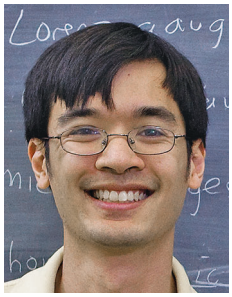
Mathematics People

Meyer, Daubechies, Tao, and Candès Receive Princess of Asturias Award


Ingrid Daubechies


Terence Tao


Emmanuel Candès

Yves Meyer, **Ingrid Daubechies**, **Terence Tao**, and **Emmanuel Candès** have been named recipients of the 2020 Princess of Asturias Award for Technical and Scientific Research. According to the prize citation, they "have made immeasurable, groundbreaking contributions to modern theories and techniques of mathematical data and signal processing. These constitute the foundations and backbone of the digital age (by enabling the compression of graphic files with little loss of resolution), of medical imaging and diagnosis (by enabling accurate images to be reconstructed from a small number of data), and of engineering and scientific research (by eliminating interference and background noise). The outstanding contributions of these world leaders in mathematics to modern mathematical data and signal processing are essentially based on two different yet complementary tools: wavelets and compressed sensing or matrix completion.

"Meyer and Daubechies have led the development of modern mathematical wavelet theory, located at the overlap between mathematics, information technology, and computer science. Mathematical wavelet theory enables images and sounds to be decomposed into mathematical fragments, which capture irregularities in the pattern, while at the same time being manageable. This technique underlies data compression and storage and noise suppression. Together with Daubechies, Meyer brought together previous studies and related them to the analytical tools used in harmonic analysis. This discovery later led to Meyer's demonstration that waves can form mutually independent sets of mathematical objects called orthogonal bases. His work inspired Daubechies to construct orthogonal wavelets with compact support, and later biorthogonal wavelets, which revolutionized the field of engineering. Both worked on the development of wavelet packages, which allow improved adaptation to the particularities of a signal or image.

"A second revolution in data and signal processing techniques came in the first decade of the twenty-first century with the development of the theories of compressed sensing or compressive sampling and matrix completion, fruit of the collaboration between Terence Tao and Emmanuel Candès. This work enables the efficient reconstruction of scattered data based on very few measurements. One of the core issues in medical imaging and, in general, in all areas of signal processing is how to reconstruct a signal from partial, noisy measurements. Advanced reconstruction techniques, such as compressed sensing and matrix completion, enable the number of required samples to be reduced, which in medical imaging means being able to examine the patient faster. … The compressed sensing technique has contributed significantly to signal processing by enabling the compressed version of a signal to be reconstructed using a small number of linear measurements. This means a lower sampling frequency, less data, less use of storage resources, decreased speed requirements for analog-to-digital converters, and less time required for data transmission. These mathematical theories, developed by Meyer, Daubechies, Tao, and Candès, highlight the unifying and cross-cutting role of mathematics in different scientific and engineering disciplines, with practical solutions applicable in multiple fields, as well as constituting an example of the usefulness of work in pure mathematics."

Yves Meyer earned his PhD from the University of Strasbourg in 1966 under Jean-Pierre Kahane. He served as professor of mathematics at Paris-Sud University (1966–1980), the Ecole Polytechnique (1980–1986), and Paris-Dauphine University (1986–1995). He was a senior researcher at CNRS from 1995–1999, then joined the faculty at Ecole Normale Supérieure de Cachan. He has been professor emeritus at Cachan since 2004. Meyer is a member of the

French Academy of Science, the American Academy of Arts and Sciences (honorary), and the US National Academy of Sciences and is an Inaugural Fellow of the AMS. His honors include the Salem Prize (1970) and the Gauss Prize (2010). He was awarded the Abel Prize in 2017.

Ingrid Daubechies received her PhD in 1980 from the Free University of Brussels, where she was employed until 1987. She spent much of 1986 visiting the Courant Institute of Mathematical Sciences. In 1987 she joined the AT&T Bell Laboratories Mathematical Research Center, serving until 1994, while concurrently holding a professorship in the Department of Mathematics of Rutgers University. She became a professor in the Department of Mathematics at Princeton University in 1994 and was director of the program in applied and computational mathematics from 1997 to 2001. She joined Duke University in 2011 and currently holds the James B. Duke Chair. Among her honors and awards are the AMS Leroy P. Steele Prize for Mathematical Exposition (1994), the Satter Prize in Mathematics (1977), a MacArthur Fellowship (1992), the National Academy of Sciences Medal in Mathematics (2000), the Steele Prize for Seminal Contribution to Research (2011), the Benjamin Franklin Medal in Electrical Engineering (2011), the BBVA Foundation Frontiers of Knowledge Award in the Basic Sciences (with David Mumford, 2012), the Benter Prize in Applied Mathematics (2018), and the Fudan-Zhongzhi Science Award (2018). She is the first woman awarded the Nemmers Prize in Mathematics (2012). She is a member of the American Academy of Arts and Sciences, the US National Academy of Sciences, the Royal Netherlands Academy of Arts and Sciences, the American Philosophical Society, the London Mathematical Society, and the Paris Academy of Sciences. She is a Fellow of the Association for Women in Mathematics and an Inaugural Fellow of the AMS.

