Mathematics People

Lempert and Webster Receive 2001 Bergman Prize

László Lempert and Sidney Webster have been awarded the 2001 Stefan Bergman Prize. Established in 1988, the prize recognizes mathematical accomplishments in the areas of research in which Stefan Bergman worked. For two years each awardee will receive half of the income from the prize fund. Currently this income is about $26,000 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), and Masatake Kuranishi (2000). On the selection committee for the 2001 prize were Frederick Gehring, J. J. Kohn (chair), and Yum Tong Siu.

László Lempert

Sidney Webster

László Lempert

Citation

Lempert's work has contributed to both the geometric and analytic aspects of the subject, and his techniques include those from partial differential equations, complex analysis, real and complex geometry, and topology. One of his important contributions is his analysis of the complex Monge-Ampère equation. This fundamental equation is written in terms of holomorphic coordinates as

$$\det(u_{z_i \bar{z}_j}) = f.$$

It is an example of a fully nonlinear equation, and it arises in many geometrical situations such as the Calabi conjecture. The Dirichlet problem for this equation on domains in $\mathbf{C}^n$ is of special geometric significance when f vanishes near the boundary. In that case the equation is not elliptic and has defied any of the general methods that have been developed. Lempert has been able to treat such problems on convex domains; this work is a major contribution both to complex geometry and to nonlinear partial differential equations.

Lempert has introduced the notions of extremal and stationary analytic discs; these have become important tools in the study of analytic continuation. He has proved that the Carathéodory and Kobayashi distances coincide on convex domains.

Lempert's work also includes precise theorems on boundary regularity of biholomorphic mappings and several deep results on imbeddings of CR manifolds. He discovered new techniques in the study of CR manifolds and proved that a large class of 3-dimensional CR manifolds can be imbedded in some $\mathbf{C}^n$. Another striking result he obtained is that a compact strictly pseudoconvex real analytic hypersurface can be imbedded into the unit sphere of a Hilbert space.

Most recently his work has turned to infinite-dimensional holomorphy. He has made a systematic study of the Cauchy-Riemann equations and Dolbeault cohomology in the Banach space setting.

Biography

László Lempert was born in Budapest, Hungary, on June 4, 1952. He received the Diploma (1975), University Doctorate (1979), and Candidate of Sciences (1984) degrees, all from Eötvös University in Budapest. He was on the faculty there from 1977 until 1988, when he assumed his present position as professor of mathematics at Purdue University. He was a visiting research fellow at the Université de Paris VII (1979–80), a visiting lecturer at Princeton University (1984–85), and a visiting professor at Eötvös University (1994–95).

In 1981 Lempert received the Grünwald Prize of the Hungarian Mathematical Society, and in 1985 he received the Alexits Prize of the Hungarian Academy of Sciences. He was an invited speaker at the International Congress of Mathematicians in Berkeley in 1986.

Sidney Webster

Citation

One of Webster's seminal contributions bears directly on the Bergman kernel function. In 1974 Fefferman proved that a biholomorphic mapping between two strictly pseudoconvex domains extends to be a C^∞ mapping of the boundaries. Webster took the first crucial steps to extend this theorem to weakly pseudoconvex domains. He formulated three conditions related to the boundary behavior of the Bergman kernel of a smoothly bounded domain and proved that these conditions implied boundary smoothness. This work led to the results of Bell and Ligocka.

Webster is an expert on Chern-Moser invariants and has used them very effectively in his work on CR geometry. For example, Webster studied CR mappings between spheres in different dimensions. In this work he discovered that proper holomorphic mappings from the unit ball $\mathbf{B}_n$ to the unit ball $\mathbf{B}_{n+1}$ (where $n \geq 3$), when sufficiently smooth on the sphere, are conjugate via automorphisms to the imbedding $z \to (z, 0)$. Many authors have extended this work in diverse directions. Webster was also an early contributor to the study of biholomorphic mappings between algebraic hypersurfaces. He proved that biholomorphic mappings between ellipsoids must be linear.

