Association for Women in Mathematics
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Yunqing Tang to be Awarded the 2024 AWM Microsoft Research Prize

AWM will present the sixth AWM-Microsoft Research Prize in Algebra and Number Theory to **Professor Yunqing Tang**, in recognition of her breakthrough work in arithmetic geometry, including results on the Grothendieck-Katz p-curvature conjecture, a conjecture of Ogus on algebraicity of cycles, arithmetic intersection theory, and the unbounded denominators conjecture of Atkin and Swinnerton-Dyer. An observer wrote that Tang "has a knack for absorbing difficult ideas with lightning speed, making them her own, and then applying them in creative and unexpected ways."

Citation

The p-curvature conjecture lies in the field of arithmetic geometry: it predicts that for a certain vector bundle associated to a variety over a number field, if an invariant called the p-curvature vanishes for all but finitely many primes, then an associated "monodromy representation" has finite image. Tang has made progress toward this conjecture by proving for example that the conclusion holds if the p-curvature vanishes for all primes, when the variety is the projective line minus three points. In the area of p-adic Hodge theory, Tang has proved Ogus' conjecture (which predicts that cycles in de Rham cohomology which are invariant by almost all crystalline Frobenii are Hodge cycles) for a large class of abelian varieties.

With collaborators, Tang has developed a program in arithmetic intersection theory on Shimura varieties that can prove a phenomenon of interest occurs at infinitely many primes. This has had many interesting consequences. As a first example, Ananth Shankar and Tang have proved that an abelian surface with real multiplication over a number field is isogenous to a product of elliptic curves when reduced modulo infinitely many primes. As a second example, with Ananth Shankar, Arul Shankar, and S. Tayou, Tang's work proves that a K3 surface over a number field with everywhere good reduction has the property that the Picard rank of the reduction jumps, at infinitely many places.

Recently, in joint work with F. Calegari and V. Dimitrov, Tang has presented a proof of the 50-year-old "unbounded denominators conjecture," originally posed by Atkin and Swinnerton-Dyer. This conjecture can be framed (roughly speaking) as the statement that a modular form for a finite index subgroup of SL_2(Z), expanded as a Fourier series in q, has integral coefficients if and only if it is a modular form for some congruence subgroup of SL_2(Z).

Yunqing Tang is an assistant professor at University of California, Berkeley. She received a PhD from Harvard University in 2016, and she was awarded the AWM Dissertation Prize. Tang subsequently was a Member at the IAS, an Instructor at Princeton University, a junior researcher (Chargée de recherche) at CNRS/Université Paris-Sud, and an assistant professor at Princeton University. Her work is supported by the NSF, and Tang has recently been awarded a Sloan Research Fellowship and the SASTRA Ramanujan prize. A press release from the Ramanujan Prize committee wrote that Tang's "wide ranging contributions are bound to have impact in the decades ahead."

Response from Yunqing Tang

I am very honored to receive the 2024 AWM-Microsoft Prize in Algebra and Number Theory. I would like to thank the AWM and Microsoft for their generosity in recognizing my

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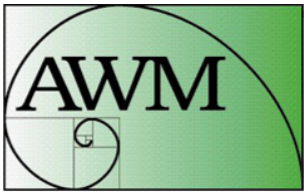

work. I have been very lucky to have several amazing mentors: my PhD advisor, Mark Kisin, as well as Peter Sarnak and Shouwu Zhang; they have been supportive over the years and shared with me numerous mathematics insights. I am deeply indebted to my collaborator Ananth Shankar, with whom I have been working since graduate school time; our numerous discussions have shaped part of my research program. I also would like to give a special thank you to my collaborators Wanlin Li and Vesselin Dimitrov for numerous zoom discussion and working sessions to keep me stay productive during the pandemic. I would like to thank all my collaborators: Frank Calegari, Victoria Cantoral Farfán, Elena Mantovan, Davesh Maulik, Rachel Pries, Arul Shankar, Sho Tanimoto, Salim Tayou, and Erik Visse; I am very grateful to have the opportunities to work with them and learn interesting math from them.

I would like to thank the math department and my colleagues, especially the algebraic geometry and number theory group, at UC Berkeley for a supportive working environment. Many of my works have been done during my stay at Princeton, CNRS, Université Paris-Saclay, IAS and Harvard and I am grateful for the excellent working environment at these places. Finally, I would like to thank AWM again for providing the community of women mathematicians and for recognizing my work at an early stage through the dissertation prize.

Photo by Neil Freese/UC Berkeley

Established in 2012, the biennial presentation of the AWM Microsoft Research prize serves to highlight to the community outstanding contributions by women in the field of algebra and number theory, and to advance the careers of the prize recipients. This award is made possible by a generous contribution from Microsoft Research. It will be presented at the Joint Mathematics Meetings, scheduled for January 3-6, 2024 in San Francisco, CA.