
Mathematics People

Tsimerman Awarded 2015 SASTRA Ramanujan Prize



Jacob Tsimerman, winner of the 2015 SASTRA Ramanujan Prize, was born in Russia, lived in Israel, and moved to Canada when he was eight. He plays squash, judo, and guitar.

JACOB TSIMERMAN of the University of Toronto has been awarded the 2015 SASTRA Ramanujan Prize, awarded annually for outstanding contributions by young mathematicians to areas influenced by the work of Srinivasa Ramanujan. The age limit for the prize has been set at thirty-two because Ramanujan achieved so much in his brief life of thirty-two years. The prize was awarded in December 2015 at the International Conference on

Number Theory at SASTRA University in Kumbakonam (Ramanujan's hometown), where the prize has been given annually.

The prize citation reads as follows: "Jacob Tsimerman is an extraordinary young mathematician who has made deep and highly original contributions to diverse parts of number theory, and most notably to the famous Andre-Oort conjecture. He is one of the few mathematicians to have complete mastery over two very different areas of mathematics—analytic number theory and algebraic geometry. This has enabled him to achieve significant progress on a number of fundamental problems lying at the interface of the two subjects.

"Much of Tsimerman's research stems from the spectacular PhD thesis entitled 'Towards an unconditional proof of the Andre-Oort conjecture and surrounding

problems' that he wrote at Princeton University in 2010 under the direction of Professor Peter Sarnak. The thesis concerns arithmetical questions around the Andre-Oort conjecture and makes substantial progress towards it.

"The Andre-Oort conjecture states that special subsets of Shimura varieties that are obtained as Zariski closures of special points are finite unions of Shimura varieties. Shimura varieties are special algebraic varieties (such as moduli spaces of Abelian varieties) which arise as quotients of suitable complex domains by arithmetic groups. Thus Shimura varieties lie at the heart of arithmetic geometry and automorphic forms. Yves Andre initially stated this conjecture for one-dimensional subvarieties, and subsequently Frans Oort proposed that it should hold more generally. The conjecture lies at the confluence of Diophantine problems and the arithmetic of modular forms. By assuming the Generalized Riemann Hypothesis (GRH), the conjecture was proved in 2006 by Klinger, Ullmo, and Yafaev, but as of 2008 only the very simplest cases had been proved unconditionally. One of the techniques to attack the Andre-Oort conjecture is to obtain suitable bounds for certain Galois orbits of special points. A major achievement of Tsimerman in his thesis was to establish certain unconditional bounds up to dimension 6, and this was published in the *Journal of the American Mathematical Society* in 2012. This went beyond the work of Ullmo and Yafaev, who had unconditionally established such bounds up to dimension 3.

"Another very important result in his thesis was to answer in the affirmative a question due to Nick Katz and Oort whether there exists an Abelian variety over the set of all algebraic numbers which is not isogenous to the Jacobian of a stable algebraic curve over the algebraic numbers. This fundamental result appeared in the *Annals of Mathematics* in 2012. Previously Ching-Li Chai and Frans Oort had answered the question assuming the Andre-Oort conjecture, but Tsimerman was able to do so unconditionally.

"About a decade ago, Jonathan Pila had introduced a new method to attack the Andre-Oort conjecture. In

2009 Tsimerman and Pila joined forces and over the next few years established several deep results, one of which was a functional transcendence statement known as Ax-Lindemann for Abelian varieties of all dimensions (Ax-Lindemann is one of the tools to attack the Andre-Oort conjecture). This paper has just been accepted in the *Annals of Mathematics*. In another major joint paper of Pila-Tsimerman that appeared in *Compositio Mathematica* in 2013, they establish the Andre-Oort conjecture for certain moduli spaces of Abelian surfaces.

“The most recent advance by Tsimerman is his proof this year of the Andre-Oort conjecture for the moduli spaces of principally polarized Abelian varieties of any dimension g , which has been sought for a long time. What was missing was a certain lower bound for Galois orbits of special points in dimensions greater than 6. Tsimerman’s brilliant insight was to use a recently proven weighted average version of a conjecture of Colmez to establish the crucial lower bound, building on deep results of Andreatta, Goren, Howard, and Madapusi-Pera.

