describing the local forms of these stable mappings. These astonishing generalizations of the earlier work of Hassler Whitney have provided approaches to understand a variety of applied issues ranging from the structure of the Pareto set of the utility mapping in economics to phase transitions in physics.

Switching to the theory of dynamical systems, Mather has made several major contributions. An early highlight was his result with Richard McGehee proving that binary collisions in the Newtonian 4-body problem could accumulate in a manner that would force the system to expand to infinity in finite time. He was a co-founder of Aubry-Mather theory where, in particular, he proved that twist maps of an annulus possess so-called Aubry-Mather invariant sets for any irrational rotation number. These sets are Cantor sets and the diffeomorphism on them is equivalent to a rigid rotation of a circle. Since KAM theory, which extends research going back to the work of Birkhoff, provides information about such situations when the rotation number is Diophantine, Mather found the missing circles in KAM theory.

Mather extended this work to multidimensional positive definite Lagrangian systems. He proved the invariant sets he found here—called Mather sets—are Lipschitz graphs over configuration space. He also developed a variational method for constructing shadowing trajectories first for twist maps and then for positive definite Lagrangian systems. In the twist map setting, he established the existence of heteroclinic orbits joining Aubry-Mather sets in the same Birkhoff instability region.

Currently he is doing seminal work on Arnold diffusion. In particular Mather proved the existence of Arnold diffusion for a generic perturbation of an a priori unstable integrable Hamiltonian system, solving the problem left standing from Arnold's famous 1964 paper.

Mather is a member of the US and Brazilian National Academies of Sciences, a Guggenheim and Sloan Fellow, and the winner of the 1978 John J. Carty Medal from the NAS.

Biographical Note

John N. Mather was born in Los Angeles, California, on June 9, 1942. He received a B.A. from Harvard University in 1964 and a Ph.D. from Princeton University in 1967. From 1967 to 1969, he was professeur associé (visiting professor) at the Institut des Hautes Études Scientifiques (IHES) in France. In 1969, he joined the faculty of Harvard University as associate professor and was promoted to professor in 1971. He was a visiting professor at Princeton University in 1974–1975 and joined the faculty of Princeton University as professor in 1975. He has been a visiting professor at IHES in 1982–83 and the ETH in Zurich in 1989–90.

Professor Mather was an editor of the *Annals of Mathematics* from 1990 to 2001 and has been an editor of the *Annals of Math. Studies* from 1990 to present.

Professor Mather was a Sloan Fellow in 1970–72 and a Guggenheim Fellow in 1989–1990. He was elected a member of the National Academy of Sciences in 1988 and a member of the Brazilian Academy of Sciences in 2000. He received the John J. Carty Medal of the National Academy of Sciences in 1978 and the Ordem nacional do Mérito Científico from the Brazilian Academy of Sciences in 2000.

Professor Mather's current research is in the area of Hamiltonian dynamics. In the past, he has worked in the theories of singularities of mappings and foliations.

Response from Professor Mather

It is a pleasure to accept the Birkhoff Prize for my work in singularities of mappings, the theory of foliations, and Hamiltonian dynamics. I greatly appreciate the generous citation of my achievements, as well as the honor of the prize. While I have not (yet) worked on applications of mathematics as such, I have always been fascinated by theoretical mathematical questions that originated in applications, for example the n-body problem in Newtonian mechanics. Poincaré showed long ago that the study of the dynamics of area preserving mappings of surfaces provides important insights into this problem. G. D. Birkhoff greatly extended Poincaré's work on area preserving mappings, and his work was one of the inspirations of my contribution to Aubry-Mather theory.

I am grateful to my teachers at Harvard University and Princeton University, as well as colleagues and friends, from whom I have learned so much. I also wish to express my appreciation of the system of higher education, which makes a career of mathematical research possible.

Louise Hay Award for Contributions to Mathematics Education

In 1990, the Executive Committee of the Association for Women in Mathematics (AWM) established the annual 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

Katherine Puckett Layton

In recognition of her significant contributions to mathematics education, her outstanding achievements as a teacher and scholar, and her role in bridging mathematics education communities, the Association for Women in Mathematics is pleased to present the Thirteenth Annual Louise Hay Award to Katherine Puckett Layton, Beverly Hills High School.

