

# Pavel Galashin

Cornell University, 212 Garden Ave, Ithaca, NY 14850  
galashin@cornell.edu • <http://math.ucla.edu/~galashin>

## RESEARCH INTERESTS

- Algebraic combinatorics
  - Total positivity
  - Cluster algebras

## EDUCATION

**Massachusetts Institute of Technology**, Cambridge, MA, USA

- Ph.D. in Mathematics Sep 2014 – Jun 2019
  - Advisor: Alexander Postnikov
  - Thesis title: “Totally positive spaces: topology and applications”

**St. Petersburg State University**, St. Petersburg, Russia

- M.S. in Mathematics Sep 2009 – Jun 2014
  - Advisor: Gaiane Panina
  - Diploma with distinction

## EMPLOYMENT

**Cornell University**, Ithaca, NY, USA

- Associate Professor (on leave from UCLA) Jul 2025 – present

**University of California, Los Angeles**, Los Angeles, CA, USA

- Associate Professor Jul 2023 – Jun 2025
- Assistant Professor Jul 2019 – Jun 2023

## FELLOWSHIPS AND AWARDS

- Alfred P. Sloan Research Fellowship 2021–2023
- NSF CAREER Grant DMS-2046915 2021–2026  
Statistical mechanics and knot theory in algebraic combinatorics
- NSF Grant DMS-1954121 2020–2023  
Totally positive spaces and cluster algebras
- Best Student Paper 2018  
30th International Conference on Formal Power Series and Algebraic Combinatorics
- MIT Presidential Fellowship 2014 – 2015
- V. A. Rokhlin Grant 2014 – 2015
- St. Petersburg Mathematical Society prize for students 2013

## SUBMITTED PAPERS

42. Amplituhedra and origami, II: loop level. [arXiv:2606.03439](https://arxiv.org/abs/2606.03439).
41. Amplituhedra and origami, I: tree level. [arXiv:2410.09574](https://arxiv.org/abs/2410.09574).
40. (with R. Casals, M. Gorsky, L. Shen, M. Sherman-Bennett, and J. Simental) Comparing cluster algebras on braid varieties. [arXiv:2508.03816](https://arxiv.org/abs/2508.03816)
39. (with T. Lam) Monotone links in DAHA and EHA. [arXiv:2307.16794](https://arxiv.org/abs/2307.16794).
38. (with T. Lam, M. Sherman-Bennett, and D. Speyer) Braid variety cluster structures, I: 3D plabic graphs. [arXiv:2210.04778](https://arxiv.org/abs/2210.04778).

## ACCEPTED PAPERS

37. (with T. Lam and M. Sherman-Bennett) Braid variety cluster structures, II: general type. *Invent. Math.*, available online.
36. (with T. Lam) The twist for Richardson varieties. *Rep. Theory*, to appear. [arXiv:2204.05935](https://arxiv.org/abs/2204.05935).
35. (with T. Lam) Positroids, knots, and  $q, t$ -Catalan numbers. *Duke Math. J.*, 173(11): 2117–2195, 2024.
34. (with T. Lam) Positroid Catalan numbers. *Comm. AMS*, 4: 357–386, 2024.
33. (with T. George) Move-reduced graphs on a torus. *Trans. AMS*, 377(6): 4055–4099, 2024.
32. (with T. Lam) Plabic links, quivers, and skein relations. *Algebr. Comb.*, 7(2): 431–474, 2024.
31. (with T. Lam, M.-T. Trinh, and N. Williams) Rational noncrossing Coxeter–Catalan combinatorics. *Proc. Lond. Math. Soc.*, 129(4): e12643, 2024.
30. Poset associahedra. *Selecta Math. (N.S.)*, 30(6), 2024.