Terence Tao earned his PhD in mathematics from Princeton University in 1996. He joined the faculty of the University of California at Los Angeles, where he is currently full professor. He was awarded a Fields Medal in 2006. Among his many honors and awards are the Salem Prize (2000), the Bôcher Prize (2002), the Ostrowski Prize (with Ben Green, 2005), the Levi L. Conant Prize (2005), a MacArthur Fellowship (2006), the SASTRA Ramanujan Prize (2006), the Alan T. Waterman Award (2008), the Nemmers Prize (2010), the Polya Prize (with Emmanuel Candès, 2010), and the Breakthrough Prize in Mathematics (2014). He is a member of the Australian Academy of Science, the US National Academy of Sciences, and the American Academy of Arts and Sciences and an Inaugural Fellow of the AMS.

Emmanuel Candès earned his PhD in statistics from Stanford University in 1998. He has held positions as professor of applied and computational mathematics and Ronald and Maxine Linde Professor at the California Institute of Technology. In 2009, he joined the faculty at Stanford University, where he is currently Barnum-Simon Professor of Mathematics and Statistics, Professor of Electrical Engineering, and codirector of the Data Science Institute. His honors include the Alan T. Waterman Award (2006), the James H. Wilkinson Prize in Numerical Analysis and Scientific Computing (2005), the SIAM 2010 George Pólya Prize (with Terence Tao, 2010), the Collatz Prize (2011), the Lagrange Prize in Continuous Optimization (2012), the Dannie Heineman Prize (2013), and the George David Birkhoff Prize (2015). He was awarded a MacArthur Genius Grant in 2017. He is a member of the US National Academy of Sciences and the American Academy of Arts and Sciences and a Fellow of the AMS.

The Princess of Asturias Award for Technical and Scientific Research recognizes "the work of fostering and advancing research in the field of mathematics, astronomy and astrophysics, physics, chemistry, life sciences, medical sciences, earth and space sciences or technological sciences, including those disciplines corresponding to each of these fields, as well as their related technologies." The Princess of Asturias Foundation is a nonprofit private institution whose essential aims are to contribute to extolling and promoting those scientific, cultural, and humanistic values that form part of the universal heritage of humanity and consolidate the existing links between the Principality of Asturias and the title traditionally held by the heirs to the Crown of Spain. The prize carries a cash award of 50,000 euros (approximately US$60,600).

—From a Princess of Asturias Foundation announcement

Sato Awarded Operator Algebra Prize


Yasuhiko Sato

Yasuhiko Sato of Kyushu University has been awarded the sixth Operator Algebra Prize for his outstanding contributions to the classification theory of amenable C^*-algebras and group actions on them. The prize consists of a cash award of approximately US$3,000, a prize certificate, and a medal.

The Operator Algebra Prize is awarded every four years to a person under forty years of age, either of Japanese nationality or principally based in a Japanese institution, for outstanding contributions to operator algebra theory and related areas.

—Yasuyuki Kawahigashi, Chair
Operator Algebra Prize Committee

NEWS

Chatterjee Awarded Infosys Prize


Sourav Chatterjee

Sourav Chatterjee of Stanford University has been awarded the Infosys Prize in Mathematics "for his groundbreaking work in probability and statistical physics. Professor Chatterjee's collaborative work has played a critical role in areas such as the emerging body of work on large deviations for random graphs." He received his PhD in statistics in 2005 from Stanford University under the direction of Persi Diaconis. He was a member of the faculty at the University of California, Berkeley, from 2006 to 2011 and at the Courant Institute of Mathematical Sciences, New York University, from 2009 to 2013. He joined the faculty at Stanford in 2013. In 2010 he was awarded the Rollo Davidson Prize, and in 2012 he was the first recipient of the Doeblin Prize in Probability. He was awarded the Line and Michel Loève International Prize in Probability in 2013. He is a Fellow of the Institute of Mathematical Statistics. Chatterjee tells the *Notices*: "I like playing chess, reading Wikipedia, listening to the music of Rabindranath Tagore (in Bengali, which is my native tongue), and going on long drives with my family (which has become hard due to Covid!)." The prize is awarded by Infosys Science Foundation "to honor outstanding achievements of contemporary researchers and scientists." It carries a cash award of US$100,000.

