JOINT MATHEMATICS MEETINGS

SAN DIEGO

JANUARY 6-9, 2002

January 2002 Prizes and Awards

4:25 p.m., Monday, January 7, 2002

Program

Opening Remarks
Ann E. Watkins, President
Mathematical Association of America

Beckenbach Book Prize
Mathematical Association of America

Bôcher Memorial Prize
American Mathematical Society

Levi L. Conant Prize
American Mathematical Society

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

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

Chauvenet Prize
Mathematical Association of America

Frank Nelson Cole Prize in Number Theory
American Mathematical Society

Award for Distinguished Public Service
American Mathematical Society

Certificates of Meritorious Service
Mathematical Association of America

Leroy P. Steele Prize for Mathematical Exposition
American Mathematical Society

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

Leroy P. Steele Prize for Lifetime Achievement
American Mathematical Society

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

Closing Remarks
Hyman Bass, President
American Mathematical Society

Beckenbach Book Prize

The Beckenbach Book Prize, established in 1986, is the successor to the MAA Book Prize. It is named for the late Edwin Beckenbach, a long-time leader in the publications program of the Association and a well-known professor of mathematics at the University of California at Los Angeles. The prize is awarded for distinguished, innovative books published by the Association.

Citation

Joseph Kirtland

Identification Numbers and Check Digit Schemes

MAA Classroom Resource Materials Series

This book exploits a ubiquitous feature of daily life, identification numbers, to develop a variety of mathematical ideas, such as modular arithmetic, functions, permutations, groups, and symmetries. Since the careful and well-paced exposition is self-contained, the book can serve a wide audience. As the author mentions, this includes, for instance, liberal arts students. However, it could be used at the high school level or even as an introduction to mathematical thinking for students who may be interested in exploring mathematics beyond the curriculum.

The author has gone the extra mile to make the book interesting and accessible. There are ample examples, exercises, and illustrations. The real-world cases presented by the author pay off, as the practical relevance of the theory remains constantly before the reader's eyes.

Finally, the teacher who is confronted by the common question, "What is math good for?" can answer by handing the questioner this book, for it can be easily read by students.

We feel that *Identification Numbers and Check Digits* is an outstanding, distinguished, and innovative expository book and therefore qualifies for the Beckenbach Prize.

Biographical Note

Joe Kirtland was born in 1963 and spent his childhood in Aurora, NY. After graduating with a B.S. from Syracuse University, he continued his studies at the University of New Hampshire, where he earned his Ph.D. His dissertation addressed topics from the field of finite group theory, and he has published articles in the areas of both finite and infinite group theory.

Professor Kirtland joined the faculty at Marist College in 1992. A highly respected teacher, he has been selected six times by the students for the Faculty Recognition Award in the School of Computer Science and Mathematics. In the fall of 2000, he was presented with the Board of Trustee's Distinguished Teaching Award. He and his wife Cindy have two children, Timmy and Betsy.

Response from Professor Kirtland

It is a great honor to receive the MAA Beckenbach Book Prize. I am extremely humbled, and greatly overshadowed, by the previous winners of this award. Each has written an outstanding book that eloquently conveys the splendor of a particular aspect of mathematics. Their contributions have set examples for all to follow.

I want to express my sincere gratitude to Andrew Sterrett who had the faith in my book and communicated it to the MAA. Finally, I would like to thank the MAA Board of Governors and the Beckenbach Book Prize Committee for this great honor.

American Mathematical Society

Bôcher Memorial Prize

This prize was founded in memory of Professor Maxime Bôcher. It is awarded for a notable research memoir in analysis that has appeared during the past five years. From 1923 to 1999, the prize was usually awarded every five years. Beginning in 2002, it will be awarded every three years. Either the recipient is a member of the Society or the memoir was published in a recognized North American journal.

Citation

Daniel Tataru

The Bôcher Memorial Prize in 2002 is awarded to Daniel Tataru for his fundamental paper "On Global Existence and Scattering for the Wave Maps Equations," Amer. Journ. of Math. 123 (2001) no. 1, 37–77. The paper introduces a remarkable functional framework which has played an important role in the recent breakthrough of T. Tao on the critical regularity for wave maps in two and three dimensions. The work of Tataru and Tao opens up exciting new possibilities in the study of nonlinear wave equations.

The prize also recognizes Tataru's important work on Strichartz estimates for wave equations with rough coefficients and applications to quasilinear wave equations, as well as his many deep contributions to unique continuation problems.

Biographical Note

Daniel Tataru was born on May 6, 1967 in a small city in the northeast of Romania. He received his undergraduate degree in 1990 from the University of Iasi, Romania and his Ph.D. in 1992 from the University of Virginia. He was assistant, associate, and then full professor at Northwestern University (1992–2001) with a two year interruption when he visited the Institute for Advanced Study and Princeton University (1995–1997). Since 2001 he is a professor of mathematics at the University of California at Berkeley.

Response from Professor Tataru

I feel very honored to receive the 2001 Bôcher Prize, for which I am grateful to the selection committee and the American Mathematical Society. I would like to take this opportunity to acknowledge several people who have significantly influenced my work. My undergraduate mentor, Viorel Barbu, provided a model and an inspiration for me on what it means to be a mathematician. Later, my thesis advisors, Irena Lasiecka and Roberto Triggiani, through their professional support as well as their warmth, helped me grow, move on confidently and adjust successfully here in U.S. From them I learned control theory, which subsequently served both as a motivation and as a source of good problems in unique continuation. Sergiu Klainerman is the one who introduced me to nonlinear hyperbolic equations. I thank him for his constant support and for a fruitful collaboration during my years in Princeton. I am also grateful for the help and the encouragement that I received earlier in my career from M.G. Crandall, J. L. Lions and P. L. Lions, as well as for the support of my friends and former colleagues at Northwestern. In addition, I continue to learn from my collaborators Herbert Koch and Hart Smith.

The wave maps equation is a semilinear second order hyperbolic equation which models the evolution of "waves" which take values into a Riemannian manifold. The starting point of the work in the citation was an earlier article of Klainerman and Machedon. At the time it was clear that bridging the gap between their result and the main wave maps conjecture required two distinct improvements of their argument. One was the so-called "division problem", which is related to controlling the bilinear interaction of waves at a fixed size of the frequency; the second was to control the interaction of low and high frequency waves in order to prevent the migration of the energy toward high frequency (which could lead to blow-up). These two problems correspond to two separate logarithmic divergencies in the work of Klainerman and Machedon, but, more importantly, they also correspond to the difference between a local and a global (in time) result. In the article cited I solved the first of these two problems; the second one was later solved by Tao. This was not an easy problem. Part of the difficulty lies in the construction of an appropriate functional framework. However one does not have a good starting point for this, since the main condition this framework has to satisfy is a self-consistency condition. The solution was to start with a "reasonable" framework, proceed with the proof, and then backtrack and re-adjust the initial set-up whenever the argument did not work. While fairly intuitive, my approach is quite technical and I hope it can be simplified in the future. After the recent work of Tao there are still some finishing touches to be put on the study of the wave-maps equation. However, the more interesting problems which are still open are the other unsolved critical problems for the Yang-Mills equation, the nonlinear Schrodinger equation and others.

My work on second order nonlinear hyperbolic equations was initially a byproduct of my attempt to use a phase space localization technique called the FBI transform for the analysis of partial differential operators with rough coefficients. Originally the FBI transform had been employed by Sjöstrand for the study of partial differential operators with analytic coefficients; as I learned later, it has also been used by physicists under the name of the Bergman transform. This approach produced sharp Strichartz type (dispersive) estimates for linear second order hyperbolic equations with rough coefficients, which in turn led to considerable progress in the local theory for second order nonlinear hyperbolic equations. At the same time an alternate approach for the nonlinear equations was pursued by Bahouri and Chemin, with comparable success. Later on, using Klainerman's vector fields method, Klainerman and Rodnianskii were able to improve my results. Around that time it became clear that the FBI transform is not robust enough for the study of nonlinear hyperbolic equations. My recent joint work with Hart Smith is based on another way of constructing a parametrix for the wave equation, using wave packets (which are highly localized solutions that stay coherent on a given time scale). The idea of constructing approximate solutions as superpositions of wave packets goes back to Fefferman, but its first effective use for second order hyperbolic equations is due to Smith. The joint work of myself and Smith largely completes the local theory for general second order nonlinear hyperbolic equations. The main open problem remains to understand whether the results can be improved for equations which have a special structure such as the Einstein equations, nonlinear elasticity and other related problems.

Unique continuation problems for pde's have long been on my list of favorite topics. Originally my interest was motivated by problems in control theory, but later it took a life of its own. My view of the subject was influenced by the work of several mathematicians: L. Hörmander, G. Lebeau, L. Robbiano, C. Zuily and others. Initially I worked on unique continuation problems which, up to that time, had received little or no attention: for boundary value problems, for operators with partially analytic coefficients, for anisotropic operators. Later on, in an ongoing joint project with Herbert Koch, I have returned to some of the more classical problems, but with a new twist: rough coefficients and/or unbounded potentials. The starting point for us was the seminal work of D. Jerison, C. Kenig and of T. Wolff.

Citation

Terence Tao

The Bôcher Memorial Prize in 2002 is awarded to Terence Tao for his recent fundamental breakthrough on the problem of critical regularity in Sobolev spaces of the wave maps equations, "Global Regularity of Wave Maps I. Small Critical Sobolev Norm in High Dimensions" Int. Math. Res. Notices (2001), No. 6, 299–328 and "Global Regularity of Wave Maps II. Small Energy in Two Dimensions", to appear in Comm. Math. Phys. (2001 or early 2002).

The committee also recognizes his remarkable series of papers, written in collaboration with J. Colliander, M. Keel, G. Staffilani, and H. Takaoka, on global regularity in optimal Sobolev spaces for KdV and other equations, as well as his many deep contributions to Strichartz and bilinear estimates.

Biographical Note

Terence Tao was born in Adelaide, Australia in 1975. He received his Ph.D. in mathematics from Princeton University in 1996 under the advisorship of Elias Stein. He has been at the University of California, Los Angeles as a Hedrick assistant professor (1996–1998), assistant professor (1999–2000), and professor (2000–). He has also held visiting positions at MSRI (1997), the University of New South Wales (1999–2000), and Australian National University (2001). He is currently on leave from UCLA as a Clay Prize Fellow.

Tao has been supported by grants from the NSF, and fellowships from the Sloan Foundation, Packard Foundation, and the Clay Mathematical Institute. He received the Salem Prize in 2000.

Tao's research is divided into three areas: real-variable harmonic analysis (especially estimates for rough operators and connections with geometric combinatorics); nonlinear evolution equations (especially the global behavior of rough solutions); and algebraic combinatorics (specifically the understanding of the Littlewood-Richardson rule and its generalizations, and its applications to linear algebra, algebraic geometry, and representation theory).

Response from Professor Tao

I am deeply flattered and honored to be nominated for the Bôcher Prize, and I am grateful to the prize committee for their recognition of this research. I have been extremely fortunate to have been supported, encouraged, and taught by many wonderful people, and collaborated with many more. For the papers cited above I was particularly influenced by many invaluable conversations with Elias Stein, Tom Wolff, Jean Bourgain, Sergiu Klainerman, Chris Sogge, Daniel Tataru, Michael Christ, and my collaborators Mark Keel, Jim Colliander, Gigliola Staffilani, Hideo Takaoka, Ana Vargas, and Luis Vega. I am particularly grateful to Mark Keel and Sergiu Klainerman for giving me a thorough and expert introduction to the field of nonlinear wave and dispersive equations.

