2023 Breakthrough Prizes in Mathematics Announced

AMS Member Daniel A. Spielman was awarded the 2023 Breakthrough Prize in Mathematics.

The world’s largest science awards, each of five main Breakthrough prizes is $3 million.

Spielman is a Sterling Professor of Computer Science and a Professor of Statistics and Data Science and of Mathematics at Yale University. He was honored “for breakthrough contributions to theoretical computer science and mathematics, including to spectral graph theory, the Kadison-Singer problem, numerical linear algebra, optimization, and coding theory,” the prize citation noted.

“In Mathematics, Daniel A. Spielman’s insights and algorithms have been significant not only for mathematics, but for highly practical problems in computing, signal processing, engineering, and even the design of clinical trials,” according to a news release.

Additionally, six New Horizons Prizes of $100,000 each were distributed between 11 early-career scientists and mathematicians who have already made a substantial impact on their fields. The 2023 New Horizons in Mathematics Prizes were awarded to:

- Ana Caraiani, Imperial College London and University of Bonn, for diverse transformative contributions to the Langlands program, and in particular for work with Peter Scholze on the Hodge–Tate period map for Shimura varieties and its applications. Caraiani is an AMS Fellow.
- Ronen Eldan, Weizmann Institute of Science and Microsoft Research, for the creation of the stochastic localization method, which has led to significant progress in several open problems in high-dimensional geometry and probability, including Jean Bourgain’s slicing problem and the KLS conjecture.
- James Maynard, Oxford University and Institute for Advanced Study, for multiple contributions to analytic number theory, and in particular to the distribution of prime numbers.

Three Maryam Mirzakhani New Frontiers Prizes of $50,000 each were awarded to women mathematicians who have recently completed their PhDs and who have produced important results:

- Maggie Miller, Stanford University and Clay Mathematics Institute, for work on fibered ribbon knots and surfaces in 4-dimensional manifolds.
- Jinyoung Park, Stanford University, for contributions to the resolution of several major conjectures on thresholds and selector processes.
- Vera Traub, University of Bonn, for advances in approximation results in classical combinatorial optimization problems, including the traveling salesman problem and network design.

The 2023 Breakthrough Prize laureates in Fundamental Physics, Life Sciences, and Mathematics were announced on September 22, 2022 by the Breakthrough Prize Foundation and its founding sponsors—Sergey Brin, Priscilla Chan and Mark Zuckerberg, Julia and Yuri Milner, and Anne Wojcicki.

2023 ICIAM Prizes Announced

The International Council for Industrial and Applied Mathematics (ICIAM) announced the winners of 2023 ICIAM Prizes, which will be awarded during the opening ceremony of the International Congress for Industrial and Applied Mathematics, to be held in Tokyo on August 20–25, 2023.

Maria Colombo of EPFL Lausanne, Switzerland, was awarded the ICIAM Collatz Prize for fundamental contributions to the regularity theory and the analysis of singularities in elliptic PDEs, geometric variational problems, transport equations, and incompressible fluid dynamics.

Alfio Quarteroni of Politecnico di Milano, Italy, was awarded the ICIAM Lagrange Prize for groundbreaking work in finite element and spectral methods, domain decomposition methods, discontinuous Galerkin methods, and other areas of applied mathematics.

—From a Breakthrough Prize announcement
methods, numerical solution of incompressible Navier–Stokes equations, multiphysics and multiscale modeling—with application to fluid dynamics, geophysics, the human heart and circulatory system, the COVID-19 epidemic, and improvement of sports performance for the America’s Cup sailing competition.

Weinan E of Peking University, China, and Princeton University was awarded the ICIAM Maxwell Prize for seminal contributions to applied mathematics and in particular on analysis and application of machine learning algorithms, multi-scale modeling, the modeling of rare events and stochastic partial differential equations.

