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AMERICAN MATHEMATICAL SOCIETY
MATHEMATICAL ASSOCIATION OF AMERICA

JANUARY 2016

PRIZES AND AWARDS

4:25 P.M., THURSDAY, JANUARY 7, 2016

Program

Opening Remarks
Francis Su, Mathematical Association of America

Chevalley Prize in Lie Theory
American Mathematical Society

Oswald Veblen Prize in Geometry
American Mathematical Society

David P. Robbins Prize
American Mathematical Society

Levi L. Conant Prize
American Mathematical Society

Award for Distinguished Public Service
American Mathematical Society

E. H. Moore Research Article Prize
American Mathematical Society

Leroy P. Steele Prize for Mathematical Exposition
American Mathematical Society

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

Leroy P. Steele Prize for Lifetime Achievement
American Mathematical Society

AMS-SIAM Norbert Wiener Prize in Applied Mathematics
American Mathematical Society
Society for Industrial and Applied Mathematics

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

Communications Award
Joint Policy Board for Mathematics

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

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

Euler Book Prize
Mathematical Association of America

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

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

Closing Remarks
Robert L. Bryant, American Mathematical Society

American Mathematical Society

Chevalley Prize in Lie Theory

The Chevalley Prize is awarded for notable work in Lie Theory published during the preceding six years; a recipient should be at most twenty-five years past the Ph.D. The prize is awarded in even-numbered years, without restriction on society membership, citizenship, or venue of publication.

Citation

Geordie Williamson

The 2016 Chevalley Prize is awarded to Geordie Williamson for his work on the representation theory of Lie algebras and algebraic groups. His results include proofs and re-proofs of some long-standing conjectures, as well as spectacular counterexamples to the expected bounds in others.

The characters of finite-dimensional simple modules for semisimple complex Lie algebras have been known for, by now, about 90 years, thanks to the work of Hermann Weyl. For certain natural infinite-dimensional generalizations, the simple modules with a highest weight, a character formula was conjectured by Kazhdan and Lusztig in 1979 and shortly after proved by Beilinson and Bernstein and (independently) by Brylinski and Kashiwara. These proofs relied on translating the problem in several steps to different areas of mathematics, further and further away from the original problem that is completely algebraic in nature. Williamson, in joint work with Ben Elias, has developed a purely algebraic Hodge theory for certain (Soergel) bimodules over polynomial rings. This has led to the first algebraic proof of the Kazhdan-Lusztig conjectures and a great simplification of the whole theory.

A most striking and new aspect of this new algebraic Hodge theory is that it applies to any Coxeter group, finite or infinite. An immediate consequence is a proof of various positivity conjectures concerning Kazhdan-Lusztig polynomials, which had been open since 1979. Thanks to these new ideas, we can now treat general Coxeter groups and their Hecke algebras as if they had a geometric construction, even though the geometric objects (flag varieties) do not exist.

Williamson's next breakthrough concerned representations of reductive groups over fields of characteristic $p > 0$. In 1980 Lusztig conjectured a character formula for the simple modules for these groups under a minor restriction on p. (For a group such as $\mathrm{GL}(n, F)$, $p > 2n$ is assumed.)

This conjecture was proved in 1994 for all p larger than a bound depending on the type of the group, first without an explicit bound (Andersen, Jantzen, Soergel) and later with a gigantic bound (Fiebig). Williamson has now stunned the experts by finding several infinite families of counterexamples to the expected bounds in Lusztig's conjecture, beginning with the special linear group $\mathrm{SL}(22, F)$. At the same time, he found counterexamples to James's 1990 conjecture on symmetric groups. More importantly, Williamson did not just provide counterexamples, he provided a new framework for thinking about these conjectures—a framework that revealed how inadequate the numerical evidence for these conjectures really had been. Williamson's work has re-opened the field of modular representations to new ideas, in a sense taking it beyond a focus on the famous conjectures.

Williamson's work on these topics appears in "The Hodge theory of Soergel bimodules," *Ann. of Math.* (2) 180 (2014), 1089–1136 (with B. Elias); "Schubert calculus and torsion explosion," arXiv:1309.5055v2 (with an appendix by A. Kontorovich, P. McNamara and G. Williamson); and "Modular intersection cohomology complexes on flag varieties," *Math. Z.* 272 (2012), no. 3–4, 697–727 (with an appendix by Tom Braden).

Biographical Note

Geordie Williamson was born in Bowral, Australia, in 1981. He received a Bachelor of Arts with honors and the University Medal from Sydney University in 2003. In 2008 he completed his Ph.D. at the University of Freiburg, Germany, under the supervision of Wolfgang Soergel. He went on to spend three years at the University of Oxford, as an EPSRC Postdoctoral Fellow and Junior Research Fellow at St. Peter's College. Since 2011 he is an Advanced Researcher at the Max Planck Institute for Mathematics in Bonn and is a Principal Research Fellow at the University of Sydney. He works on problems in representation theory, algebra, and geometry and has given invited lectures throughout the world, including at MIT, MSRI, Orsay, RIMS, Sanya, and Yale. In 2016 he will deliver an invited lecture at the European Congress of Mathematics.

Response from Geordie Williamson

I am greatly honoured to receive the Chevalley Prize in Lie Theory. I would like to express my gratitude to George Lusztig who both founded this prize and created so much of the field in which I work. Lie theory would be the poorer without his many observations, theorems, ideas, and conjectures. Chevalley's work is in good hands! Many thanks to my mentors and collaborators (in particular Wolfgang Soergel, Daniel Juteau, and Ben Elias) for all that they have taught me, and the many hours we have spent together trying to understand a little better. I would like to thank the Max Planck Institute in Bonn and the University of Sydney for providing me with the space and means to concentrate on research. Finally, I thank my family and friends for their support and encouragement.

AMERICAN MATHEMATICAL SOCIETY

OSWALD VEBLEN PRIZE IN GEOMETRY

THE 2016 Veblen Prize is awarded to Fernando Codá-Marques and André Neves for their remarkable work on variational problems in differential geometry. This work includes the proof of the Willmore conjecture, given in their paper "Min-max theory and the Willmore conjecture," *Ann. of Math. (2)* 179 (2014), no. 2, 683–782.

CITATION

Fernando Codá-Marques and André Neves

The Willmore conjecture, formulated in 1965, concerns the optimal shape of a torus T smoothly embedded in $\mathbb{R}^3$ or S^3. It states that the Willmore energy of the surface, defined in terms of its mean curvature H by

$$W(T) = \int_T H^2\, dA,$$

is minimized by the standard *Clifford torus.* (This torus is defined by $|z| = |w|$ on the unit sphere $S^3 \subset \mathbb{C}^2$.) The energy $W(T)$ is conformally invariant, so images of the standard torus under Möbius transformations should also be minimizers. The study of $W(T)$ dates from the work of Wilhelm Blaschke; physically, it measures the bending energy stored in T.

Codá-Marques and Neves proved both the minimizing property of the Clifford torus and its essential uniqueness by studying the minimizer within a 5-dimensional space of cycles, building on earlier work of Francisco Urbano (1990) and Antonio Ros (1999).

Their contributions also include two sequels to this work of a similar spirit. The first is their proof, jointly with Ian Agol, of a conjecture of Michael Freedman, Zheng-Xu He, and Zhenghan Wang (1994) on the energy of links in S^3. They proved that the Möbius energy $M(L)$ of a nontrivial link $L \subset S^3$—another conformal invariant—is minimized by the standard Hopf link, made up of two closed geodesics with linking number one.

The second is their proof of the existence of infinitely many minimal hypersurfaces in a closed manifold of positive Ricci curvature, confirming a conjecture of Shing-Tung Yau (1982). This line of research can be regarded as a deep, higher-dimensional extension of the study of closed geodesics for an arbitrary Riemannian metric on S^2, dating from the contributions of Lazar′ Lyusternik and Lev Schnirel′man in the 1940s. The key difficulty in both cases comes from multiple coverings of the same hypersurface.

Codá-Marques and Neves overcome this fundamental difficulty by using recent results of Misha Gromov and Larry Guth in an ingenious way. In each dimension p, the p-dimensional topology of the space of codimension-1 cycles is captured by the notion of a "p-sweepout," and Gromov and Guth showed that the minimax level over p-sweepouts grows sublinearly with p. Combining this result with a well-known theorem of Theodore Frankel—that in positive Ricci curvature minimal hypersurfaces intersect—they were able to rule out the possibility that there are only finitely many minimal hypersurfaces.

These sequels are detailed in their papers "Min-max theory and the energy of links" (joint with Agol), and "Existence of infinitely many minimal hypersurfaces in positive Ricci curvature."

The work of Fernando Codá-Marques and André Neves represents a landmark achievement in the use of variational methods in differential geometry.

Biographical Note

Fernando Codá-Marques was born in São Carlos in 1979 and grew up in Maceió, state of Alagoas, Brazil. He received a B.S. from Federal University of Alagoas (UFAL) and an M.S. from IMPA in 1999. He received the Ph.D. at Cornell University in 2003 under the supervision of José Fernando Escobar. He became a Professor at Princeton University in 2014, after being at IMPA since 2003. He has visited Stanford University during several periods since 2005, was a member of the IAS in Princeton (2008), and a visiting professor at several institutions in France: École Normale Superieure, École Polytechnique, Institut Henri Poincaré, Institut Fourier, and Marne-la-Vallée. In 2012 he received the Ramanujan Prize (ICTP, Abel Fund, and IMU), the TWAS Prize in Mathematics, and the UMALCA prize (Union Matematica de America Latina y el Caribe).

Codá-Marques gave an invited address at the International Congress of Mathematicians (ICM) of Hyderabad, 2010, and a plenary lecture at the ICM of Seoul, 2014. He also delivered the Barrett Memorial Lectures (Tennessee), the Yamabe Lectures (Northwestern), the Hadamard Lectures (IHP-Paris), the S. Lojasiewicz Lecture (Krakow), and the Joseph Fels Ritt Lectures (Columbia). He is a member of the Brazilian Academy of Sciences since 2014. He lives with his wife, Ana, and his son, Pedro.

Response from Fernando Codá-Marques

It is an honor and an immense pleasure to be a recipient, together with my friend André, of the prestigious Oswald Veblen Prize. I am thankful to the committee for this recognition of our work.

I am grateful to my family, especially my parents, Severino and Dilze, my wife Ana, and my siblings Gustavo and Clarissa. I am sure that without their love and support I would not be here today. I also look forward to meet my baby son, Pedro, who is joining us.

I thank also my late advisor, José Fernando Escobar (Chepe), who was always kind and supportive of me. And Richard Schoen, whose influence has been fundamental in my career. The year I spent with Rick was decisive and helped shape my vision of what is important in mathematics. I thank all my teachers, especially Professor Manfredo do Carmo. His lessons inspired me to choose the beautiful field of geometry. I am also grateful to Harold Rosenberg for the many mathematical discussions and to my students, who provide further motivation in my life. The collaboration and friendship with André has been a constant source of joy to me over the last ten years.

The study of minimal varieties is an old subject that began with the work of Lagrange on the foundations of the calculus of variations. The solution of the Plateau problem for mappings of the disk (Douglas and Rado, 1930) and for rectifiable currents (Federer and Fleming, 1960) are milestones of the field. But the question of existence of closed minimal varieties in general compact Riemannian manifolds is not a problem of minimization. This inspired Almgren (1965) to develop a deep min-max theory for the area functional. His work was improved by his Ph.D. student J. Pitts (1981), but remained largely untouched until the last few years.

André and I were extremely delighted when we discovered that this old theory would play a major role in the solution of the Willmore conjecture. This required a change of perspective: instead of trying to minimize the conformally invariant Willmore functional, as originally proposed, we used conformal transformations to convert the problem into a question of minimizing the maximum of the area of certain 5-parameter families of surfaces in the three-sphere. Our work was done mainly while we were both visiting Stanford University at the end of 2011, and the main breakthrough came when we realized how to prove such families are topologically nontrivial. We were very amazed. A few months later we wrote a paper with Ian Agol in which we used similar ideas to solve a conjecture of Freedman, He, and Wang on the Möbius energy of links. Then we turned our attention to the general min-max theory and used it to prove Yau's conjecture, about the existence of infinitely many minimal hypersurfaces, in the positive Ricci curvature setting. The ideas of Gromov and a paper of Guth on multiparameter sweepouts were very influential. There have been several articles on min-max theory recently, especially by young people, and this makes us very happy. Major questions remain open like understanding the index, topology, and multiplicity of these minimal varieties. We hope to contribute further to the field.

Biographical Note

André Neves is a Professor of Mathematics at Imperial College London. He was born in 1975 in Lisbon, Portugal, completed his Ph.D. at Stanford University in 2005 under the direction of Professor Richard Schoen, and then held positions at Princeton University from 2005 to 2009, the year he moved to Imperial College London. His field of research is Differential Geometry and his work has been distinguished with the New Horizons Prize in Mathematics in 2015, the Royal Society Wolfson Merit Award in 2015, the Whitehead Prize in 2013, and the Leverhulme Prize in 2012. He gave the Nirenberg Lectures 2015 (Montreal), gave an invited address at the International Congress of Mathematicians of Seoul in 2014, gave the Rademacher Lectures 2015 (UPenn), and gave the Barret Lectures (Tennessee) in 2013.

