

# Mathematics People

## Español Awarded Karen EDGE Fellowship



Malena Español

**Malena Español** of Arizona State University has been chosen the recipient of the 2022 Karen EDGE Fellowship. The Fellowship Program was established with a generous gift from Karen Uhlenbeck on the occasion of her 2019 Abel Prize.

According to the prize citation, Español “studies the development, analysis, and application of mathematical models and numerical methods for solving problems arising in science and engineering. Her research has been at the intersection of many different mathematical areas and is highly interdisciplinary, involving collaborations with engineers, chemists, and medical doctors. Her work has been focused on problems related to materials science, signal/image processing, and medical diagnostics. Some of her most recent projects involve the development of numerical methods for solving inverse problems in imaging.” Español received her PhD from Tufts University in 2009 under the direction of Misha E. Kilmer. She held a postdoctoral position at the California Institute of Technology (2009–2012) and joint positions in the Departments of Mathematics and of Mechanical Engineering at the University of Akron (2012–2019). She joined the faculty at Arizona State in 2019. The Fellowship will allow her to work with collaborators and experts in inverse problems and imaging, to travel to conferences to present her work, and to bring bilingual speakers to the University of Arizona. She is a member of the AMS, the Society for Industrial and Applied Mathematics (SIAM), the Mathematical Association of America (MAA), the Association for Women in Mathematics (AWM), and the US Association for Computational Mechanics (USACM). When she is not doing math, she enjoys playing with her husband, Agustin, and their son, Sebastian.

The Karen EDGE Fellowships are designed to support and enhance the research programs and collaborations of midcareer mathematicians who are members of an underrepresented minority group. The 2022 Fellow was

selected on the basis of her excellent research programs and her plans to use the funds for enhancing those programs through collaboration and travel.

—From an EDGE Foundation announcement

## Witt Awarded Michler Prize



Emily E. Witt

**Emily E. Witt** of the University of Kansas has been named the recipient of the 2022–2023 Ruth I. Michler Memorial Prize of the Association for Women in Mathematics (AWM) for her research accomplishments in commutative algebra. The citation reads: “Her results on local cohomology modules based on applications of invariant theory have been groundbreaking, striking, and unexpected. Her techniques are innovative

and broadly applicable. Witt will use the award to pursue a research project at the intersection of commutative algebra, algebraic geometry, and singularity theory. The project's title, ‘Invariants of singular plane curves,’ is a tribute to the paper with the same title published by Ruth I. Michler posthumously.”

Witt received her PhD from the University of Michigan in 2011. She was a postdoctoral fellow at the Mathematical Sciences Research Institute (MSRI) and held faculty positions at the University of Minnesota and the University of Utah before joining the faculty at Kansas in 2015, where she is an associate professor and Keeler Intra-University Professor. She has been the recipient of several National Science Foundation grants, including a CAREER Award for 2020–2025, a Simons Foundation Collaboration Grant, a Structured Quartet Research Ensemble (SQuARE) Collaboration Award from the American Institute of Mathematics, and an AMS Mathematical Research Communities Collaboration Grant. She has received several awards from the University of Kansas for research and teaching. She is involved in programs that address diversity and inclusion. At Cornell, Witt plans to work with experts in commutative algebra such as Irena Peeva and Mike Stillman. Witt

enjoys running with her husband Daniel Hernández, also a mathematician, and their rescue dog, Lucky. She is a weight lifter, a vegetarian, and bicyclist and enjoys learning how to fix things. She loves music and was a deejay as a student at the University of Chicago.

The Michler Prize grants a midcareer mathematician a residential fellowship in the Cornell University Mathematics Department without teaching obligations.