—From an Infosys Science Foundation announcement

Leverhulme Prizes Awarded

The 2020 Philip Leverhulme Prizes have been awarded. The prizes recognize the achievement of outstanding researchers whose work has already attracted international recognition and whose future careers are exceptionally promising. The prize carries a cash award of 100,000 pounds (approximately US$132,000).

The 2020 recipients in the field of mathematics and statistics are:

- **Ana Caraiani**, Imperial College London
- **Heather Harrington**, University of Oxford
- **Richard Montgomery**, University of Birmingham
- **Nick Sheridan**, University of Edinburgh
- **Sasha Sodin**, University of London

—From a Leverhulme Trust announcement

2020 Fudan–Zhongzhi Science Award

Three physicists whose work involves the mathematical sciences have been awarded the 2020 Fudan–Zhongzhi Science Award. **Sir Michael V. Berry** of the University of Bristol discovered the geometric phase that is widely known as the Berry phase in basic quantum mechanics, as well as the Berry connection and curvature. **Charles L. Kane** of the University of Pennsylvania has made pioneering contributions to the field of topological insulators. **Qi-Kun Xue** of Tsinghua University reported experimental observation of the quantum anomalous Hall effect. The award is given in recognition of scientists who have made fundamental and groundbreaking achievements in physics, mathematics, and biomedicine. The prize, divided among recipients, carries a cash award of US$442,000.

—From a Fudan University announcement

2020 Australian Mathematical Society Awards

The Australian Mathematical Society has announced several awards for 2020.


Luke Bennetts

Luke Bennetts of the University of Adelaide was honored with the Australian Mathematical Society Medal for his work on "challenging mathematical problems applied to geophysical problems, in particular wave–ice interaction and catastrophic ice-shelf disintegration in polar regions." He received his PhD in applied mathematics from the University of Reading in 2007. His honors include the Christopher Heyde Medal of the Australian Academy of Science (2016), a Simons Fellowship (2017), and a Humboldt Fellowship (2020–2021). Bennetts tells the *Notices*: "Outside of work, I enjoy hiking in the Adelaide hills with my two young sons, and I'm a keen rock climber."


Nalini Joshi

Nalini Joshi of the University of Sydney and **Ole Warnaar** of the University of Queensland were awarded George Szekeres Medals. Joshi is "a world leader in the


Ole Warnaar

theory and applications of differential equations, contributing mathematical results that have impact in fields as diverse as particle physics, quantum mechanics, large prime-number distributions, and wireless communications." Her significant contributions to the mathematics community include leadership, gender equity, and promotion of mathematics. She received her PhD from Princeton University under Martin Kruskal. She is a Fellow of the Australian Academy of Science and a recipient of the Eureka Award for Outstanding Mentor of Young Researchers (2018). Joshi tells the *Notices*: "I am an avid reader, and have been since I was a child in Burma, where I was born." Warnaar "is a leading expert in special functions, partition theory, and algebraic combinatorics." According to the prize citation, he and his collaborators "were the first to extend the celebrated Rogers–Ramanujan identities to infinite families of affine Kac–Moody algebras. He developed a beautiful theory of partial theta functions, was one of the pioneers in the field of elliptic hypergeometric functions, and is one of the leading experts on the Selberg integral and its applications." He received his PhD from the University of Amsterdam. He is the current president of the Australian Mathematical Society. He tells the *Notices*: "I am a judo coach, and keen hiker and rock climber. During quieter moments I like to read or watch art house movies at the local theatre with my wife Celestien."

The Gavin Brown Best Paper Prize was awarded to **John Bamberg**, **Michael Giudici**, and **Gordon F. Royle**, of the University of Western Australia, for "Every flock generalized quadrangle has a hemisystem," *Bulletin of the London Mathematical Society* **42** (2010).

Norman Do of Monash University received the Australian Mathematical Society Award for Teaching Excellence. His "approach to teaching combines a remarkably enthusiastic lecturing style, interactive approaches to tutorials, and initiatives targeted at students across the spectrum of mathematical proficiency."

