Mathematics People

Langlands Receives Grande Médaille d'Or

ROBERT LANGLANDS has received the Grande Médaille d'Or (Gold Medal) of the Académie des Sciences de Paris. This is the highest honor presented by the academy.

Robert Langlands

Langlands was born in Canada in 1936. He is a professor of mathematics at the Institute for Advanced Study in Princeton. His main contribution to mathematics is a program that predicts hidden relations between algebraic geometry and the theory of representations of Lie groups.

The law of quadratic reciprocity was proven in 1801 by Gauss in *Disquisitiones Arithmeticae*, though the statement was already known to Euler and Legendre. Given prime numbers p and q, the law asserts a symmetry between p and q with regard to the solubility of the equation $x^2 = p \bmod q$. It took more than a century to understand conceptually the role of the law of quadratic reciprocity in class field theory, which allows one to calculate, starting with the ideal classes, the Galois group of the maximal abelian extension of a number field. The Langlands program is a surprising generalization of class field theory that covers arbitrary Galois groups. The ideal classes are replaced by adelic Lie groups, and the reciprocity law becomes a correspondence between representations of Galois groups (which occur in the definition of Artin L-functions) and certain infinite-dimensional representations of adelic Lie groups. Langlands's conjectures, most of which are still unproved, translate large parts of algebraic geometry into the language of representation theory. They thus provide a dictionary in which translation permits, in principle, the resolution of questions that would otherwise be unsolvable, such as the Artin conjecture about the holomorphicity of L-functions. The efforts of many mathematicians, including Langlands himself, have led to proofs of some parts of the program. For example, the progress made by Andrew Wiles permitted him to complete the proof of Fermat's Last Theorem.

Each year, the Grande Médaille d'Or is awarded alternately for decisive contributions to a discipline in one of the academy's two divisions. The originality of the work is taken as much into account as is the work's international influence and the impact it has had in creating a recognizable school of thought and research. The work must be in an important area of basic research and must have shed new light and brought new understanding to the discipline involved. In the year 2000 the recipient was chosen from disciplines belonging to the Division of Mathematical and Physical Sciences and Their Applications.

—From Académie des Sciences announcements

2000 EMS Prizes Awarded

Every four years at the European Congress of Mathematics (ECM), the European Mathematical Society (EMS) awards the EMS Prizes. These prizes are meant to recognize excellent contributions to mathematics by young researchers not older than thirty-two. Each prizewinner receives a monetary award of 6,000 Euros (about US$5,600).

The 2000 EMS Prizes were given at the Third ECM, held in Barcelona July 10–14, 2000. The selection committee consisted of Noga Alon, Werner Ballmann, Jan Derezinski, Jacques-Louis Lions (chair), Maxim Kontsevich, Eduard Looijenga, Angus Macintyre, David Nualart, A. N. Parshin, Ragni Piene, Itamar Procaccia, Mario Pulvirenti, Rolf Rannacher, Caroline Series, Vladimir Sverák, and Dan Voiculescu.

The following presents the names of the prizewinners and the citations for the prizes.

Semyon Alesker

SEMYON ALESKER has contributed greatly both to the asymptotic theory of convexity and to classical convexity theory. His most significant work is on valuations (additive functionals) on convex bodies and has remodeled a central part of convex geometry.

Group invariant valuations have been studied since Dehn's solution of Hilbert's third problem, with later contributions by Blaschke and others and culminating in Hadwiger's celebrated characterization theorem for the intrinsic volumes. The latter theorem was considered the top result in this area for almost fifty years. Alesker has now considerably extended this theory, obtaining very complete classification results under weaker invariance assumptions. He approximated (continuous) rotation invariant valuations by polynomial valuations and characterized the latter, making use of representations of the orthogonal group. This enabled him to extend Hadwiger's theorem to tensor-valued valuations. In another direction, Alesker solved a problem of P. McMullen, in a much stronger form, showing that translation invariant valuations are essentially (up to linear combinations and approximation) mixed volumes. The approach is via representation theory of the general linear group and involves a surprising application of $\mathcal{D}$-modules. The new approach has also opened the way to finiteness results for valuations with other group invariances.