—From an AWM announcement

## Graves Awarded PIMS Education Prize



Sean Graves

**Sean Graves** of the University of Alberta has been chosen to receive the 2022 PIMS Education Prize of the Pacific Institute for the Mathematical Sciences (PIMS). He was honored for “his energy and enthusiasm towards teaching, and the impact of his work developing mathematical talent through outreach.” Graves has been a faculty lecturer since 2011. He received the William Hardy Alexander

Award for Excellence in Undergraduate Teaching in 2017, and he developed a course focused on mathematical reasoning for elementary teachers. He has also been the lead organizer for the University of Alberta’s SNAP Math Fairs each year since 2007 and a coorganizer of the Canadian Mathematical Society’s Alberta Math Summer Camp for students ages 12–15 years. He also serves as coordinator of the university’s Decima Robinson Support Centre, which provides help for undergraduates with their course work. In his free time, Graves enjoys camping, fishing, and juggling.

The PIMS Education Prize is awarded to members of the PIMS community who have made a significant contribution to education in the mathematical sciences and who have played a major role in enhancing public awareness and appreciation of the mathematical sciences, as well as fostering communication among various groups and organizations concerned with mathematical training at all levels.

—From a PIMS announcement

## Bulatov Awarded Morawetz Prize

**Andrei A. Bulatov** of Simon Fraser University has been awarded the 2022 Cathleen Synge Morawetz Prize of the

Canadian Mathematical Society (CMS) for his sequence of work on algorithms and complexity groups. He was honored particularly for the following publications:

- Andrei A. Bulatov and Víctor Dalmau, “Towards a dichotomy theorem for the counting constraint satisfaction problem,” *Information and Computation* 205 (2007), no. 5
- Andrei A. Bulatov and Martin Grohe, “The complexity of partition functions,” *Theoretical Computer Science* 348 (2005), nos. 2–3
- Andrei A. Bulatov, “The complexity of the counting constraint satisfaction problem,” *Journal of the Association for Computing Machinery* 60 (2013), no. 55.

According to the prize citation, he “has made fundamental and pioneering contributions to the theoretical foundations of computation, especially on the constraint satisfaction problem (CSP), a standard benchmark problem for emerging approaches in computing science.”

Bulatov received his PhD in 1995 and Habilitation in 2008 from the Ural State University. He served as associate professor at Ural State and a research officer at the University of Oxford before joining the faculty at Simon Fraser University in 2004. He has presented his work at the International Congress of Mathematicians in 2014 and the International Colloquium on Automata, Languages, and Programming in 2021, among others. He has received numerous best-paper awards, including the 2021 Gödel Prize for the *Journal of the ACM* paper, and is an editor for several journals in his field.

The Morawetz Prize is awarded for an outstanding research publication or series of closely related publications. The 2022 prize was awarded in the fields of combinatorics, discrete mathematics, logic and foundations, and mathematical aspects of computer science.

—From a CMS announcement

## 2022 Gödel Prize Awarded

The 2022 Gödel Prize has been awarded jointly to **Zvika Brakerski** of the Weizmann Institute of Science, **Vinod Vaikuntanathan** of the Massachusetts Institute of Technology, and **Craig Gentry** of TripleBlind for the following papers:

- Zvika Brakerski and Vinod Vaikuntanathan, “Efficient fully homomorphic encryption from (standard) LWE,” *SIAM Journal of Computing* 43 (2014), no. 2.
- Zvika Brakerski, Craig Gentry, and Vinod Vaikuntanathan, “(Leveled) fully homomorphic encryption without bootstrapping,” *ACM Transactions on Computation Theory* 6(2014), no. 3.

The citation reads as follows: “The above papers made transformative contributions to cryptography by constructing efficient fully homomorphic encryption (FHE)

schemes. In an FHE scheme, data is securely encrypted as in a standard encryption scheme. In addition, FHE provides capability to compute on the encrypted data and generate encrypted results, without decrypting or requiring any secret key. Such capability unlocks a vast array of applications that let us securely outsource expensive computations to untrusted servers, and securely perform collaborative computations among multiple entities. The notion of fully homomorphic encryption was conceived (as ‘privacy homomorphisms’) in work by Rivest, Adleman, and Dertouzos in 1978. Constructing an FHE scheme which enables arbitrary computations on encrypted data, however, remained an open question for the following three decades.

