Mathematics People

2022 Simons Investigators Announced

The Simons Foundation has named the Simons Foundation Investigators for 2022. Following are the new investigators whose work involves the mathematical sciences.

Mathematics

Ivan Corwin of Columbia University works at the interface of probability and mathematical physics, with a particular interest in exactly solvable probabilistic models and stochastic partial differential equations. Much of his work has focused around the Kardar–Parisi–Zhang equation and its universality class.

Nick Sheridan of the University of Edinburgh centers his work around Kontsevich’s homological mirror symmetry conjecture, which posits a deep relationship between symplectic topology and algebraic geometry. Working mainly on the symplectic side, he has developed tools for proving the conjecture and applied them to prove the conjecture in a number of cases, most notably the quintic threefold. In cases in which the conjecture is established, Sheridan has given applications to enumerative geometry and symplectic topology. He tells the Notices: “I’m from Melbourne, Australia, and I’m married to the Portuguese mathematician Ana Rita Pires. We have two daughters, Amália who is four, and Elisa who is one. I look forward to teaching them to surf—Amália caught her first wave recently!”

Wei Zhang of the Massachusetts Institute of Technology is a number theorist working on automorphic representations and arithmetic geometry. He studies special values of zeta and $L$-functions and their relation to periods and heights of algebraic cycles on moduli spaces over global fields. A focus of his research is various high-dimensional generalizations of the Gross–Zagier formula. In particular, Zhang proposed the relative trace formula approach, which has led to many new deep questions relating the harmonic analysis on spaces with a group action over local fields to the arithmetic intersection theory on local Shimura varieties.

Chenyang Xu of Princeton University works in algebraic geometry, with an emphasis on understanding the structure of higher dimensional algebraic varieties. With his collaborators, Xu led the establishment of a rich algebraic $K$-stability theory for Fano varieties, crowned by the novel construction of projective $K$-moduli spaces parametrizing Fano varieties. The new algebraic method invented by Xu and his collaborators, largely built on the minimal model program in birational geometry, also provides a solution to the algebraic Yau–Tian–Donaldson conjecture for all Fano varieties and a radically new singularity theory.

Physics

Michael Levin of the University of Chicago does research that combines ideas from condensed matter physics, quantum information, and mathematics with a focus on the theory of topological phases of matter. In one line of research, he has constructed exactly solvable lattice models that realize a general class of two-dimensional strongly interacting topological phases. These lattice models have become a useful theoretical tool for studying anyons. He has also introduced a way to probe topological phases using entanglement entropy, which has given rise to new numerical methods. Recently, Levin has made contributions to the
theory of the bulk-boundary correspondence for topological matter, both in equilibrium and in periodically driven systems. Levin tells the Notices that he has three children and enjoys hiking in his spare time.

**Theoretical Computer Science**

Shayan Oveis Gharan of the University of Washington does research that exploits deep tools from mathematics, such as the theory of real stable and log-concave polynomials, spectral graph theory, and high-dimensional simplicial complexes to design and analyze algorithms for discrete objects. He is known for his results on improved approximation algorithms for classical optimization problems such as traveling salesperson problems, as well as his analysis of the mixing time of Markov chains to efficiently sample from complex probability distributions such as the uniform distribution over the bases of a matroid. When not working, he enjoys hiking and cooking.

Shachar Lovett of the University of California, San Diego, works broadly in theoretical computer science and related mathematics. He focuses on the study of structure and randomness, and how they are pivotal to our understanding of efficient computation. One facet of Lovett’s work is discovering the mathematical structures that underlie efficient computation, such as combinatorial structure in complexity theory, geometric structure in machine learning, and algebraic structure in coding theory. Another facet is understanding the power of randomness in computation. Structure and randomness can be seen as complementary, and Lovett’s work aims to identify the fracture lines between structure and randomness, toward a better understanding of computation. Lovett and his wife have three children and a dog. He enjoys martial arts and watching British murder mysteries with his daughter.