Raphael Cerf

RAPHAEL CERF became known through his results on probability theory. Using a large deviation principle in the proper topology, he has established a Wulff construction for the supercritical percolation model in three dimensions. This result is a major advance in the subject and provides the right formulation for the geometry of the problem. Cerf has been able to carry out this program using a correct mixture of combinatorial arguments, geometric ideas, and probabilistic tools.

In addition to this research, Cerf has made original contributions in genetic algorithms. He has solved a central problem in bootstrap percolation and extended to three dimensions the measurable behavior of the low-temperature limit of the stochastic Ising model.

Dennis Gaitsgory

DENNIS GAITSGORY is one of the leaders in the geometric Langlands correspondence and related areas. In modern "geometric" representation theory one replaces functions by complexes of constructible sheaves on (infinite-dimensional) algebraic varieties. In this way many deep structures appear, and classical results in the theory of automorphic forms can be seen much more clearly.

In his thesis and in subsequent work with Braverman, Gaitsgory established fundamental properties of Eisenstein series in the geometric setting. In a recent paper on nearby cycles, he proposed an extremely elegant construction of the convolution of equivariant perverse sheaves on so-called affine Grassmannians. This implies that the center of the affine Hecke algebra coincides with the whole spherical Hecke algebra. Also, it gives the best conceptual explanation of the Satake equivalence.

Recent work of Gaitsgory relates finite quantum groups and chiral Hecke algebras. It is a very important step in the program of Beilinson and Drinfeld in the geometric Langlands theory.

Emmanuel Grenier

EMMANUEL GRENIER contributed greatly to the asymptotic analysis of Euler and Navier-Stokes equations with large Coriolis force. The simplest case (when the equations are set on the unit cube with periodic boundary conditions) was solved by Grenier around 1995. Later, in collaboration with Desjardins, Dormy, and Masmoudi, Grenier gave rigorous derivations of several asymptotic models currently used in ocean and atmosphere modeling and in magneto-hydrodynamics.

Grenier obtained important results, both positive and negative, on the problem of convergence of the Navier-Stokes equations to the Euler equations in a domain with solid boundary conditions. In particular, he showed that the positive results of Caflisch and Sammartino obtained for analytic initial data cannot be extended to Sobolev data. Grenier also justified the hydrostatic limit of the Euler equations in a two-dimensional infinitesimally thin strip.

Grenier gave a very elegant proof of convergence for the semi-classical limit of the nonlinear Schrödinger equations (before appearance of shocks). He also obtained, simultaneously with Rykov and Sinai, a hydrodynamic limit for the Zeldovich adhesion particle model.

Dominic Joyce

DOMINIC JOYCE's work on the existence of metrics with special holonomy is among the best in Riemannian geometry in the last decade. The question of existence of Riemannian metrics with special holonomy has a long history, beginning with the work of É. Cartan. It includes some of the best work of such people as M. Berger, J. Simons, S. T. Yau, and R. Bryant. Using a dazzling display of geometry and analysis, Joyce constructed compact manifolds with

holonomy Spin(7) and G_2, the only possibilities remaining after the others on Berger's list had been clarified. Joyce also computed the dimension of the deformation spaces of such metrics and many other of their invariants. As a result he also discovered a totally unexpected version of mirror symmetry for such spaces. Dominic Joyce is one of the leading young differential geometers.

Vincent Lafforgue

VINCENT LAFFORGUE's work is a major advance in the K-theory of operator algebras: the proof of the Baum-Connes conjecture for discrete co-compact subgroups of $SL_3(R)$, $SL_3(C)$, $SL_3(Q_p)$, and some other locally compact groups. The Baum-Connes conjecture predicts the K-theory of the reduced C^*-algebra of a locally compact group (and of more general objects). The conjecture plays a central role in noncommutative geometry and has far-reaching connections to the Novikov conjecture on higher signatures in topology, to harmonic analysis on discrete groups, and to the theory of C^*-algebras. Lafforgue is the first to overcome the barrier that Kazhdan's property T posed for many years in the proof of the Baum-Connes conjecture. The proof involves several remarkable technical and conceptual developments, such as a bivariant K-theory for Banach algebras (versus Kasparov's by now classical one for C^*-algebras) and establishing the conjecture for various completions of the L^1 algebras of the groups.