—From Australian Mathematical Society announcements

ICMI Freudenthal and Klein Awards Given

The International Commission on Mathematical Instruction (ICMI) announced the awarding of its 2019 Hans Freudenthal and Felix Klein Medals. **Gert Schubring** of Bielefeld University and the Universidade Federal do Rio de Janeiro was selected the recipient of the Freudenthal Medal "in recognition of his outstanding contribution to research on the history of mathematics education." The Freudenthal Medal honors "innovative, consistent, highly influential and still ongoing programs of research in mathematics education." **Tommy Dreyfus** of Tel Aviv University was honored with the Klein Medal for his contribution to research "as well as his leading role in shaping and consolidating the research community and in fostering communication between researchers." The Klein Medal honors "the most meritorious members of the mathematics education community."

—From an ICMI announcement

AAAS Fellows Elected

The American Association for the Advancement of Science has elected its class of Fellows for 2020.

The new Fellows of the Section on Mathematics are:

- **Harold P. Boas**, Texas A&M University
- **Leslie Hogben**, Iowa State University and American Institute of Mathematics
- **Kristin Lauter**, Microsoft Research
- **Paul K. Newton**, University of Southern California
- **Esmond G. Ng**, Lawrence Berkeley National Laboratory
- **Karen Hunger Parshall**, University of Virginia
- **Malgorzata Peszynska**, Oregon State University
- **Jack Xin**, University of California, Irvine

The new Fellows of the Section on Statistics are:

- **Sudipto Banerjee**, University of California, Los Angeles
- **David L. Banks**, Duke University
- **Deborah J. Donnell**, Fred Hutchinson Cancer Research Center
- **Timothy C. Hesterberg**, Google, Inc.
- **Qi Long**, University of Pennsylvania
- **Ying Lu**, Stanford University School of Medicine
- **Richard L. Smith**, University of North Carolina at Chapel Hill
- **Elizabeth A. Stuart**, Johns Hopkins Bloomberg School of Public Health

—From an AAAS announcement

NEWS

2020 NSF CAREER Awards

The National Science Foundation (NSF) has named a number of recipients in 2020 of Faculty Early Career Development (CAREER) Awards. The awards support early-career faculty members who have the potential to serve as academic role models in research and education and to lead advances in the mission of their departments or organizations. Following are the names, institutions, and proposal titles of the awardees selected by the NSF Division of Mathematical Sciences (DMS) for 2020.

- **Arash Amini**, University of California, Los Angeles: High-dimensional statistical models for unsupervised learning
- **David Anderson**, Ohio State University: Equivariant and infinite-dimensional combinatorial algebraic geometry
- **David Ayala**, Montana State University: Factorization homology and quantum topology
- **Jennifer Balakrishnan**, Boston University: New directions in p-adic heights and rational points on curves
- **Pierre Bellec**, Rutgers University: Post-differentiation inference
- **Jeffrey Calder**, University of Minnesota, Twin Cities: Harnessing the continuum for big data: Partial differential equations, calculus of variations, and machine learning
- **Roger Casals Gutierrez**, University of California, Davis: Legendrian and contact topology in higher dimensions
- **Jesse Chan**, William Marsh Rice University: Tailored entropy stable discretizations of nonlinear conservation laws
- **Nicolas Charon**, Johns Hopkins University: Shape analysis in submanifold spaces: New directions for theory and algorithms
- **Tristan Collins**, Massachusetts Institute of Technology: Differential equations, algebraic geometry, and string theory
- **Jeffrey Danciger**, University of Texas, Austin: Locally homogeneous geometric manifolds and their moduli spaces
- **Peng Ding**, University of California, Berkeley: The design-based perspective of causal inference in complex experiments
- **Tarek Elgindi**, Duke University: Formation of small scales and dissipation in incompressible fluids
- **Yang Feng**, New York University: Statistical inference of network and relational data
- **James Freitag**, University of Illinois, Chicago: Applied model theory
- **Shirshendu Ganguly**, University of California, Berkeley: Various geometric aspects of Kardar–Parisi–Zhang universality: Fractal dimensions, noise sensitivity, line ensembles, and large deviations
- **Elizabeth Gross**, University of Hawaii: Identifiability and inference for phylogenetic networks using applied algebraic geometry
- **Daniel Halpern-Leistner**, Cornell University: Moduli spaces and derived categories
- **Hao Huang**, Emory University: Algebraic methods in extremal combinatorics
- **Paata Ivanisvili**, North Carolina State University: Discrete structures and orthogonal systems
- **Hao Jia**, University of Minnesota, Twin Cities: New mechanisms for stability, regularity and long-time dynamics of partial differential equations
- **Zheng Ke**, Harvard University: Learning probabilistic factor models
- **Daniel Krashen**, Rutgers University: The arithmetic of fields and the complexity of algebraic structures
- **Sean Lawley**, University of Utah: How diffusion, dimension, geometry, and redundancy affect cellular dynamics
- **Mona Merling**, University of Pennsylvania: Applications of equivariant homotopy theory to manifolds
- **François Monard**, University of California, Santa Cruz: Integral geometry: Theory, implementations, and applications
- **Naveen Naidu Narisetty**, University of Illinois, Urbana-Champaign: Flexible and efficient exploration of the Bayesian framework for high-dimensional modeling
- **Yang Ning**, Cornell University: High-dimensional M-estimation under nonstandard conditions
- **Sung-Jin Oh**, University of California, Berkeley: Dynamics of nonlinear dispersive partial differential equations
- **Jose Perea**, Michigan State University: Machine learning, mapping spaces, and obstruction theoretic methods in topological data analysis
- **Aaditya Ramdas**, Carnegie-Mellon University: Online multiple hypothesis testing: A comprehensive treatment
- **Eric Riedl**, University of Notre Dame: Hyperbolicity properties of hypersurfaces
- **Veronika Rockova**, University of Chicago: Statistical inference for Bayesian machine learning
- **Bharath Sriperumbudur**, Pennsylvania State University: Statistical learning, inference, and approximation with reproducing kernels

