Hairer and Masmoudi
Awarded King Faisal Prize

Martin Hairer of Imperial College London and Nader Masmoudi of New York University have been awarded the 2022 King Faisal Prize in Mathematics. Hairer was honored for “his pivotal contributions in transforming the area of stochastic differential equations by introducing fundamental new techniques.” Masmoudi was recognized for his “outstanding contributions to the mathematical theory of fluid dynamics, in particular for the proof of nonlinear inviscid damping and nonlinear Landau damping for the Euler system.”

Martin Hairer received his PhD in physics from the University of Geneva in 2001. He held positions at the University of Warwick (United Kingdom) and the Courant Institute of Mathematical Sciences before moving to Imperial College London, where he currently holds a chair in probability and stochastic analysis. He works in probability theory, focusing mainly on the analysis of stochastic partial differential equations. The prize citation points out that “he recently developed the theory of regularity structures which allows [one] to give a precise mathematical meaning to a number of such equations that were previously outside the scope of mathematical analysis.” Besides his mathematical work, Hairer has also developed a piece of audio editing software. Hairer was awarded the Fields Medal in 2014 and the Breakthrough Prize in Mathematics in 2020. His other honors include Whitehead and Philip Leverhulme prizes of the London Mathematical Society in 2008, the Fermat Prize (with Camillo De Lellis) in 2013, and the Fröhlich Prize in 2014. He is a Fellow of the Royal Society.

Nader Masmoudi received his PhD in 1999 and a Habilitation in 2000, both from Université Paris-Dauphine. He served as a researcher at CNRS from 1998 to 2000. He joined the Courant Institute of Mathematical Sciences, New York University, in 2000, advancing to full professor in 2008. He is currently an affiliated faculty member at NYU Abu Dhabi. According to the prize citation, his research “has been at the forefront of partial differential equations, fluid mechanics and dynamical systems for the past 20 years.” He “has helped discover many breakthroughs in fluid mechanics and especially in 2D and 3D Euler equations, the Prandtl system, which have remained unsolved since 1757. In particular he discovered that Euler’s equations do not always apply and can sometimes ‘blow-up’ and become singular under certain conditions. This work helps to solve many problems in fluid-modeling topics ranging from airplanes and weather predictions to traffic flow and crowd management.” Among his honors are the Fermat Prize (2017), the SIAG/APDE Prize of the Society for Industrial and Applied Mathematics (SIAM), the Kuwait Award (2019) in fundamental science from the Kuwait Foundation for the Advancement of Sciences, and the Kifra Prize from the African Institute for Mathematical Sciences. He was elected to the American Academy of Arts and Sciences in 2021.

The King Faisal Prize is an international prize awarded in the fields of Service to Islam, Islamic Studies, Arabic Language and Literature, Medicine, and Science. The science prize alternates among physics, chemistry, biology, and mathematics. Prize recipients receive or share a cash award of approximately US$200,000.

—From a King Faisal Foundation announcement

News from the Clay Mathematics Institute

Hannah Larson of Stanford University, Alexander Petrov of Harvard University, and Ziquan Zhuang of the Massachusetts Institute of Technology have been named as Research Fellows of the Clay Mathematics Institute (CMI).

Larson will obtain her PhD from Stanford in 2022, advised by Ravi Vakil. The citation reads: “Displaying remarkable ingenuity, Larson has applied the modern techniques of degeneration and intersection theory to make significant advances in one of the classical areas of algebraic geometry—the geometry of complex curves and their moduli. Her papers bristle with surprising new ideas that attack classical problems. For example, searching for new perspectives on the space of vector bundles on the
Riemann sphere, she proved striking results about the moduli space of curves and about stabilization for branched covers of the sphere (with S. Canning), and extended Brill–Noether theory (which governs maps of general curves to projective space) to explain seemingly chaotic behaviour in the case of low-gonality curves (with E. Larson and I. Vogt).” Larson received the AWM Alice T. Schafer Prize and the Mumford Prize from Harvard University, both in 2017. She was named a Maryam Mirzakhani Graduate Fellow for 2019–2020, and she currently holds a Stanford Graduate Fellowship, an NSF Graduate Research Fellowship, and a Hertz Foundation Graduate Fellowship. Larson has been appointed a Clay Research Fellow for a term of five years beginning July 1, 2022.

Petrov will receive his PhD from Harvard in 2022, advised by Mark Kisin. The citation reads: “Petrov has demonstrated exceptional creativity in proving surprising theorems concerning Galois representations and arithmetic local systems on algebraic varieties. Settling a conjecture of Litt, he proved that geometrically irreducible, arithmetic local systems on varieties over p-adic fields are essentially de Rham. He discovered a deep generalization of Belyi’s famous theorem, showing that any irreducible Galois representation which arises in the cohomology of an algebraic variety over a number field appears in the space of algebraic functions on the fundamental group of the thrice punctured sphere. And he opened a new range of possibilities with counterexamples to a conjecture of Scholze on Hodge symmetry for rigid analytic varieties.” Petrov has been appointed a Clay Research Fellow for a term of five years beginning July 1, 2022.

Zhuang obtained his PhD in 2019 from Princeton University, where he was advised by János Kollár. Since then he has been a Moore Instructor at MIT. The citation reads: “Zhuang is a remarkably prolific and inventive algebraic geometer who has already made a series of fundamental contributions to higher dimensional birational geometry. These include his landmark solution, with Liu and Xu, of the higher rank finite generation conjecture, which is the final step in the Yau–Tian–Donaldson Conjecture in the case of general Fano varieties. With Xu, Zhuang proved the positivity of the CM line bundle on the K-moduli space; with Ahmadinezhad, he invented a new framework to verify the K-stability of a large class of Fano varieties; and with Stibitz he proved striking results on birational superrigidity and K-stability of Fano varieties.” Zhuang has been appointed a Clay Research Fellow for a term of two years beginning July 1, 2022.

