Margulis and Novikov Receive 2005 Wolf Prize

Gregory A. Margulis

Sergei P. Novikov

On January 18, 2005, the Wolf Foundation announced that the 2005 Wolf Prize in Mathematics will be awarded to GREGORY A. MARGULIS of Yale University "for his monumental contributions to algebra, in particular to the theory of lattices in semi-simple Lie groups, and striking applications of this to ergodic theory, representation theory, number theory, combinatorics, and measure theory" and to SERGEI P. NOVIKOV of the University of Maryland, College Park, and the L. D. Landau Institute for Theoretical Physics "for his fundamental and pioneering contributions to algebraic and differential topology on one hand, and to mathematical physics on the other hand." Margulis and Novikov will share the $100,000 prize, which will be presented by the president of the State of Israel, Moshe Katsav, at a special ceremony at the Knesset (parliament) in Jerusalem on May 22, 2005.

Gregory A. Margulis

At the center of the work of Gregory Margulis lies his proof of the Selberg-Piatetskii-Shapiro Conjecture, affirming that lattices in higher rank Lie groups are arithmetic, a question whose origins date back to Poincaré. This was achieved by a remarkable tour de force, in which probabilistic ideas revolving around a noncommutative version of the ergodic theorem were combined with p-adic analysis and with algebraic geometric ideas showing that "rigidity" phenomena, earlier established by Margulis and others, could be formulated in such a way ("superrigidity") as to imply arithmeticity. This work displays stunning technical virtuosity and originality, with both algebraic and analytic methods. The work has subsequently reshaped the ergodic theory of general group actions on manifolds.

In a second tour de force, Margulis solved the 1929 Oppenheim Conjecture, stating that the set of values at integer points of an indefinite irrational nondegenerate quadratic form in more than three variables is dense in R^n. This had been reduced (by Rhagunathan) to a conjecture about unipotent flows on homogeneous spaces, proved by Margulis. This method transformed to this ergodic setting a family of questions till then investigated only in analytic number theory.

A third dramatic breakthrough came when Margulis showed that Kazhdan's "Property T" (known to hold for rigid lattices) could be used in a single arithmetic lattice construction to solve two apparently unrelated problems. One was the solution to a problem posed by Rusiewicz, about

finitely additive measures on spheres and Euclidean spaces. The other was the first explicit construction of infinite families of expander graphs of bounded degree, a problem of practical application in the design of efficient communication networks.

Margulis's work is characterized by extraordinary depth, technical power, creative synthesis of ideas and methods from different areas of mathematics, and a grand architectural unity of its final form. Though his work addresses deep unsolved problems, his solutions are housed in new conceptual and methodological frameworks of broad and enduring application. He is one of the mathematical giants of the last half century.

Born in 1946 in Russia, Margulis received his Ph.D. in 1970 from Moscow State University. Starting in 1970, he was associated with the Institute for Problems in Information Transmission at that university, first as junior scientific worker, later as senior staff member, and from 1986 until he left in 1991, as leading scientist. Since 1991, Margulis has been a professor of mathematics at Yale University. He received the Fields Medal in 1978. He is a foreign honorary member of the American Academy of Arts and Sciences and a member of the U.S. National Academy of Sciences.

Sergei P. Novikov

Sergei P. Novikov is awarded the Wolf Prize for his fundamental and pioneering contributions to topology and to mathematical physics. His early work in algebraic and differential topology includes such milestones as the calculation of cobordism rings and stable homotopy groups, proof of the topological invariance of rational Pontrjagin classes, formulation of the "Novikov Conjecture" on higher signature invariants, and proof of the existence of closed leaves in two-dimensional foliations of the 3-sphere.

In the early 1970s Novikov turned his attention to mathematical physics, initially contributing to general relativity and conductivity of metals. He constructed a global version of Morse theory on manifolds and loop spaces that had novel applications to quantum field theory (multivalued action functionals). His most significant achievements in mathematical physics flow from his introduction of algebraic-geometric methods to the study of completely integrable systems. These include a systematic study of finite-gap solutions of two-dimensional integrable systems, formulation of the equivalence of the classification of algebraic-geometric solutions of the KP equation with the conformal classification of Riemann surfaces, and work (with Krichever) on "almost commuting" operators that appear in string theory and matrix models ("Krichever-Novikov algebras", now widely used in physics).