Response from André Neves

It is a great honor to receive the Oswald Veblen Prize in Geometry along with my dear friend Fernando.

Working and developing min-max theory together with Fernando has been a tremendous experience: it started with an academic interest in conformal deformations of surfaces but soon we realized that we were discovering some new rich topology in the space of all surfaces. Coupling that with principles of Morse Theory and ideas from minimal surfaces theory, we were able to answer some long-standing open questions in geometry. Since its beginnings, variational methods have had great influence in geometry and I am delighted that our work made some contributions on that front. This is a beautiful subject and I hope that its contributions will keep increasing for many years to come.

I consider myself very fortunate to have had Richard Schoen—one of the pioneers of geometric analysis—as my Ph.D. advisor. His mathematical work and sharp intuition have been a towering influence on my research. I would also like to thank my collaborators and friends, from whom I have undoubtedly learned a lot, and my colleague Sir Simon Donaldson for all his support and encouragement throughout my career.

Finally, none of this would have been possible without the constant love and unyielding support of my parents Nelsa and Custódio, my wife Filipa, and our two adorable children, Eva and Tomás. In one way or another, they have all made sacrifices for the pursuit of my career.

AMERICAN MATHEMATICAL SOCIETY

DAVID P. ROBBINS PRIZE

THE 2016 David P. Robbins Prize is awarded to Christoph Koutschan, Manuel Kauers, and Doron Zeilberger for their paper, "Proof of George Andrews's and David Robbins's q-TSPP conjecture," *Proc. Natl. Acad. Sci. USA* 108 (2011), 2196–2199.

CITATION

Christoph Koutschan, Manuel Kauers, and Doron Zeilberger

A plane partition π may be thought of as a finite set of triples of natural numbers with the property that if (i, j, k) is in π, then so is every (i', j', k') with $i' \le i$, $j' \le j$, and $k' \le k$. The symmetric group S_3 acts on plane partitions by permuting the coordinate axes. A plane partition π may also be "complemented" by constructing the set of points not in π that are in the smallest box enclosing π, and then reflecting them through the center of the box. The set of plane partitions that is invariant under some subgroup of these transformations is known as a "symmetry class of plane partitions."

In the early 1980s, the combined experimental observations of several people, including David Robbins himself, suggested that *all* the symmetry classes of plane partitions were enumerated by a family of remarkably simple product formulas. In some cases, this was also found to be true of the q-analogs of these formulas—generating functions where q tracks some parameter of interest. Simple combinatorial formulas usually have simple combinatorial explanations, but surprisingly that is not the case here. Many of the formulas are exceedingly difficult to prove, and to this day there is no unified proof that explains why they are all so simple and so similar. When simple combinatorial formulas fail to have simple combinatorial proofs, it usually means that something deep is going on beneath the surface. Indeed, the study of symmetry classes of plane partitions has revealed unexpected connections between several areas, including statistical mechanics, the representation theory of quantum groups, alternating sign matrices, and lozenge tilings.

By 1995, all the formulas had been proved but one: the q-TSPP (totally symmetric plane partitions, where q tracks the number of orbits of triples) formula, independently conjectured by George Andrews and David Robbins. The paper by Koutschan, Kauers, and Zeilberger, along with supporting computer files on Koutschan's website, finally established the correctness of this last conjectured formula. It is a tour de force of experimental mathematics.

The authors' starting point was a 1989 paper of Okada that reduced the problem to a conjecture on the values of the determinants of a special sequence of matrices. The form of the matrices enables one to verify the conjecture by Zeilberger's "holonomic ansatz," in which one hypothesizes a system of auxiliary functions that would certify the correctness of the determinant evaluation. If these auxiliary functions exist, then one can search for them computationally. Once found, the functions must be shown to satisfy certain recurrences in order to complete the proof. The authors performed the search, found the candidate auxiliary functions, and empirically verified that they seemed to satisfy the necessary recurrences. Although techniques existed that might in principle find proofs for the recurrences, the necessary computations seemed far beyond the reach of current computers, and the authors initially announced a semi-rigorous but not fully rigorous proof. However, the authors then developed "creative telescoping" techniques that dramatically simplified the necessary computations, resulting in a fully rigorous proof of the q-TSPP formula.

The Robbins Prize is awarded to a novel research paper in algebra, combinatorics, or discrete mathematics with a significant experimental component. The q-TSPP paper is a shining example. The conjecture itself was born from experimental observations, and the proof involved the development of new experimental mathematical techniques that are sure to solve many problems.

Biographical Note

Christoph Koutschan, born in 1978, received his master's degree in 2005 from Friedrich Alexander University (Erlangen, Germany), and the Ph.D. in 2009 from the Johannes Kepler University (Linz, Austria) under the direction of Peter Paule. He was a postdoctoral fellow at the Research Institute for Symbolic Computation (RISC, Linz), at Tulane University (New Orleans, LA, USA), and at the Institut National de Recherche en Informatique et en Automatique (INRIA, France). He is currently with the Johann Radon Institute for Computational and Applied Mathematics (RICAM) of the Austrian Academy of Sciences. His research interests are devoted to computer algebra methods related to the holonomic systems approach, particularly symbolic summation and integration algorithms, and their application in other areas of mathematics.

Response from Christoph Koutschan

I'm deeply honored to receive the David P. Robbins Prize for the proof of the q-enumeration formula for totally symmetric plane partitions. This beautiful and mysterious formula was conjectured independently by David Robbins and George Andrews in the early 1980s. It was none other than Doron Zeilberger who proposed to my colleague Manuel Kauers and me to tackle this problem, which he constantly called "the holy grail of enumerative combinatorics." Back then I was a Ph.D. student and quite excited to work on such an old and important conjecture. At the very beginning I didn't know at all what a totally symmetric plane partition was or what q-enumeration meant. But thanks to Soichi Okada, who had reformulated the conjecture in terms of a family of determinants, that wasn't even necessary; the only thing one had to do was to evaluate these determinants. And Doron had already devised a recipe—the holonomic ansatz—how one could do that, but the necessary computer algebra calculations seemed to be far beyond what was possible with the current hardware and software. As a warm-up example we applied Doron's recipe to the $q = 1$ case, first proved by John Stembridge in 1995 using a different approach, but already this considerably easier task appeared to be hopeless. At this point, the visionary suggestion of my Ph.D. advisor Peter Paule to investigate and implement the holonomic systems approach, turned out to be a lucky chance: by the end of my Ph.D. I had found a way to solve the $q = 1$ case, and shortly after, a new method for computing creative telescoping relations was born, which was efficient enough to prove the determinant evaluations that implied the q-TSPP formula. Since that time this method, which was originally motivated from David Robbins' conjecture, has been successfully applied to various other problems ranging from enumerative combinatorics and statistical physics to numerical analysis and knot theory.

Biographical Note

Manuel Kauers was born in Germany and studied computer science at the University of Karlsruhe from 1998 to 2002 before he went to Linz, Austria, to do a Ph.D. in symbolic computation under the supervision of Peter Paule. He earned his doctoral degree in 2005, and an habilitation in Mathematics in 2008. In 2009, he was awarded the START prize of the Austrian federal minister for science and education, the most prestigious award for young scientists in Austria, endowed with a research grant of 1.2 million Euros. In June 2015, Kauers was appointed full professor at the Johannes Kepler University in Linz, where he is now the director of the Institute for Algebra. He is best known for his contributions to computer algebra and its applications to combinatorics and experimental mathematics.

Response from Manuel Kauers

Back in 2006, Doron Zeilberger visited Linz and sketched a way to prove the q-TSPP conjecture computationally. The computations he suggested were quite expensive, and there was no reason (other than his intuition) that the "certificate" he aimed to compute would even exist. We were reluctant to invest time and energy on such a risky project, but Zeilberger kept pushing us until we did. Now in 2016, I am glad that he insisted, and I am happy to receive the David Robbins award together with Koutschan and Zeilberger for a hard piece of work that we have done together. I also appreciate very much that the committee has decided to recognize a paper with a proof that was found by computer algebra, thereby helping to raise the awareness of the power of today's computational methods, not just for industrial applications but also for pure mathematics.

Biographical Note

Doron Zeilberger was born on July 2, 1950, in Haifa, Israel, to Ruth (Alexander) and Yehudah Zeilberger. He received his Ph.D. in 1976, from the Weizmann Institute of Science (as a student of Harry Dym (a student of Henry McKean (a student of William Feller (a student of Richard Courant (a student of David Hilbert))))). He is currently Board of Governors Professor at Rutgers University.

In 1979 he married Jane D. Legrange (Ph.D., Physics, Illinois, 1980, currently at LGSInnovation). Their children are Celia (b. 1983), Tamar (b. 1986), and Hadas (b. 1990).

In 1998 he received, with Herbert S. Wilf (1931–2012), the Steele prize for Seminal Contributions to Research, and in 2004 an Euler Medal from the Institute of Combinatorics and Its Applications.

Response from Doron Zeilberger

David Peter Robbins's beautiful gravestone, in the Princeton Cemetery (here is a picture: `http://www.math.rutgers.edu/~zeilberg/graves/DaveRobbinsGrave.html`) says that he was a "Solver of Problems." True, of course, but he was just as great a "Poser of Problems," and many of his problems kept me, and many of my colleagues, busy for many years, and some of them are still wide open. Dave was a pioneer of what is now called "Experimental Mathematics," and it is particularly gratifying that the work that I and my collaborators, Christoph Koutschan and Manuel Kauers, did to deserve the prize that bears his name, uses his methodology of experimental mathematics, not just to conjecture interesting results, but also to prove them.

LEVI L. CONANT PRIZE

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

CITATION

Daniel Rothman

The 2016 Levi L. Conant Prize is awarded to Daniel Rothman for his article "Earth's Carbon Cycle: A Mathematical Perspective" which appeared in the *Bulletin of the AMS*, Volume 52, no. 1, (2015), 47–64.

Mathematics finds a place in Science by enunciating principles that at once classify, quantify, and illuminate natural phenomena. This heuristic is often best displayed when phenomena are simple or at least isolated from external influences. In this sense, biological processes present a particular challenge for mathematics because they are generally tapestries of confounding factors. It is nowadays common to approach such problems from a viewpoint that promotes data collection and data analysis as *the* pathway to knowledge. But, as Dan Rothman points out in this article, "Data, however, require understanding." Here, he gives us an understanding of the Earth's carbon cycle by applying classical ideas from applied mathematics to the data at hand.

The carbon cycle of the Earth uses plant photosynthesis to combine carbon dioxide and water to produce carbohydrates and free oxygen. To complete the cycle, respiration uses carbohydrates and free oxygen to give carbon dioxide and water. However, there is a leak in this process. Some carbohydrates become trapped in rock and this entails a surplus of free oxygen. Thus our atmosphere is born; life as we know it is a consequence of a feedback error. Rothman writes, "Earth's carbon cycle, therefore, plays a major role in determining not only [carbon dioxide] levels and climate, but also life's interaction with the physical environment."

Mathematics informs our understanding of the carbon cycle in a variety of ways. A fundamental part of the cycle involves the decay of organic matter. On the face of it, this is an intractable problem because organic matter comes in a multitude of forms, each with its own decay parameter. This type of disordered kinetics may be studied, however, by considering the probability density function of decay parameters and showing that decay is characterized by the Laplace transform of this density function. Data then informs the mathematics by suggesting that the density function is lognormal and, indeed, that plant decay always has lognormal density parameters. As the author says, this seems to be a "natural manifestation" of the Central Limit Theorem. Once the ubiquity of lognormality is established as an underlying principle, it allows calculations such as mean-time-to-decay which allow us to compare data with theory. Rothman goes on to discuss the scaling factors that arise in consideration of decay on land, sea, or in sediments, and this leads to his conclusion that respiration follows the "rhythm of a logarithmic clock" where local microorganisms, acting on biological time scales, have a global influence on geological time scales. Rothman also gives us an understanding of long-term fluctuations in carbon dioxide levels in the atmosphere as well as the long-term immobilization of organic carbon in rock, the latter eliciting the question of how free oxygen levels could have ever increased from a stable state. This is precisely what good mathematical models do; they explain some phenomena and they raise questions about others.

This article is especially timely as humanity grapples with the consequences of releasing trapped carbon by burning fossil fuels. The author, a geophysicist, concludes with an invitation to mathematicians to take up the challenge: "Because the carbon cycle represents the coupling between life and the environment—metabolism at a global scale—its mathematical description inherits the difficulties of biology in addition to physical science. Thus, theoretical understanding of dynamics, so crucial to advancing knowledge of how the carbon cycle works, remains more qualitative than quantitative. Such problems present scientific opportunities with no shortage of social significance. Mathematics will surely play a central role in future progress."

