Mathematics People

Liu and Thorne Awarded SASTRA Ramanujan Prize

Yifeng Liu

Jack Thorne

YIFENG LIU of Yale University and JACK THORNE of Cambridge University have been named the recipients of the 2018 SASTRA Ramanujan Prize. The prize citation for Liu reads as follows: "Yifeng Liu is awarded the 2018 SASTRA Ramanujan Prize for his many spectacular contributions to arithmetic geometry and number theory. The prize recognizes his marvelous 2012 PhD thesis at Columbia University entitled 'Arithmetic Inner Product Formula for Unitary Groups,' which includes his fundamental work on arithmetic theta lifting and L-derivatives that appeared in two substantial papers in *Algebra and Number Theory* in 2011. The prize also recognizes his subsequent three papers pertaining to Bessel and Fourier-Jacobi models that appeared in *Journal of Functional Analysis* in 2013 (coauthored with Binyong Sun), *Manuscripta Mathematica* in 2014, and *Crelle's Journal [Journal for Pure and Applied Mathematics]* in 2016, in which he made major progress on the Gan-Gross-Prasad conjectures in the representation theory of classical groups. The prize also notes that in his 2018 paper in the *Duke Mathematics Journal* (coauthored with Shouwu Zhang and Wei Zhang), important p-adic versions of theorems of Waldspurger and Gross-Zagier are established, generalizing earlier fundamental work of Bertolini, Darmon, and Prasanna. In the '80s, Gross-Zagier and Kolyvagin proved some amazing theorems which implied the celebrated Birch–Swinnerton-Dyer conjecture for certain elliptic curves. The prize recognizes that in his 2016 paper in *Inventiones Mathematicae*, as well as in a paper to appear in the *Journal of the EMS*, and in subsequent joint work, Liu has extended Kolyvagin type results to higher ranks in the general framework of the Beilinson-Bloch-Kato

conjecture. In addition, the prize notes that he has made inroads also into non-Archimedean geometry, as evidenced by his 2011 paper in the *Journal of Differential Geometry*, where he has established a non-Archimedean analogue of the famous Calabi Conjecture for abelian varities over p-adic fields with complete degeneration. Thus he has established himself as a leading and influential figure in arithmetic geometry, automorphic representations and number theory, and his work is expected to have major impact in these areas in the future."

The citation for Thorne reads: "Jack Thorne is awarded the 2018 SASTRA Ramanujan Prize for his far-reaching contributions to number theory, representation theory and arithmetic geometry, especially to the modularity of Galois representations and arithmetic invariant theory. The prize recognizes his outstanding 2012 PhD thesis at Harvard University entitled 'The Arithmetic of Simple Singularities'; one outcome of this was his 2013 paper on arithmetic invariant theory that appeared in *Algebra and Number Theory*, which leads to new bounds on the sizes of certain Selmer groups, and on the number of rational and integral points on various classes of algebraic curves. The prize notes that concerning modularity of Galois representations, Thorne has been a central force in eliminating restrictions on the Taylor-Wiles method, as evidenced in his three seminal papers with Laurent Clozel on level raising and symmetric power functoriality in *Compositio Mathematica* in 2014, the *Annals of Mathematics* in 2015, and the *Duke Journal* in 2017. Of note in his joint work with Clozel is Thorne's discovery and use of a surprising automorphy lifting theorem that was established in his 2015 paper in the *Journal of the American Mathematical Society*. The works of Thorne and of Clozel-Thorne are expected to greatly extend the scope of the Taylor-Wiles method. The prize recognizes that Thorne's 2015 joint work with Chandrashekhar Khare on potential automorphy and the Leopoldt conjecture, to appear in the *American Journal of Mathematics*, has led to a proof of a potential version of the Shimura-Taniyama conjecture for elliptic curves over imaginary quadratic fields, in a major project involving several researchers, including Thorne. Finally, the prize notes that Thorne's recent paper to appear in the *European Journal of Mathematics* establishing that all elliptic curves over Q_∞ are modular is another major breakthrough. With his outstanding contributions to

two distinct areas of number theory/arithmetic geometry, and his ability to overcome technical obstacles, Thorne has become one his generation's leaders in the field of algebraic number theory."