Novikov made a fundamental and striking contribution to two separate fields in mathematics, while he is one of those rare mathematicians who brings deep, key mathematical ideas to bear on difficult pivotal problems of physics, in ways that are stunning and compelling for both mathematicians and physicists.

Born in Russia in 1936, Sergei P. Novikov graduated from Moscow State University in 1960. In 1965, he received his Ph.D. in physics and mathematics from the Steklov Institute of Mathematics in Moscow. Since 1971, Novikov has been head of the Mathematical Division at the L. D. Landau Institute for Theoretical Physics in Moscow. Since 1992, he has been a professor in the Department of Mathematics and at the Institute for Physical Science and Technology at the University of Maryland, College Park. Novikov received the Lenin Prize of the USSR in 1967 and the Fields Medal in 1970. In 1981, he was elected as a full member of the Academy of Sciences of the USSR. He is a foreign associate of the U.S. National Academy of Sciences.

About the Wolf Prize

The Israel-based Wolf Foundation was established by the late German-born inventor, diplomat, and philanthropist Ricardo Wolf. A resident of Cuba for many years, Wolf became Fidel Castro's ambassador to Israel, where he lived until his death in 1981. Five annual Wolf Prizes have been awarded since 1978 to outstanding scientists and artists "for achievements in the interest of mankind and friendly relations among peoples, irrespective of nationality, race, color, religion, sex, or political view." The prizes of $100,000 in each area are given every year in four out of five scientific fields in rotation: agriculture, chemistry, mathematics, medicine, and physics. In the arts, the prize rotates among architecture, music, painting, and sculpture. To date, a total of 224 scientists and artists from twenty-one countries have been honored.

—From Wolf Foundation announcements

For a list of previous Wolf Prize winners in mathematics, see the Web page `http://www.aquanet.co.il/wolf/wolf5.html`.

2005 JPBM Communications Award

The 2005 Communications Award of the Joint Policy Board for Mathematics (JPBM) was presented at the 111th Annual Meeting of the AMS in Atlanta in January 2005.

The JPBM Communications Award is presented annually to reward and encourage journalists and other communicators who, on a sustained basis, bring accurate mathematical information to nonmathematical audiences. The award carries a cash prize of $1,000.

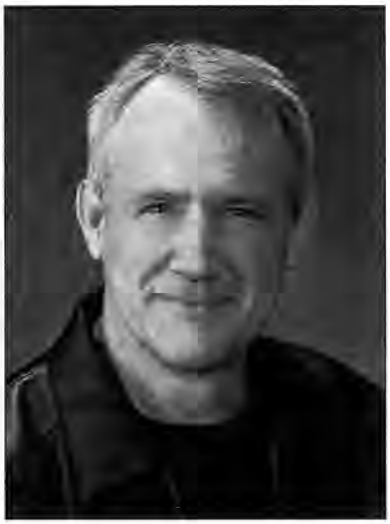
Previous recipients of the JPBM Communications Award are James Gleick (1988), Hugh Whitemore (1990), Ivars Peterson (1991), Joel Schneider (1993), Martin Gardner (1994), Gina Kolata (1996), Philip J. Davis (1997), Constance Reid (1998), Ian Stewart (1999), John Lynch and Simon Singh (special award, 1999), Sylvia Nasar (2000), Keith J. Devlin (2001), Claire and Helaman Ferguson (2002), and Robert Osserman (2003).

The 2005 JPBM Communications Award was presented to BARRY CIPRA. The text that follows presents the award citation, a brief biographical sketch, and the recipient's response upon receiving the award.

Citation

The Joint Policy Board for Mathematics presents its 2004 Communications Award to Dr. Barry Cipra who, for nearly twenty years, has written about mathematics of every kind—from the most abstract to the most applied. His lucid explanations of complicated ideas at the frontiers of research have appeared in dozens of articles in newspapers, magazines, and books.

While some of his audience undoubtedly consists of mathematicians themselves, he writes for scientists and scholars who are mathematically literate. In this way, he has reached many thousands of scientists. Dr. Cipra's work has educated mathematicians and nonmathematicians alike by exposing them to current and deep mathematical ideas about the beauty and power of mathematics. Barry Cipra has given his readers a greater understanding of the ideas of mathematics, but most importantly he has changed their perception of the nature of mathematics.



