YIFENG LIU AND JACK THORNE TO RECEIVE 2018 SASTRA RAMANUJAN PRIZE

The 2018 SASTRA Ramanujan Prize will be jointly awarded to Professors YIFENG LIU (Yale University, USA) and Jack Thorne (Cambridge University, England). This annual prize is for outstanding contributions by individuals not exceeding the age of 32 in areas of mathematics influenced by Ramanujan in a broad sense. The age limit has been set at 32 because Ramanujan achieved so much in his brief life of 32 years. The prize will be awarded at the International Conference in Number Theory during December 21-22 at SASTRA University in Kumbakonam (Ramanujan's hometown) in South India.

YIFENG LIU has made spectacular contributions to arithmetic geometry and number theory with great originality. His deep contribitions span a wide spectrum of topics such as arithmetic theta lifts and derivatives of L-functions, the Gan-Gross-Prasad Conjecture and its arithmetic counterpart, the Beilinson-Bloch-Kato Conjecture, the geometric Langlands program, the p-adic Waldspurger theorem, and the study of étale cohomology on Artin stacks. His marvelous research began with his PhD thesis at Columbia University written under the direction of Professor Shouwu Zhang. His PhD work on arithmetic theta lifts appeared in two substantial papers in Algebra and Number Theory in 2011, in which he went well beyond the work of Kudla, Rapoport and Yang on L-series connected with the minimal level for Shimura curves over the rationals. Subsequently, in three papers pertaining to Bessel and Fourier-Jacobi models that appeared in the Journal of Functional Analysis in 2013 (co-authored with Binyong Sun), Manuscripta Mathematica in 2014, and Crelle's Journal in 2016, he made real progress on the famous Gan-Gross-Prasad conjectures in the representation theory of classical groups. More recently, in a paper that appeared in the Duke Journal in 2018, Liu, Shouwu Zhang and Wei Zhang studied the p-adic logarithm of Heegner points in terms of a p-adic L-function and proved p-adic versions of theorems of Waldspurger and of Gross-Zagier; this is a vast generalization of previous important 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 elliptic curves when the analytic rank is either 0 or 1. In a paper that appeared in Inventiones Mathematicae in 2016, as well as in a paper accepted in the Journal of the EMS, and in subsequent joint work, Liu has successfully extended Kolyvagin type results to higher ranks in the more general framework of the the Beilinson-Bloch-Kato Conjecture. In addition to all these magnificent achievements, Liu has made inroads into non-Archimedean geometry as evidenced by his paper in the Journal of Differential Geometry in 2011 where he established a non-Archimedean analogue of the famous Calabi Conjecture for abelian varieties over p-adic fields with complete degeneration.

Yifeng Liu was born in Shanghai, China, and received his BS Degree from Peking University in 2007 after which he joined Columbia University, New York, where he received his PhD in 2012 under the direction of Shouwu Zhang. Following that he held the C. L. E. Moore Instructorship at MIT (2012-15) and assistant professorship at Northwestern University (2015-18) before being appointed as an associate professor at Yale University this year. He was a recipient of a Sloan Fellowship in 2017. Liu who combines tremendous technical power with great theoretical insight, has established himself as a leading and

infuential figure in three different but related areas - algebraic geometry, automorphic representations, and number theory, and his work is predicted to have major impact on these areas in the future.

JACK THORNE is an exceptionally talented young mathematician who has already made far reaching contributions to number theory, representation theory, and algebraic geometry. He works in two rather different areas: modularity of Galois representations and arithmetic invariant theory. His outstanding 2012 PhD thesis "The arithmetic of simple singularities" at Harvard University was jointly supervised by Professors Richard Taylor and Benedict Gross, two of the dominant figures in contemporary number theory. One outcome of the thesis was his paper on arithmetic invariant theory that appeared in Algebra and Number Theory in 2013 which, among other things, leads to new results about the sizes of Selmer groups for abelian varieties of small dimension, and bounds for the number of rational and integral points on various types of algebraic curves of genus greater than one. (Arithmetic invariant theory concerns the application of geometric invariant theory to number theory. The most spectacular first applications to elliptic curves were carried out by Manjul Bhargava et.al, but Thorne's work attempts to go beyond this.) Regarding modularity of Galois representations, Thorne has been a central force in eliminating restrictions on the Taylor-Wiles method. Some of his most striking results have appeared in three papers with Laurent Clozel in Compositio Mathematica in 2014, the Annals of Mathematics in 2015, and the Duke Journal in 2017. The main input in Thorne's work with Clozel is a new method due to Thorne, for eliminating the most stubborn restriction in the Taylor-Wiles method, namely the assumption that the residual (mod ℓ) Galois representation under consideration is irreducible. Another aspect of Thorne's ideas that was crucial in his joint work with Clozel, was his startling discovery of a new automorphy lifting theorem established in his 2015 paper in the Journal of the AMS. These works of Thorne and of Clozel-Thorne are expected to greatly extend the scope of the Taylor-Wiles method. What is called the Taylor-Wiles method is a collection of techniques for proving that an ℓ-adic representation of the Galois group over a global field is automorphic. Thorne's 2015 work with Khare on potential automorphy and the Leopoldt Conjecture (to appear in the American Journal of Mathematics), introduced a "trick" that plays a key role in an ongoing ten author collaboration including Thorne that will establish a potential version of the Shimura-Taniyama Conjecture for elliptic curves over imaginary quadratic fields. Also, Thorne's recent paper establishing that all elliptic curves over Q_∞ are modular (to appear in the Journal of the European Math. Soc.) is viewed as another major breakthrough.

Jack Thorne received his BA Mathematics degree from Cambridge University in 2007. He then went to Harvard University where he completed his PhD in 2012 under the joint supervision of Benedict Gross and Richard Taylor. Following that he was appointed Reader at Cambridge University in 2013, but during the period 2012-17, he was also a Clay Research Fellow of the Clay Mathematics Institute. In 2017 he was awarded the Whitehead Prize of the London Mathematical Society and just this year was promoted to full professorship at Cambridge University. 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 Committee for the 2018 SASTRA Ramanujan Prize was Krishnaswami Alladi, Chair (University of Florida), David Bressoud (Macalester College), Gerhard Frey (University of Essen), Andrew Granville (University of Montreal and University College, London), Alex Lubotzky (Hebrew Uiversity), Philippe Michel (Ecole Polytechnique, Lausanne), and Gisbert Wustholz (ETH, Zurich).

Previous winners of the SASTRA Ramanujan Prize are: Manjul Bhargava and Kannan Soundararajan (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 (2016), and Maryna Viazovska (2017). Yifeng Liu and Jack Thorne have now joined this great Hall of Fame to which these stellar SASTRA awardees are associated with.

Krishnaswami Alladi
Chair: SASTRA Ramanujan Prize Committee