Katherine Puckett Layton began her teaching career in 1960 soon after she graduated from UCLA with a bachelor's degree in mathematics. She devoted forty years of her life to teaching mathematics at Beverly Hills High School. While there, she served as the Chair of the Mathematics Department throughout the seventies and gave tirelessly to students through her association with Mu Alpha Theta. During her tenure there, she took several periods of leave for study and visiting appointments. She spent one year studying for her M.Ed. in Mathematics at Harvard University. She served as a Visiting Lecturer at Clemson University and the UCLA Mathematics Department. After her retirement in 1999, Ms. Layton served for two years as a Distinguished Educator at the UCLA Graduate School of Education. Her role was as a field supervisor in UCLA's teaching intern program for mathematics majors. Even after retirement, her contributions to mathematics education continue, both at the national level, and where it is most important, in hands-on working with teachers and students.

During her outstanding career as a mathematics educator, she became highly involved in attending and giving presentations at workshops and conferences related to the use of technology in mathematics education, revealing her devotion to lifelong learning and staying abreast of new developments in the profession. In 1990, her exemplary teaching was honored when she received the California Presidential Award for Teaching Excellence.

Attesting to her involvement in mathematics education, Lida Barrett, past president of MAA, wrote in her nomination letter, “Kathy Layton is a superb representative of the many high school teachers who have served their students well and who have, in addition, served the mathematics profession well by their leadership contribution in its organization, by bringing to meetings and workshops the know-how from their education and classroom experience, and by serving on a variety of committees and task forces to represent school educators.” Ms. Layton has served mathematics education by being involved at all levels: local, regional, and national. She has been a member of NCTM since 1959, an invited speaker 22 times at annual meetings and 17 times at regional meetings. She has been a member of MAA since 1974, served on numerous committees, and been an invited speaker six times at MAA annual meetings. Her service includes her membership on the Mathematical Science Education Board, the National Board for Professional Teaching Standards, and the College Entrance Examination Board.

Through her visiting appointments at three different universities, her post-retirement appointment at UCLA, her many activities within NCTM and MAA, and her service on other national committees, she has helped build a much-needed bridge between secondary educators and college faculty. Bert Waits, Emeritus Professor of Mathematics at the Ohio State University, wrote in his letter of recommendation, “Katherine Layton can stand shoulder to shoulder with her university colleagues and has made significant contributions to our profession with deep insights that only a classroom high school teacher can bring.”

For her exemplary educational and scholarly contributions and her sustained efforts over her career on behalf of students, Katherine Puckett Layton is awarded the Thirteenth Annual Louise Hay Award for Contributions to Mathematics Education.

Response from Professor Layton

I am very honored and surprised to have been selected by the Association for Women in Mathematics for its Annual Louise Hay Award for Contributions to Mathematics Education. As a high school mathematics teacher, I feel privileged to be the recipient of this award. I am sorry that my father, William T. Puckett, a mathematics professor at UCLA for 36 years, is not alive to help me celebrate. Through my years in school, he was always willing to talk mathematics with me and to help me. He would never tell me how to do a problem but always asked me questions to guide me to a solution. I would get very upset at this technique; I wanted the answer immediately! I now know his methods led me to develop an understanding of many concepts and to enjoy mathematics. He was an excellent model of how one should teach: in addition to teaching students mathematics, respect them as human beings and always listen to their questions and comments.

In the fall of 1955, I began my undergraduate work at UCLA with the idea of becoming an elementary school teacher. After just two days, I found out how much I missed mathematics, and the next day I began a mathematics course and declared mathematics as my major. During my graduate year (at that time 5 years were required for a secondary credential in California), I did my student teaching and took graduate-level mathematics classes. I didn't know if I would begin teaching right away or go on for a masters in mathematics. I found out how much I loved helping young people understand mathematics. When I retired from Beverly Hills High School in 1999, after having been there for thirty-nine years, I still enjoyed working with students at grades 9 through 12, showing them the beauty of mathematics. It was a wonderful adventure.

I was fortunate. I had many opportunities for fine professional experiences, in part because I happened to be born to encouraging parents, to teach in a very supportive district (Beverly Hills Unified School District), to have good mentors, to be of the right gender for the times, to be in the western part of the United States, to be teaching what was considered a critical high school subject, and to begin teaching in the 1960s.