Barry Cipra

Biographical Sketch

Barry Cipra received his doctoral degree in mathematics from the University of Maryland in 1980. After a brief career as an academic, he turned to freelance writing, and he has continued with that work for the past 15 years. He has written many articles for *Science* magazine, one of the premier journals of scientific exposition. Examples of the intriguing titles of his articles are "Simple recipe creates acid test for primes" and "How to play platonic billiards". He is a regular contributor to *SIAM News*, writing many dozens of articles that are accessible and illuminating. He has authored five volumes of *What's Happening in the Mathematical Sciences* for the AMS, each including a compilation

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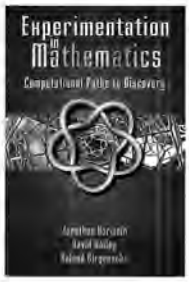

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—*American Scientist*

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of expository articles on recent mathematical developments aimed at the mathematically literate public. Those volumes have been widely distributed (and admired) in the scientific community and in Washington.

Cipra received the 1991 Merten M. Hasse Prize from the Mathematical Association of America for an expository article on the Ising model, published in the December 1987 issue of the *American Mathematical Monthly*. He is the author of *Misteaks...and how to find them before the teacher does...* (a calculus supplement), published by A K Peters, Ltd.

Cipra completed his Ph.D. degree under the direction of Michael Razar, with much help from Steve Kudla. He was a Moore Instructor at the Massachusetts Institute of Technology, a research instructor at the Ohio State University, and an assistant professor at St. Olaf College in Northfield, Minnesota, before turning to freelance writing.

Response

It is a great honor to receive the JPBM Communications Award. To be able to write about mathematics for a living—to meet so many first-rate mathematicians and learn about their exciting work—is a pleasure beyond description. This is an amazing age in which to be reporting on mathematics and its applications. I never would have guessed, in 1987, that I would wind up reporting on the proofs of Fermat's Last Theorem and the Kepler Conjecture (and, very possibly, the Poincaré Conjecture). I have witnessed an incredible growth in the applications of mathematics, especially in biology, which fifteen years ago was barely a whisper at math meetings and now is a prominent theme at many. Perhaps most surprisingly, I've seen mathematics go from a virtual nonentity in popular culture to become the basis (or McGuffin) of award-winning plays and movies.

I've been helped by many people over the years. Chief among them are Klaus Peters, Lynn Steen, Ed Block, Paul Sally, and Sam Rankin. I would like to thank my editors, especially Gail Corbett, Tim Appenzeller, and Paul Zorn, who have made the final, published versions of my articles so much better than their first drafts. Indeed, the key to writing, I've found, is expressible in a familiar mathematical term: iteration. The hard part, as mathematicians well know, is making sure the iterative process converges to the desired result

MAA Prizes Presented in Atlanta

At the Joint Mathematics Meetings in Atlanta in January 2005, the Mathematical Association of America presented the following honors.

Gung and Hu Award for Distinguished Service

The Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics is the most prestigious award made by the Association.

The 2005 Gung and Hu Award was presented to GERALD L. ALEXANDERSON of Santa Clara University. The award citation states, "Jerry has a long record of able service to mathematics as a practitioner, teacher, administrator, professional organization leader, publicist, advocate, and enthusiast whose love for mathematics and its people comes through clearly in his public talks and widely-read books." Alexanderson is known for his work on the *Mathematical People* volumes of interviews with mathematicians. Since 1975 he has been the associate director of the William Lowell Putnam competition. He served as chair of his department for thirty-five years and received a President's Special Recognition Award in 1996 for this service to his institution. Since 1994 he has been chair of the Board of Trustees of the American Institute of Mathematics. During his fifty years of MAA membership he has served in many different capacities, including serving as MAA president and secretary.

Haimo Awards for Distinguished College or University Teaching

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

The 2005 Haimo awards were presented to GERALD L. ALEXANDERSON of Santa Clara University, APARNA HIGGINS of the University of Dayton, and DEBORAH HUGHES HALLETT of the University of Arizona and Harvard University.

"Jerry Alexanderson is a master teacher, an inspiration to both students and colleagues," the citation states. "In his 47 years of teaching at Santa Clara University (35 years of which he was department chair), he has consistently had the reputation for being not only the best, but also one of the most demanding teachers. His classes are amusing, entertaining, and highly informative, an impressive mix of challenging mathematics and historical anecdotes, delivered clearly and concisely. Many mathematicians (and former students in other careers) discovered the excitement of mathematics in the first course they took with Jerry, and his personal advice and encouragement continues to guide many of those careers today."