In the analysis of nonlinear dispersive equations, the tools used can be roughly divided into "analytical" tools and "algebraic" ones. By analytic tools I mean the use of function spaces such as Sobolev or Lebesgue spaces, coupled with linear, bilinear, multilinear, or nonlinear estimates in these spaces (which are often proven by harmonic analysis techniques). These estimates can allow one to apply perturbation theory and approximate a nonlinear equation by the linear analogue, at least for short times. By algebraic tools I refer to the use of conservation laws, symmetries, monotonicity formulae, special transformations, integrability, and explicit solutions. These algebraic identities give some partial control on the global development of solutions to the nonlinear PDE. To obtain satisfactory global control of solutions, one often combines the partial global control coming from the algebraic identities, with the more detailed but local control coming from the analytic techniques. For instance, perturbation theory might show that smooth solutions exist as long as the energy remains finite, while algebraic identities (i.e. integration by parts) might show that the energy remains constant. Combining the two one would then be able to show that smooth solutions exist globally in time, so that no singularities can ever form if the initial energy is finite.

Both the algebraic and analytic tools have been under development for many decades, the groundwork being laid by many excellent mathematicians. In the last ten years there has been immense progress, particularly in the analytic side of things, thanks to the efforts of Bourgain, Klainerman-Machedon, Kenig-Ponce-Vega, and many, many other authors. Indeed, our understanding of the local theory of nonlinear wave and dispersive equations has become quite satisfactory. Unfortunately, even when this local theory is completely understood, it does not always match up with the algebraic tools needed to create good global results; for instance, the local theory may need control of the solution in the Sobolev space H^2, but the conserved quantities might only control the solution in H^1.

One interesting development in recent years is that hybrid techniques, combining both analytical and algebraic ideas, have started to bridge some of the above gaps. In particular, the use of cutoff functions (in space, or in frequency, or in both), together with the latest linear and multilinear estimates, have been used to obtain "localized" conservation laws, "localized" evolution equations, "localized" gauge transforms, etc. which are more flexible than their global algebraic counterparts, and have had some recent successes. Notable applications of this type of philosophy include Bourgain's series of papers on nonlinear Schrödinger equations, the work by Martel and Merle on the stability of solitons for the generalized Korteweg de Vries equations, the many papers on global solutions below the energy norm (starting with work of Bourgain, and also including the papers by Colliander, Keel, Staffilani, Takaoka, and myself), the recent breakthroughs on quasilinear wave equations by Bahouri-Chemin, Tataru-Smith, and Klainerman-Rodnianski; and the recent series of papers on wave maps. For instance, one effective technique for constructing global solutions when the energy is infinite is to construct a smoothing operator, define the associated smoothed out energy, and show an approximate conservation law for the smoothed out energy. For wave maps, one new technique has been to localize the wave map to different frequency modes, and then gauge transform each frequency mode independently. The work on quasilinear wave equations is also interesting in that it seems to bring geometric optics back into the cutting edge of the theory. (Intriguingly, this has also occurred in the theory of oscillatory integrals, thanks to the work of Bourgain, Wolff, and others.)

In the future I believe we will see a more systematic synthesis of the analytic and algebraic techniques, perhaps ultimately leading to a unified theory for treating the development of nonlinear PDE; at present there are only tantalizing hints of such a theory. The end result should be a more powerful and flexible theory, allowing for much more detailed control on the global behaviour of nonlinear PDE. (In particular, I hope to see finer control on the possible cascade of energy between frequencies, and on tracking particle-like behavior of solutions.)

Citation

Fanghua Lin

The Bôcher Memorial Prize in 2002 is awarded to Fanghua Lin for his fundamental contributions to our understanding of the Ginzburg-Landau (GL) equations with a small parameter. In a remarkable series of papers, among which we single out his pioneering work "Some dynamical properties of the GL vortices" Comm. Pure Appl. Math. (1996), 323–359, he has established, both in the stationary and evolutionary cases of GL equations, that the limiting phenomenon is governed by a finite dimensional system associated to the BBH renormalized energy.

The prize also recognizes his many deep contributions to harmonic maps and liquid crystals. Of particular note is his paper "Gradient estimates and blow up analysis for stationary harmonic maps," Annals of Math, 149, 1999.

Biographical Note

Fanghua Lin was born in China in 1959. He received a Ph.D. from the University of Minnesota (1985). He has held faculty positions at the Courant Institute (1985–88) and the University of Chicago (1988–89; 1996–97). Since 1989 he has been a professor of mathematics at New York University. Over the years, he has held numerous visiting positions, including those at MSRI, IAS, University of Paris-Sud, the Max-Planck Institute, Academia Sinica, Hong Kong UST, and the University of Minnesota.

Lin's awards and honors include an Alfred P. Sloan Fellowship (1989–91), a Presidential Young Investigator Award (1989–94), and the Chang Jiang Professorship (1999). He has served on the editorial committees of twelve mathematics journals, published over 110 research articles, and given numerous invited addresses.

Response from Professor Lin

It is a great honor to be awarded the Bôcher Prize and I am grateful to the members of the Bôcher Prize Selection Committee and the American Mathematical Society for their recognition of my work and this kind citation.

The Ginzburg-Landau (GL) equations with a small parameter were used to model superconductivity. They are also among the standard equations used to describe various phase transition phenomena. Many people have contributed to the study of these equations and I interpret my receipt of this prize as a tribute to all of them.

My first paper on this subject established the connection between the critical points of the Bethuel, Brezis, Hélein (BBH) renormalized energy and the static solutions of the GL equations, one of many open problems posed in the seminal work of BBH. Soon after that, I learned the importance of various dynamical issues, particularly those concerned with vortex dynamics, and the scientific views of several of my colleagues at the Courant Institute (Weinan E and Andy Majda) and also of my collaborator Jack Xin have greatly influenced me. I had a lot of fun learning and solving some of these problems related to the vortex dynamics in 2-D.

The study of the GL equations in high dimensions is more subtle and involved. The analytical method that I developed jointly with T. Rivière can also be applied to study similar problems for the Seiberg-Witten and Yang-Mills equations. Nevertheless, many difficulties remain, especially those concerned with dynamical issues.

Much of my work relies on ideas from geometric measure theory, and I take this opportunity to thank my Ph.D. advisor, my long-time friend and collaborator, R. Hardt, for introducing me to this fascinating subject. I have been extremely lucky to have been at the Courant Institute and I thank my colleagues there for their advice, support, and friendship during these past years. I also want to thank friends at the University of Chicago who have been very kind and offered a great deal of help during my career.

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

Elliott H. Lieb and Jakob Yngvason

The Levi L. Conant Prize in 2002 is granted to Elliot H. Lieb and Jakob Yngvason for their appealing and thought-provoking article "A Guide to Entropy and the Second Law of Thermodynamics," *Notices of the AMS* 45, no. 5 (1998), 571–581.

"This article is intended for readers who, like us, were told that the second law of thermodynamics is one of the major achievements of the nineteenth century ... but who were unsatisfied with the 'derivations' of the entropy principle as found in textbooks and in popular writings." Thus do Lieb and Yngvason begin their article. They proceed to take the reader on a tour of the second law of thermodynamics as seen through an axiomatic-mathematical lens, without ever losing the friendly and conversational tone of the start.

Abstractly, there is only a set G and a preorder $<$ on G. Interpreted physically, the elements of G represent states of a system and the preorder $<$ is required to satisfy certain natural axioms that characterize when one state can "lead to" another state (specifically, when the second is adiabatically accessible from the first, in a precise sense that the authors make clear). The second law of thermodynamics is then formulated in terms of an entropy function on $(G, <)$, that is, a real-value function S on G that characterizes $<$ and has certain additivity and scaling properties. The authors detail the search for simple, elegant, and mathematically precise axiom systems that allow the construction of an entropy function and, thus, that capture the powerful predictive capabilities of thermodynamics. In doing so, they illuminate a fascinating trail between the "pure" world of mathematical abstraction and the "real" world of physics, chemistry, and engineering.

Elliott H. Lieb

Biographical Note

Elliott H. Lieb was born in Boston, Massachusetts in 1932. He received his B.Sc. degree from MIT in 1953 and his Ph.D. degree in Mathematical Physics from the University of Birmingham (UK) in 1956 under the direction of S. F. Edwards. He holds honorary doctorates from Copenhagen University and EPFL in Lausanne. After a Fulbright post-doc in Kyoto, he held positions in Illinois, Cornell, IBM, Sierra Leone, Yeshiva, Northeastern, and MIT. From 1975 he has been a professor in the mathematics and physics departments of Princeton University.

He has received a number of prizes for his work in mathematics and mathematical physics, including the Birkhoff Prize of AMS/SIAM, the Rolf Schock Prize in mathematics of the Swedish Academy, the Heinemann Prize in mathematical physics of the APS, the Boltzmann Prize in statistical mechanics of the International Union of Pure and Applied Physics, and the Max-Planck Medal of the German Physical Society. He is a member of the U.S., Austrian, and Danish Academies of Science, and the American Academy of Arts and Sciences. He served twice as president of the International Association of Mathematical Physics. Invited lectures include the AMS Gibbs Lecture and the MAA Hedricks Lecture.

Jakob Yngvason

Biographical Note

Jakob Yngvason was born in Reykjavik, Iceland in 1945. He studied physics at the University of Göttingen, Germany, receiving his Ph.D. there in 1973 under the direction of H. J. Borchers. He was assistant professor at the University of Göttingen from 1973 to 1978 and from 1978 to 1985, he was senior research scientist at the Science Institute of the University of Iceland in Reykjavik. From 1985 to 1996 he was professor of theoretical physics at the University of Iceland. Since 1996 he has been professor of mathematical physics at the University of Vienna, Austria. He is also President of the Erwin Schrödinger Institute for Mathematical Physics in Vienna and Vice President of the International Association of Mathematical Physics. He has held visiting positions at many research institutions, including the Universities of Göttingen, Leipzig, and Rutgers University, IHES in Bures-sur-Yvette, DESY in Hamburg, NORDITA in Copenhagen and the Max Planck Institute for Physics in Munich.

His main research interests are in quantum field theory and rigorous quantum many-body theory. He was plenary speaker at the 13th International Congress on Mathematical Physics in Paris, 1994. He received the Olafur Danielsson Prize for Mathematics in 1993.

Response from Professors Lieb and Yngvason

This award was a pleasant surprise to us. We had worked for many years to try to formulate the second law of thermodynamics—the law of increasing entropy—in a mathematically precise, yet accessible way, and were not sure to what extent we had succeeded in communicating our enthusiasm for the subject to our colleagues. It is a very much appreciated honor to have our *Notices* article counted as "the best expository paper published in the *Notices* or the *Bulletin* in the preceding five years."

Our article is based on a long and detailed analysis (in *Physics Reports* 310, 1–96, 1999) of one of the most precise laws of physics. It was discovered in the first half of the 19th century, and by the beginning of the 20th century had attracted the attention of mathematicians, notably Carathéodory. To this day many schools of thought continue this interest.

The 20th century, however, tended to see the law as an "easy" consequence and "incomplete expression" of statistical mechanics (Gibbs). This is an overstatement since the "derivation" from statistical mechanics is, after more than a century, still in a rudimentary phase, and because the law itself makes no reference to statistical mechanics. That is to say, the second law could well hold even if the world were made of vortices in a seamless fluid instead of being made of atoms. Statistical mechanics is a beautiful and important subject, but it is essential to understand the second law in its own right if we are ever going to derive it from statistical mechanics. Beginning in the fifties some people (e.g., P. Landsberg, H. Buchdahl, G. Falk & H. Jung, and, most notably, R. Giles) advocated an approach to the law based on an order relation among equilibrium states. We built on this structure. The earlier work introduced a basic new axiom which we call "comparison"; one of our main contributions was to convert this from an axiom to a theorem.

The subject is not, and may never be, finished. Also, the logical structure may have use in other fields, such as economics. We would be delighted if our article motivated other mathematicians to take up the thread.

Our sincere thanks go to Beth Ruskai for urging us to write this article, to the editor, Tony Knapp, for patience and much helpful criticism, and to Sandy Frost for essential help with editing.

