

Mathematics People

2021 Simons Investigators Announced

The Simons Foundation has named the Simons Foundation Investigators for 2021. Following are the new investigators whose work involves the mathematical sciences.

Mathematics

Guido De Philippis of New York University works in geometric measure theory, calculus of variations, and partial differential equations. His main interest is the understanding of regularity (or lack thereof) of solutions of geometric variational problems, ranging from minimal surfaces to free boundary problems. Recently, in collaboration with Filip Rindler, he obtained a fine description of the structure of the singular part of measures satisfying a linear partial differential equation (PDE) constraint. By suitably choosing the PDE constraint, the result allowed a number of open questions to be solved: extension of Alberti's rank-one theorem to the space of bounded deformation (BD) functions, converse of the Rademacher theorem, and structure of Lipschitz differentiability spaces.



June Huh

June Huh of Princeton University studies discrete objects using geometric methods. An unexpected relation between combinatorics and algebraic geometry found by Huh was used in his proof of Read's conjecture in graph theory. In recent works, he and his collaborators proposed a more general framework that tightens the connection between the two seemingly disparate fields. This led to proofs of several other long-standing problems in combinatorics, such as the ultra-log-concavity conjecture of Mason and the top-heavy conjecture of Dowling–Wilson.



Lin Lin

Lin Lin of the University of California, Berkeley, is an applied mathematician working in electronic structure theory. With collaborators, he has developed efficient, accurate,

and scalable algorithms in Kohn–Sham density functional theory, localization theory, many-body perturbation theory, and quantum embedding theory. Several new methods have been adopted by electronic structure software packages widely used in quantum chemistry, quantum physics, and materials science. Recently, Lin has contributed to neural network-based methods for accelerating molecular simulations, as well as quantum algorithms for solving high-dimensional linear algebra problems with applications to electronic structure calculations. When he is not doing mathematics, Lin enjoys biking.



Assaf Naor

Assaf Naor of Princeton University focuses his research on analysis and geometry in high dimensions, with emphasis on understanding the structure of metric spaces, including the extent to which they can be realized in “nicer” geometries. He harnesses such insights for a variety of applications in several areas of pure mathematics (analysis, geometry, probability, combinatorics, group theory) and also in order to chart the

possibilities and limitations of algorithms. Much of Naor's work makes progress on the long-standing Ribe program, which is a web of conjectures and analogies between linear and nonlinear geometries that is inspired by a classical rigidity theorem of Ribe.

Theoretical Computer Science

Maria Florina Balcan of Carnegie Mellon University conducts research that spans machine learning, algorithms, and algorithmic game theory. She introduced general techniques that helped put modern machine-learning paradigms on solid theoretical foundations, including learning from limited labeled data, distributed learning, noise-tolerant learning, and lifelong learning. She also provided fundamental contributions to the area of analysis of algorithms beyond the worst case by providing both new models of realistic (non-worst case) instances and general techniques for designing and analyzing algorithms derived in a data-driven fashion.

Amit Sahai of the University of California, Los Angeles, proposes fundamental new concepts in cryptography and

establishes new feasibility results. He is best known for his works proposing the notions of indistinguishability obfuscation and functional encryption and for his recent work establishing the feasibility of indistinguishability obfuscation and functional encryption for general computations based on well-studied hardness conjectures.

Thomas Vidick of the California Institute of Technology conducts research at the interface of theoretical computer science, quantum information, and cryptography. He is known for his work in the theory of quantum interactive proofs, including results on device-independent cryptography, certified randomness, and the complexity of quantum multiprover interactive proof systems. The study of quantum entanglement provides a unifying goal behind all these areas and a focal point for his current research.

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

Prizes of the Canadian Mathematical Society

The Canadian Mathematical Society (CMS) has announced several awards for 2021.



Anita Layton

Anita Layton of the University of Waterloo has been awarded the 2021 Krieger–Nelson Prize, which recognizes outstanding research by a female mathematician, “for her exceptional contributions to mathematical research with applications ranging from fluid dynamics to biology and medicine.” She received her PhD in computer science from the University of Toronto. She was a professor of mathematics at Duke

University before joining the faculty of Waterloo as a Canada 159 Research Chair in mathematical biology and medicine. According to the prize citation, she “has been recognized as a distinguished figure in the applied mathematics research at the interface of mathematical computation and biomedical sciences with direct impact in clinical health care.” Her work involves computational fluid dynamics as well as mathematical biology. Anita met this cute llama during her trip to Ecuador a year and half ago; she looks forward to traveling again when the pandemic is over. Besides making friends with adorable animals on fun trips, Anita also enjoys EvenQuads with the playing cards created by the Association for Women in Mathematics,

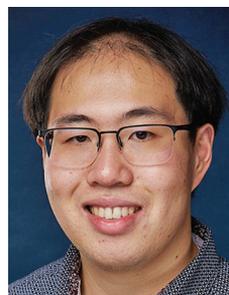
which feature sixty-three notable women in mathematics, as well as Anita.