Leslie Greengard of New York University has been awarded the ICIAM Pioneer Prize for groundbreaking work on fast algorithms, including the fast multipole method (one of the top 10 algorithms of the 20th century), fast Gauss transform, and fast direct solvers; and for the development of innovative high-order, automatically adaptive algorithms for differential and integral equations.

Jose Mario Martinez Perez of the University of Campinas, Brazil, was awarded the ICIAM Su Buchin Prize for outstanding achievements in research—a combination of theory, practice, software, and applications for solving large-scale optimization problems—and in fostering the development of the optimization and applied mathematics communities in Latin America.

Cleve B. Moler of Math Works, Inc., was awarded the ICIAM Industry Prize for his outstanding contributions to the development of mathematical and computational tools and methods for the solution of science and engineering problems and his invention of MATLAB, which allows industrial users to harness efficient and reliable numerical methods to execute numerical simulations in ever-expanding domains of science and engineering.

The 2023 ICIAM Prize Committee was chaired by ICIAM President Ya-xiang Yuan. Chairs of the prize subcommittees were Gang Bao (Maxwell Prize), Alfredo Bermudez (Pioneer Prize), Nira Chamberlain (Industry Prize), Leah Edelstein-Keshet (Lagrange Prize), Lois Curfman McInnes (Su Buchin Prize), and Kim-Chuan Toh (Collatz Prize).

—From an ICIAM announcement

Yunqing Tang Receives SASTRA Ramanujan Prize

The 2022 SASTRA Ramanujan Prize was awarded to Yunqing Tang, an assistant professor at the University of California, Berkeley, who has been described as “one of the best young number theorists to emerge in recent years worldwide.”

Tang was honored for “having established, by herself and in collaboration, a number of striking results on some central problems in arithmetic geometry and number theory,” the prize citation noted. “… Her works display a remarkable combination of sophisticated techniques, in which the arithmetic and geometry of modular curves and of Shimura varieties play a central role, and have strong links with the discoveries of Srinivasa Ramanujan in the area of modular equations.”

Tang earned her PhD from Harvard University in 2016 under supervision of Mark Kisin. A native of China, she has been a member of the Institute for Advanced Study in Princeton, NJ; a junior researcher (chargée de recherche) at CNRS/Université Paris-Sud; and an instructor and assistant professor at Princeton University. “She is one of the deepest and most creative mathematicians of her age, and her wide-ranging contributions are bound to have impact in the decades ahead,” the citation noted.

The annual $10,000 prize is for outstanding contributions by individuals not exceeding the age of 32 in areas of mathematics influenced by Srinivasa Ramanujan in a broad sense. “The age limit has been set at 32 because Ramanujan achieved so much in his brief life of 32 years,” according to the citation.

—From the SASTRA Ramanujan Prize

Hendricks Awarded AWM Joan and Joseph Birman Research Prize

The Association for Women in Mathematics (AWM) has awarded the fifth AWM Joan & Joseph Birman Research Prize in Topology and Geometry to Kristen Hendricks, associate professor of mathematics at Rutgers University.

Hendricks is being honored for highly influential work on equivariant aspects of Floer homology theories. Her work “in low-dimensional and symplectic topology has revolutionized the understanding of equivariant aspects of
Sonnleitner Wins 2022 Joseph F. Traub Information-Based Complexity Young Researcher Award

Mathias Sonnleitner, University of Passau, Germany, has received the 2022 Joseph F. Traub Information-Based Complexity Young Researcher Award from the Journal of Complexity. The annual award is given for significant contributions to information-based complexity by a young researcher who has not reached their 35th birthday by September 30 in the year of the award. The award consists of $1,000 and a plaque, which was presented at the conference “Approximation and Geometry in High Dimensions,” held in Będlewo, Poland, in October 2022.

—From Journal of Complexity

Credits
Photos of Daniel Spielman and Ana Caraiani are courtesy of the Breakthrough Prize. Photo of Yunqing Tang is courtesy of Professor George Bergman of the University of California, Berkeley math department.

—From the Association for Women in Mathematics