Gregory Valiant of Stanford University works at the intersection of algorithms, information theory, learning, and statistics to understand how to extract as much information as possible from data in various fundamental settings. What information can be inferred if the amount of data is sublinear in the support size or dimensionality of the distribution in question? How do restrictions on the amount of available memory affect the time or amount of data required to learn or optimize? Can we make learning and estimation algorithms robust to outlying training data or settings where the test and training sets are dissimilar? Valiant tells the Notices: “I’m a keen surfer and am terrible at puzzles.”

The Simons Investigators Program provides a stable base of support for outstanding scientists, enabling them to undertake long-term study of fundamental questions.

—From a Simons Foundation announcement

**Clay Research Awards Announced**

The Clay Mathematics Institute (CMI) has awarded Clay Research Fellowships for 2022 to the following three young researchers.

**John Pardon** of Princeton University was selected “in recognition of his wide-ranging and transformative work in geometry and topology, particularly his groundbreaking achievements in symplectic topology.” According to the prize citation, “Pardon’s work displays a remarkable clarity of vision, sustained through extensive projects in which he develops conceptually sophisticated theories that cast long-standing problems into settings where they become tractable. His novel treatment of the theory of the bulk-boundary correspondence for topological matter, both in equilibrium and in periodically driven systems. Levin tells the Notices that he has three children and enjoys hiking in his spare time.

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stabilization is performed by taking connected sums with an increasing number of copies of the product of two $n$-dimensional spheres. They explained how to compute the limiting homology in terms of a specific spectrum, and beyond their explicit results they developed an array of ideas that have stimulated waves of subsequent advances in the field. In a later series of papers with Alexander Kupers, Galatius and Randal-Williams pioneered an entirely new approach to homological stability results, developing the sophisticated and powerful theory of cellular $\mathcal{E}_n$ algebras. They proved the worth of their theory by settling long-standing conjectures in $K$-theory, by improving Quillen’s stability results for the homology of general linear groups over finite fields, and by establishing the first general results for the homology of mapping class groups of surfaces outside the stable range."

The CMI presents the Clay Research Award annually to recognize major breakthroughs in mathematical research.

—CMI announcement

SIAM Prizes Awarded

The Society for Industrial and Applied Mathematics (SIAM) has awarded a number of prizes for 2022 to the following mathematical scientists.

Enrique Zuazua of Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg was awarded the 2022 W. T. and Idalia Reid Prize for his "fundamental theoretical and computational contributions to the control, numerics and analysis of nonlinear PDEs and multiphysical systems with impactful scientific and industrial applications." Zuazua holds a dual PhD from the University of the Basque Country (1987) and the Université de Pierre et Marie Curie (1988). He was associate professor at the University of the Basque Country before becoming an associate professor in mathematical analysis at the Universidad Autónoma de Madrid (UAM). He holds the Alexander von Humboldt Professorship at FAU, is a professor of applied mathematics at UAM, and also holds a position at the Deusto Foundation in Bilbao, Basque Country, Spain. He tells the Notices: "I was born in Basque Country in a heavily industrialized town, but I spent my summers by the sea, in Lekeitio, a fisher village. The main spoken language there was, and still is nowadays, to a lesser extent, my mother tongue, Basque. There I could observe the strength and complex patterns that sea waves may develop." He enjoys learning German, biking, and sharing the values of his institution, FAU: "innovation, diversity, and passion." The Reid Prize carries a cash award of US$10,000.