Michael McQuillan

MICHAEL MCQUILLAN has created the method of dynamic diophantine approximation, which has led to a series of remarkable results in complex geometry of algebraic varieties. Among these results one can mention a new proof of Bloch's conjecture on holomorphic curves in closed subvarieties of abelian varieties, the proof of the conjecture of Green and Griffiths that a holomorphic curve in a surface of general type cannot be Zariski-dense, and the hyperbolicity of generic hypersurfaces of high degree in projective 3-space (the Kobayashi conjecture).

Stefan Yu. Nemirovski

STEFAN YU. NEMIROVSKI has obtained several strong results in topology and complex analysis. Using modern techniques like Seiberg-Witten invariants he has solved some old classical problems about submanifolds in complex domains. First, he generalized the Thom inequality proved by Kronheimer and Mrowka. As a very particular case Nemirovski proved that there are no nonconstant holomorphic functions in a neighborhood of an embedded nontrivial 2-sphere in a complex projective plane. Another application of his main theorems is also very attractive. Suppose that an analytic disk is attached from the outside to a strictly pseudoconvex domain U in a complex 2-plane. Then there is no smooth disk inside of U with the same boundary. As a corollary one gets that it is impossible to attach an analytic disk from the outside to a strictly pseudoconvex domain that is diffeomorphic to a closed ball.

Paul Seidel

PAUL SEIDEL became known through his work on symplectic topology. In his doctoral thesis he studied the fundamental question of whether symplectic diffeomorphisms which are diffeotopic to the identity are also symplectically diffeotopic to the identity. He showed that the answer is negative in many cases, already in dimension four. His counterexamples are generalized Dehn twists, and his proof involves Floer homology. In further work, Seidel constructed a natural representation of the fundamental group of the group of Hamiltonian symplectomorphisms into the quantum cohomology ring. This work was basic for later work of Lalonde, McDuff, and Polterovich on the topology of the group of symplectomorphisms. His latest work is related to mirror symmetry and shows his broad horizon.

Wendelin Werner

WENDELIN WERNER has obtained deep results on stochastic processes and, more precisely, he has proved a number of significant results on Brownian path properties, including the shape of Brownian islands and Brownian windings.

Werner has made remarkable contributions to the study of self-avoiding random walks and the corresponding critical exponents. More specifically, he obtained the first nontrivial upper bound of the disconnection exponent, and he developed an elegant approach for studying the limiting behavior of the nonintersection exponents for a great number of independent Brownian motions. Among his many other interesting works is a construction carried out with a collaborator of the so-called true self-repelling motion using an ingenious method involving infinite systems of coalescing Brownian motions.

—From an ECM announcement

2000 Felix Klein Prize Awarded

The Felix Klein Prize was established by the European Mathematical Society and the organization that endowed the prize, the Institute for Industrial Mathematics in Kaiserslautern, Germany. The prize is awarded to a young scientist or a small group of young scientists (normally under the age of thirty-eight) for using sophisticated methods to provide an outstanding solution, which meets the complete satisfaction of industry, to an industrial problem. The prize, which will be given every four years at the European Congress of Mathematics (ECM), carries a monetary award of 5,000 Euros (about US$4,700).

DAVID C. DOBSON of Texas A&M University received the first Felix Klein Prize, presented at the Third ECM in Barcelona July 10–14, 2000. Dobson began working on the diffraction of electromagnetic waves from periodic structures when he held an industrial postdoctoral position at the Institute for Mathematics and its Applications (IMA) at the University of Minnesota. The Honeywell Technology Center had posed the problem of modeling and analyzing the diffraction and developing appropriate numerical

algorithms. Dobson used rigorous mathematical methods to solve the problem of optimal shape design for phase lenses, a problem of great importance to Honeywell.