"Aparna Higgins is one of the dynamos of the U.S. mathematical community," the award citation states. "Her ease with and genuine connection to students is remarkable; her dedication to teaching and mentoring is recognized by colleagues near and far....[Her] love of all things mathematical and the desire to encourage others fuels her charisma, energy, and enthusiasm. Her joy is contagious in the classroom, at MAA student chapter meetings, in her REU [Research Experiences for Undergraduates] summer programs, and with Project NExT Fellows." Higgins has received two other teaching awards, from her own university and from the Ohio section of the MAA.

"Deborah Hughes-Hallett is known for her superb skills in the classroom," the prize citation

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states. "She excels at all scales, from the classroom to the international educational scene. Her pioneering programs at the University of Arizona and at Harvard will continue to support and inspire the worldwide teaching of mathematics for decades." The best known of these programs is the Harvard-based Calculus Consortium. Her role in designing mathematics courses for students at Harvard's Kennedy School of Government has won high praise. "[These courses] have involved a fundamental rethinking of either curriculum or method, and are driven by her uncompromising devotion to her students and her rigorous understanding of how they think," the prize citation says.

Beckenbach Book Prize

The Beckenbach Book Prize is awarded to an author of a distinguished, innovative book published by the MAA. The award is not given on a regularly scheduled basis but only when a book appears that is judged to be truly outstanding.

The 2005 Beckenbach Book Prize was presented to JAMES TANTON, a high school mathematics teacher at St. Mark's School in Southborough, Massachusetts. He received the prize for his book *Solve This: Math Activities for Students and Clubs*, published by the MAA. The book, the prize citation states, "is much more than just a collection of ideas to use with math clubs. It causes, coerces, and induces the reader to think about mathematics in nonconventional ways, exploring diverse topics from number theory, geometry, combinatorics, probability, knot theory, topology, tiling, and many more. The sections on 'Take it Further' and 'Solutions and Discussions' expand upon many of the problems and activities to suggest additional directions of exploration, provide notes and proofs on some important areas and theorems of mathematics, and present problems whose solutions are still unknown. Even professional mathematicians are likely to encounter questions and problems that will capture their interest in this creative, innovative, and delightful exposure to mathematics and mathematical thinking."

Certificates of Meritorious Service

The Certificate of Meritorious Service is presented for service at the national level or for service to an MAA section. Those honored in 2005 were CHARLES CABLE of Allegheny College, Allegheny Mountain Section; JON SCOTT of Montgomery College, Maryland-District of Columbia-Virginia Section; BARBARA OSOFSKY of Rutgers University, New Jersey Section; ROY DEAL JR., of Oklahoma State University, Oklahoma-Arkansas Section; and ERNIE SOLHEID of California State University at Fullerton, Southern California-Nevada Section.

AWM Prizes Presented in Atlanta

At the Joint Mathematics Meetings in Atlanta in January 2005, the Association for Women in Mathematics (AWM) presented the following honors.

Hay Award

The Louise Hay Award for Contributions to Mathematics Education recognizes outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense.

The 2005 Hay Award was presented to SUSANNA S. EPP of DePaul University. "For the past twenty-five years, she has committed herself to helping students come to understand the unspoken logic and language that underlie mathematical thought," the award citation states. She has written a very popular and well-regarded textbook, *Discrete Mathematics with Applications,* and has coauthored a volume in the University of Chicago School Mathematics Project (UCSMP) Secondary Series. Epp has written many articles on the teaching and learning of mathematics and has been active in national efforts to improve mathematics education. At DePaul University, she developed more than a dozen successful courses. The prize citation says, "For her selfless contributions to mathematics education, her role as a mentor, her scholarship, her administrative skills, her human qualities of kindness, absolute honesty and trustworthiness, and her willingness to listen, the Association for Women in Mathematics is pleased to designate Susanna S. Epp as the Fifteenth Annual Louise Hay Awardee."

Schafer Prize

The Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman honors outstanding achievement in mathematics by a female undergraduate.

The 2005 Schafer Prize was awarded to MELODY CHAN, a senior at Yale University. She has excelled in a wide variety of mathematics courses and was awarded the prestigious Hart Lyman Prize. She has made presentations at the Yale Math Club, earned an honorable mention in the Putnam Competition, and is vice president of the Yale chapter of Phi Beta Kappa. She participated in the Budapest Semesters in Mathematics in Hungary and in Research Experiences for Undergraduates (REU) programs. At the University of Minnesota at Duluth REU, she wrote three professional-level papers on the concept of the distinguishing number.