In the early '60s, the Advanced Placement Calculus program was getting underway in California. I was asked to start a course at Beverly Hills High School. My students worked hard and by their excellent questions and comments, taught me ways to help them understand the calculus. Over the years, they did quite well on the AP Exam. ETS was looking for high school women from the West Coast to help with the grading of the exams. I was in the right place at the right time with the right experience. During my 12 years of grading, I worked with many fine educators. I recognized the importance of the opportunity to interact with other teachers who really cared about helping their students learn. I became interested in becoming involved in other professional mathematics activities on the national level. John Neff gave me very good advice; he said, "Join the MAA," which I immediately did. The MAA was looking for more ways to include pre-college voices in their conversations. This was important, and I wanted an opportunity to contribute. Over the years, I have found collaboration between college and pre-college teachers has grown. In addition, I have seen mutual respect improve between the two groups. They are talking and listening to each other.

I have taken part in a number of excellent National Science Foundation Institutes and other summer programs. My school district was supportive of my professional opportunities, allowing me to attend mathematics conferences and providing substitutes so I could attend NCTM Board Meetings and meetings of the MAA Board of Governors. These activities, together with others, helped keep me up to date, let me interact with many fine educators at all levels, and helped keep teaching a fresh and learning experience for me. In the late 1980s, I was introduced to using technology to enhance the teaching of mathematics. What a charge to my teaching—I found you "can teach an old dog new methods." Frank Demana and Bert Waits helped me learn to use technology to improve my teaching for both students and teachers.

I have been so fortunate in my professional career to meet and work with caring and fine mathematics professionals at all levels. Thinking about this response has given me the opportunity to remember my fine high school mathematics teachers—three women: M. Albers, Muriel McDonald, and Estelle Mazziotta—and to reminisce about my undergraduate years at UCLA and some of the outstanding professors I had, especially Robert Sorgenfrey, Lowell Paige, and Paul Daus. I remember many wonderful people in the Beverly Hills Unified School District—I hesitate to name just a few, but the large group could be represented by my former colleagues Helen Louise Aldrich and Newman Borden and my administrators Ken Peters, Sol Levine, and Ben Bushman. I also thought of the people I have had the pleasure of considering mentors in my professional life: Lida Barrett, Phil Curtis, John Dossey, John Kenelly, John Neff, Bert Waits, and, of course, my father.

The Frank Nelson Cole Prize in Algebra

This prize was founded in honor of Frank Nelson Cole on the occasion of his retirement as secretary of the AMS after 25 years of service and as editor-in-chief of the *Bulletin* for 21 years. The endowment was made by Cole, contributions from Society members, and his son, Charles A. Cole. Prizes are awarded at five-year intervals for contributions to algebra or the theory of numbers.

Citation

Hiraku Nakajima

The Cole Prize in Algebra is awarded to Hiraku Nakajima for his work in representation theory and geometry. In particular the prize is awarded for his papers "Quiver varieties and Kac-Moody algebras" (*Duke Math. J.* **91** (1998), 515–560) and "Quiver varieties and finite dimensional representations of quantum affine algebras" (*J. AMS* **14** (2001), 145–238) where he uses his notion of "quiver varieties" to construct hyper-Kähler varieties, irreducible integrable highest weight modules for Kac-Moody algebras with a symmetric Cartan matrix, and finite dimensional representations of affine quantized enveloping algebras; and for his paper "Heisenberg algebra and Hilbert schemes of points on projective surfaces" (*Ann. of Math.* **145** (1997), 379–388), where he constructs representations of the Heisenberg algebra on the direct sum of homology groups of Hilbert schemes of points on a quasi-projective surface, thus supplying a formula giving the corresponding Poincaré polynomials, found earlier by L. Goetsche.

Biographical Note

Hiraku Nakajima was born on November 30, 1962, in Tokyo, Japan. He received his M.A. (under the direction of Takushiro Ochiai) in 1987 and his Ph.D. in 1991 from the University of Tokyo.

Nakajima began his academic career as a research assistant at the University of Tokyo (1987–1992). From 1992 to 1995 he was an assistant professor at Tohoku University's Mathematical Institute. In 1995 he returned to the University of Tokyo, where he served as an assistant professor until 1997. At Kyoto University he has advanced from assistant professor (1997–2000) to professor of mathematics (December 2000–).