Kseniya Garaschuk

Kseniya Garaschuk of the University of the Fraser Valley was honored with the 2021 Graham Wright Award for Distinguished Service. The award recognizes individuals who have made sustained and significant contributions to the Canadian mathematical community and, in particular, to the CMS. Garaschuk received her PhD from the University of Victoria in 2014, and her contributions to

the Canadian mathematical community and to CMS cover her student and postdoctoral years. She has been associate editor on the *A-Taste-Of-Mathematics* Editorial Board (2016–2020) and has been on the *CMS Notes* Editorial Board since 2018 and on the CMS Education Committee since 2014, participating in many award selection committees. She is the editor in chief of the journal *Crux Mathematicorum*. As a graduate student she organized and ran annual CMS Math Camps and founded several student initiatives. She was a lead organizer of a community-building event that explores Indigenous ways of learning and knowing with connections to mathematics and also of the CMS COVID-19 Research and Education Meeting in 2020. She tells the *Notices*: “I have a five-year old daughter; we love painting and gardening together. I thoroughly enjoy morning walks by the water with my Airedale. I read many historical books. I indulge in sewing, knitting and embroidery to honor the handcrafts and carry forward the traditions of my Belarusian grandmothers.”



Christopher Liaw

Christopher Liaw of the University of Toronto was awarded the 2021 Blair Spearman Doctoral Prize. His dissertation addresses two important problems in theoretical machine learning. He completed his PhD at the University of British Columbia in 2020 under the supervision of Nicholas Harvey. He is currently a postdoctoral fellow at Toronto. The prize recognizes outstanding performance by a doctoral student.

—From CMS announcements

SIAM Prizes Awarded

The Society for Industrial and Applied Mathematics (SIAM) and its Activity Groups have awarded a number of prizes for 2021.



Nicholas Higham

Nicholas Higham of the University of Manchester was awarded the George Pólya Prize for Mathematical Exposition for outstanding exposition in the mathematical sciences. He received his PhD in 1985 from the University of Manchester under the supervision of George Hall. He became an appointed lecturer at Manchester in 1985 and has been Richardson Professor of Applied Mathematics since 1998. He was a visiting professor at Cornell University in 1988–1989. He is a Fellow of the Royal Society and of the Association for Computing Machinery, and he blogs about mathematics at <https://nhigham.com/blog/>. The Pólya Prize carries a cash award of US\$10,000.



Jonathan Mattingly

Jonathan Mattingly of Duke University was named the I. E. Block Community Lecturer. The lecture is intended to encourage public appreciation of the excitement and vitality of science. Mattingly received his PhD in applied and computational mathematics from Princeton University in 1998. He served on the faculty of Stanford University and as a member of the Institute for Advanced Study before joining Duke in 2003. His research involves the longtime behavior of stochastic systems including randomly forced fluid dynamics, turbulence, stochastic algorithms used in molecular dynamics and Bayesian sampling, and stochasticity in biochemical networks. He has been the recipient of a PECASE CAREER Award and is a Fellow of the AMS. He tells the *Notices*: “I enjoy cooking and playing soccer. When I was three years old, I spoke Turkish better than English.”



Stefan Güttel

Stefan Güttel of the University of Manchester received the 2021 James H. Wilkinson Prize for Numerical Analysis and Scientific Computing “for his contributions to the analysis, implementation, and application of rational and block Krylov methods.” He received his PhD in 2010 from the Technical University of Bergakademie Freiberg. He has held postdoctoral positions at the University of Geneva

and the University of Oxford and is a Fellow of the Turing Institute. He is an associate editor of the *SIAM Journal on Scientific Computing* and of the *Electronic Transactions on Numerical Analysis*. He is professor of applied mathematics at Manchester. He enjoys traveling with his family and playing the bass guitar in a rock band. The Wilkinson Prize is awarded every four years to early-career researchers for research in or other contributions to numerical analysis and scientific computing during the six years preceding the award year and carries a cash award of US\$2,000.