The CMI has also appointed nine Senior Scholars for 2022. They are:

- **Maryna Viazovska**, Ecole Polytechnique Fédérale de Lausanne, to participate in “Number Theory Informed by Computation” at the Park City Mathematics Institute in July 2022.
- **Henrik W. Lenstra**, University of Leiden, to participate in “Number Theory Informed by Computation” at the Park City Mathematics Institute in July 2022.
- **Mikhail Lyubich**, Stony Brook University, to participate in “Complex Dynamics: From Special Families to Natural Generalizations in One and Several Variables” at the Mathematical Sciences Research Institute (MSRI) from January to May 2022.
- **Nikolai Makarov**, California Institute of Technology, to participate in “Analysis and Geometry of Random Spaces” at MSRI from January to May 2022.
- **Kavita Ramanan**, Brown University, to participate in the “Thematic Program on Probabilities and PDEs” at Centre de Recherches Mathématiques (CRM), Montreal, from January to June 2022.
- **Ivan Smith**, University of Cambridge, to participate in “Floer Homotopy Theory” at MSRI from August to December 2022.
- **Tomasz Mrowka**, Massachusetts Institute of Technology, to participate in “Analytic and Geometric Aspects of Gauge Theory” at MSRI from August to December 2022.
- **Henri Darmon**, McGill University, to participate in “Algebraic Cycles, L-Values, and Euler Systems” at MSRI from January to May 2023.
- **Mark Kisin**, Harvard University, to participate in “Diophantine Geometry” at MSRI from January to May 2023.

—From CMI announcements
Codá Marques and Pilloni
Awarded 2021 Fermat Prize

Codá Marques was honored “for major advances obtained with André Neves on geometric applications of the calculus of variations.” In 2012, he and Neves proved the Willmore conjecture. Codá Marques received his PhD in 2003 from Cornell University under the guidance of José Escobar. He advanced from assistant to full professor (2003–2014) at the Instituto Nacional de Matemática Pura e Aplicada (IMPA) before joining the faculty at Princeton. Among his honors are the ICTP Ramanujan Prize in 2012; the TWAS Prize in Mathematics, also in 2012; the Oswald Veblen Prize of the AMS (with André Neves) in 2016; and a Simons Investigator Award in 2020. He was a plenary speaker at the International Congress of Mathematicians in Seoul in 2014. He is a member of the Brazilian Academy of Sciences and a Fellow of the AMS.

Pilloni was recognized “for his remarkable results in arithmetic geometry on $p$-adic modular forms, in particular through the introduction and development of higher Hida theory.” He received his PhD from Université Paris XIII in 2009, advised by Jacques Tilouine. Pilloni is director of mathematics research of CNRS at Lyon. He received the Prix Elie Cartan in 2018. His research specialties are arithmetic geometry and the Langlands program.

—Istitut de Mathématiques de Toulouse announcement

Lundberg Receives
Ruscheweyh Young Researcher Award

Erik Lundberg of Florida Atlantic University was awarded the 2021 Stephan Ruscheweyh Award at the Computational Methods and Function Theory (CMFT) conference held remotely in Valparaiso, Chile, January 10–14, 2022.
Fellows of the ACM

The Association for Computing Machinery (ACM) has elected its class of Fellows for 2021. Following are the names of the new Fellows whose work involves the mathematical sciences.

- **Leonard M. Adleman**, University of Southern California, for contributions to computational complexity and cryptography.
- **David A. Bader**, New Jersey Institute of Technology, for contributions to parallel algorithms.
- **Mark Braverman**, Princeton University, for contributions to computational complexity, information theory, and algorithmic mechanism design.
- **Daniel Cohen-Or**, Tel Aviv University, for contributions to computer graphics, geometry processing, and visual computing.
- **Gautam Das**, University of Texas, Arlington, for contributions to database search and graph algorithms.
- **Amos Fiat**, Tel Aviv University, for contributions to cryptography, online algorithms, and algorithmic game theory.
- **Anupam Gupta**, Carnegie Mellon University, for contributions to approximation algorithms, online algorithms, stochastic algorithms, and metric embeddings.
- **Elad Hazan**, Princeton University, for contributions to efficient algorithms for convex and nonconvex optimization.
- **Robert Kleinberg**, Cornell University, for contributions to algorithms, random processes in networks, online learning and decision problems.
- **Tie-Yan Liu**, Microsoft Research Asia, for contributions to machine learning algorithms and their applications.
- **Dale A. Miller**, Inria Saclay Research Center, for contributions to proof theory and computational logic.
- **Joël Ouaknine**, Max Planck Institute for Software Systems, for contributions to algorithmic analysis of dynamical systems.
- **Alla Sheffer**, University of British Columbia, for contributions to geometry processing, mesh parameterization, and perception-driven shape analysis and modeling.
- **Scott Smolka**, Stony Brook University, for contributions in process algebra, model checking, and runtime verification.
- **Luca Trevisan**, Bocconi University, for contributions to complexity theory and combinatorial optimization.
- **Wenping Wang**, Texas A&M University, for contributions to geometric modeling and computer graphics.

—From an ACM announcement

**Credits**

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