Nakajima received both The Geometry Prize (1997) and the Spring Prize (2000) from the Mathematical Society of Japan. He was a plenary speaker at the International Congress of Mathematicians (Beijing, 2002). His research interests include geometry and representation theory.

Response from Professor Nakajima

It is a great honor and a great pleasure for me to receive the 2003 Frank Nelson Cole Prize in Algebra. I sincerely thank the AMS and the selection committee for awarding the prize to me.

My field of research is somewhere between geometry and representation theory. I started my mathematical career as a differential geometer. I chose to pursue the study of instanton moduli spaces on ALE spaces, and found that it is related to representation theory of affine Lie algebras and quantum groups. This was totally unexpected. But I became a representation theorist in this way. I did not learn representation theory as a student; rather, I gained knowledge from discussions with my colleagues and friends, including G. Lusztig, V. Ginzburg and others. I would like to express my thanks to all of them.

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

The Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics is the most prestigious award made by the Association. This award, first given in 1990, is the successor to the Award for Distinguished Service to Mathematics, awarded since 1962, and has been made possible by the late Dr. Hu and his wife, Yueh-Gin Gung. It is worth noting that Dr. Hu was not a mathematician. He was a retired professor of geology at the University of Maryland. He had such strong feelings about the basic nature of mathematics and its importance in all human endeavors that he felt impelled to contribute generously to our discipline.

Citation

Clarence F. Stephens

The Gung-Hu Award Committee is pleased to forward the name of Clarence Francis "Steve" Stephens as its recommended recipient of the award. Born in 1917, Dr. Stephens (Ph.D. University of Michigan 1943) was the ninth African American to receive a Ph.D. in Mathematics. From 1969 until his retirement in 1987, Stephens was Chairman of the Department of Mathematics at the State University of New York at Potsdam. It is for his role in achieving the "Potsdam Miracle" in the production of undergraduate mathematics majors at SUNY Potsdam in the 1980's, which led to a model for creating a welcoming atmosphere for undergraduate mathematics majors at many other institutions, that we are recommending him for this award.

Stephens had already received a number of accolades for a long and distinguished career in undergraduate mathematics education by the time he came to SUNY Potsdam in 1969, including an honorary doctorate from Johnson C. Smith University (1954) and a citation by Governor Millard Tawes of Maryland for distinguished service to mathematics education (1962). His connection with SUNY Potsdam began in the spring of 1969, when he was on the mathematics faculty of SUNY Geneseo and visited the Potsdam campus to give a talk sponsored by the Seaway Section of the MAA. The faculty at Potsdam were so impressed by his ideas on mathematics and teaching undergraduates that they began a campaign to have him come to the campus as the Chair of the Mathematics Department. He went to Potsdam in the fall of 1969 and retired from there in 1987.

Here are Stephens' own words about his goal as Chair, as reported in the book *Math Education at its Best: The Potsdam Model* (MEAIB), by Dilip Datta.

> My primary goal as Chair was to help establish the most favorable conditions I could for students to learn and teachers to teach. I adopted a method for developing the mathematics potential of students at Potsdam which had worked very well at Morgan State College and in National Science Foundation Summer Institutes for secondary teachers of mathematics. A team of mathematics faculty members with me as a member was formed to teach students in their early (freshman and sophomore years for undergraduates—first year for graduate students) study of mathematics, "How to Read Mathematics Literature with Understanding and to Become Independent Learners." A person selected for the team was a person who, in my opinion, had a warm relation with beginning students, strong loyalty to the department and the college. The team was informally formed by the way courses were assigned without informing faculty members that they were members of the team. Since each member of the mathematics faculty was given an opportunity to teach across the mathematics curriculum, every effort was made to add as many members to the team as possible.
>
> Sometimes I would teach a section of the same course with team members, and often I would teach a following required course for the mathematics major. From my earlier experiences at Morgan State College and in National Science Foundation Summer Institutes, if team members were successful in reaching their goal, then I had confidence that any caring mathematics faculty member could effectively teach the students developed by the team. Also, the students who were developed by the team would help us teach other students as tutors. The indicated method for developing the mathematics potential of students was as effective at SUNY Potsdam as it had been at Morgan State College.