- **Omer Tamuz**, California Institute of Technology: Probability on groups and semigroups of probabilities
- **Nam Trang**, University of North Texas: Current and future developments of the core model induction
- **Cynthia Vinzant**, North Carolina State University: Determinantal, hyperbolic, and log-concave polynomials in theory and applications
- **Lutz Warnke**, Georgia Tech Research Corporation: Understanding the evolution of random graphs with complex dependencies: Phase transition and beyond
- **Emily Witt**, University of Kansas Center for Research: New frontiers for Frobenius, singularity theory, differential operators, and local cohomology
- **Jesse Wolfson**, University of California, Irvine: Resolvent degree, Hilbert's 13th problem, and geometry
- **Chuan Xue**, University of Minnesota, Twin Cities: Multiscale modeling of axonal cytoskeleton dynamics and axonal transport
- **Haizhao Yang**, Purdue University: Deep-learning-based scientific computing: Mathematical theory and algorithms
- **Anru Zhang**, University of Wisconsin, Madison: Inference for high-dimensional structures via subspace learning: Statistics, computation, and beyond
- **Xin Zhou**, University of California, Santa Barbara: New development in geometric variational theory
- **Andrew Zimmer**, Louisiana State University: Intrinsic and extrinsic conditions in several complex variables

—NSF announcements

Rhodes Scholars 2020

The Rhodes Trust has announced the names of the American scholars chosen as Rhodes Scholars for 2020. Following are the names and brief biographies of the scholars whose work involves the mathematical sciences.

Garima P. Desai of Fremont, California, graduated in May 2020 from the University of California, Santa Cruz, with a double major in environmental studies and economics. She currently works as a transportation planner in Oakland, California. While at UC-Santa Cruz, she worked as a research assistant on issues related to housing and transportation. She is passionate about using economics as a tool to solve pressing climate issues. At Oxford, she plans to pursue an MSc in economics for development and an MSc in environmental change and management.

Nicolas J. W. Fishman of Washington, DC, is a senior at Stanford University completing majors in computer science and sociology. He is passionate about developing technologies that will expand autonomy. He has conducted independent research at Harvard University, Stanford University, Northwestern University, and the National Human Genome Research Institute, as well as Data for Progress. He is active in get-out-the-vote work around the American elections and in the Young Democratic Socialists of America. At Oxford, he will pursue an MSc in statistical science and an MSc in history of science, medicine, and technology.

Samuel E. Patterson of Marietta, Georgia, is a senior at the University of Maryland, Baltimore County, where he will receive a BS in mathematics, a BS in statistics, and a BA in economics. He has done summer research in economics and education at Harvard University and in business at the University of Chicago. An accomplished musician, he is the music director of a community organization, plays upright and electric jazz bass, and volunteered to teach the basics of computer programming to middle school students. His deep work in economics through an equity lens has focused on the importance of transportation infrastructure to improve economic opportunity. He intends to do the MSc in nature, society, and environmental governance at Oxford.

Evan C. Walker of Rowlett, Texas, is in her final year at the US Military Academy, where she majors in operations research with focuses in statistics and linear algebra. Her thesis analyzes the demographics of promotion and attrition among US Army Field Grade Officers. She is a regimental commander, served as the chief liaison between survivors of sexual harassment or assault and on-campus medical professionals, and is president of an initiative to mentor minority cadets. She is also captain of the nationally ranked and gender-integrated Army Boxing Team and last year placed second nationally in her weight class. She plans to do the MSc in sociology and the MSc in statistical science at Oxford.

—From a Rhodes Trust announcement

Credits

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