The prize committee for the 2018 SASTRA Ramanujan Prize consisted of:

- Krishnaswami Alladi, Chair, University of Florida
- David Bressoud, Macalester College
- Gerhard Frey, University of Essen
- Andrew Granville, University of Montreal; University College, London
- Alex Lubotzky, Hebrew University
- Philippe Michel, Ecole Polytechnique, Lausanne
- Gisbert Wustholz, ETH Zurich
- Previous winners of the SASTRA Ramanujan Prize are:
- Manjul Bhargava and Kannan Soundararajan (two full prizes), 2005
- Terence Tao, 2006
- Ben Green, 2007
- Akshay Venkatesh, 2008
- Kathrin Bringmann, 2009
- Wei Zhang, 2010
- Roman Holowinsky, 2011
- Zhiwei Yun, 2012
- Peter Scholze, 2013
- James Maynard, 2014
- Jacob Tsimerman, 2015
- Kaisa Matomaki and Maksym Radziwill (shared), 2016
- Maryna Viazovska, 2017

—Krishnaswami Alladi, University of Florida

Sly Awarded MacArthur Fellowship

ALLAN SLY of Princeton University has been awarded a MacArthur Fellowship, popularly known as a "genius grant," for 2018.

According to the prize citation, "Allan Sly is a mathematician and probability theorist resolving long-standing open problems in statistical physics and theoretical computer science.

Allan Sly

"Sly's accomplishments include important findings pertaining to the threshold for recovering clusters in the sparse stochastic block model; pathbreaking work on cutoff in Markov chains; and the discovery of a key to constructing embeddings of random sequences into random sequences. He has also determined a proof of the satisfiability conjecture for large *k*, linking a fundamental problem in theoretical computer science to one in statistical physics. To solve these problems that have confounded many strong mathematicians before him, Sly develops novel tools with broad applicability. For example, he has introduced an innovative strategy called "information percolation" to analyze the cutoff phenomenon in Ising-Glauber models (the existence or not of a sharp transition within a short time window from an unmixed state to the mixed equilibrium state), new graphical methods for the proof of the satisfiability conjecture, and a new geometric approach to the slow bond problem.

"Through conceptual breakthroughs in methodology, Sly is making fundamental progress on important and difficult problems that are of central interest to mathematics and have important applications in many other fields."

Allan Sly received his PhD in statistics from the University of California at Berkeley in 2009 under the direction of Elchanan Mossel. He was a postdoctoral fellow at Microsoft Research (2009–2011) and a member of the Department of Statistics at the University of California at Berkeley (2011–2016) before joining the faculty at Princeton University, where he is currently a professor in the Department of Mathematics.

—From a MacArthur Foundation announcement

Logunov Awarded 2018 Salem Prize

ALEXANDER LOGUNOV of the Institute for Advanced Study and Princeton University has been awarded the 2018 Salem Prize for his work on the conjectures of Yau and Nadirashvili on the volumes of the zero sets of Laplacian eigenfunctions. His work centers on harmonic analysis, potential theory, and geometric analysis.

Alexander Logunov

He received his PhD from St. Petersburg State University in 2015 under the supervision of Viktor Havin. He spent two years as a postdoctoral fellow at Tel Aviv University before moving to Princeton. In 2017 he received the Clay Research Award jointly with Eugenia Malinnikova for their introduction of novel geometric-combinatorial methods for the study of elliptic eigenvalue problems, and he has been appointed as a Clay Research Fellow for a two-year term beginning in July 2018. The prize, in memory of Raphael Salem, is awarded yearly to young researchers for outstanding contributions to the field of analysis.

—From a Salem Prize announcement

Håstad Awarded Knuth Prize

Johan Håstad

JOHAN HÅSTAD of KTH Royal Institute of Technology, Stockholm, Sweden, has been awarded the 2018 Donald E. Knuth Prize "for his long and sustained record of milestone breakthroughs at the foundations of computer science, with huge impact on many areas including optimization, cryptography, parallel computing, and complexity theory." The prize is sponsored jointly by ACM SIGACT and IEEE TCMF. According to the prize citation, his "multiple seminal works have not only resolved longstanding deepest problems central to circuit lower bounds, pseudorandom generation, and approximability, but also introduced transformative techniques that have fundamentally influenced much of the subsequent work in these areas." Håstad received his PhD from the Massachusetts Institute of Technology in 1986. In his spare time, Håstad enjoys a glass of good wine, picking wild mushrooms, and skating on the frozen lakes of Sweden in the winter.