And effective it certainly was. Though SUNY Potsdam is a relatively small regional state college with a total enrollment of just over 4,000 students during Stephens' time there, in 1985 the college *graduated* 184 mathematics majors, the third largest number of any institution in the U.S. that year (exceeded only by two University of California campuses). This represented about a quarter of the degrees given by SUNY Potsdam that year, and over 40% of the institution's honor students were mathematics majors.

The "Potsdam Miracle" was not in any sense accomplished by lowering standards, but rather by raising the standards for teaching the students and providing a supportive environment for them. It would take much more space than is available here to describe all of the innovations that Dr. Stephens implemented that led to the "Potsdam Miracle." Portions of the model have been adopted elsewhere by institutions of many different types, particularly since the appearance of Datta's book.

For his pioneering accomplishments in undergraduate mathematics education, and the provision of a national model for institutions that wish to replicate the "Potsdam Miracle," the MAA Gung-Hu Award Committee is pleased to recommend Clarence Stephens for this award.

Biographical Note

Clarence Stephens received his Bachelor of Science degree in Mathematics from Johnson C. Smith University in 1938, and his Master of Science and Ph.D. degrees in Mathematics from the University of Michigan in 1939 and 1943, respectively. He began his career in 1940 at Prairie View State College and served the United States Navy from May, 1942 to the honorable discharge in December, 1945. In 1946, Stephens joined the faculty of Prairie View as a Professor of Mathematics. The following year he left to become Professor and Chairman of the Mathematics Department at Morgan State College, where he remained until 1962. He then accepted an appointment as Professor of Mathematics at the State University of New York at Geneseo. In 1969, he joined the mathematics faculty at SUNY at Potsdam as Professor and Chairman of the Mathematics Department and served in this capacity until retirement in 1987.

Response from Professor Stephens

I accept the Gung-Hu award with gratitude for doing the things I enjoyed doing. I wish to share this award with my wife, Harriette, for more than 60 years of love and support. We celebrated our 60th wedding anniversary last month. Also, I have experienced the joy of seeing the growing up of our children, Jeannette and Clarence, our grandchildren, Philip and Kim, and now our great grandson Taylor.

I learned, first at Morgan and then at SUNY Potsdam, that the practice of putting emphasis on the weak high school mathematics background of entering college students and requiring students to complete remedial mathematics courses on the basis of placement examinations created a very unfavorable environment for learning mathematics. Very few students majored in mathematics or enrolled in mathematics courses unless required to do so. Almost no students learning in this environment reached a high level of achievement in mathematics.

On the other hand, a very favorable environment for learning mathematics can be established if members of the mathematics faculty have faith in the abilities of their students to reach a high level of achievement in mathematics. This task is not easy and a solution depends on place and over time. The creative abilities of the faculty are needed to find a solution. One way to begin is by providing examples, from the students regularly admitted to the college, of students who have been encouraged to reach a high level of achievement in mathematics. We established favorable learning environments at Morgan and SUNY Potsdam.

At Morgan we attracted a high percentage of the best students to major in mathematics and often the valedictorian each year was a major in mathematics. Our students were successful in the many careers they followed and in one year, three students in the same graduating class later earned the Ph.D. degree in mathematics.

At SUNY Potsdam, we had similar success. After the mathematics faculty demonstrated that they were successful in teaching almost all students who were enrolled in mathematics courses, high school teachers encouraged many of their best students to enroll in our college. Since we had a very demanding mathematics program in which students succeeded, we attracted many of the best students to major in mathematics. For a period of eight years, the average number of mathematics majors on the PRESIDENT'S LIST for academic excellence was 169, with a maximum of 197. Over 22% of the graduates in these three classes majored in mathematics.

Mathematics was not a requirement in the general education requirements at SUNY Potsdam during the 18 years I served as chair of the mathematics department. The only departments requiring calculus as part of their majors, other than mathematics, were Chemistry and Physics, and these two departments had only a few majors. As a result of a favorable environment for learning mathematics, one year with a freshman class of less than 1,000 students, more than 700 of the freshmen enrolled in calculus during the fall semester.

Indeed, I accept the Gung-Hu award with gratitude for doing the things I enjoyed.

