

W⁺AM 2025 Yearbook

Convexity and Combinatorics in Algebraic Geometry



Institute for Advanced Study, Princeton

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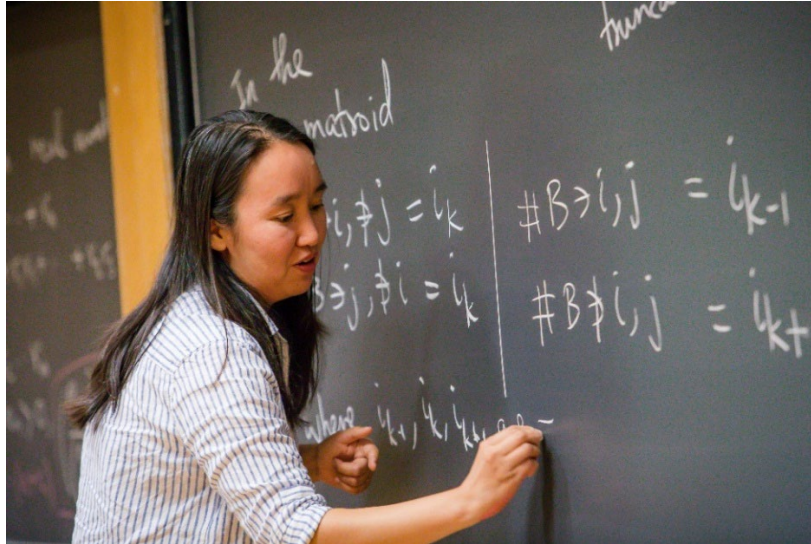
Funding for the program is provided by Jane Street, Institute for Advanced Study, the Robert S. Hillas Fund, Princeton University and Lisa Simonyi.

This is a compilation of activities and resources contributed by participants during the 2025 Women⁺ and Mathematics Program. We hope this can serve as a mathematical and professional reference guide for women mathematicians around the country.

Mathematical Talks

Terng Lectures:

Josephine Yu, Georgia Institute of Technology, “Log-concavity and Matroids”



Matroids are combinatorial structures that model independence, such as that of edges in a graph and vectors in a linear space. I will introduce the theory of matroids along with their surprising connection to a class of multivariate polynomials that are log-concave on the positive orthant. Log-concavity is an important feature of many functions and discrete sequences appearing across mathematics, including combinatorics, algebraic geometry, convex analysis, and optimization. We will explore the real and combinatorial geometry underlying log-concavity along with applications to matroids and the mixing times of random walks.

Terng Problem Sessions were run by Tracy Chin, University of Washington.



Uhlenbeck Lectures:

Melody Chan, Brown University, "Tropical Geometry"



Tropical geometry is a modern degeneration technique in algebraic geometry. Think of it as a very drastic degeneration in which one associates a limiting object to a family of algebraic varieties that is entirely combinatorial. I will introduce tropical geometry through the beautiful topics of tropical curves, tropical abelian varieties, and their moduli spaces.

Uhlenbeck Problem Sessions were run by Raluca Vlad, Brown University.



Course References:

Terng Course References:

Matroids: <https://www-users.cse.umn.edu/~reiner/Talks/Vienna05/Lectures.pdf>

Hyperbolic and stable polynomials:

<https://www2.math.upenn.edu/~pemantle/papers/hyperbolic.pdf>

Log-concave polynomials: <https://arxiv.org/pdf/1811.01600>

Uhlenbeck Course References:

<https://www.ams.org/notices/202110/rnoti-p1700.pdf>

Colloquium:

Chris Eur, Carnegie Mellon University, "Log-concave Rainbows and Where to Find Them"



W⁺AM Ambassadors:

For more information on how to apply for the W⁺AM Ambassadorships, please visit:
<https://www.ias.edu/math/wam/apply/ambassador-program>



