Mathematics People

Stein Receives Bergman Prize

ELIAS M. STEIN of Princeton University has been awarded the 2005 Stefan Bergman Prize. Established in 1988, the prize recognizes mathematical accomplishments in the areas of research in which Stefan Bergman worked. The prize consists of one year's income from the prize fund. Currently this income is about $17,000 per year.

The previous Bergman Prize winners are: David W. Catlin (1989), Steven R. Bell and Ewa Ligocka (1991), Charles Fefferman (1992), Yum Tong Siu (1993), John Erik Fornæss (1994), Harold P. Boas and Emil J. Straube (1995), David E. Barrett and Michael Christ (1997), John P. D'Angelo (1999), Masatake Kuranishi (2000), László Lempert and Sidney Webster (2001), M. Salah Baouendi and Linda Preiss Rothschild (2003), and Joseph J. Kohn (2004). On the selection committee for the 2005 prize were Michael Christ, John P. D'Angelo, and John Erik Fornæss (chair).

Citation

The Bergman prize is awarded to Elias M. Stein in recognition of his work in real, complex, and harmonic analysis. Stein has made decisive contributions through his research, his expository efforts, and his training of graduate students. In particular Stein has developed and realized a visionary program for understanding the off-diagonal behavior of the Bergman and Szegő kernels associated to wide classes of smoothly bounded pseudoconvex domains and the mapping properties of the associated projection operators.

Stein has realized his program through collaborations with many mathematicians, including G. Folland, L. Rothschild, P. Greiner, A. Nagel, S. Wainger, D. Phong, N. Kerzman, J.-P. Rosay, D-C. Chang, J. McNeal, and F. Ricci. In this vast body of work they have achieved a deep understanding of the kernels and their mapping properties in many situations: strictly pseudoconvex domains, domains of finite type in dimension two, convex domains of finite type, and special classes of domains in higher dimensions. Stein's research is noted for the beautiful interplay between detailed analysis of model cases and the insights linking the models to general theory. His work analyzing the Cauchy-Riemann equations on the Siegel domain (whose boundary is the Heisenberg group) and using it to obtain estimates for various operators on strongly pseudoconvex domains provides one of many examples. Furthermore Stein's papers and books are renowned for the exceptional quality of their exposition.

Elias Stein

Stein's program includes a systematic analysis of geometric frameworks determined both by complex structure and by collections of real vector fields, thereby influencing both partial differential equations and CR geometry. Stein has studied the Szegő and Bergman projections as singular integral operators and developed an appropriate theory for them, revealing deep connections among real, complex, and harmonic analysis. Stein also developed a flexible theory of anisotropic function spaces, a distinguishing and subtle geometric feature of function theory in several complex variables. This work connects analysis on nilpotent Lie groups (including the higher step case) with analysis in the general settings mentioned above.

Stein's fusion of complex analysis, partial differential equations, analysis on nilpotent Lie groups, and Euclidean harmonic analysis has deeply influenced countless mathematicians. His ideas and techniques will continue to impact mathematics for years to come.

Biographical Sketch

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

Stein held a National Science Foundation Postdoctoral Fellowship (1955–56), an Alfred P. Sloan Foundation Fellowship (1961–63), and Guggenheim Fellowships (1976–77 and 1984–85). He was elected to membership in the National Academy of Sciences (1974) and the

American Academy of Arts and Sciences (1982). He received the von Humboldt Award (1989–90), the Schock Prize from the Swedish Academy of Sciences (1993), and the Wolf Prize (1999). In 1984 he was awarded the AMS Steele Prize for his book *Singular Integrals and the Differentiability Properties of Functions*, published in 1970 by Princeton University Press. In 2002 he received the Steele Prize for Lifetime Achievement and the U.S. National Medal of Science.