—From an ACM announcement

2019 AWM Fellows Chosen

The Executive Committee of the Association for Women in Mathematics (AWM) established the AWM Fellows Program to recognize individuals who have demonstrated a sustained commitment to the support and advancement of women in the mathematical sciences, consistent with the AWM mission: "to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences."

The 2019 class of AWM Fellows are researchers, mentors, and educators who are recognized by their peers and students for their commitment to supporting women in the mathematical sciences.

Following are the names and institutions of the 2019 AWM Fellows.

- HÉLÈNE BARCELO, Mathematical Sciences Research Institute
- LIDA KITTRELL BARRETT
- SUN-YUNG ALICE CHANG, Princeton University
- AMY COHEN, Rutgers University
- INGRID DAUBECHIES, Duke University
- CHANDLER DAVIS, University of Toronto
- JACQUELINE DEWAR, Loyola Marymount University
- EDRAY HERBER GOINS, Pomona College
- JUDY GREEN, Marymount University
- PAO-SHENG HSU, Independent
- ELLEN E. KIRKMAN, Wake Forest University
- MARIA M. KLAWE, Harvey Mudd College
- ANNE M. LEGGETT, Loyola University Chicago
- MAGNHILD LIEN, California State University, Northridge
- MAEVE LEWIS MCCARTHY, Murray State University
- DUSA MCDUFF, Barnard College, Columbia University
- IRINA MITREA, Temple University
- ALICE SILVERBERG, University of California Irvine
- AUDREY TERRAS, University of California San Diego
- MARIE A. VITULLI, University of Oregon
- JUDY LEAVITT WALKER, University of Nebraska-Lincoln
- LESLEY WARD, University of South Australia
- ULRICA WILSON, Morehouse College

—From an AWM announcement

ICIAM Prizes for 2019 Announced

The International Council for Industrial and Applied Mathematics (ICIAM) has announced several major prizes to be awarded at its 2019 Congress in Valencia, Spain, in July 2019.

SIDDHARTHA MISHRA of ETH Zurich receives the Collatz Prize "for his breakthrough contributions that skillfully combine modeling of real-world problems and rigorous mathematical analysis with the development of efficient and accurate numerical schemes and high-performance computing." The prize recognizes scientists under forty-two years of age for outstanding work in industrial and applied mathematics.

GEORGE PAPANICOLAOU of Stanford University was named the recipient of the Lagrange Prize "for his brilliant use of mathematics to solve important problems in science and engineering; in particular, problems involving inhomogeneity, wave propagation, random media, diffusion, scattering, focusing, imaging, and finance." The prize recognizes mathematicians who have made exceptional contributions to applied mathematics throughout their careers.

CLAUDE BARDOS of Université Paris Denis Diderot (Paris 7) is recognized with the Maxwell Prize "for his seminal contributions to nonlinear partial differential equations, kinetic theory, and mathematical fluid mechanics." The prize honors a mathematician who has demonstrated originality in applied mathematics.

YVON MADAY of the Sorbonne and the Université Pierre et Marie Curie has been selected to receive the Pioneer Prize "in recognition of his leading role in the introduction of powerful methods for numerical simulation, such as spectral methods, reduced order modeling, domain decomposition, models and simulation in medical sciences,

fluid-structure interaction, and ab-initio chemistry." The prize is awarded for pioneering work introducing applied mathematical methods and scientific computing techniques to an industrial problem area or a new scientific field of applications.

Giulia di Nunno of the University of Oslo receives the Su Buchin Prize "for her long-lasting record of actively and efficiently encouraging top-level mathematical research and education in developing African countries." The prize recognizes outstanding contributions by individuals in the application of mathematics to emerging economies and human development, in particular at the economic and cultural levels in developing countries.

—From an ICIAM announcement

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