Mathematics People

Prizes Presented at the European Congress of Mathematicians

The European Mathematical Society (EMS) awarded a number of prizes at the 2004 European Congress of Mathematicians, held in Stockholm, Sweden, 27 June–2 July, 2004. The EMS prizes are awarded every four years in conjunction with the congress in recognition of distinguished contributions in mathematics by young researchers not older than 35 years. The prize carries a cash value of 5,000 euros (about US$6,000). The names of the awardees, their institutions, and brief descriptions of their work follow.

FRANCK BARTHE, the Institut de Mathématiques Laboratoire de Statistique et Probabilités, Toulouse, France: Barthe pioneered the use of measure-transportation techniques (due to Kantorovich, Brenier, Caffarelli, McCann, and others) in geometric inequalities of harmonic and functional analysis with striking applications to geometry of convex bodies. His major achievement is an inverse form of classical Brascamp-Lieb inequalities. Further contributions include discovery of a functional form of isoperimetric inequalities and a recent solution (with Artstein, Ball, and Naor) of a long-standing Shannon's problem on entropy production in random systems.

STEFANO BIANCHINI, the Instituto per le Applicazioni del Calcolo "M. Picone", Rome, Italy: Stefano Bianchini has introduced an entirely new perspective to the theory of discontinuous solutions of one-dimensional hyperbolic conservation laws, representing solutions as local superposition of traveling waves and introducing innovative Glimm functionals. His ideas have led to the solution of the long-standing problem of stability and convergence of vanishing viscosity approximations. In his best individual achievement, published in 2003 in *Arch. Rational Mech. Anal.*, he shows convergence of semidiscrete upwind schemes for general hyperbolic systems. In the technically demanding proof the traveling waves are constructed as solutions of a functional equation, applying center manifold theory in an infinite-dimensional space.

PAUL BIRÀN, Tel-Aviv University, Israel: Paul Biràn has made fundamental and influential contributions to symplectic topology as well as to algebraic geometry and Hamiltonian systems. His work is characterized by new depths in the interactions between complex algebraic geometry and symplectic topology. One of the earlier contributions is his surprising solution of the symplectic packing problem, completing work of Gromov, McDuff, and Polterovich, showing that compact symplectic manifolds can be packed by symplectic images of equally sized Euclidean balls without wasting volume if the number of balls is not too small. Among the corollaries of his proof, Biràn obtains new estimates in the Nagata problem. A powerful tool in symplectic topology is Biràn's decomposition of symplectic manifolds into a disc bundle over a symplectic submanifold and a Lagrangian skeleton. Applications of this discovery range from the phenomenon of Lagrangian barriers to surprising novel results on topology of Lagrangian submanifolds. Paul Biràn not only proves deep results, he also discovers new phenomena and invents powerful techniques important for the future development of the field of symplectic geometry.

ELON LINDENSTRAUSS, Clay Mathematics Institute and Courant Institute of Mathematical Sciences, USA: Elon Lindenstrauss has done deep and highly original work at the interface of ergodic theory and number theory. Although he has worked widely in ergodic theory, his recent proof of the quantum unique ergodicity conjecture for arithmetic hyperbolic surfaces breaks fertile new ground, with great promise for future applications to number theory. Already, in joint work with Katok and Einsiedler, he has used some of the ideas in this work to prove the celebrated conjecture of Littlewood on simultaneous diophantine approximation for all pairs of real numbers lying outside a set of Hausdorff dimension zero. This goes far beyond what was known earlier about Littlewood's conjecture and spectacularly confirms the high promise of the methods of ergodic theory in studying previously intractable problems of diophantine approximation.