Thomas J. R. Hughes

Thomas J. R. Hughes of the University of Texas at Austin was awarded the Ralph E. Kleinman Prize for his research and contributions in the areas of computational mechanics, isogeometric analysis, stabilized and variational multiscale methods, phase-field modeling, cardiovascular bioengineering, complex fluids, and turbulence. He received his PhD from the University of California, Berkeley, and held faculty positions at Berkeley, the California Institute of Technology, and Stanford University before joining the faculty at Austin in 2002. He currently holds the Peter O’Donnell Jr. Chair in Computational and Applied Mathematics and is leader of the ICES Computational Mechanics Group. He tells the *Notices*: “My life is dominated by family activities. I have a great wife, three wonderful adult children, all married, and six fantastic grandchildren, and many nice friends, within and without mathematics. I like great food and wine, travel, exercise, primarily in my home gym (Texas is hot!), and I am a sports fan. I like all sports but have a soft spot in my heart for the beautiful game [soccer]. My sense of humor is legendary. Everyone thinks I am very funny ... well, almost everyone. According to my wife, the jury is still out.” The Kleinman Prize carries a cash award of approximately US\$5,000.



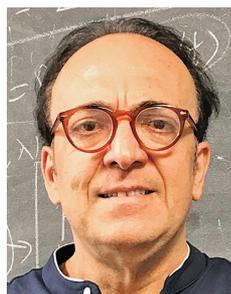
Karl Kunisch

Karl Kunisch of the University of Graz, Austria, received the W. T. and Idalia Reid Prize for Research for work in differential equations and control theory. He received his PhD and Habilitation degrees in 1978 and 1980, respectively, from the Technical University of Graz. He has held numerous positions, including as visiting assistant, associate, and full professor at Brown University between the years 1979 and 1989 and as visiting associate professor at the University of Oklahoma (1982–1983). He was also a consultant at the Institute for Computer Applications in Science and Engineering at NASA Langley, Virginia (1985–1987), and

held visiting positions at INRIA Rocquencourt and the Université Paris Dauphine. He became professor of mathematics at the Technical University of Graz in 1986. He spent the years 1993 to 1996 at the Technical University of Berlin before returning to Graz as full professor of mathematics. He was elected a Fellow of SIAM in 2017. He is an editor of the *SIAM Journal on Numerical Analysis*, the *SIAM Journal on Control and Optimization*, the *Journal of the European Mathematical Society*, and *Computational and Applied Mathematics*, among others. The Reid Prize carries a cash award of US\$10,000.

Assefaw H. Gebremedhin of Washington State University, **Fredrik Manne** of the University of Bergen, Norway, and **Alex Pothen**, Purdue University, were awarded the Pólya Prize in Applied Combinatorics for their work on “efficient graph coloring algorithms and codes with applications to Jacobian and Hessian matrix computations.” The Pólya Prize is awarded every four years for a notable application of combinatorial theory. It carries a cash award of US\$10,000.

Deborah Lockhart of the National Science Foundation was honored for Distinguished Service to the Profession for her contributions to the furtherance of applied mathematics on the national or international level. She received her PhD in continuum mechanics from Rensselaer Polytechnic Institute. She held positions at the State University of New York Geneseo and Michigan Technological University before joining the NSF in 1988. She held positions in three NSF directorates: Mathematics and Physical Sciences (MPS), Computer and Information Sciences and Engineering (CISE), and Education and Human Resources (EHR). She was both program director and deputy division director in the Division of Mathematical Sciences (DMS/MPS) and deputy division director in the Division of Information and Intelligent Systems (CISE). She was appointed deputy assistant director of MPS in 2016. She was elected to the inaugural class of Fellows of the AMS in 2013.



George Karniadakis

George Karniadakis of Brown University was awarded the 2021 SIAM/ACM Prize in Computer Science and Engineering “for advancing spectral elements, reduced-order modeling, uncertainty quantification, dissipative particle dynamics, fractional PDEs, and scientific machine learning, while pushing applications to extreme computational scales and mentoring many leaders.”

The prize is awarded every two years for outstanding contributions to the development and use of mathematical and computational tools and methods in science and engineering problems. Karniadakis received his PhD in 1987 from the Massachusetts Institute of Technology. He subsequently held positions at the Massachusetts

Institute of Technology, Stanford University, and Princeton University before joining the faculty at Brown in 1994. He was visiting professor at the California Institute of Technology (1993) and has been a visiting professor and senior lecturer in ocean/mechanical engineering at MIT since 2000. He has twice been visiting professor at Peking University (2007, 2013). He was the recipient of the SIAM Ralph E. Kleinman Prize in 2015. He is a Fellow of the American Society of Mechanical Engineers, the American Physical Society, and SIAM.