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

Ronald L. Graham

Ron Graham has been one of the principal architects of the rapid development worldwide of discrete mathematics in recent years. He has made many important research contributions to this subject, including the development, with Fan Chung, of the theory of quasirandom combinatorial and graphical families, Ramsey theory, the theory of packing and covering, etc., as well as to the theory of numbers, and seminal contributions to approximation algorithms and computational geometry (the "Graham scan"). Furthermore, his talks and his writings have done much to shape the positive public image of mathematical research in the USA, as well as to inspire young people to enter the subject. He was Chief Scientist at Bell Labs for many years and built it into a world-class center for research in discrete mathematics and theoretical computer science. He served as President of the AMS in 1993–94.

Biographical Note

Ronald Graham's undergraduate training included three years at the University of Chicago (in Robert Maynard Hutchins' Great Books program), a year at Berkeley as an E.E. major, and four years in the U.S. Air Force, three of which were spent in Fairbanks, Alaska, where he concurrently received a B.S. in Physics in 1959. He subsequently was awarded a Ph.D. in Mathematics from the University of California, Berkeley, in 1962.

He spent the next 37 years at Bell Labs as a researcher, leaving from what is now AT&T Labs in 1999 as Chief Scientist. During that time he also held visiting positions at Princeton University, Stanford University, Caltech and UCLA, and was a (part-time) University Professor at Rutgers for 10 years. He currently holds the Irwin and Joan Jacobs Chair of Computer and Information Science at the University of California at San Diego.

Professor Graham has received the Pólya Prize in Combinatorics (from SIAM), the Euler Medal from the Institute of Combinatorics and Its Applications, the Lester R. Ford Award of the MAA, and the Carl Allendoerfer Award of the MAA.

He is currently Treasurer of the National Academy of Sciences, a Foreign Member of the Hungarian Academy of Sciences, a Fellow of the American Academy of Arts and Sciences, a Fellow of the American Association for the Advancement of Science, and Past President of the International Jugglers Association. He was an invited speaker at the International Congress of Mathematicians in Warsaw in 1983, and was the AMS Gibbs Lecturer in 2000.

Response from Professor Graham

I must say that it is a great honor and pleasure for me to receive this award in recognition of a life in mathematics, and I would like to express my deep appreciation to the American Mathematical Society and to the Steele Prize Committee for their selection. When I was first notified, my initial reaction was to recall the famous Mark Twain quote who, upon seeing his obituary printed in a local newspaper, wrote that "the reports of my death are greatly exaggerated". I can't remember a time when I didn't love doing mathematics, and that desire has not dimmed over the years (yet!). But I also get great pleasure sharing mathematical discoveries and insights with others, even though this can present a special challenge for mathematicians talking to non-mathematicians. However, I really believe that this type of communication will become increasingly important in the future. As an undergraduate at Berkeley, a one-year course in number theory taught by D. H. Lehmer fired my imagination for the subject, and formed the basis for my Ph.D. dissertation under him (after a slight detour of 4 years in the military and Alaska). Although I never took another course from Dick Lehmer, he taught me the value of independence of thought, and an appreciation for the algorithmic issues in mathematics. I feel that I have been very lucky to have been at the right place and time in history for participating in the rapid and exciting current developments in combinatorics. No doubt, all mathematicians in every generation feel this way! In particular, I have had the good fortune to work with, and be inspired by, such giants as Paul Erdős and Gian-Carlo Rota, who, though different in many ways, were both driven by grand visions which have helped guide the paths of many combinatorial researchers today. Number theory and combinatorics are especially rife with simple looking problems which, like Socratic gadflies, constantly remind us how little we really know (e.g., are there infinitely pairs of primes which differ by 2? The answer, of course, is yes! However, at present we don't have a clue how to prove this). I recall the story of a civilization so advanced that a prize was awarded to the first mathematician who realized that the Riemann Hypothesis actually needed a proof. Perhaps more imminent (and more likely?) is the related version in which the Great Computer a hundred years from now, when asked whether the Riemann Hypothesis is true, pauses for a moment and then says: "Yes, it is true. But you wouldn't be able to understand the proof!" Still, I am a firm believer in Hilbert's famous dictum: "Wir müssen wissen, wir werden wissen" ("We must know, we shall know"). And with this thought in mind, I will happily continue to keep hammering pitons into the sides of the infinite mountain of mathematical truth, as we all slowly inch our way up its irresistible slopes.