But it isn't just the timeliness of the topic that draws us in and holds our interest. At every step the author takes care to explain the science as well as the mathematics involved in clear straightforward prose so that the entire article is accessible to a general mathematical audience. We often hear about Wigner's "unreasonable effectiveness of mathematics in the sciences," but it is not so often that we see this manifested in a beautiful exposition of a fundamental ingredient of our existence.

Biographical Note

Daniel H. Rothman received his undergraduate degree in applied mathematics from Brown University in 1979 and his Ph.D. in geophysics from Stanford

University in 1986. He is currently a professor of geophysics in the Department of Earth, Atmospheric, and Planetary Sciences at the Massachusetts Institute of Technology, where he has been on the faculty since 1986. In 2011 he co-founded the Lorenz Center, an interdisciplinary research center at MIT devoted to developing the foundations of climate science. Rothman was a Fellow of the Radcliffe Institute of Advanced Study in 2007–2008. He has also been honored as a Fellow of the American Physical Society (2012) and the American Geophysical Union (2014). His research spans several fields—including fluid mechanics, complex systems, and earth-system dynamics—in which he uses methods of applied mathematics and statistical physics to learn how the natural environment works.

Response from Daniel Rothman

I am delighted and honored to receive the 2016 Levi L. Conant Prize for my article in the *Bulletin of the AMS*. The paper was written to complement my invited talk for the *Current Events Bulletin* at the 2014 Joint Mathematics Meetings. I would like to thank David Eisenbud for the invitation and his encouragement of my subject. Susan Friedlander's enthusiastic support as editor of the *Bulletin* is also much appreciated. I'm thrilled that the talk and the resulting paper met such an appreciative audience. The carbon cycle resides at the intersection of biology, geology, and chemistry. Finding my way through the convergence of these subjects was like learning French: initially little made sense, but with knowledge and experience a logical structure began to emerge. I never could have arrived at that point without the help of others. I'm especially thankful that my MIT colleagues Eric Alm, Tanja Bosak, Sam Bowring, Ed Boyle, Greg Fournier, and Roger Summons have found my efforts worthy of collaboration. My students Chris Follett, David Forney, and Alex Petroff also helped guide me through the complexity of the subject. None of this would have been possible without the patient tutelage of John Hayes. During four summer visits to Woods Hole, I learned the intricacies of the carbon cycle from a master. I am deeply grateful that John recognized potential in my early forays into the field.

There may be no better way to secure our collective future than to understand more deeply the natural world around us. A significant portion of that understanding will derive from insightful applications of mathematics. I thank the Conant Prize Selection Committee and the American Mathematical Society for recognizing the intrinsic value of such work.

Award for Distinguished Public Service

The American Mathematical Society's 2016 Award for Distinguished Public Service is presented to Aloysius Helminck for his dynamic and public-spirited leadership of the Department of Mathematics at North Carolina State University, and for his work, both in his department and at the national level, to increase the diversity of the mathematical research community.

Citation

Aloysius Helminck

Dr. Aloysius "Loek" Helminck was Head of the Mathematics Department at North Carolina State University from 2005 until 2015. In that decade, he set an example for what strong departmental leadership can accomplish. The Department is an excellent citizen at all levels, including running one of the largest REU programs in the nation, supporting mathematics achievement in the community through MAA contests and a local contest of their own, community enrichment activities, as well as a Math Circle.

The Department has been recognized by the AMS through its Award for Exemplary Achievement (2010) and its Award for Programs that Make a Difference (2011). However, Dr. Helminck's leadership of multiple programs, both local and national, fostering the goal of diversity in the mathematical community, calls for individual recognition.

Dr. Helminck directed the Department's REU program, as well as a supplementary component, the REU+, designed to facilitate, both financially and intellectually, REU participation by promising minority students. He also directed the Research Scholars Program in Mathematics, which provides scholarship funding at North Carolina State University for promising mathematics students, both undergraduate and graduate. The Department has graduated African-American Ph.D.s at exceptional rates under Dr. Helminck's leadership: more than one in eight of all African-American Ph.D.s in mathematics since 2000.

Dr. Helminck is also co-director of the National Alliance for Doctoral Studies in the Mathematical Sciences, and director of the National Alliance for Building Faculty Diversity in the Mathematical Sciences. The first program encourages promising minority undergraduates to continue to graduate study.

With conferences, mentoring, and other activities, it has involved over 1500 undergraduates, and it facilitates several dozen applications to Ph.D. and Masters Programs each year. The second program provides new minority mathematics Ph.D.s with supportive postdoctoral experiences at any of seven participating universities. It is currently sponsoring fourteen postdoctoral mathematicians.

Alongside these multiple projects, Dr. Helminck maintains his scholarly activities. He has published nearly fifty research papers related to algebraic groups, especially symmetric spaces, and has directed twenty-two theses, including seventeen since becoming department head. The range, extent, and impact of Dr. Helminck's efforts richly merit recognition with the Distinguished Public Service Award.

Biographical Note

Aloysius (Loek) Helminck was born in Rotterdam, The Netherlands, and received his B.S. and M.S. in mathematics and physics from the University of Utrecht, The Netherlands. His graduate study was supported through a research position at the Centrum voor Wiskunde and Informatica (CWI) in Amsterdam, and he received his Ph.D. in 1985 under the supervision of T. A. Springer at the University of Utrecht. After a postdoctoral fellowship at the University of Michigan, he joined the faculty at North Carolina State University in 1987. He was head of his department from 2005–2015. His professional interests include algebraic groups, symmetric spaces, representation theory, symbolic computation, and integrable systems. He graduated twenty-two Ph.D. students and he is a fellow of the American Mathematical Society.

During Loek's headship the department of mathematics at North Carolina State University flourished. Under his leadership the department won prestigious national awards, doubled its federal research funding, and improved by many measures. Fundamental to Loek's leadership is his desire to enable the success of those around him. To begin, he worked to improve the environment for students and faculty at NCSU, but he quickly realized that he could play a role helping others more broadly. Loek designed and instituted many programs to improve access and success for all. For example, he started an REU program at NCSU which has had great success attracting women and those from underrepresented groups (more than 50% female participants and 25% minority). This has been one of the largest REU programs in the nation, serving almost 400 students since 2005. He also developed and obtained funding for research experiences for early graduate students which contributed to a tremendous increase in the retention rate of Ph.D. students.

To attract more underrepresented students to NCSU, Loek developed relationships with mathematics departments at many regional Historically Black Colleges and Universities (HBCUs). As he became aware of inequities in the educational system, he started creative initiatives to help at many levels. With his colleagues at HBCUs he created new pathways for talented, but underprepared, underrepresented students to participate in his REU program. With the goal of increasing the number of minority faculty at research universities, Loek was instrumental in creating a postdoctoral program called "National Alliance for Building Faculty Diversity in the Mathematical Sciences." This program affords talented new Ph.D.s the opportunity for a research postdoc at one of seven universities and time at any of the NSF Mathematical Institutes.

In addition to this postdoc alliance, Loek has helped re-envision and expand the Alliance for Doctoral Studies in the Mathematical Sciences which aims to increase the number of minority students who attend graduate programs in the mathematical sciences. Loek has been involved in many national and local diversity and mentoring efforts. He has served on committees of the AMS, AWM, and SIAM.

Response from Aloysius Helminck

I am deeply honored to receive the American Mathematical Society 2016 Award for Distinguished Public Service. I would like to thank those who nominated me and the selection committee for this recognition. I have a deep commitment to helping others. It is especially gratifying to do this in the context of mathematics: to help my department to excel in their mission of research and teaching; to help my students become successful mathematicians; to help others around the country, especially those from underrepresented groups, realize their potential place in the mathematics community and help pave the path to let them get there.

I am grateful for the opportunities I have had to develop programs which help enable others. Of course nothing can be accomplished alone and I am fortunate to have had the support from many in the community for my initiatives. There are now at least three different diversity alliances with which I am affiliated. Alliances are exactly what we need as we must work together, and trust each other to succeed. I would like to thank all of my allies in all of these alliances and in my department. Together we are building a strong network of diverse mathematicians. Most importantly, I would like to thank all the students and postdocs that I have had the good fortune to work with over the years. Their successes are my greatest reward.

Just as mathematics itself has diversified with many new fields, we now know that good mathematicians will come from all sorts of backgrounds. Mathematics is pervasive in the modern world. We must learn to recognize and nurture talent and potential everywhere, especially that which may look very different from our own. I invite my colleagues in the research community to think broadly about our efforts to diversify the mathematics community.

E. H. MOORE RESEARCH ARTICLE PRIZE

THE 2016 E. H. Moore Research Article Prize is awarded to Caucher Birkar, Paolo Cascini, Christopher D. Hacon, and James McKernan for their article, "Existence of minimal models for varieties of log general type," which appeared in the *Journal of the American Mathematical Society* in 2010.

CITATION

Caucher Birkar, Paolo Cascini, Christopher D. Hacon, and James McKernan

This article, together with its companion "Existence of minimal models for varieties of log general type II" by Hacon and McKernan in the same issue, building on ideas in earlier papers by Kawamata, by Kollár, by Mori, by Reid, by Shokurov, by Siu, and by Hacon and McKernan, has thoroughly transformed higher-dimensional birational geometry.

Given an algebraic variety X, the minimal model program aims to modify X, changing it only in a lower-dimensional locus, to produce a new variety Y that is particularly nice. The cited authors prove, via an intricate inductive argument, that these nice models Y exist in the most important cases. Their result implies many of the consequences of the minimal model program. In particular, it provides an algebraic proof of the long-standing conjecture that the canonical ring of a variety is a finitely generated algebra. Experts agree that the article together with its companion mark a watershed in algebraic geometry.

Biographical Note

Caucher Birkar was born and raised in Kurdistan where he developed a passion for mathematics. His primary research interests are in algebraic geometry particularly birational geometry. He is a professor of mathematics at the University of Cambridge where he has been since 2006. In 2010, he was awarded a Philip Leverhulme Prize and the prize of the Fondation Sciences Mathématiques de Paris. He has been active organising seminars, workshops, and conferences in various countries.

Biographical Note

Paolo Cascini was born and raised in Italy. He received his undergraduate degree from the Universitá degli Studi di Firenze. He obtained his Ph.D. in mathematics from New York University, under the supervision of Professor F. A. Bogomolov, and was awarded the Wilhelm T. Magnus Prize for significant contributions to the mathematical sciences. He held a postdoctoral position and then a permanent assistant professorship at the University of California, Santa Barbara, where he was awarded a Sloan Fellowship. Later on, he moved to the United Kingdom to join the faculty of Imperial College London, where he holds an EPSRC fellowship. His research interests are in algebraic geometry, especially birational geometry.

Biographical Note

Christopher D. Hacon is a Distinguished Professor at the Mathematics Department of the University of Utah. He received his undergraduate degrees from the University of Pisa and the Scuola Normale Superiore di Pisa in 1992 and his Ph.D. from UCLA in 1998 under the direction of Robert Lazarsfeld. His field of research is Algebraic Geometry, especially the study of higher dimensional birational geometry and the minimal model program. Hacon is a Fellow of the AMS and a recipient of the 2007 Clay Research Award, the 2009 Frank Nelson Cole Prize in Algebra, and the 2011 Antonio Feltrinelli Prize in Mathematics, Mechanics, and Application.

Biographical Note

James McKernan was born in London, England, in 1964. He received his B.A. in mathematics from Cambridge University in 1985, whilst attending Trinity College, and his Ph.D. in mathematics from Harvard University under the supervision of Joseph Harris in 1991. He then held temporary positions at the University of Utah, 1991–1993; University of Texas, at Austin 1993–1994; and Oklahoma State University, Stillwater, 1994–1995. He joined the faculty at the University of California, Santa Barbara, in 1995, the faculty at Massachusetts Institute of Technology in 2007, and the faculty at the University of California, San Diego, in 2013. He received a Clay Research award in 2007 and the Cole Prize in Algebra in 2009. He was made a fellow of the Royal Society in 2011. His research interests are in algebraic geometry, especially birational geometry and the classification of algebraic varieties.

Response from Caucher Birkar, Paolo Cascini, Christopher D. Hacon, and James McKernan

We are honored to have been selected to receive the E. H. Moore Research Article Prize. We are especially happy that the selection committee decided to recognize the recent exciting developments in birational algebraic geometry. We would like to stress that our accomplishments are based on a long series of beautiful results obtained by Y. Kawamata, J. Kollár, S. Mori, M. Reid, V. Shokurov, Y.-T. Siu, and many others. We are also in debt to A. Corti for many useful conversations on the Minimal Model Program.

One of the nicest things about receiving this award is that it gives us an opportunity to publicly acknowledge the invaluable aid, support, and encouragement we have received from co-authors, mentors, and colleagues.

Caucher Birkar would like to thank his family, Tarn, and Zanko for their love and support. He also wishes to thank his brother, Haidar, who taught him to learn and to enjoy mathematics beyond the classroom since childhood. He is indebted to his Ph.D. advisors, Ivan Fesenko and Vyacheslav Shokurov, and his many friends and colleagues for their support throughout his career. He is grateful to Cambridge University, EPSRC, Leverhulme Trust, and other supporting organisations for giving him the opportunity to focus on research.