About the Prize

The Bergman Prize honors the memory of Stefan Bergman, best known for his research in several complex variables, as well as the Bergman projection and the Bergman kernel function that bear his name. A native of Poland, he taught at Stanford University for many years and died in 1977 at the age of eighty-two. He was an AMS member for thirty-five years. When his wife died, the terms of her will stipulated that funds should go toward a special prize in her husband's honor.

The AMS was asked by Wells Fargo Bank of California, the managers of the Bergman Trust, to assemble a committee to select recipients of the prize. In addition, the Society assisted Wells Fargo in interpreting the terms of the will to assure sufficient breadth in the mathematical areas in which the prize may be given. Awards are made every one or two years in the following areas: (1) the theory of the kernel function and its applications in real and complex analysis, and (2) function-theoretic methods in the theory of partial differential equations of elliptic type with attention to Bergman's operator method.

—Allyn Jackson

Bhargava Receives Blumenthal Prize

The Leonard M. and Eleanor B. Blumenthal Award for the Advancement of Research in Pure Mathematics has been presented to MANJUL BHARGAVA of Princeton University. The award was presented at the Joint Mathematics Meetings in Atlanta in January 2005.

Bhargava was given the Blumenthal Award for his doctoral dissertation, *Higher composition laws*. He received his Ph.D. from Princeton University in 2001. The prize citation states: "[In his dissertation] Bhargava found a remarkable generalization of Gauss's law of composition on binary quadratic forms to other prehomogeneous vector spaces. Using his new understanding of some of these prehomogeneous vector spaces, Bhargava is able to count asymptotically the number of quartic number fields of absolute discriminant at most x, as x goes to infinity. This problem had been open since Davenport and Heilbronn settled the corresponding problem for cubic number fields in 1971. In his thesis Bhargava also established, for the first time, a case of the Cohen-Lenstra-Martinet heuristics on the class groups of cubic number fields."

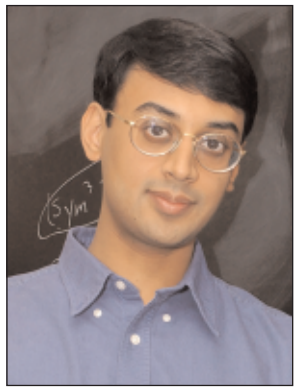

Photo courtesy of Denise Applewhite, Princeton University, Office of Communications.

Manjul Bhargava

A native of Canada, Bhargava is a professor of mathematics at Princeton University and is also the first Clay Mathematics Institute Five-Year Long-Term Prize Fellow. Among his awards are the AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Undergraduate Research in Mathematics (1997), the MAA Merten M. Hasse Prize for Exposition (2003), and a Packard Foundation Fellowship in Science and Engineering (2004).

The Leonard M. and Eleanor B. Blumenthal Trust for the Advancement of Mathematics was created for the purpose of assisting the Department of Mathematics of the University of Missouri at Columbia, where Leonard Blumenthal served as professor for many years. Its second purpose is to recognize distinguished achievements in the field of mathematics through the Leonard M. and Eleanor B. Blumenthal Award for the Advancement of Research in Pure Mathematics, which was originally funded from the Eleanor B. Blumenthal Trust upon Mrs. Blumenthal's death on July 12, 1987.

The trust, which is administered by the Financial Management and Trust Services Division of Boone County National Bank in Columbia, Missouri, pays its net income to the recipient of the award each year for four years. An independent committee selects the winner(s), restricting its attention to work published between eight years and one year before the date the award is presented. The recipient(s) accepts the award in person and presents an address on the research for which he or she received the award.

—Allyn Jackson

Harrison Awarded von Neumann Prize

The 2004 John von Neumann Theory Prize, the highest prize given in the field of operations research and management science, has been awarded to J. MICHAEL HARRISON of Stanford University for his profound contributions to two major areas of operations research and management science: stochastic networks and mathematical finance. The award, which is presented by the Institute for Operations Research and the Management Sciences (INFORMS), carries a cash award of $5,000.