Citation

Victor W. Guillemin

Victor Guillemin has played a critical role in the development of a number of important areas in analysis and geometry. In particular, he has made fundamental contributions to microlocal analysis, symplectic group actions, and spectral theory of elliptic operators on manifolds. His work on generalizations of the Poisson and Selberg trace formulae has been particularly influential. Moreover, Guillemin has greatly advanced these areas, and mathematics in general, by mentoring many graduate students and postdoctoral fellows, some of whom have become leading mathematicians in their own right.

Biographical Note

Victor Guillemin was born in Cambridge, Massachusetts on October 15, 1937. He received his B.A. from Harvard in 1959, his M.A. from the University of Chicago in 1960, and his Ph.D. from Harvard in 1962. He was an instructor at Columbia from 1963 to 1966 and an assistant professor at MIT from 1966 to 1969. He was promoted to associate professor in 1969 and to full professor in 1973. He has held a Sloan fellowship (1969–1970), a Guggenheim grant (1988–1989), and an Alexander Humboldt fellowship (1998). He was elected to the American Academy of Arts and Sciences in 1984 and to the National Academy of Sciences in 1985.

Response from Professor Guillemin

I want to thank the AMS Steele Prize committee for the wonderful honor of being selected as co-recipient, with Ron Graham, of this year's Steele lifetime achievement award. For me personally, my main "lifetime achievement" has been to have had, over the course of my career, some remarkable mentors, collaborators and students. In particular, as a graduate student I had the good fortune to have Raoul Bott and Shlomo Sternberg as teachers at a time when Morse theory, index theory, and K-theory were revolutionizing differential topology. It was also a time when Raoul Bott was, for Shlomo and me, not only a teacher and mentor but a greater-than-life role model. I can't speak for Shlomo, but "greater-than-life" remains my view of Raoul to this day.

In the collaborations I've been involved in, I feel I have been extraordinarily lucky. I was Shlomo Sternberg's Ph.D. student when we wrote our first paper together in 1962, neither of us imagining that this was going to be the first of thirty papers and six books that we would produce together or that we would still be actively working together four decades later. These four decades have tempered somewhat the awe I felt in his presence when I first started working with him, but not my awe for the range and depth of his understanding of mathematics.

When I met Richard Melrose at a conference in Nice in 1973, he seemed, with his scruffy beard and ponytail, the embodiment of the 1970's counterculture Zeitgeist. He had, however, just settled an important special case of one of the main open problems in physical optics: the glancing ray problem; and two years later, together with Mike Taylor, he solved this problem in complete generality (a result for which he won the Bocher prize in 1979). Thirty years later, the ponytail is gone and the beard marginally less scruffy, and when the occasion requires, he can pass himself off as a respectable middle-aged academic. However, he is still, with his many students and collaborators (of whom I am fortunate to be one) exploring the consequences of this result and the beautiful ideas to which it has led in microlocal analysis on manifolds-with-corners and singular spaces.

One of the most rewarding collaborations of my life was working with Hans Duistermaat on the Poisson formula for elliptic operators; however at the time it was also one of the most exasperating. I enjoy writing mathematical papers, but find it hard to edit and revise, and am often content with efforts that give one a glimpse of, without entirely embodying, the good, the true and the beautiful. Hans is the opposite: With the fiercely competitive instincts of the accomplished chess player that he is, he is content with nothing short of perfection, and our paper went through many rewrites before he was completely happy with it. With each rewrite my exasperation mounted, and when we finally sent it off, I recalled his once warning me that Duistermaat is Dutch for "dark mate".

The early 1990's saw a curious blip in the demographics of the population of x-generation mathematicians of that era. Jobs in theoretical physics became hard to come by and, as a consequence, many would-be graduate students in physics gravitated to adjoining areas of mathematics. My own field of symplectic geometry was one of the beneficiaries of this development and, in the early and mid-1990's, there were a large number of exceptionally talented post-docs in our department at MIT, some of whom became my collaborators and many of whom became cherished friends. Among them were Jiang-Hua Lu, Reyer Sjamaar, Sue Tolman, Yael Karshon, Jaap Kalkman, and Eckhard Meinrenken. I like to believe that they learned a little symplectic geometry from me, but I suspect I learned much, much more from them. (In particular, I learned from Eckhard Meinrenken that, as Shlomo and I had conjectured fifteen years before, "quantization and reduction commute".)

My first student, in 1968, was Marty Golubitsky, and my last student, in 2002, Tara Holm. To them and to the students in between I owe everything that has made my life in mathematics worthwhile.