“Prior to these papers, one of the authors, Craig Gentry, had presented (in proceedings form only) a construction of FHE in 2009. That groundbreaking contribution had great promise, but also some limitations, regarding both efficiency and the nature of the security guarantees. The above papers presented entirely new constructions of fully homomorphic encryption whose security relied only on the hardness of Regev’s learning with errors (LWE) problem. They have led to a new generation of practically efficient FHE. These papers have had enormous impact on both theoretical and applied research, ranging from the constructions of advanced cryptographic primitives, via worst-case to average-case reductions, to FHE implementation, and the design of post-quantum encryption candidates.”

The Gödel Prize is named in honor of Kurt Gödel, who was born in Austria-Hungary (now the Czech Republic) in 1906. Gödel’s work has had immense impact upon scientific and philosophical thinking in the twentieth century. The award recognizes his major contributions to mathematical logic and the foundations of computer science.

—From a Gödel Prize announcement

## Alexanderson Award Announced

**Jan H. Bruinier** of the Technische Universität Darmstadt, **Benjamin Howard** of Boston College, **Stephen S. Kudla** of the University of Toronto, **Michael Rapoport** of the University of Bonn, and **Tonghai Yang** of the University of Wisconsin, Madison, have been named the recipients of the 2022 Gerald Alexanderson Award for their paper “Modularity of generating series of divisors on unitary Shimura varieties,” *Asterisque* 421 (2020). The award recognizes the best paper from an American Institute of Mathematics (AIM) workshop or Structured Quartet Research Ensemble (SQuaRE) in the preceding three years.

—Elaine Kehoe

## Davidova Awarded Artin Prize

**Diana Davidova** of the University of Bergen has been awarded the 2022 Emil Artin Junior Prize in Mathematics. She was honored for her paper (with Lilya Budaghyan, Claude Carlet, Tor Hellesest, Ferdinand Ihringer, and Tim Penttila) “Relation between o-equivalence and EA-equivalence for Niho bent functions,” *Finite Fields and Their Applications* 72 (2021). The Emil Artin Junior Prize in Mathematics is awarded under the auspices of the Armenian Mathematical Union, carries a cash award of US\$1,400, and is presented usually every year to a student or former student of an Armenian educational institution under the age of thirty-five for outstanding contributions to algebra, geometry, topology, and number theory, the fields in which Emil Artin made major contributions. The prize committee consisted of A. Basmajian, Y. Movsisyan, and V. Pambuccian.

—Victor Pambuccian

## Marshall Scholars Announced

Three young scholars whose work involves the mathematical sciences have been awarded Marshall Scholarships for 2022. The scholarships provide support for young scholars of high ability to study in the United Kingdom. **Samuel Brody** of the U.S. Air Force Academy majored in aeronautical engineering and applied mathematics. As a cadet, he researched numerical methods applied to the Navier–Stokes equations, developing a novel preconditioned conjugate gradient method. He is pursuing an MSc in aeronautical engineering at the University of Oxford.

**Nicolas “Cole” Graber-Mitchell** graduated from Amherst College with a degree in mathematics and law, jurisprudence, and social thought. He has organized with progressive nonprofits and campaigns. He has collaborated on multiple peer-reviewed published works, including a book on the trajectory of lethal injection since the 1970s. He will study community building in the Middle East at Oxford University.

**Andrew McDonald** of Michigan State University earned undergraduate degrees in computer science, advanced mathematics, and statistics as an Alumni Distinguished Scholar and Goldwater Scholar. He has collaborated in developing algorithms for multirobot systems tasked with

environmental sensing and monitoring, and modeling meteorological extremes with deep learning.

—From a Marshall Scholarship announcement

## Regeneron International Science and Engineering Fair (ISEF) Science Talent Search

The International Science and Engineering Fair (ISEF) was held both in person and virtually in May 2022 with sponsorship from Regeneron Pharmaceuticals and the Society for Science. The following young scientists in the ninth through twelfth grades were awarded prizes in the mathematics category.

The First Award in Mathematics of US\$5,000 was earned by **Akilan Sankaran** of Albuquerque Academy, Albuquerque, New Mexico, for the project “Modifying the ABCs of number theory.”