AWM ASSOCIATION FOR WOMEN IN MATHEMATICS

Association for Women in Mathematics

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
Annie Selden

In recognition of her major contributions to mathematics education and her outstanding achievement as a scholar and mentor, the AWM is pleased to present the Twelfth Annual Louise Hay Award to Annie Selden of Tennessee Technological University.

Annie Selden has been a visionary for the promotion of research in collegiate mathematics education and has provided leadership for the professional community of mathematics educators. A leader in the field writes, ". . . the growth of interest in mathematics education by the entire mathematics community would not have happened nearly as extensively, as richly, and as quickly as it did were it not for the efforts of Annie Selden." She was a key supporter in the realization of a professional organization, the Association for Research in Undergraduate Mathematics Education (ARUME). The recognition of this organization led to the formation of SIGMAA on RUME as an MAA special interest group of which she currently serves as Coordinator. Her vision and investment of time and energy have made a vital contribution to the mathematics community's understanding of teaching and learning undergraduate mathematics.

Annie Selden has contributed to the field of research in teaching and learning collegiate mathematics through significant writings on calculus learning and proof in advanced mathematical thinking. A colleague states, "Relative to the calculus reform she has produced thoughtful papers on topics such as functions, technology, the constructivist approach and research." Her stature as a scholar in undergraduate mathematics education is evident from her invitations to chair a research forum on Advanced Mathematical Thinking and to serve as an editor or member of the editorial board of several mathematics education publications, including the *Journal for Research in Mathematics Education*, *FOCUS/MAA Online*, *UME Trends*, *The College Mathematics Journal*, *Journal of Computers in Mathematics and Science Teaching*, and *Research in Collegiate Mathematics Education*. Over the past twelve years, in addition to editing numerous manuscripts, she authored or coauthored 18 mathematics education research papers, 26 Research Sampler columns, 36 news/feature articles, and 83 abstracts of mathematics education research. As an Associate Editor of *MAA Online*, she assumed the added responsibility of giving thoughtful and substantive responses to a wide variety of requests for additional information from scholars, teachers, and parents. She has taught a broad spectrum of students in Turkey, Nigeria, and the United States.

Annie Selden has given generously of her time and expertise by mentoring young faculty who are interested in pursuing research in undergraduate mathematics education. She has served as an effective mentor for the Research in Undergraduate Mathematics Education Community (RUMEC) efforts to pair senior mathematics education researchers with mathematicians and other young faculty interested in carrying out research projects in undergraduate mathematics education. She listens carefully to research plans of young faculty and provides suggestions and critiques of their work. Her commitment has involved the devotion of many hours in long-distance communication and assistance in the preparation of research talks. Her collaborative spirit extends to others in her role as organizer of working groups and research sessions. She provides guidance to other researchers in the field by sharing her insight on issues ranging from how to write a quality research article to where to submit a paper for publication. She productively works with her colleagues from a base of respect, honoring the views of others, and promoting shared decisions on important research issues.

For her outstanding scholarly contributions to undergraduate mathematics education, her sustained efforts to promote the mathematics community's understanding of the importance of research in mathematics education, and her role as a mentor to young faculty, Professor Annie Selden is awarded the Twelfth Annual Louise Hay Award for Contributions to Mathematics Education.

Response from Professor Selden

I am very honored to have been selected by the Association for Women in Mathematics for its 12th Annual Louise Hay Award for Contributions to Mathematics Education.

I began my academic career intending to become a research mathematician. An auspicious start at graduate work in 1959, one failed marriage, and two children later, I finally completed the Ph.D. at Clarkson University in 1974. The job market being what it was at that time, this was followed by eleven years at universities abroad, teaching mathematics to students whose native language was not English. Perhaps as a consequence, I developed an interest in problems of teaching and learning. Why, if one explains things slowly and well with many interesting examples, do so many students not learn? Surely, I thought, such questions have answers. In 1978, I began modestly by examining the reasoning errors of students in my modified Moore Method abstract algebra course. Some years later, I was pleasantly surprised to learn that such efforts at investigating how students think about mathematics were regarded as a legitimate and important research area with well-developed criteria and standards.

Along the way, many people have influenced and encouraged me. One such person was, and still is, Ed Dubinsky. In 1988 he asked John and me to write what was to become the Research Sampler Column in *UME Trends*, which continues today in *MAA Online*. Thus began our continuing excursion into exposition for the mathematics community. It is no easy task to try to convey, in an engaging yet faithful way, the results of research in one area (mathematics education) to its potential consumers in another (the mathematics community). Good expository work in any field ought to be regarded as a valid scholarly endeavor.

Another opportunity to learn and develop came when I was asked to serve on the Editorial Panel of the *Journal for Research in Mathematics Education*. I can assure you that, should you ever be invited, this job is no hollow honorific. One is never without one or more manuscripts that need one's careful attention. I learned a great deal about what makes for good, publishable mathematics education research—the kind that "pushes the field forward." I became a very critical reader of the research literature. What was the research question? What is claimed in the way of an answer, or partial answer? What evidence is provided for that claim? Is that evidence convincing? I would like to thank the many mathematics education colleagues who served with me during those three years. That experience, along with my other editing and reviewing work for a variety of journals, convinced me of the importance of such scholarly work.

I would like to thank the members of SIGMAA on RUME (formerly ARUME) without whose hard work (and the support of ExxonMobil) our organization would not have come into existence and prospered. It has been my pleasure to serve as Coordinator in these early years; together we have written a charter and by-laws (three times), begun a literature database devoted to research in undergraduate mathematics education, written guidelines for mathematics departments seeking to hire and tenure specialists in mathematics education, and organized many research sessions and conferences. We are a growing vibrant organization and we invite anyone interested in research into the teaching and learning of undergraduate mathematics to join us.

Thanks are also due to the many students who have been a continuing source of inspiration about the varied ways one can interpret mathematics. My musings on mathematical cognition have been stimulated by their input. Mathematics education research has its pure and applied sides with the ultimate aim being improved student learning.

I would like to thank Tennessee Tech for allowing me to switch research areas. Despite its having hired me to do one thing (mathematics), I was never curtailed in my efforts to redefine myself and work in new, exciting directions. Tennessee Tech gave me time off to visit and learn from some very hospitable mathematics education researchers at Berkeley and San Diego State. Most of all I would like to thank my husband, John Selden, for joining me in these new directions—he is my most important research collaborator and critic.

AWM
ASSOCIATION
FOR WOMEN IN
MATHEMATICS

ASSOCIATION FOR WOMEN IN MATHEMATICS

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 Twelfth Annual Alice T. Schafer Prize to two outstanding young women mathematicians: **Kay Kirkpatrick** from Montana State University and **Melanie Wood**, from Duke University.

Additionally, five outstanding young women were recognized at the conclusion of the AWM Panel on Sunday, January 6, 2002. AWM was pleased to recognize five outstanding women who were nominated and given an **honorable mention** in the Schafer Prize competition: **Karen M. Lange**, a senior who is a double major in mathematics and computer science at Swarthmore College; **Sonja Mapes**, a senior mathematics major at the University of Notre Dame; **Amy E. Marinello**, a senior mathematics major at Swarthmore College; **Kathleen A. Ponto**, a senior mathematics major at the University of Notre Dame; and **Grace C. Wang**, a senior mathematics major at the University of California at Berkeley. Citations on the Honorable Mention recipients are available from the AWM.

Citation

Kay Kirkpatrick

Kay Kirkpatrick is a senior at Montana State University. She has taken many graduate courses; her professors say that she "routinely takes 20–22 credits per term, earning A's in them all." In summer 2000, she participated in the Industrial Mathematics

Workshop for Graduate Students at the Center for Research in Scientific Computation at North Carolina State University. Her mentor there says that Kay "was extremely insightful, very creative in her thinking, and was the intellectual peer of the best graduate students in the program. She is one of the brightest undergraduates I have encountered in more than 30 years in academia." He says that her team's work is "destined for publication." Kay also participated in an REU in summer 2001, resulting in a paper which has been accepted by the *Houston Journal of Mathematics.* Her mentor in this program says that Kay "was just a delight to work with, and to talk to. If I had made a wish-list for the perfect candidate for my summer REU program, Kay would have exceeded that beyond all expectations." In addition, Kay was awarded a Barry M. Goldwater Scholarship in 2001. One of her professors says that Kay is "an extremely warm, respectable, enthusiastic and hard working person. Her brilliance and dedication renew my inspiration as a professor."

Response from Kay Kirkpatrick

I feel extremely honored to be numbered among today's rising women in math. The Association for Women in Mathematics is doing a wonderful thing to encourage and support aspiring mathematicians. I'll spend the rest of my life repaying this debt to AWM and to all of my professors and mentors. You all have not only supported me, but also have been true inspirations. I'd like to thank the Honors Program and Music Department at MSU for bringing me to Montana State University-Bozeman in the first place. I feel indebted to the math professors who noticed my ability while I was still a psychology major, and those who continued to nurture me when I switched to math. Kudos to the scientists and mathematicians at the Center for Computational Biology at MSU, the Modeling Workshop at North Carolina State, and the University of Houston, who all helped me discover the exhilaration of being on the cutting edge of research. Because of each one of you, the quality of my undergraduate education has exceeded even my own high expectations. Special thanks to my family, who always told me that I could do whatever I wanted, even before I figured out what "whatever" was. And to my sister Bonnie, who is also my roommate, best friend and biggest fan: you know you're a mathematician at heart.

Citation

Melanie Wood

Melanie Wood is a junior at Duke University. In 1999, she was a member of Duke's 3rd-place Putnam team and received an Honorable Mention for her individual Putnam performance. She has excelled in many graduate courses, beginning in the fall of her freshman year and continuing to the present. Her professors say that Melanie is "a truly remarkable student, one of the best I have ever encountered in my 21 years of teaching" and that "I know that she will become a top-flight mathematician." In summer 2000, she participated in an REU which resulted in a paper that has been submitted to a well-respected journal. Her mentor from this program expects that the paper will be accepted and writes that "in this elite group (of REU participants) Melanie ranks with the best." She has recently begun independent research on another topic and "has already made original and non-trivial progress." In addition, Melanie was awarded a Barry M. Goldwater Scholarship in 2001. Her professors agree that Melanie "has a passion for mathematics" and "will become a wonderful role model for others."

Response from Melanie Wood

It is a wonderful honor to be awarded the Alice T. Schafer Prize from the Association for Women in Mathematics. I would like to thank those who established the award for their vision to recognize and encourage young women mathematicians. Mathematics, though extremely rewarding, is a difficult career to pursue, and thus it is so important for young mathematicians to feel support from the community as they pursue their careers. I want to thank the Association for Women in Mathematics for showing me such support and recognizing me among such outstanding young women mathematicians. Also, I would like to thank the Duke Math Department for providing an encouraging, supportive, challenging, and exciting environment in which to do mathematics. My wonderful experience in the department has really solidified my decision to go to math graduate school and pursue math research as a career. In particular, I would like to thank David Kraines for his help in practically every aspect of my mathematical activities, Richard Hain for being a great research mentor, Robert Bryant for leading me through exciting independent work, and Paul Aspinwall for challenging and inspiring classes. The Research Experience for Undergraduates at the University of Minnesota-Duluth has also been an invaluable part of my undergraduate mathematical career. I would like to thank everyone there who helped me with my research, especially Manjul Bhargava for everything from inspiration to detailed comments on my paper. Finally, I would like to thank Joe Gallian for creating such a top-notch program, inviting me to attend, and supporting all of my mathematical endeavors.