Paolo Cascini would like to thank his family for their support and their encouragement all these years. Since the beginning of his studies, he benefited enormously from interacting with many colleagues all over the world. He is especially grateful to his Ph.D. supervisor, F. A. Bogomolov. He would also like to thank the department of mathematics at New York University, at the University of California, Santa Barbara, and at Imperial College, for providing an excellent environment to do research. He is also very grateful to the NSF, Sloan Foundation, and EPSRC for their financial support.

Christopher Hacon would like to thank his family Aleksandra, Stefan, Ana, Sasha, Kristina, Daniela, Marko, Derek, Carol, and Giovanni for their love and support; his mentors F. Bardelli, F. Catanese, and R. Lazarsfeld for introducing him to Algebraic Geometry; the NSF, the AMS, the Sloan Foundation, the Clay Foundation, and the Simons Foundation for financial support; and the University of Utah for providing a great research environment.

James McKernan would like to thank Elham Izadi and his family for their support, love, and encouragement. He would also like to thank his advisor, J. Harris, for inspiring him with so much beautiful projective geometry; J. Kollár and S. Mori for their support and encouragement over the whole of his career; V. Shokurov, who is always so generous with his ideas; and Y. Kawamata and M. Reid for their help. He would like to thank the mathematics department at the University of California, Santa Barbara—where a considerable amount of this work was done—for providing such a great environment to do research, the mathematics department at the Massachusetts Institute of Technology, and the University of California, San Diego. He is also very grateful to the NSF, NSA, and Clay Foundation for their generous financial support.

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

David Cox, John Little, and Donal O'Shea

The 2016 Leroy P. Steele Prize for Mathematical Exposition is awarded to David Cox, John Little, and Donal O'Shea for their book *Ideals, Varieties, and Algorithms* that has made algebraic geometry and computational commutative algebra accessible not just to mathematicians but to students and researchers in many fields.

With the 1992 publication of *Ideals, Varieties, and Algorithms,* the authors, all then faculty at liberal arts colleges, invited a broad audience to study algebraic geometry by writing an undergraduate text with only linear algebra as a prerequisite. Throughout the book the authors maintain fidelity to their assumptions about their reader's background, using geometry to introduce core topics and appealing to computational theory to prove fundamental results. They complement the development of theoretical results with applications to such topics as automated theorem proving and robotics. Clear algorithms are provided that help the reader to further understand the concepts.

Even more impressive than its clarity of exposition is the impact it has had on mathematics. *CLO,* as it is fondly known, has not only introduced many to algebraic geometry, it has actually broadened how the subject could be taught and who could use it. One supporter of the nomination writes "this book, more than any text in this field, has moved computational algebra and algebraic geometry into the mathematical mainstream. I, and others, have used it successfully as a text book for courses, an introductory text for summer programs, and a reference book."

Another writer, who first met the book in an REU two years before it was published, says "Without this grounding, I would have never survived my first graduate course in algebraic geometry." This theme is echoed in many other accounts: "I first read *CLO* at the start of my second semester of graduate school. . . . Almost twenty years later I can still remember the relief after the first hour of reading. This was a math book you could actually read! It wasn't just easy to read but the material also grabbed me."

For those with a taste for statistics, we note that *CLO* has sold more than 20,000 copies, it has been cited more than 850 times in MathSciNet and it has 5000 citations recorded by Google Scholar. However, these numbers do not really tell the story. *Ideals, Varieties, and Algorithms* was chosen for the Steele Prize because it is a rare book that does it all. It is accessible to undergraduates. It has been a source of inspiration for thousands of students of all levels and backgrounds. Moreover, its presentation of the theory of Groebner bases has done more than any other book to popularize this topic, to show the powerful interaction of theory and computation in algebraic geometry, and to illustrate the utility of this theory as a tool in other sciences.

Biographical Note

David A. Cox went to Rice University and received his Ph.D. from Princeton University in 1975 under the direction of Eric Friedlander. After teaching at Haverford and Rutgers, he moved to Amherst College in 1979, where he is now the William J. Walker Professor of Mathematics. He has served on the editorial boards of the Pure and Applied Mathematics series published by Wiley, the Graduate Studies in Mathematics series of the AMS, and is currently on the board of the Undergraduate Texts in Mathematics series of Springer. He gave an AMS-MAA Joint Invited Address in 1995 and served on the Council of the AMS from 1991 to 1994. In 2012, he became a Fellow of the AMS and received a Lester R. Ford Award from the MAA for his Monthly article "Why Eisenstein Proved the Eisenstein Criterion and Why Schönemann Discovered It First."

Cox's current areas of research include toric varieties and the commutative algebra of curve and surface parametrizations, though he also has interests in number theory and the history of mathematics. He is the author of texts on number theory, computational algebraic geometry, mirror symmetry, Galois theory, and toric varieties. He loves teaching at all levels of the undergraduate curriculum and greatly enjoys working with students on senior theses. He has interacted with graduate students in numerous summer programs, including MSRI Summer Graduate workshops in Berkeley and Cortona, Italy.

Biographical Note

John Little earned an A.B. from Haverford College in 1976 and a Ph.D. in Mathematics from Yale University in 1980 under the direction of Bernard Saint-

Donat. He has taught at the College of the Holy Cross in Worcester, MA, since 1980 and is currently Professor of Mathematics. He has supervised many undergraduate research projects, including work at eight REU-type summer programs—at Amherst College, at Mount Holyoke college, at two campuses of the University of Puerto Rico, at MSRI in Berkeley, and at the University of Hawaii at Hilo. Starting in the mid-1980s he developed a strong interest in computational techniques in algebraic geometry and commutative algebra that led to *Ideals, Varieties, and Algorithms* and its companion volume *Using Algebraic Geometry*. In recent research work, he has considered applications of computational methods in algebraic geometry to areas such as error-control coding theory, signal processing, and celestial mechanics.

Biographical Note

Donal O'Shea has been president and professor of mathematics at New College of Florida since 2012. Prior to that, he was at Mount Holyoke College, the last fourteen years as Vice-President of Academic Affairs and Dean of Faculty. He received his undergraduate degree from Harvard, and his Ph.D. from Queen's University in Canada under the direction of A. John Coleman. He has spent extended research leaves at IHES, IHP, and the universities of Amherst, Kaiserslautern, Hawaii, Miami, Edinburgh, and Cambridge. His favorite research interests concern the topological and geometric (most recently, bi-Lipschitz) behavior of hypersurface singularities. He enjoys teaching, reading, writing, cooking (which he unfortunately eats too much of), and shares life with his wife and best friend, Mary, their four grown children, Seamus, Brendan, Sarah, and Kathleen, their partners, and his five, soon to be six, grandchildren.

Response from David Cox, John Little, and Donal O'Shea

We are deeply honored and grateful to receive the Leroy P. Steele prize for our book *Ideals, Varieties, and Algorithms*. We started writing it in 1988, partly to provide background materials and notes for students involved in undergraduate research, and partly to provide alternatives to the usual algebra courses for undergraduate mathematics majors. At that time, new algorithms and ever-faster computing speeds were making it possible for undergraduates to explore examples that would previously have been inaccessible without deeper theoretical tools, a trend which has only increased in the intervening years. Through four editions, we have learned a tremendous amount by working on this project, and our readers include many individuals who expanded our horizons and whom we would never have encountered otherwise.

Many wonderful books and papers in mathematics have appeared in the last few decades, and those singled out by the Steele prize are among the best. Having our book listed in this company gives us great pleasure, and we are deeply touched by the citation. We worked hard to keep the book accessible to those with a modest background in mathematics, especially undergraduates, while including enough novel topics and new points of view to interest experts in the subject. The avoidance of abrupt changes in mathematical sophistication was almost as challenging as presenting algebraic geometry without using the full power of its modern abstract language. Although writing for students, we were surprised and gratified by the delight which professional mathematicians and other scientists and engineers have taken in the book. Writing for undergraduates is not always a recipe for elegance, but just as universal design principles seem to result in better buildings, our focus on accessibility resulted in a better and more usable book.

We thank the generations of readers who have sent us suggestions and pointed out infelicities and errors. We thank our colleagues who read successive drafts, and our families and friends from whom we took the time to prepare them. We thank those who nominated the book. And we thank the American Mathematical Society for honoring a book that was written to be accessible to undergraduates. When learning of the award, one of us wrote the others saying that collaborating with the two of you has been one of the greatest pleasures of my professional life. He voiced what we each felt, and although we like to think that we would have eventually told each other this, we are grateful that the award nudged us into full disclosure. And we thank you, the members of the extended mathematical community, for the encouragement and collegiality that has led to this great honor. We are in your debt.

AMERICAN MATHEMATICAL SOCIETY

LEROY P. STEELE PRIZE FOR SEMINAL CONTRIBUTION TO RESEARCH IN APPLIED MATHEMATICS

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

CITATION

Andrew J. Majda

Andrew J. Majda, Samuel F. B. Morse Professor of Arts and Sciences at the Courant Institute of New York University, is awarded the 2016 Leroy P. Steele Prize for Seminal Contribution to Research in Applied Mathematics for two papers published in the *Memoirs of the AMS* in 1983: "The existence of multidimensional shock fronts," Vol. 43, Number 281, and "The stability of multidimensional shock fronts," Vol. 41, Number 275.

Multidimensional systems of conservation laws are important models in fluid mechanics in the absence of dissipation. The mathematical difficulty in the analysis of these partial differential equations is the development of singularities and the appearance of shocks. Riemann recognized that an important step in the study of conservation laws is the understanding of the structure of the shock fronts/waves and he considered the problem in one space-dimension.

This is where the work of Majda begins with emphasis on the multidimensional setting. The cited works, which shortly after appeared also in the book *Compressible Fluid Flow and Systems of Conservation Laws in Several Space Variables* (Springer-Verlag, 1984) are pioneering and seminal. They were written at a time when research on hyperbolic systems of conservation laws was extremely active but focused on the one-dimensional case or spherically symmetric solutions. The aforementioned papers pioneered the expansion to the multidimensional case by providing the first rigorous treatment of the existence and stability of multidimensional shock fronts. This required very detailed and hard analysis and it is fair to say that the papers are a tour de force. The analysis revealed a number of new instability phenomena that are not present in the one-space-dimensional case. This work, which immediately became classic, is at the same level of importance as the entropy solutions of Lax and the random choice method of Glimm.

Biographical Note

Andrew J. Majda is the Morse Professor of Arts and Sciences at the Courant Institute of New York University. He was born in East Chicago, Indiana, on January 30, 1949. He received a B.S. degree from Purdue University in 1970 and a Ph.D. degree from Stanford University in 1973. Majda began his scientific career as a Courant Instructor at the Courant Institute from 1973–1975. Prior to returning to the Courant Institute in 1994, he held professorships at Princeton University (1984–1994), the University of California, Berkeley (1978–1984), and the University of California, Los Angeles (1976–1978).

Majda's primary research interests are modern applied mathematics in the broadest possible sense merging asymptotic methods, numerical methods, physical reasoning, and rigorous mathematical analysis. He is well known for both his theoretical contributions to partial differential equations and his applied contributions to diverse areas such as scattering theory, shock waves, combustion, incompressible flow, vortex motion, turbulent diffusion, and atmosphere ocean science.

Majda is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and has received numerous honors and awards including the National Academy of Science Prize in Applied Mathematics, the John von Neumann Prize of the Society of Industrial and Applied Mathematics, and the Gibbs Prize of the American Mathematical Society. In 2012 he received the Wiener Prize of the American Mathematical Society and the Society of Industrial and Applied Mathematics and in 2015 Majda received the Lagrange Prize, awarded every four years by the International Council of Industrial and Applied Mathematics. He has been awarded the Medal of the College de France, twice, and is a Fellow of the Japan Society for the Promotion of Science. Majda has received three honorary doctorates including one from his undergraduate alma mater, Purdue University. He has given plenary one-hour lectures at both ICM (Kyoto 1990) and the first ICIAM (Paris 1987) and is both an AMS and SIAM Fellow.

In his years at the Courant Institute, Majda has created the Center for Atmosphere Ocean Science with seven multi-disciplinary faculty to promote cross-disciplinary research with modern applied mathematics in climate modeling and prediction.

Response from Andrew J. Majda

I am honored and pleased to receive the 2016 Steele Prize for Seminal Contributions to Research in Applied Mathematics. My work cited on multidimensional shock fronts is part of the mathematically beautiful yet practical area of hyperbolic conservation laws such as, for example, the flow of gases or water at both low and high speeds. The serendipity between mathematical structure and physical phenomena attracted me to this research topic. I would like to acknowledge many members of the Courant Institute who strongly influenced my interest in shock waves when I was a young post doc including Joe Keller, Cathleen Morawetz, and especially Peter Lax as well as the book by Courant and Friedrichs on supersonic flow.