Second Awards of US\$2,000 were presented to **Jiahui Li**, Emma Willard School, Troy, New York, for “From the Manhattan Project to statistics of zeros of  $L$ -functions” and to **Shirley Xu** of The Bishop’s School, La Jolla, California, for “A heuristic solution to the closest string problem using wave function collapse techniques.”

Third Awards of US\$1,000 went to **Daniel Salkinder**, Half Hollow Hills High School East, Dix Hills, New York, for “ $N \times n \times n$  Rubik’s cubes and God’s number”; to **Donald Liveoak**, Allen Park High School, Allen Park, Michigan, for “Schrodinger bridges on discrete domains”; and to **Ram Goel**, Krishna Homeschool, Portland, Oregon, for “Products of reflections in smooth Bruhat intervals.”

Four young mathematicians received Fourth Awards of US\$500: **Edward Garth**, Redeemer Baptist School, New South Wales, Australia, for “Validating a predictive mathematical modelling paradigm for travelling from Point A to Point B”; **Sarth Chavan**, Aditya English Medium School, Maharashtra, India, for “On Ramanujan’s identity for odd zeta values and its generalization”; **Yavuz Yurduseven**, Amasya Sehit Ferhat Unelli Bilim ve Sanat Merkezi, Turkey, for “A circular approach to the broken pick-up sticks problem”; and **Sophie Zhu**, Williamsville East High School, East Amherst, New York, for “Factorizations in evaluation monoids of Laurent semirings.”

A number of special awards were also given at ISEF. Mu Alpha Theta, the National High School and Two-Year College Mathematics Honor Society, honored six students in the Mathematics category. First Awards of US\$1,500 were presented to **Niranjana Baskaran**, Gateway International School, Chennai, Tamil Nadu, India, for “On worker-optimal matchings in many-to-many markets with

indifferences,” and to **Shirley Xu**, The Bishop’s School, La Jolla, California, for “A heuristic solution to the closest string problem using wave function collapse techniques.” Second Awards of US\$1,000 were given to **Emilie Morgan Steinberg**, Dr. Michael M. Krop Senior High School, Aventura, Florida, for “Utilizing convergence tests and complex analysis to redefine the provability of the partition formula”; to **Chia-Wei Lu** and **Ming-Te Hong**, both of the Affiliated Senior High School of National Taiwan Normal University, Taipei City, Taiwan, for “Farey sequences and Ford spheres in higher dimensions”; and to **Sanuja Dilanka Manage**, College Park High School, Conroe, Texas, for “Random forest to predict dengue cases and outbreaks.”

The Air Force Research Laboratory, on behalf of the U.S. Air Force, awarded a US\$750 prize to **Sanuja Dilanka Manage**, College Park High School, Conroe, Texas, for “Random forest to predict dengue cases and outbreaks.”

The American Statistical Association awarded an Honorable Mention to **Lucas Gutman**, iPrep Academy North, Miami, Florida, for “LD-based mapping by cluster analysis of the GWAS to determine a single variant most associated with Alzheimer’s disease.”

The Central Intelligence Agency presented a US\$1,000 First Award to **Emilie Morgan Steinberg**, Dr. Michael M. Krop Senior High School, Aventura, Florida, for “Utilizing convergence tests and complex analysis to redefine the provability of the partition formula.”

The National Security Agency presented the following mathematics awards. **Morgan Arthur Holien**, Monarch High School, Superior, Colorado, was awarded first place for “Attempting to define tetration of non-integer heights.” Second place went to **Donald James Liveoak**, Allen Park High School, Allen Park, Michigan, for “Schrodinger bridges on discrete domains.” Third place was awarded to **Meryl Zhang**, R. C. Clark High School, Plano, Texas, for “Fast and furious: Designing an ultra-efficient hybrid matrix multiplication algorithm.”

The University of Arizona awards scholarships to outstanding awardees who have demonstrated robust research for the greater good of society. The 2022 Renewal Tuition Scholarship was awarded to **Iliyas Bashir Noman**, Sofia High School of Mathematics, Sofia, Bulgaria, for “Minimal number of monochromatic edges in bicolored graphs.”

—From a Society for Science announcement

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