Dobson received his Ph.D. from Rice University in 1990 under the direction of W. Symes. In addition to spending two years at the IMA, where he worked under the supervision of Avner Friedman, Dobson spent one year as a visiting assistant professor in the School of Mathematics at the University of Minnesota. Since 1993 he has been at Texas A&M University, where he is currently a professor of mathematics. Dobson received an NSF Mathematical Sciences Postdoctoral Research Fellowship in 1992 and an Alfred P. Sloan Research Fellowship in 1997.

The selection committee for the 2000 Felix Klein Prize consisted of Heinz Engl, Andras Frank, Horst Loch, Helmut Neunzert (chair), Olivier Pironneau, and John Ockendon.

—Allyn Jackson

2000 Heineman Prize Awarded

SIDNEY R. COLEMAN of Harvard University has been awarded the 2000 Dannie Heineman Prize for Mathematical Physics for his contributions to the development and understanding of modern theories of elementary particles. The prize carries a cash award of $7,500 and is presented in recognition of outstanding publications in the field of mathematical physics.

The prize was established in 1959 by the Heineman Foundation for Research, Educational, Charitable, and Scientific Purposes, Inc., and is administered jointly by the American Physical Society (APS) and the American Institute of Physics (AIP). The prize is presented annually.

—From an APS announcement

ICIAM Prizes Awarded

The International Council for Industrial and Applied Mathematics (ICIAM) has established a number of prizes that were awarded for the first time at the Fourth International Congress on Industrial and Applied Mathematics, held in July 1999 in Edinburgh, Scotland. The names of the prizes and the recipients are given below.

The Lagrange Prize was awarded to JACQUES-LOUIS LIONS of the Collège de France. The prize citation states: "Jacques-Louis Lions is one of the most distinguished and influential scientists in the domain of applied and industrial mathematics in this century. He has made outstanding contributions in many areas and has opened up large classes of new problems and methods." Funded by the Société des Mathématiques Appliquées et Industrielles, the Sociedad Española de Matematica Aplicada, and the Società Italiana di Matematica Applicata e Industriale, the

$3,000 prize provides international recognition to mathematicians who have made exceptional contributions to applied mathematics throughout their careers.

The Collatz Prize was awarded to STEFAN MÜLLER of the Max-Planck-Institut für Mathematik in den Naturwissenschaften. The prize citation states: "The scientific work of Stefan Müller is distinguished by highly original and profound contributions to applied mathematics, calculus of variations and nonlinear partial differential equations, the mechanics of continua, and mathematical material sciences. In these fields he is one of the leading scientists in the world." Funded by the Gesellschaft für Angewandte Mathematik und Mechanik, the $1,000 prize provides international recognition to a scientist under forty-two years of age for outstanding work in industrial and applied mathematics.

The SIAM Pioneer Prize was awarded to RONALD R. COIFMAN of Yale University and to HELMUT NEUNZERT of Universität Kaiserslautern. Coifman was honored for "his pioneering work in exploiting harmonic and, especially wavelet, analysis to provide new computational methods and algorithms in a wide variety of important contexts involving signal and image processing." Neunzert was honored "for his work over the last twenty years in developing 'techno-mathematics' both as a scientific discipline and as a curriculum". Funded by the Society for Industrial and Applied Mathematics, the prize is given for pioneering work introducing applied mathematical methods and scientific computing techniques to an industrial problem area or a new scientific field of applications. The prize commemorates the spirit and impact of the American pioneers. Each awardee received $1,000.

The Maxwell Prize was awarded to GRIGORY ISAAKOVIC BARENBLATT. The prize citation states: "Grigory Barenblatt is one of the most distinguished Russian applied mathematicians. He is well-known for his numerous contributions to the mathematical theory of fluid motion, solid structure, nonlinear waves, scaling and asymptotics." Funded by the Institute of Mathematics and its Applications in the United Kingdom and the James Clerk Maxwell Foundation, the $1,000 prize provides international recognition to a mathematician who has demonstrated originality in applied mathematics.

—From an ICIAM announcement

Elsner Awarded Schneider Prize

LUDWIG ELSNER of Universität Bielefeld has been awarded the Hans Schneider Prize in Linear Algebra by the International Linear Algebra Society (ILAS).