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

Barry Simon

The 2016 Leroy P. Steele Prize for Lifetime Achievement is awarded to Barry Simon, IBM Professor of Mathematics and Theoretical Physics at the California Institute of Technology, for his tremendous impact on the education and research of a whole generation of mathematical scientists. His significant research achievements, highly influential books, and mentoring of graduate students and postdocs comprise a career of exceptional achievement.

His accomplishments span 333 papers and sixteen books on topics ranging from mathematical physics to orthogonal polynomials. Simon proved a number of fundamental results in statistical mechanics, the most significant of which is the proof of phase transitions for the classical Heisenberg ferromagnet and the quantum antiferromagnet. Almost forty years later these are the only rigorous proofs of continuous symmetry breaking with a non-Abelian symmetry group.

Simon was an important contributor to the construction of quantum fields in two space-time dimensions. His work with Guerra and Rosen, especially their 146-page paper published in *Annals of Mathematics* in 1975, established an analogy with classical statistical mechanics which led to a number of new insights. An outgrowth of his work in this area is the theory of hypercontractive semigroups, which in turn led to a theory of ultracontractivity.

These topics, which have grown into major industries, figure prominently in Simon's work on the general theory of Schrödinger operators, where he proved a number of definitive results. In this effort he was a pioneer in the use of path integral techniques, which he beautifully described in his book *Functional Integration and Quantum Mechanics*. In the past fifteen years, he has advanced the theory of orthogonal polynomials, elucidating and expanding upon many apsects of Szegő's Theorem. His work on this topic, with Killip Rowan and David Damanik, includes two papers in *Annals of Mathematics* and one in *Inventiones Mathematicae*.

His four-volume set of books, *Methods of Modern Mathematical Physics*, written with Mike Reed, "played the role that Courant and Hilbert I and II did for the preceding generation. This is true not only in the West; the Russian translation was a bible for a generation of analysts and mathematical physicists behind the Iron Curtain," to quote the nominators. Similarly, his two volume set of AMS Colloquium Publications, *Orthogonal Polynomials on the Unit Circle*, became instant classics connecting the theory of orthogonal polynomials with the spectral theory of Schrödinger operators and other topics in mathematical physics. In 2015, Simon won the International János Bolyai Prize of Mathematics for these books.

Biographical Note

Barry Simon is the IBM Professor of Mathematics and Theoretical Physics at Caltech. He was born in Brooklyn, NY, in 1946, received a B.A. from Harvard University (where he was a top five Putnam winner) in 1966, and a Ph.D. in Physics from Princeton in 1970. He started as an instructor in Mathematics at Princeton in 1969–1970 but since then all his appointments at Princeton and Caltech have been joint. He received tenure in 1972, two years after Charlie Fefferman who was in the same graduate class. Since 1981, he has been at Caltech where he served as Executive Officer (aka Chair) for ten years.

Simon has published just under 400 papers and twenty-one math books (plus several end user oriented computer books). His most recent books are the five volume (3200 pages) *Comprehensive Course in Analysis* published by the AMS in December, 2015. At Google Scholar, his citation number is about 60,000 and his h-index is 102 (i.e., 102 publications with at least 102 citations). His research has been in many aspects of mathematical physics and in the analytic theory of orthogonal polynomials.

He has been recognized with honorary degrees from the Technion, University of Wales–Swansea, and LMU–Munich. He was awarded the Poincaré Prize of the IAMP in 2012 and the Bolyai Prize of the Hungarian Academy of Science in 2015. He is a fellow of the APS (1981), American Academy of Arts and Science (2005), and AMS (2013). He has served as Vice-President of the AMS and IAMP.

Response from Barry Simon

I should like to thank the AMS and especially the Steele Prize committee for this noteworthy recognition. It is a great honor to join the distinguished list of former winners. I'd also like to acknowledge my mentors Arthur Wightman and Ed Nelson who have passed away in the past few years. They not only taught me mathematics but how to be a mathematician.

I am especially pleased by this prize since it recognizes not only my research but my greater impacts. At the perhaps silly level this includes a listing of terms which appeared first in my papers including hypercontractive and ultracontractive semigroups, Birman-Schwinger principle, diamagnetic inequality, Kato's inequality, CLR bound, Berry's phase, almost Mathieu equation, wonderland theorem, OPUC/OPRL, Verblunsky coefficients, CMV matrix, and clock behavior.

More importantly, the impact of my books. It is always a little thrill when I get into an email discussion with someone who then mentions that it was Reed-Simon that first turned them on to functional analysis. I take pleasure in the invigoration of the analytic theory of OPUC that was caused in part by those books. And I hope that my most recent five volume opus will have impact.

Most directly, I cherish the impact on thesis students, postdocs, and others I've mentored. Mathematics is a communal enterprise and I've taken great joy in my interaction with coauthors and those I've taught.

American Mathematical Society
Society for Industrial and Applied Mathematics

AMS-SIAM Norbert Wiener Prize in Applied Mathematics

The 2016 Norbert Wiener Prize in Applied Mathematics is awarded to Professor Constantine M. Dafermos for his foundational work in partial differential equations and continuum physics.

Citation

Constantine Dafermos

The 2016 Norbert Wiener Prize in Applied Mathematics is awarded to Professor Constantine M. Dafermos for his foundational work in partial differential equations and continuum physics. Professor Dafermos is recognized for his seminal contributions to the theory of nonlinear conservation laws and its application to continuum mechanics, gas dynamics, and nonlinear elasticity. His work has advanced the research areas of fading memory, N-waves, periodicity and decay, dissipation, entropy, and compensated compactness; it has directed applications to two-phase flows, thermo-elasticity, viscoelastic materials, and both sonic and subsonic flows. He has introduced several fundamental concepts such as the methods of relative entropy, generalized characteristics, wave-front tracking, and the entropy rate criterion for the selection of admissible wave fans.

Biographical Note

Constantine Dafermos was born in Athens, in 1941. He received a diploma in Civil Engineering from the National Technical University, in 1964, and a Ph.D. in Mechanics from Johns Hopkins, in 1967. After teaching for three years at Cornell, he moved to Brown in 1971, where he is currently a Professor of Applied Mathematics. His work lies at the interface between continuum mechanics and partial differential equations.

Response from Constantine Dafermos

I am deeply honored to receive the Wiener prize, but also humbled by the prospect of joining the company of such distinguished earlier recipients. I feel that I am sharing the award with scores of teachers, colleagues, and students who shaped me as a scientist and provided, over the years, invaluable support and inspiration. The list is very long, so I shall only mention those who departed way too early: my wife Stella and Ron DiPerna.

AMERICAN MATHEMATICAL SOCIETY
MATHEMATICAL ASSOCIATION OF AMERICA
SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

FRANK AND BRENNIE MORGAN PRIZE FOR OUTSTANDING RESEARCH IN MATHEMATICS BY AN UNDERGRADUATE STUDENT

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

CITATION

Amol Aggarwal

Amol Aggarwal is the recipient of the 2016 AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student for his outstanding research in combinatorics. He has four published papers, which have appeared in *Journal of Combinatorial Theory, Series A; European Journal of Combinatorics; Discrete Mathematics*; and *Electronic Journal of Combinatorics*. His numerous letters of support describe these papers as being of postdoctoral caliber.

Aggarwal participated in the 2014 University of Minnesota–Duluth Research Experience for Undergraduates, in the 2013 MIT Undergraduate Research Opportunities Program, and in the 2012 MIT Summer Program for Undergraduate Research. The research Aggarwal conducted as a high-school student under the direction of Professor János Pach has recently been published.

Aggarwal has also been awarded the National Science Foundation Graduate Research Fellowship, the National Defense Science and Engineering Graduate Fellowship, and was named a finalist for the Hertz Foundation Fellowship. As a high-school student, he was a finalist in the 2011 Intel Science Talent Search and a 2010 Siemens Research Competition semifinalist.

Biographical Note

Amol Aggarwal was born and raised in New York until the age of eleven. He then moved with his family to California, where he went to middle school and high school. It was in high school when Amol was introduced to mathematical research, after unwittingly working on an unsolved question in combinatorial geometry about convex point configurations. After graduating from Saratoga High School in 2011, Amol attended the Massachusetts Institute of Technology, where he had the privilege of learning a diverse selection of mathematical topics from experts in the field. As a student at MIT, Amol pursued several research projects in different areas, including integrable probability, random matrices and map enumeration, and simultaneous core partitions. Recently having graduated from MIT with a major in mathematics, Amol is currently a doctorate student at Harvard University, where he is planning to focus on probability theory.

Response from Amol Aggarwal

I am deeply honored to receive the 2016 Frank and Brennie Morgan Prize, and I express my profound gratitude to Mrs. Frank Morgan and the AMS-MAA-SIAM committee, both for selecting me for this award and for inspiring young mathematicians to pursue research. The list of people who have influenced my perspective towards mathematics goes well beyond the capacity of this response, but please permit me to mention a few names regardless. First, I would like to thank my research advisors. These include János Pach, who selflessly agreed to advise me in my first research project when I was still in high school; Joe Gallian, who generously invited me to participate in his REU; and Alexei Borodin, who has consistently offered me both practical advice and academic knowledge throughout my time at MIT. Second, I would like to thank several mathematicians who had the time and patience to talk to me about their fields of interest. These include Victor Guillemin, Ivan Corwin, Jacob Fox, Alan Edelman, Rishi Nath, and Michael La Croix. Third, I thank my friends, whose kindness, creativity, and joy for life continues to inspire me. Finally, my deepest thanks go to my family, whose everlasting support has shaped who I am today.

Citation

Evan O'Dorney

Evan O'Dorney is recognized with an Honorable Mention for the 2016 Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. He has several published papers in the areas of number theory, algebra, and combinatorics, which have appeared in *Integers, Linear Algebra and its Applications, Semigroup Forum*, and *Annals of Combinatorics*.

O'Dorney has participated in REUs at Emory University and the University of Minnesota–Duluth. He is a recipient of the Churchill Scholarship and is a three-time Putnam Fellow. As a high-school student, he was a four-time medalist of the International Mathematical Olympiad, a three-time winner of the US Mathematical Olympiad, and the national champion of the 2011 Intel Science Talent Search.

Biographical Note

Evan O'Dorney, a resident of Danville, California, was fascinated by numbers from an early age and gained an appreciation for mathematics from many popular books, especially the works of Martin Gardner. Throughout high school, he enrolled in college-level math courses at the University of California, Berkeley. He received his B.A. in mathematics *summa cum laude* from Harvard in 2015. He is currently attending the one-year "Part III" program at Cambridge University, UK, after which he plans to pursue a Ph.D. at Princeton under Manjul Bhargava. His nonmathematical pursuits include composing and improvising on the piano and organ and praying the rosary.

Response from Evan O'Dorney

It is a privilege to be counted among the young mathematicians that AMS, MAA, and SIAM honor through the institution of the Morgan Prize. I thank the many advisors who made my undergraduate research career possible, especially Lek-Heng Lim (who introduced me to mathematical research in the tenth grade), Zvezda Stankova, Ravi Vakil, Brian Conrad, Joe Gallian, Ken Ono, David Zureick-Brown, Joe Harris, Benedict Gross, and Noam Elkies.

JOINT POLICY BOARD FOR MATHEMATICS

JOINT POLICY BOARD FOR MATHEMATICS

COMMUNICATIONS AWARD

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

CITATION

Museum of Mathematics

2016 JPBM Communications Award for Public Outreach

The award is presented to the Museum of Mathematics, "MoMath," for its innovative approach to presenting fundamental mathematical ideas to the public in a variety of creative, informative, and entertaining exhibits and events that engage audiences with the beauty and utility of mathematics in daily life.

Biographical Note

Museum of Mathematics

To a mathematician, math is a world of discovery and exploration. It's a place where one can wonder "what if" and then seek the answers. It's a world of color, imagination, and beauty, a place where one can be creative and discover a host of unexpected connections to the world around us. But this place, this idea of math as an unbounded realm yet to be fully explored, is foreign to many people. Mathematics is often portrayed as a tool; a series of steps one performs to solve a particular problem. And those problems may have nothing to do with the world around us, or with the human experience.

The National Museum of Mathematics was founded to share the real world of mathematics with the public and to allow everyone to experience the sense of the wonder and beauty that can be found within this world. For more than seven years, the Museum has been working to create a sense of community, to bring together seasoned professionals with bright young students, academic mathematicians with their counterparts in education, senior citizens with wide-eyed toddlers, and people from all walks of life and all backgrounds, sharing together a unique experience as they view the world around them through a new, mathematical lens.

Response from Museum of Mathematics

It is with great honor and appreciation that the National Museum of Mathematics accepts the 2016 Communications Award for Public Outreach of the Joint Policy Board for Mathematics. Since its inception, MoMath has been warmly welcomed by the mathematical societies and indeed by the entire mathematical community. Your members have provided support, encouragement, ideas, and feedback, and the Museum simply would not exist today and would not continue to flourish without the continued involvement and collaboration of each of your organizations and its members. It is our sincere hope that together we will continue to foster a greater understanding of mathematics and to provide a place that encourages one to step into this exciting world.