Enrique Zuazua

Antti Kupiainen of the University of Helsinki, Rémi Rhodes of Université Aix-Marseille, and Vincent Vargas of École Normale Superieure were awarded the 2022 George Pólya Prize in Mathematics for a rigorous justification of the DOZZ (Dorn-Otto-Zamolodchikov-Zamolodchikov) formula for three-point structure constants in Liouville conformal field theory. Kupiainen received his PhD from Princeton University in 1979. He spent a postdoctoral year at Harvard University (1979–1980), did research at the University of Helsinki, then became professor of mathematics at Rutgers University (1989) and the University of Helsinki (1991). He has held a number of visiting professor and visiting scholar positions. He was an invited speaker at the International Congresses of Mathematicians in Kyoto (1990) and Hyderabad (2010). He was president of the International Association of Mathematical Physics from 2012 to 2014. Rhodes received his PhD in 2006 from the University of Provence and his Habilitation in 2012 from the University of Paris-Dauphine. He was professor at Université Paris-Est Créteil, Val de Marne, from 2014 to 2018, when he joined the University of Aix-Marseille. He was awarded the Bernoulli Prize of the Bernoulli Society in 2018. He tells the Notices that his main interests have always been mathematics and sports; he owns a motorbike; and his father educated him in the art of wine tasting. Vargas received his PhD in probability and statistical physics from Pierre and Marie Curie University in 2006. He worked as a consultant in the financial industry as well as in academia. He held positions at the Centre National de la Recherche Scientifique (CNRS) between 2007 and 2021, when he joined the University of Geneva. He was awarded the Prix M. Yor de l’Académie des Sciences in 2019. The Pólya Prize in Mathematics is awarded every four years and carries a cash award of US$10,000.

Antti Kupiainen

Rémi Rhodes

Vincent Vargas

Antti Kupiainen

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Vincent Vargas
Kristin Lauter of Meta AI Research and the University of Washington was named the 2022 I. E. Block Community Lecturer. She presented a lecture on “Artificial Intelligence and Cryptography: Privacy and Security in the AI Era” at the SIAM Annual Meeting in July 2022. Her research focuses on private AI, homomorphic encryption, and post-quantum cryptography. Lauter received her PhD in mathematics from the University of Chicago in 1996. From 1996 to 1999 she was an assistant professor at the University of Michigan. She worked as principal researcher and partner research manager of cryptography and privacy research at Microsoft Research for twenty-two years. She is a Fellow of the AMS, as well as of SIAM, the Association for Women in Mathematics (AWM), and the American Association for the Advancement of Science (AAAS). She is a former president of AWM, founder of Women in Numbers (WIN), and a recipient of the Selfridge Prize in Computational Number Theory (2008). Lauter has identical twin daughters who are both studying for PhDs in computer science. She enjoys soccer, sailing, and biking with her husband in her (scant) free time. She plays the viola and is learning to fiddle. The Block Lecture is intended to encourage public appreciation of the excitement and vitality of science.

Leah Keshet of the University of British Columbia was honored with the 2022 John von Neumann Prize “in recognition of her far-reaching contributions to mathematical biology. Her work on cellular biophysics as well as collective behavior of organisms has had enormous impact in deciphering biological processes. In addition, her book *Mathematical Models in Biology* is a classic that has been used by students worldwide and, in no small part, laid the foundation for interdisciplinary research in mathematics and life sciences that is flourishing today.” Keshet received her PhD in applied mathematics from the Weizmann Institute of Science in 1982 under Lee Segel. She held positions at Brown University and Duke University before joining the faculty at British Columbia. She is a recipient of the Krieger–Nelson Prize of the Canadian Mathematical Society (2003) and is a Fellow of SIAM. She and her husband have two sons who are software engineers, and they recently became grandparents. Her hobbies include gardening and audiobooks.

Michael J. Ward of the University of British Columbia was honored with the 2022 Julian Cole Lecturer “for his seminal and wide-ranging contributions to the development and application of singular perturbation methods effective in the analysis of spatially localized structures in nonlinear PDEs.” He received his PhD in 1988 from the California Institute of Technology. He has held positions at the IBM Thomas J. Watson Research Laboratory and Stanford University and was a visiting member at the Courant Institute of Mathematical Sciences, working under Peter Lax, before joining the faculty at British Columbia. He was a corecipient (with Nigel Higson) of the André Aisenstadt Prize of the Centre de Recherches Mathématiques (CRM) in 1995. He was awarded the Coxeter–James Prize of the Canadian Mathematical Society in 1998 and the Canadian Applied and Industrial Mathematics Society (CAIMS) Senior Research Prize in 2011. He enjoys adventure traveling with his family to explore off-the-beaten-path locations and to learn about other cultures. He likes reading both fiction and nonfiction, and he wishes he had invented Wordle.