MATHEMATICAL ASSOCIATION OF AMERICA

CHAUVENET PRIZE

The Chauvenet Prize, 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 Mathematical Association of America. 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

Ellen Gethner, Stan Wagon, and Brian Wick

A Stroll through the Gaussian Primes

***American Mathematical Monthly,* vol. 105, no. 4, 1998, pp. 327–337**

This excellent expository article describes the Gaussian moat problem concerning the distribution of the Gaussian primes in the complex plane. The problem was first posed by Basil Gordon at the International Congress of Mathematicians in Stockholm in 1962 and later popularized by Paul Erdős. If one uses the Gaussian primes as stepping stones, can one walk to infinity with steps of bounded length? It is a fascinating and still an unanswered question.

Using a very accessible and pleasant style, Ellen Gethner, Stan Wagon, and Brian Wick present the history of and motivation for the problem. The paper includes a proof that the walk to infinity cannot take place on a straight line. It is known that there are regions of any size containing no Gaussian primes, but it not known whether there are angular sectors not admitting a walk to infinity. The authors then discuss the main problem, of the existence of large moats without Gaussian primes, and describe computational methods that they use. The paper contains striking illustrations of some moats and of the eight-fold symmetry of the set of all Gaussian primes.

Biographical Notes

Ellen Gethner received her AB in 1981 from Smith College, her Ph.D. from Ohio University in 1992, and is in the final stages of another Ph.D. in Theoretical Computer Science at the University of British Columbia. She taught at Swarthmore, Grinnell, and Claremont McKenna Colleges, and enjoyed a two-year postdoctoral fellowship at the Mathematical Sciences Research Institute (MSRI). Her research interests span many fields including graph theory, graph algorithms, combinatorics, number theory, computational and discrete geometry, complex analysis, and the surprising connections among them. She has given numerous research talks throughout North America, and continues to enjoy her role as a communicator of mathematics.

Stan Wagon is a professor of mathematics at Macalester College in St. Paul, Minnesota. He is the author of several books, such as *The Banach-Tarski Paradox*, *Which Way Did the Bicycle Go?*, *Mathematics in Action*, and *A Course in Computational Theory*. A book-software combination authored by him and titled *The Mathematical Explorer* was recently released by Wolfram Media, Inc. He obtained some notoriety when he built a squared-wheeled bike and road for riding it smoothly, a construction that earned him an appearance in Ripley's *Believe-It-Or-Not*. His main interests are the impact of modern software on mathematics teaching and research, and he has written many papers showing how *Mathematica* can be used to examine and gain understanding about objects that formerly were considered quite abstract. He is a competent rock-climber, ski mountaineer, and in May 2000 participated in a 17-day expedition that skied to 19,000 feet, near the summit of Mt. Logan, the highest peak in Canada.

Brian Wick was raised in La Jolla, CA and attended San Diego University where he received B.S. and M.S. degrees in mathematics. After that, he moved to Seattle where he studied under the direction of Dr. Robert Warfield in the area of infinite Abelian groups. He received his Ph.D. in 1972 from the University of Washington. Upon graduation, he accepted the first full-time mathematics position at the University of Alaska at Anchorage (nee Anchorage Senior College). There, he served as chairman of the Department of Mathematics for 10 years as well as the Division Head of the Division of Science and Mathematics. He developed the baccalaureate degree in mathematics and was instrumental in starting the disciplines of physics, applied statistics, and computer science. During his tenure at UAA, he taught the majority of the mathematics courses, the calculus-level physics course, and many computer science courses. In 1997, he received the Distinguished College or University Teaching of Mathematics Award by the Pacific Northwest Section of the Mathematical Association of America.

Response from Professor Gethner

The question "Can one walk to infinity on Gaussian primes in steps of bounded length?" is still unanswered, though an early wish was simply to solve it once and for all. After living, breathing, and not solving this compelling problem, other kinds of questions and results began to surface. The work on The Gaussian Moat Problem with Stan Wagon and Brian Wick evolved into a set of diverse explorations including elusive history of the problem, new computational approaches, and classical techniques from Number Theory. The adventure took many pleasant twists and turns; one highlight was the opportunity to discuss the problem with Paul Erdős.

It is an honor and a privilege to be a co-recipient of the Chauvenet Prize; I offer thanks to Stan and Brian for their collaboration and sincere appreciation to the MAA for their recognition of our paper.

Response from Professor Wagon

The primes in the complex numbers have inspired several generations of mathematical artists. In the 1950's, small tablecloths depicting the Gaussian primes were manufactured in Switzerland. And I have tiled my bathroom wall in this pattern. In our paper, we used modern software to view and study the Gaussian primes in new ways, and it contains some complicated graphics that are informative and pleasing to look at. There is no question that a visual approach can have an impact on mathematics at all levels, and we encourage the community to consider how graphics can enhance their mathematical explorations and explanations.

Response from Professor Wick

The problem concerning whether or not one can walk to infinity with a maximum step size and by stepping only on Gaussian primes is one that is easy to understand by and of interest to undergraduate students. It is a problem that leads to many conjectures and generalizations for which students can write computer programs to explore their validity as well as to obtain beautiful images. It is an especially good problem to stimulate research interest in students.

AMERICAN MATHEMATICAL SOCIETY

FRANK NELSON COLE PRIZE IN NUMBER THEORY

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. From 1928 to 2000, prizes were awarded at two different five-year intervals for contributions to algebra and the theory of numbers, respectively. Beginning in 2002 (number theory) and 2003 (algebra), the prizes will be awarded at three-year intervals.

Citation

Henryk Iwaniec

The Frank Nelson Cole Prize in Number Theory is awarded to Henryk Iwaniec of Rutgers University for his fundamental contributions to analytic number theory. In particular, the prize is awarded for his paper (with J. Friedlander) "The polynomial $X^2 + Y^4$ captures its primes," in *Ann. Math.*, which is the first paper ever to show that an integer polynomial with "sparse" range takes on infinitely many prime values. The method is robust, and already D. R. Heath-Brown has extended the method to certain cubic polynomials. In addition, the prize is awarded for the series of papers (with W. Duke and J. Friedlander) "Bounds for automorphic L-functions, I, II, III," in *Invent. Math.*, and the paper (with B. Conrey) "The cubic moment of central values of automorphic L-functions," in *Ann. Math*. In these papers, critical-line bounds for L-functions associated to certain modular forms were greatly improved by novel methods, including an amplification technique that provided the starting point for J. W. Cogdell, I. Piatetskii-Shapiro and P. Sarnak to finally resolve Hilbert's eleventh problem (on representation by quadratic forms in a number field). And, the prize is awarded for the paper (with P. Sarnak) "The nonvanishing of central values of automorphic L-functions and Landau-Siegel zeros," *Israel J. Math*., for the introduction of far-reaching averaging and mollification techniques for families of automorphic L-functions.

Biographical Note

Henryk Iwaniec was born in Elblag, Poland, on October 9, 1947. He graduated from Warsaw University in 1971, and he received his Ph.D. there in 1972. From 1971 until 1983 he held various positions in the Institute of Mathematics of the Polish Academy of Sciences. In 1976 he defended his habilitation thesis. In the year 1976–77 he enjoyed a fellowship of the Academia Nationale dei Lincei at the Scuola Normale Superiore di Pisa. In 1979–1980 he visited University of Bordeaux. In 1983 he was promoted to Professor. The same year he became member correspondent of the Polish Academy of Sciences.

Iwaniec left Poland in 1983 to take several visiting positions in the USA at the Institute for Advanced Study at Princeton in 1983–84 and 1985–1986, the University of Michigan at Ann Arbor in the summer of 1984, and as the Ulam Distinguished Visiting Professor at Boulder in the fall of 1984. In January 1987 he assumed his present position as New Jersey State Professor of Mathematics at Rutgers University. He was elected to the American Academy of Arts and Sciences in 1995. He spent the year 1999–2000 as a distinguished visiting professor at IAS. Recently he became a citizen of the USA.

Iwaniec received first prizes in the Marcinkiewicz contests for student works in the academic years 1968–69 and 1969–70. In 1978 he received the State Prize from the Polish Government, in 1991 he received Jurzykowski Award from the Alfred Jurzykowski Foundation in New York, and in 1996 he received the Sierpinski Medal. Iwaniec was an invited speaker at the International Congress of Mathematicians in Helsinki (1978) and in Berkeley (1986).

Response from Professor Iwaniec

I thank from my heart the American Mathematical Society and the Committee of the Cole Prize for selecting me for this award. My joy is even greater when I think that this is a significant award for professional accomplishments from beyond my native country, and in particular that this is coming from my new homeland in the USA. Less emotional, nevertheless important for me is also the feeling of larger recognition of analytic number theory which the Cole Prize manifests in this case. Indeed, all the works cited for the prize are joint with many of my colleagues. Without their collaboration I cannot imagine how could I get that far. Yes, working together offers an immediate satisfaction from sharing ideas, but above all it is the only way we can cultivate in depth the modern analytic number theory.

Analytic number theory pursues hard classical problems of arithmetical nature by means of best available technologies from any branch of mathematics, and that is its beauty and strength. Analytic number theory is not driven by one concept; consequently it has no unique identity. Fourier analysis was always present, but in the last two decades it has been expanded to nonabelian harmonic analysis by employing the spectral theory of automorphic forms. For example, applying this analysis implicitly we have established the asymptotic distribution of primes in residue classes in the range beyond the capability of the Grand Riemann Hypothesis. Moreover, along these lines, we were able to produce primes in polynomial sequences. To this end one needs to enhance the Dirichlet characters by more powerful cusp forms on congruence groups. In a different direction we performed amplified spectral averaging from which to deduce important estimates for individual values of L-functions, and to apply the latter to questions of equidistribution of many arithmetical objects. Other fruitful resources for solving problems in analytic number theory were uncovered by exploiting the Riemann hypothesis for varieties. Connections of these problems with the profound theory of Deligne are by no means straightforward. Perhaps these brief words may give some idea what are the trends in the subject today, or at least what we are doing there.

There are many colleagues to whom I owe my gratitude for inspiration and joint research over the last years, among them I would like to mention Enrico Bombieri, Brian Conrey, Jean-Marc Deshouillers, William Duke, John Friedlander, Etienne Fouvry, Philippe Michel and Peter Sarnak.

Citation

Richard Taylor

The Frank Nelson Cole Prize in Number Theory is awarded to Richard Taylor of Harvard University, for several outstanding advances in algebraic number theory. He led an effort to extend his earlier work with Wiles, to show that all elliptic curves over $\mathbb{Q}$ are modular; i.e. are factors of the Jacobians of modular curves. In his book with M. Harris, he established the local Langlands conjecture, giving a complete parametrization of the n-dimensional representations of a Galois group of a local field. He has also made important progress on 2-dimensional Galois representations, establishing the Artin conjecture for an infinite class of nonsolvable cases, and increasing our understanding of the conjectures of Fontaine-Mazur and Serre.

Biographical Note

Richard Taylor was born on May 19, 1962 in Cambridge, England. At the age of two he moved to Oxford, where he grew up. In 1980 he went back to Cambridge for his undergraduate studies. In 1984 he moved to Princeton University for his graduate studies, receiving his Ph.D. in 1988 for a thesis on congruences between modular forms. His advisor was Andrew Wiles, who had a very great influence on Taylor's mathematical development.

After graduating Richard Taylor spent a post-doctoral year at the Institut des Hautes Études Scientifiques outside Paris. Encouraged and supported by John Coates, he then moved back to Cambridge University for 6 years. Following his marriage in 1995, he left Cambridge first for the Savilian chair of geometry at Oxford University, and a year later moved to Harvard University, where he is still employed. In 1990 he was awarded a junior Whitehead Prize by the London Mathematical Society, in 1992 he was awarded the Prix Franco-Brittanique by the French Academie des Sciences and in 1995 he was elected a fellow of the Royal Society.

Richard Taylor is an algebraic number theorist working on the interconnections between automorphic forms and representations of Galois groups. In 1994 he collaborated with Andrew Wiles to repair the gap in Wiles' proof of Fermat's last theorem.