CITATION

Simon Singh

2016 JPBM Communications Award for Expository and Popular Books

The award is presented to Simon Singh for his fascinating books on mathematical topics, including *Fermat's Enigma*, *The Code Book*, and *The Simpsons and Their Mathematical Secrets*, which have opened up the beauty of mathematics and mathematical thinking to broad audiences with clear and charming prose.

Biographical Note

Simon Singh is a writer and broadcaster, who lives in London.

Having completed his Ph.D. in particle physics at the University of Cambridge and CERN, Simon joined the BBC's Science Department in 1990. He was a producer and director on programs such as *Tomorrow's World*, *Horizon*, and *Earth Story*. His documentary about Fermat's last theorem was titled "The Proof" in North America and broadcast as part of the *Nova* series on PBS. The film was nominated for an Emmy and won a BAFTA.

In 1997 he wrote a book on the same subject, titled *Fermat's Last Theorem* in the UK and *Fermat's Enigma* in North America, which was the first mathematics book to become a number one bestseller in Britain. It has been translated into over twenty-five languages.

Simon published *The Code Book* in 1999, a history of codes and codebreaking. His most recent book is *The Simpsons and Their Mathematical Secrets*, which explores the numerous references to mathematics hidden in the world's most successful TV show. The references are the result of a writing team that contains several people with strong mathematical backgrounds. His other books are *Big Bang*, a history of cosmology, and *Trick or Treatment? Alternative Medicine on Trial*, co-authored with Professor Edzard Ernst.

He has presented several radio and TV shows in the UK, most notably "The Science of Secrecy" (a 5-part history of cryptography), "Mind Games" (a puzzle series), and "Five Numbers," "Another Five Numbers," and "A Further Five Numbers."

His mathematical activities on stage have included *Theatre of Science* (which he performed with Professor Richard Wiseman in London, Edinburgh, Dublin, and New York) and *The Uncaged Monkeys* (a show involving comedians and nerds, which played to 40,000 people across twenty-three shows in the UK). Online, he is a contributor to Brady Haran's very successful YouTube channel "Numberphile."

He has spoken to approximately 500 school groups over the last twenty-five years, and his school-based projects include the Undergraduate Ambassadors Scheme, which currently runs in over 100 STEM departments in the UK, sending 1,000 undergraduates into schools each year in order to support pupils.

Response from Simon Singh

I am delighted to receive this award, particularly as my background is in physics rather than mathematics.

Although I am very proud of my books and my other work, I am sometimes concerned that we place too much emphasis on popularisers such as myself, while paying insufficient attention to what happens in high schools. And when we do look at the achievements of schools, my experience is that we tend to focus on supporting and encouraging the weak or average students, while perhaps ignoring the strong students.

While many keen, strong young mathematicians will read popular books on mathematics, they are not a replacement for a rich and challenging curriculum, presented day after day, year and year, something that will provide a springboard for the mathematicians (and scientists and engineers) of tomorrow.

LOUISE HAY AWARD FOR CONTRIBUTIONS TO MATHEMATICS EDUCATION

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

CITATION

Judy Walker

In recognition of her leadership and contributions as a mathematical scholar and educator, the AWM presents the 2016 Louise Hay Award to Professor Judy Walker of the University of Nebraska. Creating and adapting innovative courses at all levels, Dr. Walker has made extraordinary contributions to mathematics education, guiding high school through graduate students, including freshmen and honors nonmathematics majors, as well as practicing teachers. She has received numerous awards for her teaching excellence including the MAA Haimo Award in 2006.

Dr. Walker is a recognized role model committed to nurturing the talent of emerging scholars. Locally, graduate students in her department selected her for the Roger Wiegand Award. Nationally, since 1999, Dr. Walker has been involved with the Nebraska Conference for Undergraduate Women in Mathematics, advancing over 250 undergraduate women each year, a feat recognized in 2013 with the AMS Programs that Make a Difference Award. Dr. Walker also helped to establish a program to support the transition to graduate study for undergraduates from small institutions, and with a colleague, created a mathematics summer camp for high-school girls.

Dr. Walker has published over thirty papers and organized eleven research conferences in algebraic coding theory, including six special sessions at AMS meetings. She is one of only four women chosen to present the George Pólya Lecture for the MAA.

A mathematician and educator fully in the tradition of Louise Hay, Dr. Judy Walker is richly deserving of the 2016 Louise Hay Award.

Response from Judy Walker

My first interaction with the Association for Women in Mathematics was in 1990, when I received Honorable Mention for the First Annual Alice T. Schafer Prize. I did not know at that time what a profound effect this organization would have on my career. I feel fortunate to have participated in AWM Workshops as a graduate student in 1996 and again as a recent Ph.D. in 2000, to have received an AWM Travel Grant to attend a conference in my field in 2000, and to have had the opportunity to serve AWM through the Executive Committee (2002–2005), the organizing committee for the AWM Workshops (2004–2006), and, most recently, the Nominating Committee (2015). The AWM plays a critically important role in our profession, and I am truly honored to receive the Louise Hay Award this year.

I am grateful to those who have worked with me on educational endeavors throughout my career. Special thanks go to Jim Lewis, who provided me with countless opportunities and invaluable mentoring; to Wendy Hines, with whom I co-created All Girls/All Math; to Allan Donsig, who co-created the Nebraska Conference for Undergraduate Women in Mathematics with me; to Tom Marley who took the idea for Nebraska IMMERSE and developed it into a fabulous program; and to the many students I have had the privilege of teaching and mentoring. Finally, very special thanks go to my husband, Mark, and to my daughters, Madeline and Becca, for their patience, their support, and their love.

M. GWENETH HUMPHREYS AWARD FOR MENTORSHIP OF UNDERGRADUATE WOMEN IN MATHEMATICS

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

CITATION

Naomi Jochnowitz

The Association for Women in Mathematics is pleased to present its sixth annual M. Gweneth Humphreys Award to Naomi Jochnowitz of the Department of Mathematics at the University of Rochester.

Dr. Jochnowitz has been a teacher and mentor for over forty years, devoting herself to the development and support of undergraduate students of mathematics, in addition to her activities with math graduate students and postdocs, with a particular impact on scores of women students. She offers very demanding courses with the explicit assumption that everyone can succeed and she will provide all the support necessary for that outcome. Student letters, even from students more than thirty years ago, still vividly and passionately recount their experiences: Dr. Jochnowitz's students embark on a math[ematical] journey together with her, where she sets high standards, treating even her youngest students like respected colleagues. Her courses are challenging, with exams notoriously long and difficult, but Dr. Jochnowitz is fiercely devoted to teaching, not leaving evening office hours until everyone's questions have been answered, sometimes past midnight. She pushes her students to think smarter and achieve more.

Dr. Jochnowitz is often cited as motivating young women to take challenging mathematics courses, directly confronting any insecurities or lack of confidence they may have. She encourages students to pursue summer opportunities and advanced degrees, checking in with them regularly after they graduate. Many former students work to emulate her passion for teaching and nurturing students. Dr. Jochnowitz cares deeply about her students, and she nurtures them one student at a time.

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

Response from Naomi Jochnowitz

I thank the AWM for this Honor, plus Mike Gage, John Harper, and Tom Tucker for nominating me. Seeing letters from so many former students has evoked beautiful memories, and I want to reiterate what every past Humphreys recipient has said in their own way, that it is my students, not me, who deserve this award.

Women of my generation were allowed to be good in math, but only if we firmly believed that we weren't. I know things are changing, but don't know how fast.

Partly as a result of my own experiences, I feel a special affinity for creatively talented students unaware of their own strengths. I believe I have a kind of radar helping me detect such individuals, often recognizing their potential before others do. I am happy to provide maximal support, since I know with the right encouragement, these students can develop the confidence needed to let their natural creativity shine through, often with rather spectacular results. Sometimes (not always) these students are female, and I see glimpses of myself at a younger age in them. By symmetry, such students identify with me, and I become a much appreciated role model/friend.

My students understand I am always on their side, and am not here to judge them, rather to encourage them to do their best. They don't have to prove to me how good they are. Instead it is my responsibility to prove to them how good they can be! In doing this, I am simply repaying a debt for what others did for me.

ALICE T. SCHAFER PRIZE FOR EXCELLENCE IN MATHEMATICS BY AN UNDERGRADUATE WOMAN

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

AWM is pleased to present the twenty-sixth annual Alice T. Schafer Prize to **Mackenzie Simper**, University of Utah. Additionally, the accomplishments of three outstanding young women were recognized at the AWM Reception and Awards Presentation on Wednesday, January 6, 2016. AWM was pleased to honor **Sarah Tammen**, University of Georgia, as **runner-up** for the 2016 Schafer prize competition. **Kaavya G. Valiveti**, University of California, Berkeley, and **Madeleine Weinstein**, Harvey Mudd College, were recognized as **honorable mention** recipients in the Schafer prize competition. Their citations are available from the AWM.

CITATION

Mackenzie Simper

Mackenzie Simper is a senior mathematics major at the University at Utah where she received the Calvin Wilcox Scholarship, one of the department's most prestigious scholarships. After a flawless academic performance at Salt Lake Community College, Simper transferred to the University of Utah where she has impressed the faculty as a student with a stellar academic track record, proven ability to do original mathematical research, [who] is keenly committed to excelling in her mathematical career, and is highly praised as a student and a colleague with research ability never witnessed before in someone so young.

In just one year, Simper has participated in three research projects: two at an REU at the University of Utah, one of which derived a surprisingly general model for the equilibrium distribution of the Bak-Sneppen model of evolution.

The results will appear in a paper that is currently in preparation. Given the mathematical depth and the technical difficulty of the problem, this is an extraordinary achievement for a 17-year-old undergraduate student. Simper also participated in a third REU in the Applied Mathematics Department at Brown University, where her performance was simply amazing. The resulting paper is also in preparation and expected to be submitted to a top dynamics journal.

Simper's mentors agree that she is passionate about mathematics and one of the most creative and advanced undergraduates with whom they have worked.

Response from Mackenzie Simper

I am honored to be selected as the winner of the 2016 Alice T. Schafer Prize and I would like to thank the AWM for encouraging and supporting women in mathematics. Nothing has contributed more to my success than the many wonderful people who have helped me on my journey, including my amazing family. Kyle Costello at Salt Lake Community College was the first to encourage me to pursue math, for which I am tremendously grateful. I am also grateful to the entire math department at the University of Utah, for creating a welcoming and stimulating environment in which to explore this spectacular subject. I very much appreciate everyone involved in the REU at Brown this past summer, for the great experience and all of the advice. Specifically, I am thankful to John Gemmer, for supervising my project, which was an absolute blast, and Professor Bjorn Sandstede, for creating countless opportunities to learn. Finally, I would like to thank Professor Tom Alberts, who was the first to expose me to the fascinating realm of mathematical research and has continually provided guidance and inspiration since then.

CHAUVENET PRIZE

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

CITATION

Susan Marshall and Donald R. Smith

Susan Marshall and Donald R. Smith "Feedback, Control, and the Distribution of Prime Numbers," *Mathematics Magazine*, Volume 86, No. 3, June 2013.

As you might expect from an exemplary piece of mathematical exposition, the first sentence of this article speaks for itself: "We explore the system of prime numbers from an unusual viewpoint, that of an applied mathematician employing mathematical modeling to study a natural phenomenon." Differential equations and numerical analysis are then used to derive well-known properties of the distribution and density of prime numbers. After being introduced to the concept of a feedback and control system, the reader is given a clear, number-theoretic intuition for why it makes sense to apply this particular mathematical model to the system of prime numbers. Graphs of various estimation functions support that intuitive explanation. The article includes fascinating connections to such topics as the Prime Number Theorem, the Riemann Hypothesis, and the work of Gauss. The authors accomplish a surprising amount in only thirteen pages, and their prose is extremely readable. The reader comes away understanding why the system of prime numbers "appears to have an element of randomness yet the primes do 'stay on track' in a very specific way."

Biographical Note

Susan H. Marshall received a B.S. in Mathematics from Wake Forest University in 1993, with a minor in Psychology. After a brief stint as a data analyst for the Hubble Space Telescope at Goddard Space Flight Center in Maryland, she returned to school and received a Ph.D. in Mathematics from the University of Arizona in 2001. While in graduate school, Susan studied arithmetic geometry with Minhyong Kim. Following graduate school, Susan was a postdoctoral fellow at the University of Texas at Austin from 2001–2004. She is currently an Associate Professor of Mathematics at Monmouth University, and enjoys living on the Jersey Shore with her husband (and colleague) David, and their two children Gillian and Dylan.

Biographical Note

Donald R. (Bob) Smith received an A.B. in Physics (magna cum laude) from Cornell in 1969, an M.S. in Operations Research from Columbia University in 1974, and a Ph.D. in Operations Research from the University of California at Berkeley in 1975. He was an Assistant Professor of Operations Research at Columbia University from 1975–1979, before working at Bell Laboratories as a Member of Technical Staff and a supervisor from 1980–2001. After leaving Bell Laboratories, he joined the faculty at Monmouth University where he is currently an Associate Professor in the Management and Decision Science Department. Most of his publications are in operations research journals in the areas of stochastic processes. Bob has always been fascinated by prime numbers because they are a deterministic system with elements of apparent randomness but hidden control. He and his wife Pat have three grown children and two grandchildren. He is an avid cyclist averaging over 11K miles per year.