29. Critical varieties in the Grassmannian.  
*Comm. Math. Phys.*, 401: 3277–3333, 2023.
28. (with T. Lam) Positroid varieties and cluster algebras.  
*Ann. Sci. Éc. Norm. Supér.*, 56(3): 859–884, 2023.
27. (with A. Postnikov) Purity and separation for oriented matroids.  
*Mem. Amer. Math. Soc.*, 289, 2023.
26. Totally nonnegative critical varieties.  
*Int. Math. Res. Not. IMRN*, 2024(5): 3649–3689, 2024.
25. (with G. Nenashev and A. Postnikov) Trianguloids and triangulations of root polytopes.  
*J. Combin. Theory Ser. A*, 201: 105802, 2024.
24. (with A. Postnikov and L. Williams) Higher secondary polytopes and regular plabic graphs.  
*Adv. Math.*, 407: 108549, 2022.
23. A formula for boundary correlations of the critical Ising model.  
*Probab. Theory Related Fields*, 182: 615–640, 2022.
22. (with S. Karp and T. Lam) The totally nonnegative Grassmannian is a ball.  
*Adv. Math.*, 397: 108123, 2022.
21. (with S. Karp and T. Lam) Regularity theorem for totally nonnegative flag varieties.  
*J. Amer. Math. Soc.*, 35(2): 513–579, 2021.
20. Symmetries of stochastic colored vertex models.  
*Ann. Probab.*, 49(5): 2175–2219, 2021.
19. (with S. Hopkins, T. McConville, and A. Postnikov) Root system chip-firing II: Central-firing.  
*Int. Math. Res. Not. IMRN*, 2021(13): 10037–10072, 2021.
18. (with T. Lam) Parity duality for the amplituhedron.  
*Compos. Math.*, 156(11): 2207–2262, 2020.
17. (with P. Pylyavskyy) Ising model and the positive orthogonal Grassmannian.  
*Duke Math. J.*, 169(10): 1877–1942, 2020.
16. (with P. Pylyavskyy) Quivers with subadditive labelings: classification and integrability.  
*Math. Z.*, 295: 945–992, 2020.
15. (with S. Karp and T. Lam) The totally nonnegative part of  $G/P$  is a ball.  
*Adv. Math.*, 351: 614–620, 2019.
14. (with P. Pylyavskyy) The classification of Zamolodchikov periodic quivers.  
*Amer. J. Math.*, 141(2): 447–484, 2019.
13. (with P. Pylyavskyy) Quivers with additive labelings: classification and algebraic entropy.  
*Doc. Math.*, 24: 2057–2135, 2019.
12. (with S. Hopkins, T. McConville, and A. Postnikov) Root system chip-firing I: Interval-firing.  
*Math. Z.*, 292: 1337–1385, 2019.
11. Periodicity and integrability for the cube recurrence.  
*Math. Z.*, 299: 1533–1563, 2021.
10. (with P. Pylyavskyy) Linear recurrences for cylindrical networks.  
*Int. Math. Res. Not. IMRN*, 2019(13): 4047–4080, 2019.
9. (with P. Pylyavskyy)  $R$ -systems.  
*Selecta Math. (N.S.)*, 25(22), 2019.
8. (with P. Blagojević, N. Palić, and G. Ziegler) Some more amplituhedra are contractible.  
*Selecta Math. (N.S.)*, 25(8), 2019.
7. (with M. Farber) Weak separation, pure domains and cluster distance.  
*Selecta Math. (N.S.)*, 24(3): 2093–2127, 2018.
6. Plabic graphs and zonotopal tilings.  
*Proc. Lond. Math. Soc.*, 117(4): 661–681, 2018.
5. A Littlewood-Richardson rule for dual stable Grothendieck polynomials.  
*J. Combin. Theory Ser. A*, 151: 23–35, 2017.
4. (with D. Grinberg and G. Liu) Refined dual stable Grothendieck polynomials and generalized Bender-Knuth involutions.  
*Electron. J. Combin.*, 23(3): Paper 3.14, 28, 2016.
3. (with V. Zolotov) Extensions of isometric embeddings of pseudo-Euclidean metric polyhedra.  
*Electron. Res. Announc. Math. Sci.*, 23: 1–7, 2016.
2. (with G. Panina) Manifolds associated to simple games.  
*J. Knot Theory Ramifications*, 25(12): 1642003, 14, 2016.
1. Existence of a persistent hub in the convex preferential attachment model.  
*Probab. Math. Statist.*, 36(1):59–74, 2016.