Response from Professor Taylor

It is a great honour and pleasure for me to receive the Frank Nelson Cole Prize. It is also an honour to share the prize with a mathematician I admire as much as Henryk Iwaniec. The citation mentions three papers and one book, on which I have worked with a total of seven collaborators. I would like to thank them all, above all for the enjoyment I have had working on these various projects.

American Mathematical Society

Award for Distinguished Public Service

The Council of the AMS established the Award for Distinguished Public Service to provide proper recognition and encouragement to a research mathematician who has made a distinguished contribution to the mathematics profession through public service during the preceding five years. It is awarded every two years.

Citation

Margaret H. Wright

The 2001 American Mathematical Society Award for Distinguished Public Service is presented to Professor Margaret H. Wright, newly appointed Chair of Computer Science at New York University after 14 years with the Computing Sciences Research Center at Bell Laboratories.

Professor Wright was elected to the National Academy of Engineering in 1997 and was chosen Emmy Noether Lecturer by the Association for Women in Mathematics and Forsythe Lecturer by the Computer Science Department at Stanford University in 2000.

Among her notable contributions to the federal government are service as Chair of the Advisory Committee for the Directorate of Mathematical and Physical Sciences at the National Science Foundation, as current Chair of the Advanced Scientific Computing Advisory Committee for the Department of Energy and recently as a member of committees of the National Research Council.

Professor Wright's contributions to the scientific community include service as President of SIAM in 1995–96, as co-Chair of the Scientific Advisory Committee of the MSRI at Berkeley, California, as the current Editor-in-Chief of the *SIAM Review* and as an Associate Editor of the *SIAM Journal on Scientific Computation*, the *SIAM Journal on Optimization* and the IEEE/AIP journal, *Computation in Science and Engineering*.

Finally Professor Wright has been active for many years in encouraging women and minority students, for example by means of programs that brought them together with leaders and researchers from industry to discuss opportunities outside academia.

Biographical Note

Margaret H. Wright is Professor of Computer Science and Mathematics and chair of the Computer Science Department in the Courant Institute, New York University. From 1988–2001 she was with the Computing Sciences Research Center at Bell Laboratories, Lucent Technologies (formerly AT&T Bell Laboratories), where she was named a Distinguished Member of Technical Staff in 1993 and a Bell Labs Fellow in 1999. She served as head of the Scientific Computing Research Department from 1997–2000. From 1976–1988 she was a research staff member in the Systems Optimization Laboratory, Department of Operations Research, Stanford University.

She received her B.S. in Mathematics, and her M.S. and Ph.D. in Computer Science, from Stanford University. Her research interests include optimization, linear algebra, numerical and scientific computing, and scientific and engineering applications.

She was elected to the National Academy of Engineering in 1997 and to the American Academy of Arts and Sciences in 2001. During 1995–1996 she served as president of the Society for Industrial and Applied Mathematics (SIAM), and she is now a member of the Board of Trustees; she was previously a member of the SIAM Council and Vice-President at Large. She is chair of the Advisory Committee on Advanced Scientific Computing for the Department of Energy's Office of Science, and is currently chair of the peer committee in Computer Science and Engineering at the National Academy of Engineering. She is also a member of the National Science Foundation Blue Ribbon Panel on Cyberinfrastructure. From 1996–2001 she served on the Scientific Advisory Committee of the Mathematical Sciences Research Institute (MSRI), and was co-chair during 1999–2001.

In 2000 she was chosen as the Noether Lecturer by the Association for Women in Mathematics, and as the Forsythe Lecturer by the Computer Science Department, Stanford University; she also received the Award for Distinguished Service to the Profession from SIAM.

Wright is Editor-in-Chief of *SIAM Review*, as well as an associate editor of the *SIAM Journal on Scientific Computing,* the *SIAM Journal on Optimization, Mathematical Programming,* and *Computing in Science and Engineering*.

Response from Professor Wright

It is a great privilege for me to receive the 2001 Award for Distinguished Public Service, and I am deeply grateful to the selection committee and the American Mathematical Society.

Thinking about public service, I would like to echo some thoughts of Don Lewis, the 1995 recipient of this award and one of my heroes. In his response, Don stressed a point that deserves frequent repetition: mathematical sciences research will thrive only if constant attention is paid to the multiple environments in which we work and live. Because mathematical scientists function in many different contexts, some broad, some narrow, it follows that public service takes many forms—improving education, encouraging students to pursue careers in mathematics, supporting young people in the mathematical sciences, arguing for funding, sustaining the vitality of scientific societies, and conveying the excitement and importance of scientific research.

Some of the activities mentioned in my citation involve service on committees, and I want to offer a plug for the joys of committee service. Despite the stereotype (undeniably true at times!) that the way not to get something done is to form a committee, being in the room when decisions are made—and they are often made by a committee—does matter. Since our community needs to be involved in discussions at all levels about science policy and education, we also need to be on committees at all levels. Happily, the best committees provide an opportunity to meet fascinating people and to appreciate and understand other points of view.

In everything that I have done, it has been a privilege to work with many outstanding, dedicated individuals. I thank them for providing irrefutable proof that public service can make a difference.

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

Fredric Zerla, Florida Section

The Florida Section of the Mathematical Association of America is pleased to recommend Professor Fredric Zerla for the Certificate of Meritorious Service. Dr. Zerla received his B.S. degree in 1958 from the Franciscan University of Steubenville and his Ph.D. from Florida State University in 1967. Dr. Zerla has been a member of the faculty at the University of South Florida for 38 years, and has contributed in a host of ways to the development of that institution. He has served on the Faculty Senate, on curriculum committees at both the university and state levels, and continues to serve on the statewide curriculum-coordinating group for mathematics. He has, for several years, been advisor to student mathematical societies, including Pi Mu Epsilon and the University's student MAA chapter.

Professor Zerla was already an active MAA member when the Florida Section was founded in 1967, and has attended the past 33 consecutive section meetings — one of the longest active streaks on record. During that period, he has held many of the offices of the Section, including Vice-President for Programs (1984–85), President (1987–88), Local Arrangements Coordinator (1976–77, 1999–2000), and Governor (1998–2001). In addition, he has served for many years as coordinator of the Suncoast Region, one of the most active and visible regions within the Florida Section. Fred has long been known for his extensive experience with MAA, and his part of our institutional memory has been called upon for advice and counsel numerous times. His many and varied contributions to the Florida Section were acknowledged in 1994 with the section's Distinguished Service Award.

For his service to the students and faculty of the University of South Florida, for his efforts on behalf of the mathematics curricula throughout the state, and for his long and extensive record of contributions to the Florida Section, we are proud to nominate Dr. Fredric Zerla for the Certificate of Meritorious Service.

Response from Professor Zerla

I thank the Florida Section and the MAA for finding my work worthy of this honor. Working with and for the MAA has been a rewarding experience because of its dedication to quality in college-level mathematics education. The programs and encouragement of the MAA have been of immense benefit in facilitating communication among the institutions of higher learning in Florida. This system, consisting of 28 community colleges, most with semi-autonomous branches, in concert with 11 state universities and numerous private colleges, is unmatched in any other state in the Union. Articulation among these schools is both vital and difficult. For mathematics, the MAA provides the grease that allows this cumbersome machinery to operate. The state meeting in March and various regional meetings scattered throughout the rest of the year allow mathematics instructors to meet to discuss programs, to discover new methods, to hear interesting mathematics and to know their colleagues at other schools. It has been my privilege to have helped to facilitate this communication for many years.

Citation

Cynthia J. Woodburn, Kansas Section

Cynthia Woodburn has been the kind of faculty member any chair dreams of hiring. Cynthia is always searching for real-life, homey ways to help students understand concepts, such as using an onion in teaching about thin shell volume method. She is actively engaged in using writing to learn about mathematics, having taught Writing to Learn courses for years. She will go out of her way to help students succeed without seeming to count the cost herself.

She was active in MAA before she arrived at Pittsburg State, since she was a participant in Project NExT. She continued her activity in this project over several years, acting as mentor to new Ph.D.'s in mathematics. She has also been active in MAA since she came to Pittsburg State, giving several talks at Kansas Section meetings and volunteering to design and manage the Kansas Section webpage. She has also served on several nominating committees.

For her dedication, the Kansas Section is happy to honor Cynthia Woodburn with the Certificate of Meritorious Service.

Response from Professor Woodburn

I feel greatly honored to be receiving an MAA Certificate of Meritorious Service. I am very proud to be a member of the MAA and the Kansas Section, and I have truly enjoyed and benefited from my work with the MAA. Thank you for your recognition.

Citation

John W. Petro, Michigan Section

The Michigan Section of the MAA is pleased to recognize Professor John W. Petro as its 2001 recipient of the Certificate of Meritorious Service. We gratefully acknowledge the many contributions that he has made to the Michigan Section, to the MAA, and to the greater mathematical community.

Professor Petro has served the Michigan Section as Program Chair (1987–88), Chair (1988–89), Newsletter Editor (1994–97), Governor (1995–98), Section Archivist (1991–present), and Liaison Coordinator (1999–2001). He has been a regular grader of the Michigan Mathematics Prize Competition since he joined the section in 1963. In 1999, he published an update to the Brief History of the Michigan Section. Also in service to the section, he has been a member or chair of several committees, including the Nominating Committee, the Student Chapter Committee, and Local Arrangements Committee. In addition, John has worked behind the scenes as a very effective recruiter of section members.

In 2000, John retired from Western Michigan University, where he had been a member of the faculty since 1961 and Chair of the Department of Mathematics and Statistics from 1996 to 2001. John has directed many symposia and workshops on matrix analysis and applications, college teaching, group theory, and Maple. He has also made many presentations at colleges and universities and at many Michigan Section, NCTM, and MAA meetings. His service at the national level includes a six-year membership on the AMS-MAA-SIAM Joint Committee on Employment Opportunities (which he chaired in 1986–87), and a six-year term as chair of the Committee on MAA Departmental Liaisons (1995–2001).

For his many years of dedicated service and outstanding leadership, the Michigan Section is proud to present the 2001 Certificate of Meritorious Service to Professor John W. Petro.

Response from Professor Petro

Forty years ago, as a new faculty member at Western Michigan University, I was very privileged to have the opportunity to meet and become personally acquainted with two of the founding members of the Michigan Section, T. H. Hildebrandt, Professor Emeritus, University of Michigan, and John P. Everett, Professor Emeritus, Western Michigan University. These distinguished scholars and their many fine colleagues throughout the Michigan Section displayed a contagious enthusiasm for the Mathematical Association of America that really impressed me from the very beginning and which has remained with me throughout my own career.

It has been a pleasure for me to follow in the footsteps of those who have gone before me, and to be just one of the many dedicated colleagues in the Michigan Section who have shared in the vision of building a truly outstanding mathematics community for the benefit of all. My greatest reward has been to see the Michigan Section and the Mathematical Association of America prosper through the years. I humbly accept the MAA Certificate of Meritorious Service and I trust that what I have done will be an inspiration for my colleagues who go after me, just like the accomplishments of those who went before me were an inspiration for me.

Citation

Dennis Luciano, Northeastern Section

It is with great pleasure that the Northeastern Section of the Mathematical Association of America recognizes Dennis Luciano as its 2001 recipient of the Certificate of Meritorious Service. We gratefully acknowledge his devotion to the MAA and his exemplary service to the Northeastern Section.

Professor Luciano has served the Northeastern Section in a variety of important capacities. He, together with his colleagues at Western New England College, has hosted numerous section activities: section meetings, dinner meetings, minicourses, and, this year, the short course. He was Local Arrangements Chair for one of our largest section meetings; the 1984 Fall meeting with 225 participants. He was the coordinator for the Student Papers Sessions at the section meetings from 1985–87. At the 1985 Spring Meeting, he gave a talk entitled “Public Key Cryptosystems,” based on work with Gordon Prichett of Babson College. In 1988, he received the Pólya Award for the subsequent paper “Cryptology: From Caesar Ciphers to Public-Key Cryptosystems,” which had been published in the *College Mathematics Journal* in 1987. He served as Section Chair from 1987–89. His Message from the Chair in our section newsletter received national attention and excerpts were published in FOCUS. He served two terms as Governor, 1991–94 and 1997–2000. Among his activities as Governor, he updated the Department Representative list for all colleges and universities in the Northeast. Currently, he is Co-Chair of the Section Short Course Committee.