Paris Perdikaris

Paris Perdikaris of the University of Pennsylvania was awarded the SIAM Activity Group on Computational Science and Engineering Early Career Prize for his work on machine learning using Gaussian processes and neural networks, “which has set the foundation for a new paradigm in data-driven and physics-informed scientific computing.” He received his PhD in applied mathematics from Brown University in 2015 and

was a postdoctoral research associate at the Massachusetts Institute of Technology from 2015 to 2017, when he joined the faculty at Penn. He tells the *Notices*: “Growing up in Greece, I’m a big fan of the ocean and water sports (mostly swimming and sailing). In fact, my undergraduate degree is not in mathematics, but in ocean engineering! More recently, I’ve been torturing my tennis racquet as an attempt to stay active during the pandemic.” The prize is given every two years to an early-career researcher in the field of computational science and engineering for outstanding, influential, and potentially long-lasting contributions to the field.

Ventakaramanan Balakrishnan of Case Western Reserve University, **James Vogel** of Systems and Technology Research, Boston, **Jianlin Xia** of Purdue University, and **Stephen Cauley** of Harvard Medical School and the Massachusetts General Hospital are the recipients of the 2021 SIAM Activity Group on Computational Science and Engineering Best Paper Prize for “Superfast divide-and-conquer method and perturbation analysis for structured eigenvalue solutions,” *SIAM Journal on Scientific Computing* **38** (2016), no. 3. According to the prize citation, they were honored “for their impressive work which reduces the computational complexity of a whole eigendecomposition of Hermitian matrices from cubic to loglinear by utilizing the hierarchical semi-separable structure.”

—From SIAM announcements

ACM Awards Announced

The Association for Computing Machinery (ACM) has announced several awards for 2020.



Alfred V. Aho

Alfred V. Aho of Columbia University and **Jeffrey D. Ullman** of Stanford University are the recipients of the 2020 A. M. Turing Award, given for major contributions of lasting importance to computing. They were honored for “fundamental algorithms and theory underlying programming language implementation and for synthesizing these results and those of others in their highly influential books, which edu-

cated generations of computer scientists.” Aho earned his PhD in electrical engineering and computer science from Princeton University. He held positions at Bell Laboratories and Bellcore (now Telcordia) before joining the Columbia faculty. He is a past recipient of the IEEE John von Neumann Medal. He is a Fellow of the Royal Society of Canada and of the American Association for the Advancement of Science and the ACM. He enjoys bridge and golf and plays the violin in a string quartet. Ullman received his PhD in 1966 from Princeton University. He was a member of the technical staff at Bell Laboratories from 1966 to 1969, when he joined the Stanford faculty. Since 2003 he has been chief executive officer of Gradiance Corporation in Stanford, California. His honors include the Knuth Prize (2000) and the von Neumann Medal of the IEEE (2010). He was elected to the American Academy of Arts and Sciences in 2012 and to the National Academy of Sciences in 2020. The prize recipients will split the cash award of US\$1 million.



Scott Aaronson

Scott Aaronson of the University of Texas at Austin was awarded the 2020 ACM Prize in Computing “for groundbreaking contributions to quantum computing.” He “showed how results from computational complexity theory can provide new insights into the laws of quantum physics, and brought clarity to what quantum computers will, and will not, be able to do.” With Avi Wig-

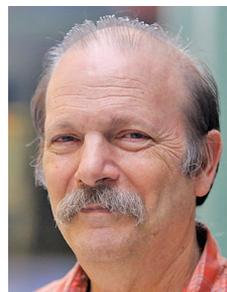
derson, he invented the technique of “algebrization” to understand the limits of algebraic techniques for separating and collapsing complexity classes. Aaronson received his PhD from the University of California, Berkeley, in 2004. He held postdoctoral positions at the Institute for Advanced Study and the University of Waterloo and served on the faculty at the Massachusetts Institute of Technology from 2007 to 2016, when he joined

the faculty at Texas. He was a corecipient of the Alan T. Waterman Award in 2012. He was named a Simons Investigator in 2017 and elected a Fellow of the ACM in 2019. Aaronson tells the *Notices*: “Ping-Pong is the only sport that I’m not terrible at. I get *much* more nervous and flustered ordering at a drive-thru than giving a lecture to a packed auditorium.” The prize carries a cash award of US\$250,000.