“Tsimerman has made major contributions not just to the Andre-Oort conjecture, but to many other fundamental problems. Even as a graduate student at Princeton, Tsimerman collaborated with Manjul Bhargava (recipient of the first SASTRA Ramanujan Prize in 2005) and Arul Shankar to determine the second term in the asymptotic formula for the number of cubic fields with a bounded discriminant. This work appeared in *Inventiones Mathematica* in 2013. Especially relating to Ramanujan’s mathematics, we note his 2014 paper joint with Ali Altug entitled ‘Metaplectic Ramanujan conjecture over function fields with applications to quadratic forms’ that appeared in the *International Mathematical Research Notices* (IMRN). Most recently, Tsimerman and Pila have turned their attention to multiplicative relations among singular moduli—a topic dear to Ramanujan.

“Tsimerman has several more first-rate contributions spanning algebraic geometry, number theory, mathematical logic, and analysis. He is an exceptionally broad and creative mathematician. The breadth of his expertise seems unrivaled among number theorists of his age. All indications are that he will continue to contribute at the very highest level and will be a major force in the world of mathematics for the next several decades.”

Jacob Tsimerman was born in Kazan, Russia, on April 26, 1988. He received his PhD in 2011 from Princeton University under Peter Sarnak, supported by an AMS Centennial Fellowship. He held a postdoctoral position at Harvard University. In 2014 he was awarded a Sloan Fellowship and joined the faculty at the University of Toronto.

The members of the 2015 SASTRA Ramanujan Prize Committee were:

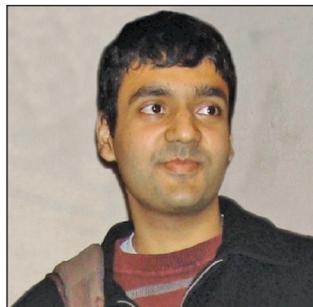
- Krishnaswami Alladi, chair, University of Florida
- Henri Darmon, McGill University
- Winnie Li, Pennsylvania State University
- Hugh Montgomery, University of Michigan
- Peter Paule, Johannes Kepler University, Linz
- Michael Rapoport, University of Bonn
- Cameron Stewart, University of Waterloo

The full list of awardees of the SASTRA Ramanujan Prize follows.

- 2005 Manjul Bhargava and Kannan Soundararajan (two full prizes)
- 2006 Terence Tao
- 2007 Ben Green
- 2008 Akshay Venkatesh
- 2009 Kathrin Bringmann
- 2010 Wei Zhang
- 2011 Roman Holowinsky
- 2012 Zhiwei Yun
- 2013 Peter Scholze
- 2014 James Maynard
- 2015 Jacob Tsimerman

—Krishnaswami Alladi University of Florida

Bhatt and Wood Awarded



To help other latecomers, I want to point out that I started out relatively late in math: at least half of my time in college was spent trying to be an engineer (my BS is from the engineering school at Columbia), and, before college, I basically spent all my time playing cricket.

— Bhargav Bhatt



Outside of mathematics, my recent hobbies include reading Supreme Court briefs and opinions and ballroom dancing with my husband. I also love the theater, and in college I studied drama with a particular focus in performing Shakespeare.

— Melanie Matchett Wood

2015 Packard Fellowships

BHARGAV BHATT of the University of Michigan and MELANIE MATCHETT WOOD of the University of Wisconsin, Madison, have been awarded Packard Fellowships by the David and Lucile Packard Foundation, which provided eighteen early-career scientists in science and engineering flexible funding and the freedom to take risks and explore new frontiers in their fields of study in 2015. Bhatt works in arithmetic geometry, a field that lies at the intersection of algebraic geometry and number theory. Much of his work, according to the prize citation, “draws inspiration from topology (the study of shapes, up to continuous perturbation) to understand the behavior of certain subtle notions in arithmetic geometry.” About Wood’s work, the prize

citation says, in part, “the structure of how numbers like 1, 2, 3,...factor into primes is incredibly complex. It not only underlies the encryption that protects all of our data online, but also contains the oldest unsolved mysteries of mathematics. Wood develops geometric and probabilistic tools that can unlock some of these mysteries.” The two new fellows will receive grants of \$875,000 each over five years to pursue their research.