ANDREI OKOUNKOV, Princeton University, USA: Andrei Okounkov contributed greatly to the field of asymptotic combinatorics. An extremely versatile mathematician, he found a wide array of applications of his methods. His early results include a proof of a conjecture of Olshanski on the representation theory of groups with infinite-dimensional duals. Okounkov gave the first proof of the celebrated Baik-Deift-Johansson conjecture, which states that the asymptotics of random partitions distributed according to the Plancherel measure coincides with that of the eigenvalues of large Hermitian matrices. An important and influential result of Okounkov is a formula he found in joint work with Borodin, which expresses a general Toeplitz determinant as the Fredholm determinant of the product of two associated Hankel operators. The new techniques of working

with random partitions invented and successfully developed by Okounkov lead to a striking array of applications in a wide variety of fields: topology of moduli spaces, ergodic theory, the theory of random surfaces, and algebraic geometry.

SYLVIA SERFATY, the Courant Institute of Mathematical Sciences, USA: Sylvia Serfaty was the first to make a systematic and impressive asymptotic analysis for the case of large parameters in theory of the Ginzburg-Landau equation. She established precisely the values of the first, second, and third (with E. Sandier) critical fields for nucleation of one stable vortex, vortex fluids, and surface superconductivity. In micromagnetics, her work with F. Alouges and T. Rivière breaks new ground on singularly perturbed variational problems and provides the first explanation for the internal structure of cross-tie walls.

STANISLAV SMIRNOV, Royal Institute of Technology, Sweden, and University of Geneva, Switzerland: Stanislav Smirnov's most striking result is the proof of existence and conformal invariance of the scaling limit of crossing probabilities for critical percolation on the triangular lattice. This gives a formula for the limiting values of crossing probabilities, a breakthrough in the field, which has allowed for the verification of many conjectures of physicists concerning power laws and critical values of exponents. Stanislav Smirnov also made several essential contributions to complex dynamics around the geometry of Julia sets and the thermodynamic formalism.

XAVIER TOLSA, ICREA and the Universitat Autònoma de Barcelona, Spain: Xavier Tolsa has made fundamental contributions to harmonic and complex analysis. His most outstanding work solves Vitushkin's problem about semiadditivity of analytic capacity. The problem was raised in 1967 by Vitushkin in his famous paper on rational approximation in the plane. Tolsa's result has important consequences for a classical (100 years old) problem of Painlevé about a geometric characterization of planar compact sets that are removable in the class of bounded analytic functions. Answering affirmatively Melnikov's conjecture, Tolsa provides a solution of the Painlevé problem in terms of the Menger curvature. Xavier Tolsa has also published many important and influential results related to Calderón-Zygmund theory and rational approximation in the plane.

WARWICK TUCKER, Uppsala University, Sweden: Warwick Tucker has given a rigorous proof that the Lorenz attractor exists for the parameter values provided by Lorenz. This was a long-standing challenge to the dynamical system community and was included by Smale in his list of problems for the new millennium. The proof uses computer estimates with rigorous bounds based on higher-dimensional interval arithmetics. In later work, Warwick Tucker made further significant contributions to the development and application of this area.

OTMAR VENJAKOB, Universität Heidelberg, Germany: Otmar Venjakob has made a number of important discoveries in both the algebraic and arithmetic aspects of noncommutative Iwasawa theory, especially on problems which appeared intractable from the point of view of the classical commutative theory. In arithmetic geometry, Iwasawa theory is the only general technique known for studying the mysterious relations between exact arithmetic formulae and special values of L-functions, as typified by the conjecture of Birch and Swinnerton-Dyer. Venjakob's work applies quite generally to towers of number fields whose Galois group is an arbitrary compact p-adic Lie group (which is not, in general, commutative) and has done much to show that a rich theory is waiting to be developed. His most important results include the proof of a good dimension theory for modules over Iwasawa algebras and the proof of the first case of a structure theory for modules over these algebras. With Hachimori he discovered the first examples of arithmetic Iwasawa modules which are completely faithful, as well as proving a remarkable asymptotic upper bound for the rank of the Mordell Weil group of elliptic curves in certain towers of number fields over Q whose Galois group is a p-adic Lie group of dimension 2. Very recently, he found the key to the problem of defining, in noncommutative Iwasawa theory, the analogue of the characteristic series of modules over Iwasawa algebras.