Webster has made an impressive contribution to the understanding of the local embedding problem of strongly pseudoconvex CR manifolds; in particular he modified the Kuranishi method by using integral formulas for inverting the Cauchy-Riemann operator $\overline{\partial}$.

Biography

Sidney Webster was born on November 12, 1945, in Danville, Illinois. After a period of military service, he attended the University of California at Berkeley as an undergraduate and then as a graduate student, receiving the Ph.D. degree in 1975 under the direction of S. S. Chern. Webster spent five years at Princeton University and then went to the University of Minnesota. In 1989 he took his present position as professor of mathematics at the University of Chicago. He has held visiting positions at the Gesamthochschule Wuppertal in Germany, Rice University, and the Eidgenössische Technische Hochschule in Zürich. He was an Alfred P. Sloan Fellow in the early 1980s.

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 year, in the case of a single recipient, or every other year, in the case of two joint recipients who share the prize funds over two consecutive years. The Bergman Prize is given 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

Peres Receives 2001 Loève Prize

YUVAL PERES of the University of California at Berkeley has been awarded the 2001 Line and Michel Loève International Prize in Probability. The prize, which carries a monetary award of $30,000, will be presented at Berkeley in fall 2001.

Biographical Sketch

Yuval Peres was born in Jerusalem in 1963. He obtained his Ph.D. in 1990 from the Hebrew University in Jerusalem, working under Hillel Furstenberg. In 1993 Peres was appointed to the faculty of the statistics department at UC Berkeley, where he is currently a professor in the mathematics and statistics departments.

The Work of Peres

Peres's research is extraordinarily prolific and mostly collaborative, encompassing a broad range of topics in theoretical probability with numerous coauthors. A central theme of his research might be called "probability on infinite discrete structures where geometry plays a role". This includes, for instance, the study of random percolation on infinite Cayley graphs, where (in contrast to the usual d-dimensional lattice setting) one has the possibility of coexistence of infinitely many infinite components. Infinite trees appear often in his work. An early result gave non-computational proofs of classical theorems of Kesten-Stigum and others for branching processes; subsequent work studied tree-indexed random walks and the speed of random walks on random trees. In recent years he has contributed to the study of uniform random spanning trees and forests in infinite graphs, which has emerged as a pivotal topic. This work has connections to random walks, algorithms, domino tilings, electrical networks, potential theory, amenability, percolation, and hyperbolic spaces. In another direction, a key breakthrough was the observation that certain (hard to prove) intersection properties for Brownian motion and random walks are in

fact equivalent to (easier to prove) survival properties of branching processes. This led ultimately to deep work on sample path properties of Brownian motion; for instance, on the fractal dimension of the frontier of 2-dimensional Brownian motion and precise study of its thick and thin points and cover times. Fractal dimension questions appear in other aspects of his work, on affine maps and expanding maps for instance.

Peres is widely acknowledged as leader of a diffuse group of younger and peer researchers; his work illustrates and delineates active and exciting areas where probability meets other areas of pure mathematics.

About the Prize

The prize commemorates Michel Loève, professor at the University of California at Berkeley from 1948 until his untimely death in 1979. The prize was established by his widow, Line Loève, shortly before her death in 1992. Awarded every two years, it is intended to recognize outstanding contributions by researchers in probability who are under forty-five years of age.

—David Aldous, Department of Statistics, UC Berkeley

Zhang Receives Third World Academy of Sciences Award

The Third World Academy of Sciences (TWAS) has presented its 2000 Award in Mathematics to WEIPING ZHANG of the Nankai Institute of Mathematics, Nankai University, Tianjin, China, for various contributions to index theory, including work on Ray-Singer analytic torsions and the geometric quantization conjecture, and for his recent work on the Kervaire semi-characteristic.