Hector Levesque

Hector Levesque of the University of Toronto and **Moshe Vardi** of Rice University are the recipients of the ACM-AAAI Allen Newell Award. Levesque was recognized for “fundamental contributions to knowledge representation and reasoning, and their broader influence within theoretical computer science, databases, robotics, and the study of Boolean satisfiability.” Vardi was honored for “contributions to the development of logic as a unifying foundational framework and a tool for modeling computational systems.” Levesque received his PhD in 1981 from the University of Toronto. He held a position at the Fairchild Laboratory for Artificial Intelligence Research in Palo Alto, California, before joining the University of Toronto in 1984, from which he retired in 2014. He is a founding Fellow of the Amer-



Moshe Vardi

ican Association of Artificial Intelligence (AAAI) and is the recipient of several of its best-paper awards. He was elected to the Royal Society of Canada in 2006 and to the American Association for the Advancement of Science in 2011. He received the Lifetime Achievement Award of the Canadian Artificial Intelligence Association in 2012. He serves on editorial boards of several journals. Vardi received his PhD from Hebrew University of Jerusalem in 1981. He held a position at the IBM Almaden Research Center before joining the faculty at Rice in 1993. His honors include the 2000 Gödel Prize, the 2005 ACM Kanellakis Award for Theory and Practice, the 2021 Knuth Prize, and the ACM Presidential Award in both 2008 and 2017. He is a Fellow of the AMS, the American Association for the Advancement of Science, the Association for Computing Machinery, the Institute for Electrical and Electronic Engineers, and the Society for Industrial and Applied Mathematics, among others. He is a member of the National Academy of Science and the American Academy of Arts and Sciences. The Newell Award is presented by the ACM and the Association for the Advancement of Artificial Intelligence (AAAI) for career contributions that have breadth within computer science or that bridge computer science and other disciplines. It carries a cash award of US\$10,000.

The 2020 Paris Kanellakis Theory and Practice Award was given to **Yossi Azar** of Tel Aviv University, **Andrei Broder** of Google Research, **Anna Karlin** of the University of Washington, **Michael Mitzenmacher** of Harvard University, and **Eli Upfal** of Brown University. They were honored “for the discovery and analysis of balanced allocations, known as the power of two choices, and their extensive applications to practice.” The prize carries a cash award of US\$10,000 and honors specific theoretical accomplishments that have had a significant and demonstrable effect on the practice of computing.

—From ACM announcements

CAIMS Prizes 2021

The Canadian Applied and Industrial Mathematics Society (CAIMS) has awarded the following prizes for 2021.

Nilima Nigam of Simon Fraser University received the 2021 CAIMS-Fields Industrial Mathematics Prize “in recognition of her many broad-ranging contributions to the discipline of industrial mathematics. Her recent interdisciplinary research is groundbreaking and demonstrates how theoretical results can have a major impact on the development of new mathematical models. Dr. Nigam has also provided outstanding national leadership as a vocal, effective and selfless advocate for the industrial mathematics community.” Nigam received her PhD in 1999 from the University of Delaware. She held a postdoctoral position at the University of Minnesota and a faculty position at McGill University before joining Simon Fraser University.

James Colliander of the University of British Columbia was recognized with the Arthur Beaumont Distinguished Service Award for his “outstanding service to applied and industrial mathematics at many levels in Canada.” He has been director of the Pacific Institute for Mathematical Sciences (PIMS) since 2016. He developed Syzygy, a cloud-hosted platform used by universities in Canada and the United States. Based on this, Callysto was developed for school grades five through twelve and is now widely used in classrooms, as well as Jupyter, which is used by faculty and students to share research work. The prize citation states: “His efforts have resulted in a better computational infrastructure for applied and industrial mathematicians in Canada, as well as increased access to computational resources for educators at all levels, from K–12 to post-secondary.” Colliander received his PhD in 1997 from the University of Illinois. He has also served as a postdoctoral scholar at the University of California, Berkeley, and on the faculty of the University of Toronto.

Brendan Pass of the University of Alberta was awarded the 2021 CAIMS/PIMS Early Career Award “in recognition of his contributions to the study of optimal transport

problems. In particular, Dr. Pass has worked on multi-marginal optimal transport problems, Wasserstein barycenters, and optimal transportation between unequal dimensions. These problems have many applications, including in economics, physics, and quantum chemistry.” Pass received his PhD from the University of Toronto in 2011.

David Earn of McMaster University received the 2021 Research Prize “in recognition of his outstanding contributions to the mathematical epidemiology of infectious diseases. His work and digitization efforts have had and will continue to have incredible impact in epidemiology, applied mathematics, and beyond.” Earn received his PhD in 1993 from the University of Cambridge Institute of Astronomy. He held postdoctoral fellowships at the Hebrew University of Jerusalem, the University of Cambridge, and Princeton University before joining the McMaster faculty.

—From CAIMS announcements

Credits

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