Response from Susan Marshall and Donald R. Smith

We are excited and grateful for the recognition of our work with the 2016 Chauvenet Prize. Last year, this same article received a Carl B. Allendoerfer award and we were surprised and grateful; this year we are (almost) beyond words!

Thank you to the Selection Committee for their time, and for choosing our article among so many worthy options. Thank you to the MAA for sponsoring this and its many other awards. Receiving the Allendoerfer award last year led to many opportunities for which we are extremely grateful! Thank you to *Mathematics Magazine* Editor Walter Stromquist. This article would never have been published without his compassionate and persistent support, and we are indebted to him! Thank you also to our colleagues and family who supported us through the rather lengthy process of writing and revising this article. Finally, Susan would like to thank Bob (Donald) for sharing his discovery of the star of our article, the differential equation modeling the density of primes, and giving her the opportunity to be a part of telling its story.

Euler Book Prize

The Euler Book Prize is awarded annually to the author of an outstanding book about mathematics. The Prize is intended to recognize authors of exceptionally well-written books with a positive impact on the public's view of mathematics and to encourage the writing of such books. The Euler Prize, established in 2005, is given every year at a national meeting of the Association beginning in 2007, the 300th anniversary of the birth of Leonhard Euler. This award also honors Virginia and Paul Halmos, whose generosity made the award possible.

Citation

Jordan Ellenberg

How Not to Be Wrong: The Power of Mathematical Thinking, The Penguin Press, New York, 2014.

"Mathematics is the extension of common sense by other means." This is a recurring theme in Ellenberg's wide-ranging, informative, and engaging survey of the application of critical mathematical thinking to situations ranging from sex, politics, lotteries, and diplomacy to physics, biology, and, of course, mathematics itself.

Through parables and cautionary tales, Ellenberg shows how to apply fundamental mathematical ideas to perplexing problems, while keeping the discussion (relatively) nontechnical and avoiding complex computations.

Many of the book's chapter titles beg that they be read, e.g., "Everyone is obese" (linear regression predicts that all Americans will be obese by 2048!), "Does lung cancer make you smoke cigarettes?" and "Miss more planes!"

The book succeeds in making some really advanced mathematics seem accessible and delightful, like the projective plane, the seven-point Fano plane and its application in coding theory, Zhang's recent theorem on bounded gaps between primes, and Bernoulli's "untwisting" of the St. Petersburg paradox, that includes a slick tabular proof that $1/2 + 2/4 + 3/8 + 4/16 + 5/32 + \ldots = 2$. Its treatment of Buffon's Needle and its generalization, Buffon's Noodle (an early result in integral geometry), is a superb piece of pedagogy.

The conversational style of much of the text gives you the feeling that you're in Ellenberg's office, chatting with him about the problems and issues at hand.

This impression is reinforced by the nature of most of the figures in the book, which are hand-drawn and the sort of diagrams one would scribble on the office blackboard to illustrate a point.

Occasionally, Ellenberg provides clues to his pedigree and experience—he is a prominent number theorist, the son of statisticians, a Harvard Ph.D., and a script consultant for the “Numb3rs” television show—that both reinforce his mathematical authority and provide motivation and texture for the mathematics. For example, in the course of discussing why a person looking for “remarkable” coincidences in a large enough data set will find them, we learn that he was a graduate student at Harvard when a controversy erupted among the faculty there about the possibility of secret prognostications encoded in the Torah.

How Not to Be Wrong is a *tour de force* of mathematical and statistical reasoning applied in diverse theoretical and applied settings that appeals to specialists and nonspecialists alike. Just about everyone should find something to like and learn from in this delightful book.

Biographical Note

Jordan S. Ellenberg is the John D. MacArthur Professor of Mathematics at the University of Wisconsin-Madison. He received his Ph.D. in math at Harvard under the supervision of Barry Mazur and his M.A. in fiction writing from Johns Hopkins. He was a postdoc at Princeton and has been on the faculty at Wisconsin since 2005, specializing in algebraic number theory and arithmetic geometry. He is a Fellow of the American Mathematical Society and a 2015 Guggenheim Fellow, and has advised thirteen Ph.D. students. Ellenberg has written about math for the public in the *New York Times*, the *Wall Street Journal*, the *Washington Post*, and *Slate*, among many other publications. *How Not To Be Wrong* is his first book about mathematics.

Response from Jordan Ellenberg

It’s a really great honor and pleasure to have my work on *How Not To Be Wrong* recognized by my professional community. When I started writing about math for a broad audience, almost fifteen years ago, some people counseled me to worry about whether people would take me less seriously as a mathematician. That worry was misplaced. I think the community of mathematicians now recognizes and honors outward-facing mathematics (general-interest writing, blogging, giving interviews to journalists, generally spreading the word about what we do) as a part of our mission and a worthy use of our time.

I am really grateful, not only to the MAA, but to *Slate*, whose idea it was in the first place to write newspaper columns about math; and to the editors and marketers at the Penguin Press, who let me write a very unusual and idiosyncratic book with a lot of math in it, and promised me they could get lots of normal people to buy it. I thought they were crazy. But they were right.

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

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

Citation

Satyan Devadoss

Professor Satyan Devadoss is a dynamic, engaging, and inspirational teacher who is devoted to connecting math with other disciplines. Colleagues praise his uniquely visual style of teaching involving unforgettable pictures, and they admire his ability to attract students into the math major while teaching courses that are known for their difficulty. One semester, Professor Devadoss taught three sections of multivariable calculus and earned difficulty ratings in the ninety-fifth, ninety-seventh, and ninety-eighth percentiles. His senior seminar course tied in student surveys for the most difficult course at Williams.

Professor Devadoss' colleagues and students admire the exciting array of courses he has developed at Williams since his arrival in 2002. There is the notoriously challenging yet incredibly popular *Computational Geometry*, which led to the "strikingly beautiful" textbook *Discrete and Computational Geometry* (Princeton University Press), coauthored with Joseph O'Rourke of Smith College. Williams students describe *Computational Geometry* as "awesome," "amazing," "flat-out cool," and "by far the most entertaining math course I have ever taken." Professor Devadoss shared the ideas behind this extraordinary level of success in an MAA short course he co-taught at JMM in 2012. Tapping into his interests in art and design, Professor Devadoss also developed three interdisciplinary courses offered through Williams' Art Department: *Modeling Geometric Shapes*; *Design School*; and *Mural*. In these courses, students not only had the opportunity to learn about important ideas and open problems in mathematics, they explored the visualization of these ideas and produced sculptures, newspapers, and murals to make these ideas more visible and accessible to the community at large. Other courses designed by Professor Devadoss include *Lessons in Go*, *Visualization*, *Origami*, *Phylogenetics*, and a senior seminar titled *Geometric Group Theory*. Finally, Professor Devadoss has made mathematics more accessible to an even wider audience through his thirty-six-lecture DVD course *The Shape of Nature*, produced in 2010 by the Great Courses Company.

Outside of the classroom, Professor Devadoss has advised ten original research undergraduate theses and six undergraduate research projects (through the Williams SMALL REU program). As an undergraduate research mentor, he is known for his ability to find a simple and beautiful problem, one that is probably way too hard but that has the potential to develop in many different directions in the hands of students. Professor Devadoss' collaborations with students have led to over a dozen research publications. One joint paper, "Deformations of bordered Riemann surfaces," appeared in the *Notices of the American Mathematical Society*.

Professor Devadoss is no novice when it comes to winning awards. In 2007 he won the MAA's Henry L. Alder National Teaching Award, and in 2014 he was the recipient of the MAA Northeastern Sectional Award for Distinguished Teaching. In 2013 he was named an inaugural fellow of the American Mathematical Society, and in 2012 he was awarded the Nelson Bushnell Prize at Williams for his excellence in both scholarship and teaching.

Biographical Note

Satyan Linus Devadoss was born and raised in south India, where he developed his lifelong love of rice. During the reign of Michael Jordan, he became valedictorian at North Central and received a doctorate at Johns Hopkins. This was followed by an Arnold Ross postdoc at Ohio State, ideal preparation for arriving at Williams in 2002. His current mathematical interests range from cartography and origami to phylogenetics and design, attracting support from the National Science Foundation, the John Templeton Foundation, the Mellon Foundation, and the Department of Defense. He is particularly fascinated by the different approaches taken by academic disciplines in measuring truth and reality. In addition to invitations at Google, Pixar, and LucasFilm, he has held visiting positions at Harvey Mudd, Ohio State, UC Berkeley, MSRI, and Stanford. Regardless of location, the pursuit of exceptional ice cream is a high priority.

Response from Satyan Devadoss

Accepting this honor, I am humbled to stand in the stead of those who have poured their hearts into mine. My life has been paved with exemplary teachers, starting with my parents: my father instilling in me the love of structure and puzzles, my mother the love of art and nature. My wonderful colleagues at

Williams have modeled for me excellence, purpose, and stewardship, entrusting me with freedom to pursue my passions. Wise mathematicians have guided me, including Shirley Wilson (North Central), Jack Morava (Johns Hopkins), Jim Stasheff (UPenn), Peter March (Ohio State), Joe O'Rourke (Smith), Bernd Sturmfels (Berkeley), and Ed Burger (Southwestern). A big shout-out to my students for showing me grace, and teaching me compassion. A special thanks to Regina Graeter and Jeni Britton Bauer for elevating the dignity of the physical. And most of all, to my wife Doris, who has stood in the shadows, laying her life down while lifting mine to the skies.

CITATION

Tyler Jarvis

Tyler Jarvis is a master teacher who has had a significant national impact on the mathematics education of students. In his twenty years of teaching, he has demonstrated that he is both a superb classroom teacher and also a skilled administrator, creator, and founder of math programs and resources that help train mathematicians throughout the country as math educators.

Professor Jarvis has a strong passion for mathematics and a talent for inspiring students to learn as he challenges them to do more than they normally would. His teaching evaluations note the care he has for students, and his sincere desire for them to learn. Over the past several years, 63% of the evaluations note that Professor Jarvis is either one of the best teachers at Brigham Young University or an "awesome teacher." He has been successful both in teaching large lecture classes and in working with students in smaller groups. In larger classes, his sections have demonstrated high student retention rates and above-average performance on common exams. He has been extremely successful in mentoring undergraduate students; thirty-two undergraduates have completed projects as part of his algebraic geometry research group.

Professor Jarvis has made fundamental contributions to mathematics education nationally through the creation or co-creation of the "We Use Math" web site, the Center for Undergraduate Research in Mathematics (CURM), and the Applied and Computational Mathematics Emphasis curriculum materials. He created the `WeUseMath.org` website in 2009 to help inform students about careers in mathematics. The website has had over 1,000,000 page views and been linked to by the MAA, AMS, Utah State Office of Education, and numerous mathematics departments as a resource for helping students learn about math careers. Professor Jarvis has served as the co-director of CURM since cofounding it in 2007. CURM trains mathematics faculty throughout the United States to successfully do undergraduate research. CURM has supported more than eighty professors from seventy different colleges and universities nationwide, and over 225 undergraduates have been mentored in undergraduate research. In 2015, CURM received the American Mathematical Society's "Programs that Make a Difference" award.

Professor Jarvis is also the co-creator of the Applied and Computational Math Emphasis (ACME) program at BYU, and a co-PI of the related NSF-supported project "A New Curriculum in Applied and Computational Mathematics." These two programs, both started in 2013, aim to modernize the mathematics major by better integrating it with the broader STEM community through the creation of an upper level mathematics curriculum with increased use of math modeling and advanced computational expertise in interdisciplinary work.

Biographical Note

Tyler Jarvis earned a B.S. and an M.S. in mathematics from Brigham Young University in 1989 and 1990, respectively. He earned a Ph.D. in mathematics from Princeton University in 1994. In 1995 he received an NSF CAREER award. He has taught mathematics at Mississippi State University, Boston University, and Brigham Young University.

He served as chair of the Department of Mathematics at Brigham Young University from 2006 to 2012. In 2007 he cofounded the Center for Undergraduate Research in Mathematics (CURM) [`http://curm.byu.edu/`], and he is currently a co-director of CURM. He is also a coauthor of a new curriculum for undergraduates in applied and computational mathematics, designed to better integrate the mathematics major with the broader STEM community, and increase the use of mathematic modeling and advanced computational expertise in interdisciplinary work.

Response from Tyler Jarvis

I feel very honored to be one of this year's recipients of the Deborah and Franklin Tepper Haimo award. I am very grateful to the MAA and to the many outstanding teachers who have influenced and inspired me throughout my life. I am also deeply indebted to my wonderful colleagues at BYU and elsewhere, and most especially to my department chair, Michael Dorff. They have supported, encouraged, and improved my teaching and scholarship for many years. I am lucky to have had not only great colleagues, but also truly fantastic students—they make teaching a real joy. Finally, I thank my family for their support and for all they have taught and done for me.

