Melissa Sherman-Bennett

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EMPLOYMENT

07/2024-	**UC Davis**, Assistant Professor
07/2022-06/2024	**MIT**, NSF Postdoctoral Fellow and Instructor
10/2021-06/2022	**University of Michigan**, NSF Postdoctoral Fellow
07/2021-09/2021	**UCLA**, UC President's Postdoctoral Fellow

EDUCATION

2016–2021 **University of California at Berkeley**, Ph.D. in Mathematics received May 2021.
Advisor: Lauren Williams
Exchange Scholar at Harvard University, 2018–2021.

2012–2016 **Bard College at Simon's Rock**, B.A. in Mathematics, *summa cum laude.*
Attended Budapest Semesters in Mathematics, 2014–2015

RESEARCH INTERESTS

Algebraic combinatorics and connections to algebraic geometry, representation theory, physics. In particular, total positivity, cluster algebras, scattering amplitudes.

PUBLICATIONS

18. The Magic Number Conjecture for the m=2 amplituhedron and Parke-Taylor identities *with M. Parisi, R. Tessler, L. Williams* arXiv:2402.03026
Mathematische Annalen, to appear.

17. A dimer view on Fox's trapezoidal conjecture *with K. Mészáros, A. Vidinas*
Algebraic & Geometric Topology, to appear. arXiv:2512.02314

16. Grassmannian geometries for non-planar on-shell diagrams *with A. Lisitsyn, U. Oktem, J. Trnka* arXiv:2512.25005
JHEP, to appear.

15. Dimer face polynomials in knot theory and cluster algebras *with K. Mészáros, G. Musiker, A. Vidinas* arXiv:2408.11156
Selecta, to appear.

14. Plabic tangles and cluster promotion maps *with C. Even-Zohar, M. Parisi, R. Tessler, L. Williams* arXiv:2508.02891
Journal of Algebra, 695 (2026), 14-102.

13. Braid variety cluster structures, II: General type *with P. Galashin, T. Lam*
Invent. Math. 243 (2026), 1079–1127. arXiv:2301.07268

12. BCFW tilings and cluster adjacency for the amplituhedron *with C. Even-Zohar, T. Lakrec, M. Parisi, R. Tessler, L. Williams* arXiv:2504.01217
Proc. Natl. Acad. Sci. U.S.A. 122(12) (2025).

11. A cluster of results on amplituhedron tiles *with C. Even-Zohar, T. Lakrec, M. Parisi, R. Tessler, L. Williams* arXiv:2402.15568
Letters in Mathematical Physics 114, 111 (2024).

10. Leclerc's conjecture on cluster structure for type A Richardson varieties *with K. Serhiyenko* arXiv:2210.13302
Adv. Math. 447 (2024), Paper No. 109698, 53 pp.

9. The m=2 amplituhedron and the hypersimplex: signs, clusters, triangulations, Eulerian numbers *with M. Parisi, L. Williams* arXiv:2104.08254
Comm. Amer. Math. Soc. 3 (2023), 329-399.

8. k-positivity of dual canonical basis elements from 1324- and 2143-avoiding Kazhdan-Lusztig immanants *with S. Chepuri* arXiv:2106.09150
Algebraic Combinatorics 6 (2023), no.1, 95-108.

7. Saturation of Newton polytopes of type A and D cluster variables *with A. Mattoo*
Combinatorial Theory, 2 (2) (2022), 1-37. arXiv:2012.07500

6. Positroid cluster structures from relabeled plabic graphs, *with C. Fraser*
Algebraic Combinatorics, vol 5 (2022) no. 3, 469-513. arXiv:2006.10247

5. 1324- and 2143-avoiding Kazhdan-Lusztig immanants and k-positivity *with S. Chepuri*
Canadian Journal of Mathematics, (2021), 1-31. arXiv:2002.07851

4. Cluster structures in Schubert varieties in the Grassmannian *with K. Serhiyenko, L. Williams* arXiv:1902.00807
Proc. Lond. Math. Soc. (3), 119 (2019), 1694-1744.

3. Combinatorics of X-variables in finite type cluster algebras
J. Combin. Theory Ser. A, 165 (2019), 273-298. arXiv:1803.02492

2. Large induced acyclic and outerplanar subgraphs of 2-outerplanar graphs *with C. Borradaile, H. Viet Le* arXiv:1711.00212
Graphs Combin. 33, no. 6, 1621-1634, 2017.