Matthew J. Colbrook of the University of Cambridge received the 2022 Richard C. DiPrima Prize “for the high quality and mathematical innovation of his PhD dissertation on the computation of spectra in infinite dimensions.” Colbrook received his PhD in 2020 from the University of Cambridge. He became a junior research fellow at Trinity College in 2020 and spent the academic year 2021–2022 at the Centre Sciences des Données of Ecole Normale Supérieure before joining the University of Cambridge as an assistant professor. He received a Cecil King Travel Scholarship from the London Mathematical Society in 2020. In 2021 he received the Lighthill–Whitham Prize of the Institute of Mathematics and Its Applications (IMA) for his paper, “Diagonalising the infinite: How to compute spectra with error control.” He tells the Notices: “I play drums (mainly jazz and funk) in various bands. I have an interest in European medieval history.”

James Crowley of SIAM was honored with the 2022 SIAM Prize for Distinguished Service to the Profession “in recognition of his extraordinary dedication to promoting applied mathematics through his work with SIAM, AAAS, and ICIAM.” Crowley received an MS from Virginia Tech in 1972, and until 1977 he worked as a mathematician for the US Air Force. He became an associate professor at the US Air Force Academy in 1977. In 1981 he earned his PhD.
Prizes of the London Mathematical Society

The London Mathematical Society (LMS) has awarded prizes to the following mathematical scientists in 2022.

Sir John Ball, FRS, of Heriot-Watt University and the University of Oxford was awarded the De Morgan Medal for his multifaceted and deep contributions to mathematical research and the mathematical community over many years.

John Greenlees of the University of Warwick and Brooke Shipley of the University of Illinois at Chicago were awarded the Senior Berwick Prize for their paper “An algebraic model for rational torus-equivariant spectra,” published in the Journal of Topology in 2018.

Andrew Lobb of Durham University was awarded the Shephard Prize in recognition of his remarkable paper “The rectangular peg problem,” published in the Annals of Mathematics.

Richard Thomas of Imperial College London received the Fröhlich Prize for his extraordinary mastery and vision in creating and developing what has become known as the Donaldson–Thomas theory.

Asma Hassannezhad of the University of Bristol was awarded an Anne Bennett Prize for her outstanding work in spectral geometry and her substantial contributions toward the advancement of women in mathematics.

Jessica Fintzen of the University of Cambridge, Duke University, and Universität Bonn received a Whitehead Prize for her groundbreaking work in representation theory, in particular as it relates to number theory via the (local) Langlands program.

Ian Griffiths of Oxford University was awarded a Whitehead Prize for his many contributions and insights to a wide range of challenging questions in applied and industrial mathematics, which he has achieved using a combination of asymptotic analysis and numerical simulations, supplemented by outstanding physical understanding.

Dawid Kielak of the University of Oxford received a Whitehead Prize for his striking, original, and fundamental contributions to the fields of geometric group theory and low-dimensional topology, and in particular for his work on automorphism groups of discrete groups and fibrings of manifolds and groups.

Chunyi Li of the University of Warwick was awarded a Whitehead Prize for his deep contributions to a wide range of questions in algebraic geometry, in particular in the theory of stability conditions and moduli spaces.

Tadahiro Oh of the University of Edinburgh was awarded a Whitehead Prize for his contributions to the theory of dispersive PDEs, in particular to the understanding of their interaction with random data.