The TWAS annually awards five prizes of $10,000 each to scientists from developing countries who have made outstanding contributions to the advancement of basic sciences: biology, chemistry, mathematics, physics, and basic medical sciences.

—From a TWAS announcement

Wasilkowski Receives Information-Based Complexity Prize

GRZEGORZ W. WASILKOWSKI of the University of Kentucky has been awarded the Prize for Achievement in Information-Based Complexity for 2001. The prize consists of $3,000 and a plaque.

The Prize Committee consisted of Erich Novak, Sergei Pereverzev, Joseph F. Traub, and Henryk Wozniakowski.

—Joseph F. Traub, Columbia University

Witten and Smirnov Receive Clay Awards

The Clay Mathematics Institute has presented its Clay Research Awards for 2001 to EDWARD WITTEN of the Institute for Advanced Study and STANISLAV SMIRNOV of Yale University. According to the prize citations, Witten was selected for "a lifetime of achievement, especially for pointing the way to unify apparently disparate fields of mathematics and to discover their elegant simplicity through links with the physical world." Smirnov was chosen "for establishing the existence of the scaling limit of two-dimensional percolation and for verifying John Cardy's conjectured relation."

The awards were presented on July 13, 2001, at the closing ceremonies of the International Mathematical Olympiad in Washington, DC.

—From a Clay Institute announcement

LMS Prizes Awarded

The London Mathematical Society (LMS) has awarded a number of prizes for 2001.

J. A. (SANDY) GREEN received the De Morgan Medal for his fundamental contributions to group representation theory.

DEREK W. MOORE received the Senior Whitehead Prize for his leading role in the application of scientific computing and computational applied mathematics to the solution of problems in many areas of theoretical fluid mechanics.

MARCUS DU SAUTOY received the Berwick Prize for work that completely transformed the study of zeta functions associated to infinite groups.

Four Whitehead Prizes were awarded. JOHN R. KING was recognized for his contributions to applied mathematics, particularly through his work on nonlinear diffusion equations and free-boundary problems. MICHAEL MCQUILLAN was recognized for his work on diophantine and complex analytic geometry. ALEXEI N. SKOROBOGATOV was recognized for work that is based on algebraic geometry and ranges from number theory to combinatorics and the theory of error-correcting codes. VALERY SMYSHLYAEV was recognized for deploying his distinctive combination of powerful analytical technique and deep physical insight in applied mathematics.

—From the LMS Newsletter

NSF Postdoctoral Fellowships Awarded

The Mathematical Sciences Postdoctoral Research Fellowship program of the Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) has announced the names of fellowship recipients for 2001. These fellowships are awarded each year for research in pure

mathematics, applied mathematics and operations research, and statistics. The following lists the names of the fellows, their Ph.D. institutions (in parentheses), and the institutions at which they will use their fellowships:

PRAMOD N. ACHAR (Massachusetts Institute of Technology) University of Chicago; DOROTHY E. BUCK (University of Texas, Austin) Mount Sinai School of Medicine, New York University; PETER P. CALABRESE (Cornell University) University of Southern California; ERIK D. DEMAINE (University of Waterloo) State University of New York, Stony Brook; ALEXANDER GAMBURD (Princeton University) Stanford University; FREDERIC G. GIBOU (University of California, Los Angeles) Stanford University; SEAN J. HALLGREN (University of California, Berkeley) California Institute of Technology; BENDEK B. HANSEN (University of California, Berkeley) University of Pennsylvania; ANTHONY A. HARKIN (Boston University) Harvard University; DAVID J. HEMMER (University of Chicago) Utah State University; PATRICIA L. HERSH (Massachusetts Institute of Technology) University of Michigan, Ann Arbor; BENJAMIN S. JOSEPH (Massachusetts Institute of Technology) University of Michigan, Ann Arbor; ADAM KALAI (Carnegie Mellon University) Massachusetts Institute of Technology; ANTON MALKIN (Yale University) Harvard University; WILLIAM R. MANN (Harvard University) University of Michigan, Ann Arbor; JAMES E. MIHALISIN (University of Washington) University of California, Berkeley; THOMAS A. NEVINS (University of Chicago) University of Michigan, Ann Arbor; MARTIN C. OLSSON (University of California, Berkeley) Massachusetts Institute of Technology; SCOTT T. PARSELL (University of Michigan, Ann Arbor) Pennsylvania State University; SEAN T. PAUL (Princeton University) Columbia University; ROBERT J. POLLACK (Harvard University) University of Washington; SEAN M. SATHER-WAGSTAFF (University of Utah) University of Illinois, Urbana-Champaign; SAUL D. SCHLEIMER (University of California, Berkeley) University of Illinois, Chicago; ROBERT R. SCHNEIDERMAN (University of California, Berkeley) University of California, San Diego; JASON R. SCHWEINSBERG (University of California, Berkeley) Cornell University; ROCCO A. SERVEDIO (Harvard University) Harvard University; ROMYAR T. SHARIFI (University of Chicago) Harvard University; SHANNON L. STARR (University of California, Davis) Princeton University; ALEXANDER B. VLADIMIRSKY (University of California, Berkeley) Cornell University; MAXIM VYBORNOV (Yale University) University of Massachusetts, Amherst; JESSICA M. YOUNG (Massachusetts Institute of Technology) Massachusetts Institute of Technology; and WENDY W. ZHANG (Harvard University) University of Chicago.

—From an NSF announcement

China Finishes First in International Mathematical Olympiad

The team from China has won six gold medals at the 42nd International Mathematical Olympiad (IMO), held in Washington, DC, July 1–14, 2001. Russia finished with five gold and one silver medal, and the United States followed closely with four gold and two silver medals.

The six members of the U.S. team, all high school students, were REID BARTON (Arlington, Massachusetts), gold medalist; GABRIEL CARROLL (Oakland, California), gold medalist; IAN LE (Princeton Junction, New Jersey), gold medalist; TIANKAI LIU (San Jose, California), gold medalist; OAZ NIR, (Cupertino, California), silver medalist; and DONG SHIN (West Orange, New Jersey), silver medalist. Barton, the first contestant with four IMO gold medals, and Carroll both received perfect scores on this year's exam.

The team was chosen on the basis of the students' performance in the 30th USA Mathematical Olympiad. The students attended a four-week Mathematical Olympiad Summer Program at Georgetown University in Washington, DC, over the past summer under the leadership of Titu Andreescu (Illinois Mathematics and Science Academy), director of the American Mathematics Competitions. The USA Mathematical Olympiad is a program of the Mathematical Association of America. More information is available on the official scoring site of the IMO at `http://imo.wolfram.com/`.

The four who had perfect scores—Liang Xiao and Zhiqiang Zhang from China, and Reid Barton and Gabriel Carroll from the United States—received the CMI-IMO Award from the Clay Mathematics Institute. The award consists of a state-of-the-art notebook computer.

—Elaine Kehoe

American Academy of Arts and Sciences Elections

Six mathematicians have been elected to membership in the American Academy of Arts and Sciences in 2001. They are: DEMETRIOS CHRISTODOULOU (Princeton University), CONSTANTINE M. DAFERMOS (Brown University), RONALD A. DEVORE (University of South Carolina), ANDREI A. SUSLIN (Northwestern University), MARGARET H. WRIGHT (Bell Laboratories-Lucent Technologies), and HORNG-TZER YAU (New York University). OLGA A. LADYZHENSKAYA (Steklov Institute, Russia) was elected a foreign honorary member.

The American Academy of Arts and Sciences was founded in 1780 to foster the development of knowledge as a means of promoting the public interest and social progress. The membership of the academy is elected and represents distinction and achievement in a range of intellectual disciplines: mathematical and physical sciences, biological sciences, social arts and sciences, and humanities and fine arts.

—From an American Academy announcement