Professor Luciano has also been active in the MAA at the national level. He gave lectures as part of the MAA Visiting Lecture Program for several years. He served on the Committee on the Undergraduate Program in Mathematics from 1991–99 and on the MAA Coordinating Council on Education 1992–95.

In addition to his formal service, Dennis is always a very positive presence at our section meetings. He has encouraged many people at his own institution and others to be active members of the Northeastern Section.

Response from Professor Luciano

It is indeed an honor to be the 2001 recipient of the Certificate of Meritorious Service to the Northeastern Section of the Mathematical Association of America. I am humbled that I now will be sharing the company of the distinguished group of past winners; Donald Small (Colby College), James J. Tattersall (Providence College), Frank P. Battles, and Laura L. Kelleher (Massachusetts Maritime Academy). Further, knowing all the fine individuals in the section I have been fortunate enough to have worked with, over almost twenty years, makes this citation even more special to me.

Early in my career, I realized that my professional life would be greatly enhanced by attending regional and national MAA meetings, and clearly it was. Initially, I was a spectator reaping the rewards of listening to well-known mathematicians, as well as other mathematicians, who provided a model by their enthusiasm for mathematics and teaching. Soon, I found myself on the other side of the podium, and later I committed myself to continue the well-honored traditions of the Northeastern Section. Clearly though, my participation at the national level gave me a more complete understanding of the vital importance of the Mathematical Association of America, not only to all the individuals it serves, but also to the mathematical culture that has influenced our society in the past, present, and into the future. For me, this has been a labor of love, and will continue to be. Through the MAA, professional goals have been realized, and special friendships have been fostered. That alone would have been sufficient reward from my service.

My sincere gratitude goes to the Northeastern Section and the Board of Governors for this prestigious honor.

Citation

Richard A. Gibbs, Rocky Mountain Section

Professor Emeritus Richard A. Gibbs joined the faculty of the Department of Mathematics at Fort Lewis College in 1971, after completing a Ph.D. in mathematics at Michigan State University in 1970 and spending a year teaching at Hiram Scott College. He is currently a member of the Mathematical Association of America, the National Council of Teachers of Mathematics, the School Science and Mathematics Association, Sigma Xi, Kappa Mu Epsilon, the Colorado Council of Teachers of Mathematics, and the Four Corners Council of Teachers of Mathematics.

During his tenure at Fort Lewis College, he has served, often as chair or director on numerous professional bodies among which are the MAA Committee on the American Mathematical Competitions, the Colorado Mathematics Awards, Kappa Mu Epsilon, the American High School Mathematics Examination, and the Four Corners Council of Teachers of Mathematics. He has chaired his department, and has served as the director of four NSF grants and one NSF Summer Conference. He chaired the Rocky Mountain Section of the MAA for the 1988–1989 term. He has furthered the education of numerous students of mathematics through his activities coaching 30 Putnam teams from his institution, through encouraging their efforts to prepare presentations for MAA and Kappa Mu Epsilon, and through the weekly puzzles column he has edited for the Durango Herald for nearly 30 years.

The Rocky Mountain Section of the Mathematical Association of America therefore takes great pleasure in awarding Professor Richard A. Gibbs, of Fort Lewis College, this Certificate of Meritorious Service in recognition of his outstanding contributions to his discipline, to his institution, and to the Rocky Mountain Section.

Response from Professor Gibbs

This is a wonderful award and I thank the members of the Rocky Mountain Section of the MAA for this recognition. I am honored, humbled, and very pleased to accept this award. I accept it as well on behalf of the many members of the Rocky Mountain Section who are at least as deserving of it as I. It is particularly gratifying to be recognized for work that has been so enjoyable over the years.

Citation

Vivian Dennis-Monzingo, Texas Section

The Texas Section is pleased and proud to recognize Vivian Dennis-Monzingo as recipient of the MAA Meritorious Service Award. She has a long and active record of participation in and support of the Texas Section. She has presented papers, served on numerous committees and participated in panel discussions. She has served with distinction as Chair of the Section (1993–1994) and as Level I Director (1981–1984). In 1998, she received the Distinguished Service Award from the Texas Section.

In addition to being appreciated for her many areas of service, Dr. Dennis-Monzingo is widely known as a friend and mentor to other members. Her gracious greetings and genuine hospitality have enriched many Section meetings.

More recently, Dr. Dennis-Monzingo has assisted with the Texas Section Project NExT program. She helps to arrange meetings, handling a multitude of details involving speakers, rooms, and meals.

Dr. Dennis-Monzingo was educated at Texas A&M- Commerce, and since 1970 has been on the faculty at Eastfield College. There she has served as President of the Eastfield College Faculty Association (1990–1992, 1992–1994) and as President of the Texas Technical Society (1981). She has also been Chair of the Mathematics Department since 1995. In 2000, she was recipient of a Minnie Piper Stevens Award for outstanding teaching.

The Texas Section is fortunate to have such a dedicated and tireless member who promotes mathematics with energy and enthusiasm.

Response from Professor Dennis-Monzingo

Borrowing from one of Elizabeth Barrett Browning's sonnets, namely, the line "let me count the ways": let me count the ways the Mathematical Association of America has benefited me and my students.

1. A continual renewal of my interest in mathematics.
2. An opportunity to form lasting friendships with colleagues from other institutions.
3. Through meetings and publications, I am able to provide my students with the latest technology and teaching methods.
4. By keeping me abreast of changes in the course content at other institutions.

And the list goes on, but one of the greatest benefits both at state and national levels of the MAA is the many opportunities that are available to members to serve the organizations, students, and field of mathematics.

To each and everyone, please accept this statement of appreciation for all that you have done for me during my thirty-plus years of membership. Thank you.

AMERICAN MATHEMATICAL SOCIETY

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

Yitzhak Katznelson

Although the subject of Harmonic Analysis has gone through great advances since the sixties, Fourier analysis is still its heart and soul. Yitzhak Katznelson's book on Harmonic Analysis has withstood the test of time. Written in the sixties and revised later in the seventies, it is one of those "classic" Dover paperbacks that has made the subject of Harmonic Analysis accessible to generations of mathematicians at all levels.

The book strikes the right balance between the concrete and the abstract and the author has wisely chosen the most appropriate topics for inclusion. The clear and concise exposition and the presence of a large number of exercises make it an ideal source for anyone who wants to learn the basics of the subject.

Biographical Note

Yitzhak Katznelson was born in Jerusalem in 1934. He graduated from the Hebrew University with a master's degree in 1956 and obtained the Dr. és Sci. degree from the University of Paris in 1959.

After a year as a lectuer at the University of California, Berkeley, and a few more at the Hebrew University, Yale, and Stanford, he settled in Jerusalem in 1966. Until 1988 he taught at the Hebrew University, while making extended visits to Stanford and Paris. He is now a professor of mathematics at Stanford University.

Katznelson's mathematical interests include harmonic analysis, ergodic theory (and in particular its applications to combinatorics), and differentiable dynamics.

Response from Professor Katznelson

What a pleasant surprise!

I am especially gratified by the Committee's approval of "the balance between the concrete and the abstract", which was one of my main concerns while teaching the course and while developing the notes into a book.

How should one look at things, and in what generality? If a statement and its proof apply equally in an abstract setup, should it be introduced in the most general or the most familiar terms?

When I came to Paris in 1956 I heard a rumor that the old way of doing mathematics was being replaced by a new, "abstract" fashion which was the only proper way of doing things. The rumor was spread mostly by younger students—typically hugging a freshly-purchased volume of Bourbaki—but seemed confirmed also by the way some courses were taught.

As late as 1962, Kahane and Salem find the need to apologize (undoubtedly tongue-in-cheek) in the preface to their exquisite book, *Ensembles parfaits et séries trigonométriques* for dealing with subject matter that might be considered too concrete.

The balance I tried to strike in the book—and I believe that I was strongly influenced by Kahane and Salem—was to set up the subject matter in the most concrete terms, and allow as much generality and abstraction as needed for development, methods, and solutions.

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 geometry/topology.

Citation

Mark Goresky and Robert MacPherson

In two closely related papers, *Intersection homology theory*, Topology 19 (1980), no. 2, 135–162 (IH1) and *Intersection homology. II*, Invent. Math. 72 (1983), no. 1, 77–129 (IH2), Mark Goresky and Robert MacPherson made a great breakthrough by discovering how Poincaré Duality, which had been regarded as a quintessentially manifold phenomena, could be effectively extended to many singular spaces. Viewed topologically, the key difficulty had been that Poincaré Duality reflects the transversality property that holds within a manifold but which fails in more general spaces. IH1 introduced “intersection chain complexes,” which are the subcomplexes of usual chain complexes consisting of those chains which satisfy a transversality condition with respect to the natural strata of a space. More precisely, by introducing a kind of measure, called a “perversity,” of the amount of variation from transversality a chain would be allowed, Goresky and MacPherson actually introduced a parametrized family of intersection chain complexes. Each of these yielded a corresponding sequence of intersection homology groups and these theories intermediated between homology and cohomology. Starting with methods of local piecewise-linear transversality that had been developed by investigations of M. Cohen, E. Akin, D. Stone and C. McCrory, IH1 showed that its intersection homology theories were related to each other by a version of Poincaré Duality; in particular, the intersection homology theory which was positioned midway between homology and cohomology satisfied, when defined, a self-duality, as was familiar for manifolds. This immediately yielded a signature invariant for many singular varieties and that, in turn, was used in IH1 to yield, in analogy with the Thom-Milnor treatment of piecewise linear manifolds, rational characteristic classes for many triangulated singular varieties. However, these characteristic classes of singular varieties naturally were elements in homology rather than cohomology groups, a distinction which for singular varieties was significant.

The continuation paper, IH2, reformulated this theory in a natural and powerful sheaf language. This language, suggested by Deligne, gave local formulations of a version of Poincaré Duality for singular spaces in terms of a Verdier Duality of sheaves. Furthermore, IH2 presented beautiful axiomatic characterizations of its intersection chain sheaves. These were all the more valuable as the achievement of duality for nonsingular spaces came at the cost of giving up the familiar functorial and homotopy properties that characterized usual homology theories; in particular, intersection homology theory is not a “homology theory” in the sense of homotopy theory.

IH1 and IH2 made possible investigations across a great spectrum of mathematics which further extended key classical manifold phenomena and methods to singular varieties and used these to solve well-known problems. While it is impossible to list all of these, a few important ones in 1) differential geometry, 2) algebraic geometry and representation theory, 3) geometrical topology, and 4) geometrical combinatorics will be indicated.

1) An immediate question was the relation of intersection homology theory to an analytic theory of L^2 differential forms and L^2 cohomology on suitable singular varieties with metrics that J. Cheeger had concurrently developed. In fact, for many metrics the resulting groups were seen to be isomorphic by a generalization of the classical de Rham isomorphism of manifold theory. Questions about when and how this can be generalized to various natural metrics have since occupied many investigators.

2) The work of IH2 led to the discovery of the important category P(X) of perverse sheaves on an algebraic variety X. In the case when X is a smooth algebraic variety over a field of characteristic zero the [generalized] Riemann-Hilbert theorem says that the category P(X) is equivalent to the category of D-modules on X. This equivalence made possible the applications of Grothendieck’s yoga to the theory of D-modules and, in particular, to the formulation and proof of the Kazhdan-Lusztig conjecture, which gives a formula for characters of reducible representations of Lie groups in terms of intersection homology of the closures of Schubert cells. In the case when X is an algebraic variety over a finite field F, P(X) is used in investigating “good” functions on the points X(F) of X over F. This is the basic ingredient in the geometrization of representation theory which has had remarkable successes in recent years.