1. Chromatic Ramsey number of acyclic hypergraphs *with A. Gyárfás, A. Riasanovsky*
Discrete Mathematics, 340:373-378, 2017. arXiv:1509.00551

PREPRINTS

A mathematical perspective on nonplanar on-shell forms *with A. Lisitsyn, E. Pratt, J. Trnka (submitted)* arXiv:2610.10041

Permutahedra, Lusztig varieties, degenerations, and subdivisions *with A. Knutson, M. Sanchez* arXiv:2607.02701

Persistent subdivisions of Coxeter permutahedra *with T. Blanton, J. De Loera (submitted)* arXiv:2606.28680

Unexpected toric Richardson varieties *with E. Gorsky, S. Kim (submitted)* arXiv:2603.29260

Permutahedron triangulations via total linear stability and the dual braid group *with C. Defant, N. Williams (submitted)* arXiv:2509.11497

Comparing cluster algebras on braid varieties *with R. Casals, P. Galashin, M. Gorsky, L. Shen, J. Simental (submitted)* arXiv:2508.03816

Cluster algebras and tilings for the m=4 amplituhedron *with C. Even-Zohar, T. Lakrec, M. Parisi, R. Tessler, L. Williams (submitted)* arXiv:2310.17727

Demazure weaves for reduced plabic graphs (with a proof that Muller-Speyer twist is Donaldson-Thomas) *with R. Casals, I. Le, D. Weng (submitted)* arXiv:2308.06184

Braid variety cluster structures, I: 3D plabic graphs *with P. Galashin, T. Lam, D. Speyer (submitted)* arXiv:2210.04778

GRANTS, HONORS, AWARDS

2026 UC Davis Society of Hellman Fellow ($32,000)
2026 Emmy Noether Fellowship, Perimeter Institute
2025 CA-Israel Collaborations in Research Award ($20,000, with co-PI C. Even-Zohar)
2024 NSF DMS Grant No. 2444020 ($180,000)
2021 NSF Mathematical Sciences Postdoctoral Research Fellowship
2021 UC President's Postdoctoral Fellowship
2021 Kenneth Ribet & Lisa Goldberg Award in Algebra (dissertation prize)
2018 NSF Graduate Research Fellowship
2018 Outstanding Graduate Student Instructor Award, UC Berkeley

2016 Academic Prize for Outstanding Achievement in the Division of Sciences, Simon's Rock

INVITED TALKS

2026 Nov. AMS Fall Western Sectional Meeting, Arizona State University, Pheonix
Sep. Colloquium, Washington University in St. Louis
July Algebraic Combinatorics and Applications Conference, Notre Dame
June Algebra seminar, Universite de Caen Normandie
May Colloquium, Universite de Caen Normandie
April Mathematical physics seminar, Perimeter Institute
April Algebraic combinatorics seminar, Waterloo
Feb. Amplitudes and algebraic geometry program, ESI Vienna (5 hr lecture series)
Jan. UC Santa Cruz mathematics colloquium

2025 Dec. Cluster Colloquium, online
Nov. Cluster algebra, algebraic geometry, and representation theory conference, Hong Kong U.
Oct. Michigan Interdisciplinary Meeting on Amplitudes, University of Michigan
Aug. WARTHOG 2025, University of Oregon (6 hr lecture series)
July Summer School on Algebraic Combinatorics, KIAS Seoul
Formal Power Series and Algebraic Combinatorics 2025, Sapporo (poster)
June Graphical models in combinatorics summer school, SLMath (5 hr lecture series)
Representation Theory Down Under Conference, SMRI, Sydney
May AlCovE conference, online
Apr. Graduate Online Combinatorics Colloquium, online
Mar. Alcove polytopes in physics and optimization mini-workshop, Oberwolfach
Feb. Positive geometry in scattering amplitudes and cosmological correlators, ICTS, Bangalore (3 hr lecture series)
Workshop on combinatorics of enumerative geometry, IAS, Princeton
Jan. Joint Mathematics Meetings, Seattle

2024 Nov. Bay Area Discrete Math Day, UC Berkeley
June Mirror symmetry for cluster varieties and representation theory, King's College
May Mathematical aspects of scattering amplitudes, CMSA, Harvard
Apr. "Gone Fishing" Poisson Geometry conference, Northwestern
Feb. Mathematical aspect of N=4 Super Yang Mills Theory, Simons Center Stonybrook
Harvard/MIT combinatorics seminar, Harvard
Positive geometry in particle physics and cosmology, MPI Liepzig

2023 Dec. Paris algebra seminar, Paris/online
Algebra seminar, Tufts
Nov. Current trends in representation theory, cluster algebras and geometry, CIRM