—From a Packard Foundation announcement

Cox Awarded Michell Medal

BARRY COX of the University of Adelaide has been awarded the 2015 J. H. Michell Medal of the Australian Mathematical Society for his “groundbreaking” contributions to the area of nanotechnology. His work involves the geometry of carbon nanotubes that properly incorporate the effect of curvature. The award is given for distinguished research in applied and/or industrial mathematics, with a significant proportion of the research work having been carried out in Australia and/or New Zealand.

—From an ANZIAM announcement

Pi Mu Epsilon Student Paper Presentation Awards

Pi Mu Epsilon (PME), the US honorary mathematics society, makes annual awards to recognize the best papers by undergraduate students presented at a PME student paper session. PME held a session in conjunction with the Mathe-



tical Association of America MathFest held August 5–8, 2015, in Washington, DC. The AMS, the American Statistical Association, and Budapest Semesters in Mathematics for Excellence in Student Exposition or Research sponsor awards to student speakers for excellence in exposition and research. The names, institutions, and paper titles of the award-winning students follow.

ANNA SNYDER, Hope College, “An extension of a theorem of Polya”

MONICA BUSSEY, Youngstown State University, “Unique Hamiltonicity and computational algebraic geometry”

WILLIAM O’BROCHTA, Hendrix College, “Rational decision-making models of conflicts in the 1990s”

MADLINE HANSALIK, Texas A&M University, “Magnetic spectral decimation on self-similar fractals”

ELLIOT GOLIAS, Kent State University, “Geometry to number theory: Minkowski’s theorem”

SARAH HILSMAN, Hope College, “Real algebraic level curves and the intersection of lines of positive slope”

ZACK WHILE, Youngstown State University, “The ultimate mind-bender: Futurama’s mind-switching problem”

DOUGLAS KNOWLES, State University of New York at Geneseo, “Finite fun with numerical ranges”

DANIEL GILES, Portland State University, “Convex optimization methods for the smallest intersecting ball problem”

JOHN VASTOLA, University of Central Florida, “On the structure and calculation of a class of infinitely nested radicals”

SAMANTHA PARSONS, Roanoke College, “Interests in conflict: Supporting scientific development and ensuring data security”

SHARAT CHANDRA, University of California, Irvine, “On the morphology of arithmetic sums of Cantor sets”

JACK JENKINS, State University of New York at Geneseo, “There’s a glitch in the matrix!”

A. J. VOGT, Duquesne University, “A mathematical framework for evaluating a cost-effective balance of human trafficking prevention and aid resources”

COLE WATSON, Hope College, “Graph pebbling and Graham’s conjecture”

JACK RYAN, North Central College, “Recognition of textural differences in infrared and ultraviolet images using fractal characteristics”

MEGAN CHAMBERS, Youngstown State University, “An agent-based model of *Eleutherodactylus coqui* on the Big Island of Hawaii.”

—From a Pi Mu Epsilon announcement

About the Cover

Above the lighted nighttime Seattle skyline float the images of some of this year’s JMM Invited Speakers who contributed to the *Notices’ 2016 Joint Mathematics Meetings Lecture Sampler* (page 7).

Thanks to Daniel Alan Spielman, Kristin Estella Lauter, Mohammad Reza Pakzad, Tanya A. Moore, Tatiana Toro, Panagiota Daskalopoulos, Karen E. Smith, Steve Zelditch, Alex Eskin, Marta Lewicka, Teresa Levy, Katharine Merow, Bill Casselman, and iStock Photo for contributions to this cover.

—Frank Morgan
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