3) Paul Segal used the methods of Goresky and MacPherson and a cobordism theory of singular varieties to show that their rational characteristic classes could in many cases be lifted, after inverting 2, to a KO-homology class. Intersection chain sheaves were extensively used in various collaborations of Cappell, Shaneson and Weinberger which extended results of classical Browder-Novikov-Sullivan-Wall surgery theory of manifolds to yield topological classifications of many singular varieties, which developed new invariants for singular varieties and their transformation groups, which gave methods of computing the characteristic classes of singular varieties and which related these to knot invariants.

4) In investigations of the geometrical combinatorics of convex polytopes, the intersection homology groups of their associated toric varieties have become a fundamental tool. This began with R. Stanley’s investigations of the face vectors of polytopes. A calculation of the Goresky-MacPherson characteristic classes of toric varieties was used by Cappell and Shaneson in obtaining an Euler-MacLaurin with remainder formula for lattice sums in polytopes. Recent works of MacPherson and T. Braden on flags of faces of polytopes used results on the intersection chain sheaves of toric varieties. The already astonishing range of research areas influenced by this seminal work continues to grow.

Mark Goresky

Biographical Note

Mark Goresky received his B.Sc. from the University of British Columbia in 1971 and attended graduate school at Brown University. He spent the 1974–75 academic year at the Institut des Hautes Études Scientifiques, and received his Ph.D. in 1976. He was a C.L.E. Moore Instructor at the Massachusetts Institute of Technology (1976–78) and an Assistant Professor at U.B.C. (1978–81). In 1981 he moved to Northeastern University where he eventually attained the rank of Professor with a joint appointment in Mathematics and Computer Science. Since 1995 he has lived in Princeton, New Jersey, where he is currently a member at the Institute for Advanced Study. He has held other visiting positions at the University of Chicago, the Max Planck Institut für Mathematik, the I.H.E.S., and the University of Rome.

Professor Goresky received a Sloan Fellowship in 1981. He is a Fellow of the Royal Society of Canada, and he received the Coxeter-James Award (1984) and the Jeffrey-Williams Prize (1996) from the Canadian Mathematical Society.

Robert MacPherson

Biographical Note

Robert MacPherson received a B.A. from Swarthmore College and a Ph.D. from Harvard University. He held faculty positions at Brown University from 1970 to 1987, at MIT from 1987 to 1994, and at the Institute for Advanced Study since then. Over the years, he has held visiting positions at IHES in Paris, Université de Paris VII, Steklov Institute in Moscow, IAS in Princeton, Università di Roma I, University of Chicago, MPI in Bonn, and Universiteit Utrecht. He received the NAS Award in Mathematics, and honorary doctorates from Brown University and Université de Lille. He served as Chair of the NRC Board on Mathematical Sciences from 1997 to 2000, and is a member of the American Academy of Arts and Sciences, the National Academy of Science, and the American Philosophical Society.

Response from Professors Goresky and MacPherson

We are very grateful to the American Mathematical Society for awarding us the Steele Prize. We are particularly pleased to receive a joint prize for our joint research. We know of no other mathematical prize that is awarded jointly to the participants of a collaboration. Given the increasing role of collaborative research in Mathematics, this policy on the part of the AMS seems particularly enlightened to us.

In September 1974 we began a year at the Institut des Hautes Études Scientifiques with a pact to try to understand what intersection theory should mean for singular spaces. We thought the question might have importance for several areas of Mathematics, given the ubiquity with which singular spaces naturally arise. By late autumn, we had found intersection homology and Poincaré duality. Jeff Cheeger, Pierre Deligne, Clint McCrory, John Morgan, and Dennis Sullivan played significant roles in the early stages of this research.

Starting around 1980, an explosion of activity surrounding intersection homology occurred. Our dream that the subject would find applications suddenly became true. Many mathematicians contributed a remarkable collection of ideas to this activity, and our collaboration was swept along with this flow into new fields such as combinatorics and automorphic forms.

Today, extensions and applications of the theory are pursued by a new generation of highly talented mathematicians, some of whom have already received mathematical awards in Europe (where prizes for younger mathematicians are more common). It is gratifying to see that these ideas, in whose discovery we participated, are now in such capable hands.

AMERICAN MATHEMATICAL SOCIETY

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

Elias Stein

During a scientific career that spans nearly half a century, Eli Stein has made fundamental contributions to different branches of Analysis.

In Harmonic Analysis, his Interpolation Theorem is a ubiquitous tool. His result about the relation between the Fourier transform and curvature revealed a deep and unsuspected property and has far reaching consequences. His work on Hardy spaces has transformed the subject. He has made important contributions to the representation theory of Lie groups as well.

His work on several complex variables is equally striking. His explicit approximate solutions for the $\bar{\partial}$-problems made it possible to prove sharp regularity results for solutions in strongly pseudoconvex domains. In this connection he also obtained subelliptic estimates which sharpened and quantified Hörmander's hypoellipticity theorem for second order operators.

Besides his contributions through his own research and excellent monographs, Stein has worked with and influenced many students, who have gone on to make profound contributions of their own.

Biographical Note

Elias M. Stein was born in Belgium in 1931 and came to the U.S. at the age of 10. He received his Ph.D. from the University of Chicago in 1955. Since 1963 he has taught at Princeton University, where he has served twice as chair of the mathematics department (1968–71 and 1985–87).

Stein's many fellowships and awards include an NSF Postdoctoral Fellowship (1955–56), an Alfred P. Sloan Foundation Fellowship (1961–63), Guggenheim Fellowships (1976–77 and 1984–85), membership in the National Academy of Sciences (1974) and the American Academy of Arts and Sciences (1982), the von Humboldt

Award (1989–90), the Schock Prize from the Swedish Academy of Sciences (1993), and the Wolf Prize (1999). He was awarded the AMS Steele Prize in 1984 for his book, *Singular integrals and the differentiability properties of functions*, published in 1970 by Princeton University Press. Stein received an honorary Ph.D. from Peking University and an honorary D.Sc. from the University of Chicago.

Response from Professor Stein

I want to express my deep appreciation to the American Mathematical Society for the honor represented by this award. At this occasion I am mindful of the great debt I owe others for my present good fortune. Beginning with my teachers and mentors, and continuing with my peers, colleagues, and students, I have had the advantage of their warm support and encouragement, and the indispensable benefit of their inspiration and help. To all of them I am very grateful.

I would like also to say something about the area of mathematics of which I am a representative. For more than a century there has been a significant and fruitful interaction between Fourier analysis, complex function theory, partial differential equations, real analysis, as well as ideas from other disciplines such as geometry and analytic number theory, etc. That this is the case has become increasingly clear, and the efforts and developments involved have, if anything, accelerated in the last 20 or 30 years. Having reached this stage, we can be confident that we are far from the end of this enterprise, and that many exciting and wonderful theorems still await our discovery.

Citation

Michael Artin

Michael Artin has helped to weave the fabric of modern algebraic geometry. His notion of an algebraic space extends Grothendieck's notion of scheme. The point of the extension is that Artin's theorem on approximating formal power series solutions allows one to show that many moduli spaces are actually algebraic spaces, and so can be studied by the methods of algebraic geometry. He showed also how to apply the same ideas to the algebraic stacks of Deligne and Mumford. Algebraic stacks and algebraic spaces appear everywhere in modern algebraic geometry, and Artin's methods are used constantly in studying them.

He has contributed spectacular results in classical algebraic geometry, such as his resolution (with Swinnerton-Dyer in 1973) of the Shafarevich-Tate conjecture for elliptic K3 surfaces. With Mazur, he applied ideas from algebraic geometry (and the Nash approximation theorem) to the study of diffeomorphisms of compact manifolds having periodic points of a specified behavior.

For the last twenty years he has worked to create and define the new field of noncommutative algebraic geometry.

Artin has supervised thirty doctoral students and influenced a great many more. His undergraduate algebra course was for many years one of the special features of an MIT education; now some of that insight is available to the rest of the world through his textbook.

Biographical Note

I have departed from the usual format here to write a bit about my early life and the origins of my interest in mathematics.

When I was nearly forty years old I had a revelation: A recurring dream that I'd had since age twelve was an allegory of my birth! In the dream, I was stuck in a secret passage in our house but eventually worked my way out and emerged into a sunlit cupola. After my revelation, the dream went away.

My mother says that I was a big baby and it was a difficult birth, although I don't know what I weighed. The conversion from German to English pounds adds ten percent, and I suspect that my mother added another ten percent every few years. She denies this, of course. Anyway, I'm convinced that a birth injury caused my left-handedness and some seizures, which, fortunately, are under control.

The name Artin comes from my great-grandfather, an Armenian rug merchant who moved to Vienna in the nineteenth century. Armenians were declared "Aryan" by the Nazis, but one side of my mother's Russian family was Jewish, and because of this, my father Emil was fired from the university in Hamburg. We came to America in 1937, when I was three years old.

My father loved teaching as much as I do, and he taught me many things: sometimes mathematics, but also the names of wild flowers. We played music and examined pond water. If there was a direction in which he pointed me, it was toward chemistry. He never suggested that I should follow in his footsteps, and I never made a conscious decision to become a mathematician.

I had decided to study science when I began college, but fields such as chemistry and physics gradually fell away, until biology and mathematics were the only ones left. I loved them both, but decided to major in mathematics. I told myself that changing out of mathematics might be easier, since it was at the theoretical end of the science spectrum, and I planned to switch to biology at age thirty when, as everyone knew, mathematicians were washed up. By then I was too involved with algebraic geometry. My adviser Oscar Zariski had seen to that.

Response from Professor Artin

I thank the AMS and the Prize Committee for choosing to award me the Steele Prize for Lifetime Achievement, and I congratulate my fellow recipient Eli Stein. This award gives me great pleasure.

I also want to thank the many inspiring people who have surrounded me throughout my career. It has been a privilege to teach at MIT, where the students are gifted and motivated, and where my colleagues are as deserving of an award for lifetime achievement as I am. My thesis students there have been a constant source of inspiration. The financial support provided by the National Science Foundation for my work has been invaluable.

Alexander Grothendieck, Barry Mazur, John Tate, and of course my thesis adviser Oscar Zariski, are among the people who influenced me the most during the 1950s and 1960s. Those were exciting times for algebraic geometry. The crowning achievement of the Italian school, the classification of algebraic surfaces, was just entering the mainstream of mathematics. The sheaf theoretic methods introduced by Jean-Pierre Serre were being absorbed, and Grothendieck's language of schemes was being developed. Zariski's dynamic personality, and the expolsion of activity in the field, persuaded me to work there. I became his student along with Peter Falb, Heisuke Hironaka, and David Mumford. Later, in the 1960s, I visited the Institut des Hautes Études Scientifiques several times to work with Grothendieck and Jean-Louis Verdier.

My interest in noncommutative algebra began with a talk by Shimshon Amitsur and a visit to Chicago, where I met Claudio Procesi and Lance Small. They prompted my first foray into ring theory, and in subsequent years noncommutative algebra gradually attracted more of my attention. I changed fields for good in the mid-1980s, when Bill Schelter and I did experimental work on quantum planes using his algebra package, *Affine*.

My early training has led me to concentrate on dimension two, or noncommutative surfaces. They display many interesting phenomena which remain to be explained, and I've come to understand that two is a critical dimension. Thanks to recent work of people such as Johan de Jong, Toby Stafford and Michel Van den Bergh, the methods of algebraic geometry are playing a central role in this area too, and I hope to see it absorbed into the mainstream in the near future.

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

Dennis DeTurck

The report of an NSF committee on a site visit to one of Dennis DeTurck's many educational projects calls him creative, innovative, and charismatic. These characteristics mark a distinguished career of dedication to the improvement of teaching and learning of mathematics and science.