The Schneider Prize, founded with a gift from Hans Schneider, the first president of ILAS, is awarded every three years for research, contributions, and achievement at the highest level of linear algebra. The prize consists of a plaque and certificate with citation. The prize committee

consisted of Hans Schneider, Angelika Bunse-Gerstner, Biswa Datta, Mirek Fiedler, and Russ Merris.

—From an ILAS announcement

2000 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 2000 has been awarded jointly to ELISABETH BUSSER of Lycée Bartholdi and GILLES COHEN of Lycée Saint-Louis for a variety of work, including columns in daily and monthly publications that communicate curiosity and a lively mathematical spirit to a broad general public.

—Société Mathématique de France

NSF Postdoctoral Fellowships Awarded

The Mathematical Sciences Postdoctoral Research Fellowship program of the Division of Mathematical Sciences of the National Science Foundation has announced the names of fellowship recipients for 2000. 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.

MICHAEL ANSHELEVICH (University of California, Berkeley) University of California, Berkeley; ROBERT BENEDETTO (Brown University) Boston University; JAMES BORGER (University of California, Berkeley) Massachusetts Institute of Technology; JUSTIN CORVINO (Stanford University) Brown University; BERNARD DECONINCK (University of Colorado, Boulder) University of Washington; NATHAN DUNFIELD (University of Chicago) Harvard University; MARIA GORDINA (Cornell University) University of California, San Diego; JOHN HOLT (University of Michigan, Ann Arbor) Harvard University; DANIEL ISAKSEN (University of Chicago) University of Notre Dame; KIRAN KEDLAYA (Massachusetts Institute of Technology) University of California, Berkeley; DENNIS KEELER (University of Michigan, Ann Arbor) Massachusetts Institute of Technology; ARNOLD KIM (University of Washington) Stanford University; AARON KING (University of Arizona) University of California, Davis; KENNETH KOENIG (Princeton University) University of Wisconsin, Madison; MIKHAIL KOGAN

(Massachusetts Institute of Technology) Northeastern University; ROGER LEE (Stanford University) Courant Institute of Mathematical Sciences; GRAHAM LEUSCHKE (University of Nebraska, Lincoln) University of Kansas; DAVID MAZZIOTTI (Harvard University) Duke University; EZRA MILLER (University of California, Berkeley) Massachusetts Institute of Technology; JEFFREY MOEHLIS (University of California, Berkeley) Princeton University; BENJAMIN MORRIS (University of California, Berkeley) Stanford University; DUANE NYKAMP (New York University) University of California, Los Angeles; DAVID SOLOMON (Cornell University) University of Wisconsin, Madison; WILLIAM STEIN (University of California, Berkeley) Harvard University; CHRISTINE TAYLOR (Harvard University) Massachusetts Institute of Technology; ALEXANDER TEPLYAEV (Cornell University) University of California, Riverside; DYLAN THURSTON (University of California, Berkeley) Harvard University; PETER TRAPA (Massachusetts Institute of Technology) Harvard University; HARRISON TSAI (University of California, Berkeley) Cornell University; THOMAS WESTON (Harvard University) University of Michigan, Ann Arbor.

—From NSF announcement

USA Mathematical Olympiad

The 29th annual USA Mathematical Olympiad (USAMO) was held on May 2, 2000. The students participating in the Olympiad were selected on the basis of their performances on the American High School and American Invitational Mathematics Examinations, which involved hundreds of thousands of students.

Tied for the best score on the USAMO were REID W. BARTON of Arlington, Massachusetts, and RICKY I. LIU of Newton, Massachusetts. The other top scorers were: DAVID G. ARTHUR of Toronto, Ontario; GABRIEL D. CARROLL of Oakland, California; KAMALDEEP S. GANDHI of Briarwood, New York; IAN T. LE of Princeton Junction, New Jersey; GEORGE LEE, San Mateo, California; PO-RU LOH and PO-SHEN LOH, both of Madison, Wisconsin; OAZ NIR of Saratoga, California; PAUL A. VALIANT of Belmont, Massachusetts; and YIAN ZHANG of Fitchburg, Wisconsin. Po-Ru Loh and Po-Shen Loh are brothers.