Kirwan Awarded Sylvester Medal

Frances Kirwan of the University of Oxford has been awarded the 2021 Sylvester Medal of the Royal Society of London “for her research on quotients in algebraic geometry, including links with symplectic geometry and topology, which has had many applications.” The prize citation states that she “conducts research in the field of pure mathematics, focusing on algebraic geometry. [She] studies geometric objects known as moduli spaces by investigating their algebraic and topological properties. Her work incorporates ideas from other areas of mathematics, as well as theoretical physics. She has made important contributions to geometric invariant theory, a method for constructing quotients in algebraic geometry. Frances has also striven to address gender imbalance in the mathematics community, as a member of the European Women in Mathematics network and the London Mathematical Society’s Women in Mathematics Committee.”

Kirwan received her PhD in 1984 from Oxford under the direction of Michael Atiyah. She has held a Junior Fellowship at Harvard University and a Fellowship at Magdalen College, Oxford, before becoming a Fellow of Balliol College, Oxford. She has received both the Whitehead (1989) and Senior Whitehead (2013) Prizes of the LMS. She served as President of the London Mathematical Society from 2003–2006. She has chaired the Council of the United Kingdom Mathematics Trust since 2010. She was elected a Fellow of the Royal Society in 2001 and a Fellow of the AMS in 2012. Kirwan tells the Notices that she has three children and two grandchildren, including a newborn granddaughter.

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Euan Spence of the University of Bath was awarded a Whitehead Prize for his profound contributions to the theoretical understanding and design of numerical algorithms for wave propagation and scattering at high frequency, particularly through the development and application of methods from the world of semiclassical analysis.  

—LMS announcement

European Girls’ Mathematical Olympiad

The team from the United States took first place in the European Girls’ Mathematical Olympiad, held in hybrid form, both virtually and in Eger, Hungary, from April 6–12, 2022. The US team consisted of Jessica Wan, fifteen, who had a perfect score of 42 and received a gold medal; Kaylee Ji, sixteen, with a score of 28 for a silver medal; Isabella Zhu, sixteen, with a score of 37 for a gold medal; and Vivian Loh, with a score of 33, for a gold medal. Their total team score was 140. Wan received the only perfect score in the competition. The team was led by Rachel Zhang, Oleksandr Rudenko, and Anna Kelemen. A team from Peru finished second, with a total of 130 points, and a team from Australia was third, with a total of 126 points.  

—Elaine Kehoe

Sloan Fellowships Announced

The Alfred P. Sloan Foundation has announced the recipients of its 2022 Research Fellowships. The following are the recipients in mathematics. They will each receive US$75,000, which can be used over two years for research expenses.

• Charlotte Chan, University of Michigan
• Yuxin Chen, University of Pennsylvania
• Lei Chen, University of Maryland, College Park
• Asaf Ferber, University of California, Irvine
• Chao Gao, University of Chicago
• Michael Groechenig, University of Toronto, Mississauga
• Daniel Halpern-Leistner, Cornell University
• Jingyin Huang, Ohio State University
• Ilya Kachkovskiy, Michigan State University
• Alexander Kupers, University of Toronto, Scarborough
• Yuchen Liu, Northwestern University
• Frederick R. W. M. Manners, University of California, San Diego
• Guido F. Montúfar, University of California, Los Angeles
• Connor R. Mooney, University of California, Irvine
• Jonathan Niles-Weed, New York University
• Lisa Sauermann, Massachusetts Institute of Technology
• Tatyana Shcherbina, University of Wisconsin, Madison
• Li-Cheng Tsai, Rutgers, The State University of New Jersey
• Ruixiang Zhang, University of California, Berkeley
• Andrew Zimmer, University of Wisconsin, Madison

—From a Sloan Foundation announcement

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Photo of Ivan Corwin is courtesy of Timothy Lee Photographers.
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Photo of Gregory Valiant is courtesy of Katie Rain.
Photo of John Pardon is courtesy of Denise Applewhite, Princeton University.
Photo of Oscar Randal-Williams is courtesy of Oscar Randal-Williams.
Photo of Enrique Zuazua is courtesy of Enrique Zuazua.