		Combinatorics seminar, Brandeis
	Aug.	Dimers conference, CUNY (2 hr lecture series)
	May	Combinatorics seminar, Cite Universite, Paris
	Apr.	Spring school in representation theory, University of Kent (4 hr lecture series)
		Mathematical physics and representation theory seminar, LSU
	Mar.	AMS Southern sectional meeting, University of Georgia
2022	Dec.	Toric degenerations workshop, BIRS, Canada
	Nov.	Combinatorics seminar, University of Washington
	Oct.	Geometry, physics and rep theory seminar, Northeastern University
	Oct.	Combinatorics seminar, MIT
	Oct.	AMS Fall Eastern Sectional Meeting, University of Massachusetts, Amherst
	Sept.	Bases for Cluster Algebras, BIRS, Oaxaca
	Aug.	QUACKS II conference, University of Oregon
	Jul.	Formal Power Series and Algebraic Combinatorics 2022, Indian Institute of Science Bangalore (talk)
	May	Workshop on nonlinear algebra and combinatorics from physics, Center for Mathematical Science and Applications, Harvard University
	Feb.	Combinatorics seminar, KTH, Stockholm
2021	Nov.	Combinatorics seminar, UC Davis
	Nov.	Combinatorics seminar, UCLA
	Nov.	Interdisciplinary applications of cluster algebras conference, Newton Institute, Cambridge
	Sep.	Combinatorics, physics and probability seminar, CMSA, Harvard University
	Sep.	Combinatorics seminar, University of Michigan
	Aug.	SIAM Conference on Applied Algebraic Geometry 2021 (virtual)
	Jul.	Geometry and number theory seminar, Simon Fraser University
	Jul.	Amplitudes journal club, U. Hertfordshire (virtual)
	Jun.	Algebra, Geometry, Combinatorics colloquium (virtual)
	May	Algebraic geometry seminar, UC Davis
	Mar.	American Graduate Student Algebraic Geometry Seminar (virtual)
2020	Nov.	Combinatorics seminar, Washington University at St. Louis
	Oct.	Combinatorics seminar, University of Michigan
	Oct.	Combinatorics seminar, UCLA
	Oct.	Combinatorics seminar, UC Berkeley
	Oct.	Online cluster algebra seminar (virtual)
	Oct.	AMS Fall Sectional Meeting (virtual)
	Aug.	Cluster algebras 2020 (virtual)

	Jul.	Formal Power Series and Algebraic Combinatorics 2020, virtual (poster)
	May	QMAP seminar, UC Davis
	Apr.	LACIM combinatorics seminar, UQAM
	Mar.	Combinatorics seminar, UC Berkeley
	Feb.	Mini-Workshop: Superpotentials in Algebra and Geometry, Oberwolfach
2019	Nov.	Buildings, Varieties, and Applications, MPI Leipzig
	Nov.	Discrete math seminar, University of Massachusetts, Amherst
	Jul.	SIAM Conference on Applied Algebraic Geometry, University of Bern
	Jul.	Formal Power Series and Algebraic Combinatorics 2019, University of Ljubljana
	Apr.	AMS Spring Eastern Sectional Meeting, University of Connecticut, Hartford
	May	Combinatorics seminar, University of Minnesota
	Mar.	GASC seminar, Northeastern University
	Feb.	Combinatorics seminar, University of Michigan
2018	Dec.	Combinatorics seminar, Brandeis
	Nov.	Combinatorics seminar, MIT
	Oct.	AMS Fall Central Sectional Meeting, University of Michigan, Ann Arbor
	Oct.	Geometry, combinatorics and integrable systems seminar, Ohio State University
	Jul.	Formal Power Series and Algebraic Combinatorics 2018, Dartmouth (poster)
	Jun.	Encuentro Colombiano de Combinatoria, Universidad del Norte (poster)
	Mar.	IRIF Enumerative and Analytic Combinatorics Seminar, Universite Paris Diderot
	Mar.	Combinatorics seminar, UC Berkeley

SERVICE & ORGANIZATION

2026	Organizer, “Amplituhedra and total positivity” workshop, UC Davis
	Co-organizer, “Cluster algebras, webs, and canonical bases” workshop, BIRS
	Reviewer for UC Presidential Postdoctoral Fellowship Program
2025	Co-organizer, “Representation theory, symplectic geometry, and cluster algebras” workshop, BIRS
	Co-organizer, “Graphical models in algebraic combinatorics” summer school, SLMath
2024-2026	Combinatorics seminar co-organizer, UC Davis
2023	Co-organizer, “Cluster algebras and braids” workshop, AIM
2021-2022	Combinatorics learning seminar co-organizer, University of Michigan
2021-2022	Webmaster for AWM Student Chapter, University of Michigan
2020-2021	Combinatorics seminar co-organizer, UC Berkeley
2020	Harvard-MIT student combinatorics reading group organizer
2020	Mentored undergraduate research in Herchel-Smith program, Harvard University

2018-2020 Directed Reading Program mentor, Harvard University
2018-2020 Research group mentor, Girl's Angle (Cambridge girl's math club)
2017-2018 Combinatorics learning seminar organizer, UC Berkeley

REFEREEING

Electronic Journal of Combinatorics, IMRN, Inventiones, Journal of Combinatorial Theory Series A, SIGMA, Selecta Mathematica, CAMS, Combinatorial Theory