The prize citation reads in part: "Over the past 30 years, Harrison has spearheaded the formulation, development and application of the theory of Brownian networks for performance analysis and control of stochastic processing networks. He has defined a framework with elegance and depth.... Under his intellectual leadership, heavy traffic

theory has gone from being an esoteric pursuit practiced by a small band of devotees to being a powerful and widely accepted technique used by many researchers in the applied probability/queueing community."

—From an INFORMS announcement

Prizes of the Mathematical Society of Japan

The Mathematical Society of Japan (MSJ) has awarded a number of prizes for the year 2004.

ARAI TOSHIYASU of Kobe University has been awarded the Autumn Prize for his distinguished contributions to Hilbert's second problem. The Autumn Prize is awarded to an individual who has made outstanding contributions to mathematics within the preceding five years.

The Geometry Prizes have been awarded to SEIICHI KAMADA of Hiroshima University and SHIN NAYATANI of Nagoya University. Kamada was recognized for his fundamental research on the foundation of two-dimensional braid and knot theory. Nayatani was honored for research on the construction of invariant metrics (often called Nayatani metrics) on the ideal boundaries of real or complex hyperbolic spaces and its application to vanishing theorems of cohomology groups.

The Analysis Prizes were awarded to MASAFUMI AKAHIRA of Tsukuba University for work on the higher order asymptotic theory of statistical estimation, to KATSUNORI IWASAKI of Kyushu University for work on the finite dimensionality of the space of polyhedral harmonic functions and on Painlevé equations, and to TAKAAKI NISHIDA of Kyoto University for mathematical analysis on the global structure of solutions of nonlinear partial differential equations.

The Takebe Senior Prizes have been awarded to MASASHI ISHIDA of Sophia University for the applications of stable Seiberg-Witten invariants to the geometry of 4-dimensional manifolds, to YASUSHI TANIUCHI of Shinshu University for the study of hydrodynamic equations, and to TOMOYUKI ARAKAWA of Nagoya University for his proof of the Frenkel-Kac-Wakimoto conjecture. The Takebe Junior Prizes were awarded to: KURODA SHIGERU of Kyoto University for the study of invariant rings by combinatorial methods, HIDEKAZU FURUSHO of Nagoya University for the study of p-adic multi-zeta values, HIDEAKI SUNAGAWA of Tsukuba University for the study of asymptotic behavior of solutions of nonlinear Klein-Gordon equations, TETSUYA HOSAKA of Utsunomiya University for the study of infinite Coxeter groups and CAT(0) spaces, RYO TAKAHASHI of Okayama University for the study of homological properties of Cohen-Macaulay local rings, and TAKUJI NAKAMURA of Osaka City University for the study of positive knots and canonical Seifert surfaces for knots.

—From a Mathematical Society of Japan announcement

AWM Essay Contest Winners Announced

The Association for Women in Mathematics (AWM) has announced the winners of its 2004 essay contest, "Biographies of Contemporary Women in Mathematics". The grand prize went to SAMANTHA VAN ANH TRAN, a student at Presentation High School, San Jose, California, for her essay "I Apply Computational Mathematics to Understand the Natural World—Dr. Margot Gerritsen". This essay won first place in the grade 9–12 category and, as grand prize winner, will be published in the *AWM Newsletter.* The first-place winner in the college category was STEFANIE COFORIO of Hartwick College, Oneonta, New York, for her essay "Delving into Bioinformatics: Dr. Susan B. Davidson, Professor of Computer and Information Science". First place in the middle school category (grades 6–8) went to MALLORY BROWN of St. Gregory College Preparatory School, Tucson, Arizona, for an essay titled "From Neural Networks to Mentor Networks: Dr. Mary Poulton Teaches Connections". A complete list of the winners, as well as copies of their essays, can be found on the AWM website, `http://www.awm-math.org/biographies/contest/2004.html`.

—From an AWM announcement