Runners-up for the Schafer Prize are MARGARET I. DOIG, University of Notre Dame, and ELENA FUCHS, University of California, Berkeley. ANNALIES VUONG, University of California, Santa Barbara, received an honorable mention.

Happy 100th, Baley Price!

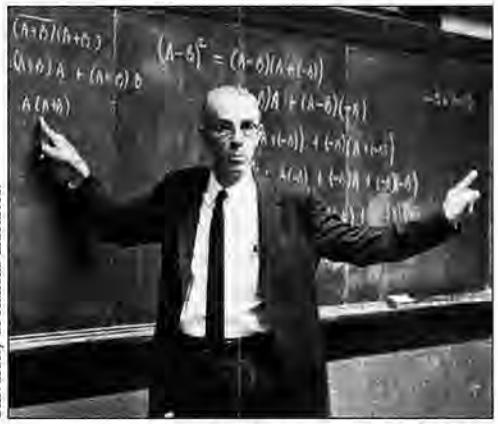

Photo courtesy of University Archives, University of Kansas Libraries.

G. Baley Price in class, 1960s.

G. Baley Price, Distinguished Professor Emeritus of the University of Kansas, turned 100 years old on March 14, 2005. Known for his dedication to teaching and to public service, Price had a hand in many key developments in the American mathematical community during the twentieth century. He has been a member of the AMS since January 1, 1929.

Griffith Baley Price was born in 1905 and received his bachelor's degree from Mississippi College in Clinton, Mississippi, in 1925. He received his doctorate in 1932 from Harvard University, where, like his fellow students C. B. Morrey and Hassler Whitney, he was a student of G. D. Birkhoff. The title of Price's dissertation was "Double pendulum and similar dynamical systems". After a short stint teaching at Brown University, in 1937 he joined the faculty of the University of Kansas, where he remained for the rest of his career. In 1970 he was named the first E. B. Stouffer Distinguished Professor of Mathematics. He retired in 1975.

Price devoted a great deal of time and effort to service on behalf of the mathematics profession and the general public. While at Brown University he had become acquainted with R. G. D. Richardson, who was then AMS secretary and who was instrumental in launching *Mathematical Reviews*, which began publication in 1940. Price served on the publicity committee that helped drum up subscriptions for the fledgling journal. Around this time he served on the AMS Council and was also named an associate secretary of the Society, but his World War II service prevented his serving in that capacity: in 1943 he began a three-year tour of service as a civilian member of the Operational Section of the Eighth Air Force. His job was to use mathematics to improve the accuracy of bombing attacks. In 2003 the United States Congress paid him a special tribute for this service.

During the 1950s Price worked to get the mathematical community involved in undergraduate and school education. While he was president of the Mathematical Association of America (MAA) in 1957–58, Price collaborated with AMS president Richard Brauer and National Council of Teachers of Mathematics president Harold Fawcett to appoint a committee to establish the School Mathematics Study Group (SMSG). This group launched the "new math" program that transformed mathematics teaching in schools across the country. While sometimes dismissed as a failure, SMSG was often successful when teachers were properly trained. Price participated in writing sessions for SMSG and also taught in a summer institute designed to train teachers to use the "new math" curriculum.

Price served as an AMS associate secretary from 1946 until 1949 and was editor of the *Bulletin* from 1950 until 1957. He was also very active in the MAA, serving not only as president but also as a vice president and as a longtime member of the MAA Board of Governors. During the 1950s he was on the MAA Committee on the Undergraduate Program in Mathematics. He received the MAA's Distinguished Service Award in 1970. He was the first chairman of the Conference Board of the Mathematical Sciences (CBMS) (1959–60) and also served as CBMS executive secretary (1960–62).

A University of Kansas alumnus who became a publishing sales representative was so impressed with Price when they first met in the 1960s that in 2004 he committed nearly a million dollars toward the establishment of an endowed chair in Price's honor. Not long thereafter, Price himself made a gift of $500,000 to the university for an endowed professorship in honor of his wife, Cora Lee Beers Price, who held a Ph.D. in English and was on the faculty of the University of Kansas. She passed away in late 2004.

Still active in his retirement, Price wrote a history of the mathematics department at the University of Kansas as well as historical pieces for the AMS centennial celebration in 1988 and the MAA's seventy-fifth anniversary in 1990. His long career of service to mathematics has made him a beloved member of the community. Happy Birthday, Professor Price!

—Allyn Jackson