A charismatic classroom teacher who inspires students at all levels to learn and to love the subject, DeTurck is also a talented innovator who has created a variety of programs to enhance teaching. Let us cite a few of these.

Through an NSF grant, he founded the Middle Atlantic Consortium for Mathematics and its Applications Throughout the Curriculum. This group creates and disseminates interdisciplinary course materials aiming to stimulate the interest of math majors in applications of mathematics and to convince non–math majors of the value of mathematics in their fields.

DeTurck serves as a faculty coordinator for America Counts, a federal work-study program, in which some 40 University of Pennsylvania undergraduates spend 8–10 hours a week as tutors in West Philadelphia elementary schools. He directs Penn's NSF program, Access Science, in which 25 Penn undergraduates and graduates promote the teaching of hands-on science at West Philadelphia schools. In order to apply for this grant, he organized a team of faculty from mathematics, physics, chemistry, biology, engineering, and education. He also plays an active role in the Penn Summer Science Academy, a project integrating mathematics, physics, and chemistry designed to give pre-freshmen (many of them from minorities) a head start at Penn. He is also a distinguished researcher in the areas of partial difference equations and differential geometry.

Many of Professor DeTurck's innovative programs involve creative use of technology. He teaches a web-based course, Ideas in Mathematics, to Penn students, high school students around the country, and alumni. He was active in introducing substantial use of computers in all of Penn's calculus classes, in establishing "Maple Centers" in residence halls, where students can work on assignments cooperatively, and in promoting various uses of the internet such as on-line tutorials and late-at-night help from faculty and graduate students.

It is an honor to present Dennis DeTurck with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Dennis DeTurck is the Chairperson of the Mathematics Department and Davidson Kennedy Professor at the University of Pennsylvania. He also serves as Faculty Master of one of the College Houses at the University of Pennsylvania. His research interests center on systems of partial differential equations and differential geometry. He is currently managing editor of the *Contemporary Mathematics Series* of the AMS, and has served as associate editor of the *American Mathematical Monthly*. He was the founding director of the Middle Atlantic Consortium for Mathematics and its Application Throughout the Curriculum, and now directs the Access Science program that connects Penn's science and engineering departments with K–12 public schools in West Philadelphia.

Response from Professor DeTurck

This is a time of immense challenge and opportunity on both the research and teaching sides of our profession. Our departments are constantly asked to do more with less, to provide mathematical foundations to increasingly diverse audiences for increasingly diverse purposes. Working in West Philly public schools, I have seen the enormous potential of the students and the formidable obstacles to the realization of that potential. The dedicated, overworked teachers there, and their colleagues everywhere, need our insight, help and support. The mathematical needs of engineers, scientists, physicians, businesspeople, social scientists and the general public are changing rapidly. It is crucial for us as individuals and departments to maintain aggressive contact with these constituencies, to learn about interesting developments on the one hand and to inform and enrich our teaching on the other. The general public needs to be reminded often of the essential role that mathematics plays in their lives and of its usefulness as a way of looking at the world. One of my most satisfying recent teachable moments happened during the NBA Championships last spring, when a TV reporter remarked, "I hadn't thought about it that way, but now I understand after we did an interview about the hoopla over the millionth 76er's fan of the year."

It is simultaneously gratifying and humbling to have been selected to join the ranks of the current and former Haimo awardees. It is a great pleasure to accept one of this year's awards on behalf of the tireless efforts of all my colleagues to educate, inform, and stimulate interest in and support for mathematics.

Citation

Paul J. Sally, Jr.

Paul Sally is a highly respected research mathematician who is enormously committed to the cause of education and excellence at all levels. In the past forty years, his superb classroom teaching and his long-range educational programs have affected thousands of students and teachers from the elementary grades to the Ph.D.

In 1983, Professor Sally became director of the newly formed University of Chicago Mathematics Project, which gained prominence in reform of mathematics education, K–12. Within this project, he worked with teachers from school districts all around the country. In 1992, he founded the SESAME program (Seminars for Endorsement of Science and Mathematics Educators), a staff development program for middle school teachers in the Chicago Public Schools, which continues to be a leading program for teachers in Chicago.

Sally also co-founded a Young Scholars Program for mathematically talented students. An impressive number of these, including students from minority and underrepresented groups, have gone on to undergraduate and graduate studies in mathematics and related fields. His personal mentoring has provided encouragement and guidance to many of these students.

Paul Sally is the Director of Undergraduate Studies in the Mathematics Department of the University of Chicago and has been recognized for the excellence of his undergraduate teaching. He has coached the Putnam team, has helped establish a mathematics club, and currently oversees three different levels of calculus courses. At the graduate level, he is a popular and inspiring instructor who has directed 18 Ph.D. students, several of whom have achieved recognition for their research.

Paul Sally's mathematical business card playfully asserts that he represents groups in all fields. Clearly, he represents the best in teaching to all groups, from elementary groups, to undergraduate groups, to Lie groups. It is fitting then, that he be honored with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Biographical Note

Paul Sally is professor of mathematics at the University of Chicago, where he has taught since 1965. He served as chairman of the department from 1977 to 1980 and has produced 18 Ph.D. students in his area of research: harmonic analysis on semisimple groups over real and p-adic fields.

Professor Sally began his involvement in the Chicago Public Schools in 1969 by running a mathematics competition in collaboration with the Office of Special Programs and conducting classes for both students and teachers. In 1983, he was appointed the first director of the University of Chicago School Mathematics Project (UCSMP). He served in his post until 1987, at which point he became more involved in the staff development activities of UCSMP. In 1992, Professor Sally founded Seminars for Endorsement of Science and Mathematics Educators (SESAME), a staff development program for elementary school teachers from Chicago Public Schools. Since its inception, SESAME has involved more than 600 teachers from 125 Chicago public schools. In another enterprise begun in 1988, Professor Sally has directed the University of Chicago Young Scholars Program for mathematically talented 7–12 grade students.

Among other professional activities, Professor Sally has been a member of the U.S. Steering Committee for the Third International Mathematics and Science Study since 1991 and has served in a variety of capacities, including Chairman of the Board of Trustees, for the American Mathematical Society. His awards include the Quantrell Award for Excellence in Undergraduate Teaching (1966); the AMOCO Award for a Distinguished Career in Undergraduate Teaching (1995); the Boston College Alumni Award for Excellence in Education (1999); and the American Mathematical Society Award for Distinguished Public Service (2000). Professor Sally received a B.S. and M.A. from Boston College and a Ph.D. from Brandeis University.

Response from Professor Sally

It is a great honor to receive the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics. For almost fifty years, I have had the good fortune to work with students of all ages, cultivating their understanding of mathematics and, in many cases, guiding them into research in mathematics. There are numerous aspects to the teaching and creating of mathematics, but nothing makes the fire brighter than the light of understanding gleaming in a student's eyes.

I am especially grateful because this award is named after Frank and Debbie Haimo. I first met Frank and Debbie at Washington University in 1963. Frank was a sterling group theorist who had a remarkable touch with students. Debbie is an accomplished analyst who has worked continually and effectively in the mathematics community for many years. She and I have crossed paths regularly. My respect for her leadership qualities and her achievements is very high. I salute them both.

Citation

Edward Spitznagel, Jr.

The Mathematics Department of Washington University in St. Louis considers Edward Spitznagel to be its pre-eminent teacher, pre-eminent statistics guru, and pre-eminent computer jock.

Ed Spitznagel packs his lively lectures with real-world applications; students regularly oversubscribe his courses. He applies statistics to research in many fields and uses his experience in developing new teaching materials. He makes innovative use of the computer in his classroom.

With remarkable energy, Spitznagel collaborates with investigators in such diverse fields as medicine, pharmacology, marketing, engineering, and psychology. His breadth of scholarship and his feeling for the practical find immediate application to his teaching. In fact, he considers his research and teaching seamless. In Spitznagel's own words, "Because what I publish addresses problems in the world, there is no problem bringing it to the classroom. If I make a judgment call, for instance, that a development in biostatistics will be significant in 10 or 20 years, I teach it."

Here is one example of his approach. When the department decided to create a calculus sequence for pre-med students, Spitznagel devised a course based on research in pharmacokinetics that introduces students to both statistical and calculus techniques in medicine. It has been received enthusiastically both by students and their pre-med advisors.

When Spitznagel reorganized and started teaching a beginning-level statistics course, the enrollment jumped from a yearly average of 15 to nearly 300. He uses a hands-on approach and has students using a computer on the second day of class. He has been known to teach five sections of the course, a huge overload, so that it would be done correctly.

Ed Spitznagel consults all over Missouri and the U.S. on educational, statistical, and social issues and incorporates his wide knowledge into his teaching. For his extraordinary success in applying his vast practical experience and great enthusiasm to the classroom it is a pleasure to recognize him with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching.

Biographical Note

Edward Spitznagel received his Ph.D. from the University of Chicago in 1965. He served on the faculty of Northwestern University from 1965 to 1969. Since 1969, he has been on the faculty of Washington University, with a primary appointment in the Department of Mathematics. Since 1978, he has also held a joint appointment in the Division of Biostatistics in the Washington University School of Medicine. He has received ten awards for teaching. He has authored two books and 166 papers in physics, group theory, mathematical modeling, statistics, and medicine.

Response from Professor Spitznagel

I am greatly honored to be a recipient of the MAA Deborah and Franklin Tepper Haimo Award, particularly since I knew Debbie and Frank as very active and important members of the St. Louis mathematics community. I wish to thank my colleagues and students for nominating me for this award, as well as the selection committee for choosing me.

I feel blessed to have had a remarkably large number of teachers and colleagues who helped shape my career—a career that has evolved through undergraduate mathematics and physics, to graduate study in pure mathematics, to my current work in mathematical modeling and statistics. In my own teaching, I try to pass along all their knowledge and excitement to a new generation.

Summary of Awards

For AMS

Award for Distinguished Public Service: Margaret H. Wright

Bôcher Memorial Prize: Fanghua Lin, Terence Tao, Daniel Tataru

Frank Nelson Cole Prize: Henryk Iwaniec, Richard L. Taylor

Levi L. Conant Prize: Elliot H. Lieb, Jakob Yngvason

Leroy P. Steele Prizes: Michael Artin, Mark Goresky, Yitzhak Katznelson, Robert D. MacPherson, Elias Stein

For AWM

Louise Hay Award for Contributions to Mathematics Education: Annie Selden

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman: Kay Kirkpatrick, Melanie Wood

For MAA

Beckenbach Book Prize: Joseph Kirtland

Certificates of Meritorious Service: Vivian Dennis-Monzingo, Richard A. Gibbs, Dennis Luciano, John W. Petro, Cynthia J. Woodburn, Fredric Zerla

Chauvenet Prize: Ellen Gethner, Stan Wagon, Brian Wick

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics: Dennis DeTurck, Paul J. Sally, Jr., Edward Spitznagel, Jr.

Index of Award Recipients

Michael Artin .33
Vivian Dennis-Monzingo .27
Dennis DeTurck .36
Ellen Gethner .15
Richard A. Gibbs .26
Mark Goresky .29
Henryk Iwaniec .17
Yitzhak Katznelson .28
Kay Kirkpatrick .13
Joseph Kirtland .1
Elliott H. Lieb .8
Fanghua Lin .6
Dennis Luciano .25
Robert D. MacPherson .29
John W. Petro .24
Paul J. Sally, Jr. .37
Annie Selden .10
Edward Spitznagel, Jr. .39
Elias Stein .32
Terence Tao .4
Daniel Tataru .2
Richard Taylor .19
Stan Wagon .15
Brian Wick .15
Melanie Wood .13
Cynthia J. Woodburn .23
Margaret H. Wright .20
Jakob Yngvason .8
Fredric Zerla .22