TALKS

- Amplituhedra and Origami Fall 2024-2025  
 Michigan Interdisciplinary Meeting on Amplitudes  
 Solvable Lattice Models & Interacting Particle Systems. Simons symposium in Krün, Germany  
 The Amplituhedron: Structure, Combinatorics, and Positive Geometry. Les Diablerets, Switzerland  
 Perfectly matched perspectives on statistical mechanics, combinatorics and geometry. A conference in honor of Richard Kenyon. Marseille, France  
 Cornell Discrete Geometry and Combinatorics Seminar  
 IAS Combinatorics of Fundamental Physics Workshop
- Move-reduced graphs on a torus vs positroid Catalan numbers Spring 2024  
 IPAM Workshop II: Integrability and Algebraic Combinatorics
- Geometric objects associated to planar bipartite graphs Spring 2024  
 IPAM Workshop I: Statistical Mechanics and Discrete Geometry
- Introduction to cluster algebras Spring 2024  
 IPAM: Geometry, Statistical Mechanics, and Integrability Tutorials
- Monotone links in DAHA and EHA Spring–Summer 2023  
 AIM Workshop “Algebra, geometry, and combinatorics of link homology”  
 UC Davis Combinatorics Seminar
- Parity duality for the amplituhedron Spring 2023  
 Simons Center for Geometry and Physics Workshop “Combinatorics and Geometry of Convex Polyhedra”
- Braid variety cluster structures and 3D plabic graphs Winter 2023  
 USC Combinatorics Seminar  
 AIM workshop “Cluster algebras and braid varieties”
- Positroids, knots, and  $q, t$ -Catalan numbers 2021–2023  
 MIT Applied Mathematics Seminar  
 Cornell Oliver Club  
 Duke Mathematics Department Colloquium  
 Canada-Mexico-USA Conference in Representation Theory, Noncommutative Algebra, and Categorification  
 Open Problems in Algebraic Combinatorics 2022  
 Stanford Mathematics Department Colloquium  
 AIM link homology group, cluster structures seminar (Zoom)  
 AlCoVE conference (Zoom)  
 Torus Knots Seminar (Zoom)  
 ICERM workshop, Brown University (Zoom)
- Ising model, total positivity, and criticality 2021–2022  
 FPSAC 2021 (Zoom)  
 Oberwolfach Mini-Workshop: Scattering Amplitudes, Cluster Algebras, and Positive Geometries (Zoom)  
 Harvard CMSA, Combinatorics, Physics and Probability Seminar (Zoom)  
 CCNY Math Colloquium (Zoom)  
 Séminaire Dimers (Zoom)  
 Positive Geometries in Scattering Amplitudes and Beyond Workshop (Zoom)  
 Yale University Clusters and Geometry Seminar (Zoom)  
 University of Michigan Combinatorics seminar (Zoom)
- Symmetries of stochastic colored vertex models Summer 2020  
 Dimers in Combinatorics and Cluster Algebras conference (Zoom)  
 Russian Integrable Probability Seminar (Zoom)
- Totally positive spaces: topology and applications 2019–2020  
 St. Petersburg Geometry and Combinatorics Seminar (Zoom)  
 MIT Thesis Defense
- Higher secondary polytopes and regular plabic graphs 2019–2020  
 Southern California Discrete Mathematics Symposium 2020  
 10h Discrete Geometry and Algebraic Combinatorics Conference, South Padre Island, TX
- Regularity theorem for totally nonnegative flag varieties Spring 2019  
 MIT Infinite Dimensional Algebra Seminar
- Ising model and total positivity Fall 2018  
 University of Toronto Special Colloquium  
 University of Illinois Integrability and Representation Theory seminar  
 MIT Integrable Probability seminar  
 University of California, Los Angeles Math Department Colloquium  
 University of Michigan combinatorics seminar
- Plabic graphs and zonotopal tilings 2017–2018  
 30th International Conference on Formal Power Series and Algebraic Combinatorics  
 University of California, Berkeley, Math 270 “Hot topics in algebra” (guest lecture)
- The totally nonnegative Grassmannian is a ball Spring 2018  
 MIT, 18.218 “Topics in combinatorics” (guest lecture)

- *R*-systems Fall 2017  
AMS Joint Meeting, Special Session on Dynamical Algebraic Combinatorics, San Diego, CA  
Université du Québec à Montréal, LaCIM seminar
- Zamolodchikov periodicity and integrability 2017–2018  
University of California, Los Angeles algebra seminar  
Infinite Analysis 17, Osaka, Japan (two lectures)  
University of California, Berkeley combinatorics seminar  
University of Michigan combinatorics seminar  
AMS Sectional Meeting at Hunter College  
Brandeis University combinatorics seminar  
University of Minnesota combinatorics seminar  
AMS Sectional Meeting at Bowdoin College  
MIT combinatorics seminar
- The symmetry and Schur expansion of dual stable Grothendieck polynomials Fall 2015  
MIT combinatorics seminar
- Existence of a persistent hub in the convex preferential attachment model Summer 2014  
11th International Vilnius Conference on Probability and Mathematical Statistics
- Manifolds associated to simple games Spring 2014  
Algebraic topology and its applications seminar at Moscow State University  
St. Petersburg A. D. Aleksandrov geometry seminar

**TEACHING  
EXPERIENCE**

- UCLA Math 61: Introduction to Discrete Structures Spring 2025  
Undergraduate class  
Lecturer. Evaluation score: 8.0 (max = 9.0)
- UCLA Math 206A: Combinatorial Theory Fall 2022  
Graduate class on Symmetric Functions  
Lecturer. Evaluation score: 8.8 (max = 9.0)
- UCLA Math 180: Graph Theory Spring 2022  
Undergraduate class  
Lecturer. Evaluation score: 8.23 (max = 9.0)
- UCLA Math 206A: Combinatorial Theory Fall 2021  
Graduate class on Geometric Combinatorics  
Lecturer. Evaluation score: 9.0 (max = 9.0)
- UCLA Math 184: Enumerative Combinatorics Spring 2021  
Undergraduate class  
Lecturer. Evaluation score: 8.14 (max = 9.0)
- UCLA Math 206B: Combinatorial Theory Winter 2021  
Graduate topics class on cluster algebras  
Lecturer. Evaluation score: 8.57 (max = 9.0)
- UCLA Math 180: Graph Theory Spring 2020  
Undergraduate class  
Lecturer. Evaluation score: 8.21 (max = 9.0)
- UCLA Math 206B: Combinatorial Theory Winter 2020  
Graduate topics class on total positivity  
Lecturer. Evaluation score: 9.0 (max = 9.0)
- MIT IAP 18.01 Calculus make-up class January 2018  
Lecturer and recitation leader
- MIT 18.02 Multivariable calculus Fall 2016  
Recitation leader. Evaluation score: 6.2 (max = 7.0)
- PRIMES, SPUR, RSI, and DRP programs at MIT 2015–2016  
Undergraduate and high school student mentor
- Differential and convex geometry Fall 2013  
Recitation leader (St. Petersburg State University)
- Differential geometry Spring 2012  
Recitation leader (St. Petersburg State University)