CITATION

Glen Van Brummelen

Professor Glen Van Brummelen is described as a dedicated and practical teacher of mathematics. He has thought deeply about how to motivate complex mathematical ideas for his students and has mentored other faculty in his department to do the same. By focusing on why a student should learn the material at hand, rather than presenting the material as knowledge to be learned, he allows students to see the cohesive story behind the formal language. His colleagues describe Professor Van Brummelen's students as passionate about mathematics and inspired to learn the importance and the history of the subject. Notably, Professor Van Brummelen received the highest teaching evaluation scores of all faculty at a university ranked number one in North America in the National Survey of Student Engagement. Of course, perfect scores by every student are impossible for another faculty member to beat, regardless of the institution, and perfect scores are precisely what he managed to achieve! He also earned the highest average scores this past year.

As a founding faculty member at Quest University, Professor Van Brummelen has had great influence on the teaching of mathematics at his institution. He served as a lead writer of the learning objectives document for the university, the initiator of monthly faculty pedagogical discussion groups, and was the original designer of the mathematics portion of the foundation program. His influence has expanded beyond his institution by the example he has set for his students, many of whom are now teaching in places around the world such as Vermont, Texas, and Pakistan. He has also taught mathematics to the broader community through his MAA mini courses and his published books that address accessible and provocative questions at the root of mathematics. Glen's invited address on Ptolemy's model of planetary motion at the 2010 AMS/MAA Joint Meetings in San Francisco was one more example of making mathematics relevant and interesting to a broad audience.

Professor Van Brummelen's passion for teaching also goes beyond his own classroom with the substantial work he has done in serving two terms as president of the Canadian Society for the History and Philosophy of Mathematics, his current appointment to the Education Committee in the Canadian Mathematical Society, and Governor-at-Large for Canadian members of the MAA. He is dedicated to strengthening these organizations which focus on the teaching of mathematics, because this work will in turn strengthen the teaching of mathematics on a global scale.

Whether creating curriculum and learning objectives, giving an invited address, serving as a plenary lecturer at MathPath, writing a new book, or participating in the leadership of multiple national mathematics professional organizations, Professor Van Brummelen is a leader in mathematics education.

Biographical Note

Glen Van Brummelen is coordinator of mathematics at Quest University. After receiving his B.Sc. in mathematics from the University of Alberta, he went off in search of context, studying the history of mathematics for his M.Sc. and Ph.D. with Len Berggren at Simon Fraser University. He has taught at The King's

University (Edmonton), Bennington College (VT), and is one of the five founding faculty of Quest University, starting in 2006. His passion for the mathematics of different cultures led him to explore ancient and medieval mathematical astronomy, leading to his *The Mathematics of the Heavens and the Earth: The Early History of Trigonometry* (Princeton, 2009) and *Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry* (Princeton, 2013), which was short-listed for the Neumann Prize and selected a *Choice* Outstanding Academic Title of 2013. He has authored fifty publications, several with undergraduate students, both in the history of mathematics and in its uses in teaching. In addition to establishing the innovative mathematics program at Quest University, Glen has been there at the beginning of several other educational initiatives. He was the founding program coordinator of HOMSIGMAA; has taught at the summer camp MathPath (for elite eleven–fourteen year olds) since its first year in 2002; and serves on the advisory board of Proof School, a new middle/high school for mathematics students in San Francisco that opened this past September.

Response from Glen Van Brummelen

I'm extremely grateful for this recognition, fully aware that the MAA is chock full of teachers every bit as deserving. My career has blessed me with a incredible wealth of opportunities. I was born into a family of insightful educators—my father Harro, who was instrumental in designing a teacher education program; and my mother Wilma and siblings Tim and Yolanda, all of whom have been outstanding teachers. How can you not reflect deeply about how to teach and learn when it is on everyone's lips, all the time? As a rookie teacher at The King's University in Edmonton I found myself mentored by science education visionaries Brian Martin and Peter Mahaffy. Daily I watched them place the student first, and treat their discipline as a verb rather than a noun. At Bennington College I had the all-too-rare freedom to try, to fail, and to learn from it. Over the last decade I have worked with some of the most gifted teachers in North America at the summer camp MathPath. They have enhanced my appreciation of the beauty and diversity of mathematics, a subject that after twenty-five years still holds an endless capacity to surprise me. At Quest University I have come to appreciate that it takes a village to raise a math student. My colleagues (Ryan Derby-Talbot, Richard Hoshino, Chris Stewart, and our Project NExT fellow Sarah Mayes-Tang) may be the four most creative teachers I have ever met, and wonderful people besides. Finally, from the people who share my classroom every day, I have learned that we don't teach math...we teach students. Understand *them*, and the math will follow.

My greatest thanks to the MAA. I hope I will prove to be a worthy recipient by continuing to grow in a way that honors my mentors, supports my colleagues, and cultivates my students.

YUEH-GIN GUNG AND DR. CHARLES Y. HU AWARD FOR DISTINGUISHED SERVICE TO MATHEMATICS

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

CITATION

George Berzsenyi

The 2016 Gung and Hu Award goes to George Berzsenyi for his remarkable career empowering generations of high school students to pursue their mathematical and scientific passions by promoting the art of problem solving, creating national and international mathematical talent searches, and supporting mathematical competitions.

George is a native of Hungary and came to the United States as a high-school student in 1957 following the end of the Hungarian Revolution of 1956. He completed his education in Texas, including a Ph.D. in mathematics at Texas Christian University. He taught at universities in Texas and Louisiana prior to moving to Indiana to chair the Department of Mathematics at the Rose-Hulman Institute of Technology (RHIT), where he is now Professor Emeritus.

Being brought up in the Hungarian tradition, George enjoyed *KöMaL*, the high-school mathematics journal dedicated to creative mathematical problem solving. In order to provide similar challenges to students in the United States, he spent his professional career writing problems and solutions accessible to high-school students in a variety of venues:

- “Competition Corner” in NCTM’s *Mathematics Student* (1978–1981, twenty columns),
- “Kürschák Corner” in *Arbelos* (1982–1987, seventeen columns),
- “The USA Mathematical Talent Search” in *Consortium* (1989–1996, quarterly),
- “Problems, Puzzles, and Paradoxes” in *Consortium* (1985–1996, forty-one columns),
- “International Mathematical Talent Search” in *Mathematics and Informatics Quarterly* (1991–1999, quarterly),
- “Math Investigations” in *Quantum* (1989–1997, forty-one columns), and
- “Problem Section” in *Math Horizons* (1993–1995, six sets of problems and solutions).

Most notably, in cooperation with the Rose-Hulman Institute for Technology (RHIT) and the Consortium for Mathematics and Its Applications (COMAP), he founded the USA Mathematical Talent Search (USAMTS). Unlike other mathematics competitions, the USAMTS is about talent identification and development rather than competition. Begun in 1989, problems were printed quarterly in the COMAP publication *Consortium*. Students had a full month to work on problems and submit carefully written solutions. USAMTS continues to this day as a program of the Art of Problem Solving Foundation, though the delivery method of the problems is now electronic. Now, as then, solutions are graded by mathematicians and comments returned to the students with the goal “to help all students develop their problem solving skills, improve their technical writing abilities, and mature mathematically while having fun.”

George maintained an extensive correspondence with scores of students, guiding them with respect to their reading, their selection of problems, and their scientific aesthetic. He crafted kind, thoughtful, and deliberate letters, invariably with the invitational closing “Yours in problem solving.” He presented competitors with prizes of rare mathematics books and puzzles instead of trophies: a thoughtful and humbling reminder to winners that there was always more to learn. He makes mathematics personal, by sharing colorful vignettes of the lives of mathematicians and former protégés and the Hungarian mathematical tradition. Many of his protégés have never actually met him in person, but rather, forged long-distance relationships dedicated to problem solving and discovery—in a pre-Internet era when such correspondence was carried on via the US postal service.

George has an international problem-writing reputation. He served on the MAA’s mathematical competitions committees for many years (USAMO twelve years; AIME six years as chair; AHSME fifteen years). He also served as a member of the Problems Committee at the 2001 IMO in Washington, DC; was a member of the Problems Committee of the Australian Mathematics Competitions four times (a record for non-Australians); and was the Chief Coordinator of Topic Area 3: Mathematical Competitions at the 6th International Congress on Mathematics Education (ICME-6) in Budapest, Hungary, in 1988. He has edited and enhanced four collections of competition problems:

- *The Contest Problem Book V: American High School Mathematics Examination and American Invitational Mathematics Examination (1983–1988)* with Steve Maurer, MAA, Washington, DC, 1997,
- *C2K-Century 2 of KöMaL (1994–1997)* with Vera Olah, Roland Eötvös, Physical Society, Budapest, 1999,
- *International Mathematical Talent Search Part I*, Australian Mathematics Trust Publishing, Canberra, 2010, and
- *International Mathematical Talent Search Part II*, Australian Mathematics Trust Publishing, Canberra, 2011.

In 1996, George received the Paul Erdős Award from the World Federation of National Mathematics Competitions in recognition of his significant contributions to the development of mathematical challenges as a means to enrich mathematical learning.

Throughout his career, George created opportunities and supported students in many ways including the Young Scholars Program at RHIT (1990–1995), the Texas Mathematical Olympiad (forerunner of AIME), Lamar Mathematics Day (1977–1982), Texas in ARML—American Regional Mathematics League, and International Science and Engineering Fairs. George mentored students for the Westinghouse (now Intel) Science Talent Search and has been recognized as "the one person who has been most influential in the development of my career" by six scholarship winners. George's nomination letter, co-signed by ten former students, attests to his lasting and undeniable impact:

> *Though our life trajectories have taken us to very different directions, each one of us benefitted from George's mentorship. Some of us, for example, are now professional mathematicians, while others chose disciplines in neuroscience, medicine, and finance, and continue to utilize quantitative approaches. Yet others work in very diverse disciplines, such as entrepreneurship and law, and acknowledge the valuable impact high school mathematics training had on us. George encouraged us and believed that high school students could excel. He helped to nurture confidence in ourselves that would serve us a lifetime.*

George Berzsenyi has played an instrumental role in promoting creative problem solving to enrich and inspire mathematical learning, whether through the creation of the USAMTS, posing problems and solutions for worldwide competitions, or individual mentoring of generations of talented high-school students.

Response from George Berzsenyi

I am most thankful to the members of the Committee in charge of this award and of the Board of Governors of the MAA for their recognition of the importance of my work with talented high-school students. It is my hope that this recognition will encourage other mathematicians as well to devote their efforts to talent search and, just as importantly, to talent development. I am also grateful to my wife, Kay, who was an equal partner in all of my mathematical endeavors for the past 50 years and to the thousands of students, whose enthusiasm for my programs kept me going throughout the years. Among my close co-workers I must also single out my colleagues at Rose-Hulman, as well as Steve Maurer, Peter Taylor, Vera Oláh, Andy Liu, Sol Garfunkel, Stan Rabinowitz, and Willie Yong, who are still active in the field. Moreover, I remember fondly the late Dave Logothetti, Peter O'Halloran, Erzsébet Fried, Endre Hódi, Walter Mientka, Henry Alder, and my dissertation advisor, Charlie Deeter, for their support.

Summary of Awards

For AMS

- **Chevalley Prize in Lie Theory**: Geordie Williamson
- **Oswald Veblen Prize in Geometry**: Fernando Codá-Marques and André Neves
- **David P. Robbins Prize**: Christoph Koutschan, Manuel Kauers, and Doron Zeilberger
- **Levi L. Conant Prize**: Daniel Rothman
- **Award for Distinguished Public Service**: Aloysius Helminck
- **E. H. Moore Research Article Prize**: Caucher Birkar, Paolo Cascini, Christopher D. Hacon, and James McKernan
- **Leroy P. Steele Prize for Mathematical Exposition**: David Cox, John Little, and Donal O'Shea
- **Leroy P. Steele Prize for Seminal Contribution to Research in Applied Mathematics**: Andrew J. Majda
- **Leroy P. Steele Prize for Lifetime Achievement**: Barry Simon

For AWM

- **Louise Hay Award for Contribution to Mathematics Education**: Judy Walker
- **M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics**: Naomi Jochnowitz
- **Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman**: Mackenzie Simper

For MAA

- **Chauvenet Prize**: Susan Marshall and Donald R. Smith
- **Euler Book Prize**: Jordan Ellenberg
- **Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics**: Satyan Devadoss, Tyler Jarvis, and Glen Van Brummelen
- **Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics**: George Berzsenyi

For AMS-MAA-SIAM

- **Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student**: Amol Aggarwal and Evan O'Dorney

For AMS-SIAM

- **AMS-SIAM Norbert Wiener Prize in Applied Mathematics**: Constantine Dafermos

For JPBM

- **Communications Award**: Museum of Mathematics and Simon Singh

Index of Award Recipients