The winners were honored during ceremonies held in Washington, DC, on June 4–5, 2000. At that time the Clay Mathematics Institute named Ricky Liu as the CMI American Olympiad Scholar for the year 2000. Po-Ru Loh received that distinction last year.

This group of twelve students, along with eighteen others who did well on the USAMO, were invited to attend a four-week Mathematical Olympiad Summer Program at the University of Nebraska, Lincoln, from June 6 to July 4, 2000. This program helps to broaden students' view of mathematics and prepares them for possible participation on the USA Team for the International Mathematical Olympiad (IMO).

Six students were chosen to compete as the USA Team for the 41st IMO in July, 2000, in Seoul, South Korea. The

Math Olympiad winners with John Ewing and Sam Rankin of the AMS. Front row, left to right: Yian Zhang, Gabriel D. Carroll, David G. Arthur, Po-Shen Loh, Ian T. Le. Back row, left to right: Ewing, Kamaldeep S. Gandhi, Reid W. Barton, George Lee, Po-Ru Loh, Ricky I. Liu, Oaz Nie, Paul Valiant, Rankin.

USA Team members are Barton, Lee, Liu, Po-Ru Loh, Nir, and Valiant. The head coach of the team is Titu Andreescu, director of the American Mathematics Competitions.

—Allyn Jackson

AMS-AAAS Media Fellows Chosen

This year the AMS is again participating in the Mass Media Science and Engineering Fellowship program of the American Association for the Advancement of Science (AAAS). This program places graduate students in internships in major media organizations for ten weeks during the summer. The purpose of the program is to improve public understanding and appreciation of science and technology and to sharpen the ability of the fellows to communicate complex technical issues to nonspecialists.

Two graduate students were awarded fellowships this year through the sponsorship of the AMS. They are KATHRYN LEONARD of Brown University, who will spend her fellowship at *Popular Science* magazine, and MARY ANN SAADI of the University of Rhode Island, who will spend her fellowship at *Business Week* magazine.

—Elaine Kehoe

Visiting Mathematicians

(Supplementary List)

Mathematicians visiting other institutions internationally during the 2000–01 academic years were listed in the August 2000 issue of the *Notices*, pp. 790-1. The following is an update (home country is listed in parentheses).

SRINIVASAN BALAJI (India), New Jersey Institute of Technology, Stochastic Processes, 9/99-6/01.

RAUSHAN Z. BUZYAKOVA (Russia), Ohio University, Set-theoretic Topology and Topological Algebra, 9/00-6/01.

ANNA GEORGIEVA (Bulgaria), New Jersey Institute of Technology, Mathematical Biology and Toxicology, 1/00-6/01.

MARCEL HERZOG (Israel), University of Hawaii, Group Theory, 8/00-7/01.

VALENTIN LYCHAGIN (Russia), New Jersey Institute of Technology, Differential Geometry, 8/00-7/01.

DUMITRU MOTREANU (France), Ohio University, Differential Geometry, 3/01-6/01.

CYRILL MURATOV (Russia), New Jersey Institute of Technology, Mathematical Physics and Applied Mathematics, 9/99-6/01.

EUGEN POPA (Romania), Ohio University, Dynamical Systems, 3/01-6/01.

DAVID J. A. TROTMAN (France), University of Hawaii, Singularity Theory, 1/01-6/01.

Deaths

FLORENT J. BUREAU, of the University of Liège, Belgium, died on June 28, 1999. Born on December 17, 1906, he was a member of the Society for 45 years.

HENRY D. COLSON, professor emeritus at Ohio State University, Columbus, died on February 11, 2000. Born in October 1920, he was a member of the Society for 56 years.

ANTHONY J. EIARDI, of Fairfield University, Fairfield, CT, died on February 10, 2000. Born on July 3, 1909, he was a member of the Society for 54 years.

THOMAS H. WOLFF, of the California Institute of Technology, died on July 31, 2000. Born on July 14, 1954, he was a member of the Society for 13 years. He received the AMS Bôcher Prize in 1999.