The Carl-Erik Fröberg Prize was also awarded at the ECM. The prize is awarded in even-numbered years to a young Nordic author of an article published in the journal *BIT Numerical Mathematics.* The prize was awarded to ANNA-KARIN TORNBERG of the Courant Institute of Mathematical Sciences for her article "Multidimensional quadrature of singular and discontinuous functions". The prize carries a cash award of SEK 30,000 (about US$4,000).

—From an ECM announcement

Serguei Denissov Awarded Popov Prize

SERGUEI DENISSOV of the California Institute of Technology was awarded the fourth Vasil Popov Prize at the International Conference in Approximation Theory held in Gatlinburg, Tennessee, in May 2004. The Popov Prize is awarded every third year to a young mathematician (within six years of receipt of the Ph.D.) who has made outstanding research contributions to approximation theory and related areas. This year the prize consisted of a cash award of $1,000.

Denissov received his Ph.D. in mathematics from Moscow State University in 1999. He was awarded the Popov Prize for his contributions to spectral theory and orthogonal polynomials. He has introduced new ideas and powerful new techniques in spectral theory that have enabled him to solve deep problems. In particular, he was the first to show that there exist Schrödinger operators with square integrable potentials for which absolutely continuous and singular spectra coexist on the same spectral interval. Previous winners of the Popov Prize are Albert Cohen (1995), Arno Kuijlaars (1998), and Emmanuel Candes (2001).

—From a Popov Prize announcement

George Ellis Wins 2004 Templeton Prize

The 2004 Templeton Prize has been awarded to GEORGE F. R. ELLIS, professor of applied mathematics at the University of Cape Town. Ellis is a theoretical cosmologist who has made important contributions to the dialogue between science and religion. The prize has a cash value of 795,000 pounds (about US $1.4 million).

Ellis was born in Johannesburg, South Africa, and received his Ph.D. in applied mathematics and theoretical physics in 1964 from Cambridge University. He specializes in general relativity theory and is considered to be among a handful of the world's leading relativistic cosmologists. His most recent investigations question whether or not there was ever a start to the universe and if there is only one universe or many.

Ellis has advocated balancing the rationality of evidence-based science with faith and hope, a view shaped in part by his firsthand experiences in South Africa. He has promoted using religious and theological perspectives to view the universe in terms of "kenosis", or self-sacrificing love.

More than one hundred of Ellis's publications appear in MathSciNet. His works include *The Large Scale Structure of Space-Time* (1973), coauthored with Stephen Hawking.

He has devoted much of his energies to developing the social, political, cultural, and educational future of South Africa, particularly in making mathematics and science education more broadly available to his fellow citizens. He plans to use a portion of the Templeton Prize money to provide tutorial and monetary assistance for black youths in Cape Town.

The Templeton Prize for Progress toward Research or Discoveries about Spiritual Realities was founded by Sir John Templeton and is the world's largest annual monetary prize given to an individual. It is given each year to a living person who has contributed to spiritual matters and to understanding the relationship between theology and science.

—From a Templeton Prize announcement

LMS Prizes Awarded

The London Mathematical Society (LMS) has awarded a number of prizes for 2004.

SIR ROGER PENROSE of the University of Oxford was awarded the De Morgan Medal for his wide and original contributions to mathematical physics.

BORIS ZILBER of the University of Oxford was awarded the Senior Berwick Prize for a paper titled "Exponential sums equations and the Schanuel conjecture", published in the *Journal of the London Mathematical Society,* which discussed the long-neglected subject of the model theory of the complex exponential and revealed many fascinating possibilities.

RICHARD JOZSA of the University of Bristol received the Naylor Prize for his fundamental contributions to the new field of quantum information science, which encompass such theoretical areas as quantum computation, communication and coding, and the role of quantum resources in quantum information processing.

IAN GROJNOWSKI of the University of Cambridge was awarded the first Fröhlich Prize in recognition of his originality and influence across a wide range of problems in representation theory and algebraic geometry.

Four Whitehead Prizes were awarded. MARK AINSWORTH of Strathclyde University was honored for his contributions to the analysis and application of high-order (hp) finite element methods to the numerical approximation of partial differential equations in continuum mechanics. VLADIMIR MARKOVIC of the University of Warwick was chosen for his work on infinite-dimensional Teichmüller spaces. RICHARD THOMAS of Imperial College, London, was recognized for his contributions to algebraic and differential geometry. ULRIKE TILLMANN of the University of Oxford was honored for her work in the study of the moduli spaces of algebraic curves (or Riemann surfaces).

—From an LMS announcement

2004 d'Alembert Prize Awarded

Every two years the Société Mathématique de France presents the d'Alembert Prize. Established in 1984, the prize is intended to encourage mathematical works in the French language and the exposition of mathematics for the general public. The prize recognizes an article, book, radio or television broadcast, film, or other project that is designed to improve understanding of mathematics and its recent developments.

The d'Alembert Prize for 2004 has been awarded to Ex Nihilo "for a series of six films distributed by Arte in 2003: 'Carré Magique', '20 février 2002 (Jour Palindromique)', 'Signe', 'Jonglage', 'Le Coeur Net', and 'Incertitudes'."

—Société Mathématique de France

Paul Erdös Award Recipients Announced

The 2004 recipients of the Paul Erdös Award have been announced. They are WARREN ATKINS, Australia; ANDRÉ DELEDICQ, France; and PATRICIA FAURING, Argentina.

The Paul Erdös National Award is given by the World Federation of National Mathematics Competitions in recognition of mathematicians who have contributed to the development of mathematical challenges at the national level and to the enrichment of mathematics learning.

—From an Australian Mathematics Trust announcement

International Mathematical Olympiad, Athens 2004

The 45th International Mathematical Olympiad (IMO) was held July 4–18, 2004, in Athens, Greece. The IMO is the pre-eminent mathematical competition for high-school age students from around the world. More than 480 students from 85 countries competed in the 2004 IMO. The IMO awarded 45 gold medals for correctly and elegantly solving six extremely challenging mathematical problems in a 9-hour competition administered over two days. More information about the 45th International Mathematical Olympiad is at `http://www.imo2004.gr`.

The USA team did very well at the competition, winning 5 gold medals and 1 silver medal and finishing second overall among the 85 participating countries. The final team standings had China first, the USA second, followed by Russia in third place. This is the best medal count and highest placing for the USA team since 1994.

OLEG GOLDBERG of Bedford, Massachusetts, distinguished himself by accumulating 40 out of 42 possible points to have the best overall score on the USA team. TIANKAI LIU of Saratoga, California, had 38 points for another of the USA's gold medals. AARON PIXTON of Vestal, New York, had 37 points, and ALISON MILLER of Niskayuna, New York, and TONY ZHANG of Arcadia, California, each had 33 points, all for gold medals. MATT INCE of Arnold, Missouri, gained a silver medal with a score of 31 points. Alison Miller is the first female gold medal winner for a team from the USA.

The sponsor of the USA team to the IMO is the Mathematical Association of America through its America Mathematics Competitions program, with travel support provided by a grant from the Army Research Office. Training for the team at the University of Nebraska-Lincoln is aided by a grant from the Akamai Foundation. Additional support for the team is provided by the National Council of Teachers of Mathematics.

—Steven R. Dunbar, MAA American Mathematics Competitions, University of Nebraska-Lincoln

Royal Society of Canada Elections

Two scholars who work in the mathematical sciences have been elected fellows of the Royal Society of Canada for 2004. They are STEPHEN E. FIENBERG of Carnegie Mellon University and JACQUES HURTUBISE of McGill University.

—From a Royal Society announcement

Correction

The June/July 2004 *Notices*, page 664, carried an announcement about the mathematicians selected in the 2004 fellowship competition of the John Simon Guggenheim Memorial Foundation. Inadvertently omitted from this list was CURTIS T. MCMULLEN, Maria Moors Cabot Professor of Natural Science at Harvard University, whose area of research is dynamics over moduli space.

—Allyn Jackson