

Steven N. Karp

Curriculum Vitae

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Pronouns: he, him, his

Research Interests

Combinatorics and its relations to algebra, geometry, topology, and physics.

Education

- 2017 Ph.D., Mathematics, University of California, Berkeley
Dissertation: *Total positivity for Grassmannians and amplituhedra*
Advisor: Lauren K. Williams
- 2012 M.A.St. (with Distinction), Mathematics, University of Cambridge
- 2011 BMath, Combinatorics & Optimization and Pure Mathematics, University of Waterloo

Employment

- 2022 – Visiting Assistant Professor, University of Notre Dame
- 2019 – 2022 Postdoctoral Fellow, LaCIM, Université du Québec à Montréal
- 2017 – 2021 Postdoctoral Assistant Professor, University of Michigan (on leave 2019 – 2021)

Awards

- 2019 – 2021 NSERC Postdoctoral Fellowship
- 2017 – 2019 AMS–Simons Travel Grant
- 2017 Ribet–Goldberg Award in Algebra, University of California, Berkeley
- 2014 Chateaubriand Fellowship
- 2012 – 2015 NSERC Postgraduate Scholarship
- 2011 – 2012 Studentship in Mathematics, Trinity College, Cambridge
- 2011 – 2012 Julie Payette–NSERC Research Scholarship
- 2011 Valedictorian, Faculty of Mathematics, University of Waterloo
- 2011 Mike Vangoch Memorial Scholarship, University of Waterloo
- 2010 NSERC–CMS Math in Moscow Scholarship
- 2009, 2010 Honorable Mention, William Lowell Putnam Mathematical Competition
- 2008, 2009 NSERC Undergraduate Student Research Assistantship
- 2007 – 2011 R.G. Stanton National Scholarship, University of Waterloo
- 2007 Bronze Medal, International Mathematical Olympiad

Publications and Preprints

13. (with Hugh Thomas) q -Whittaker functions, finite fields, and Jordan forms.
`arXiv:2207.12590`
12. (with Anthony M. Bloch) On two notions of total positivity for partial flag varieties.
`arXiv:2206.05806`
11. Wronskians, total positivity, and real Schubert calculus.
`arXiv:2110.02301`
10. (with Anthony M. Bloch) Gradient flows, adjoint orbits, and the topology of totally nonnegative flag varieties.
`arXiv:2109.04558`
9. (with John Machacek) Shelling the $m = 1$ amplituhedron.
`arXiv:2104.02786`
8. (with Pavel Galashin and Thomas Lam) Regularity theorem for totally nonnegative flag varieties.
J. Amer. Math. Soc. 35 (2022), no. 2, 513–579. `arXiv:1904.00527`
7. Moment curves and cyclic symmetry for positive Grassmannians.
Bull. Lond. Math. Soc. 51 (2019), no. 5, 900–916. `arXiv:1805.06004`
6. (with Pavel Galashin and Thomas Lam) The totally nonnegative part of G/P is a ball.
Adv. Math. 351 (2019), 614–620. `arXiv:1801.08953`
5. (with Lauren K. Williams and Yan X Zhang) Decompositions of amplituhedra. Appendix written with Hugh Thomas.
Ann. Inst. Henri Poincaré D 7 (2020), no. 3, 303–363. `arXiv:1708.09525`
4. (with Pavel Galashin and Thomas Lam) The totally nonnegative Grassmannian is a ball.
Adv. Math. 397 (2022), Paper No. 108123, 23 pp. `arXiv:1707.02010`
3. (with Lauren K. Williams) The $m = 1$ amplituhedron and cyclic hyperplane arrangements.
Int. Math. Res. Not. IMRN (2019), no. 5, 1401–1462. `arXiv:1608.08288`
2. Sign variation, the Grassmannian, and total positivity.
J. Combin. Theory Ser. A 145 (2017), 308–339. `arXiv:1503.05622`
1. (with R.P. Anstee) Forbidden Configurations: Exact bounds determined by critical substructures.
Electron. J. Combin. 17 (2010), no. 1, Research Paper 50, 27 pp.

Conference and Seminar Talks

- 2022 04/27 Combinatorics seminar, University of Washington
- 2021 12/09 Scattering amplitudes, cluster algebras, and positive geometries mini-workshop,
Mathematisches Forschungsinstitut Oberwolfach
- 2021 12/03 CMS Winter Meeting scientific session on combinatorics and geometry of moduli
of curves, online

- 2021 11/09 Combinatorics, physics and probability seminar, Center of Mathematical Sciences and Applications
- 2021 10/25 Algebra and combinatorics seminar, North Carolina State University
- 2021 10/08 Séminaire de combinatoire, LaCIM, Université du Québec à Montréal
- 2021 09/22 Algebraic geometry seminar, Washington University in St. Louis
- 2021 05/20 Algebraic and enumerative combinatorics seminar, University of Waterloo
- 2021 04/08 The amplituhedron: algebra, combinatorics, and physics, online
- 2021 01/24 Combinatorial Algebra meets Algebraic Combinatorics (CAAC), online
- 2020 10/03 AMS Sectional special session on cluster algebras and plabic graphs, online
- 2020 07/22 Formal Power Series and Algebraic Combinatorics conference (FPSAC), online
- 2020 03/09 Applied algebra seminar, York University
- 2020 03/07 Algebra, Geometry and Combinatorics Day (ALGECOM), University of Illinois at Urbana–Champaign
- 2020 01/10 Séminaire de combinatoire, LaCIM, Université du Québec à Montréal
- 2019 03/28 Geometry, combinatorics, and integrable systems seminar, Ohio State University
- 2018 11/30 Combinatorics seminar, Massachusetts Institute of Technology
- 2018 11/29 Discrete math seminar, University of Massachusetts Amherst
- 2018 10/21 AMS Sectional special session on cluster algebra, Poisson geometry, and related topics, University of Michigan
- 2018 07/19 Formal Power Series and Algebraic Combinatorics conference (FPSAC), Dartmouth College
- 2018 05/10 Cluster Algebras and Mathematical Physics conference, Michigan State University
- 2017 10/27 Combinatorics seminar, University of Michigan
- 2017 09/29 Combinatorics seminar, University of Minnesota, Twin Cities
- 2017 09/28 Student combinatorics seminar, University of Minnesota, Twin Cities
- 2017 07/09 Formal Power Series and Algebraic Combinatorics conference (FPSAC), Queen Mary University of London
- 2017 03/30 Algebra-geometry-combinatorics seminar, University of Illinois at Urbana–Champaign
- 2016 12/01 Combinatorics seminar, University of California, Los Angeles
- 2016 10/17 Discrete geometry and combinatorics seminar, Cornell University
- 2016 08/29 Combinatorics seminar, University of California, Berkeley
- 2016 04/22 Discrete math seminar, Texas State University
- 2016 02/19 Combinatorics seminar, University of Michigan
- 2015 07/07 Formal Power Series and Algebraic Combinatorics conference (FPSAC), Korea Advanced Institute of Science and Technology
- 2015 03/11 Algebra-geometry-combinatorics seminar, San Francisco State University
- 2015 02/09 Combinatorics seminar, University of California, Berkeley
- 2014 11/20 Séminaire de combinatoire, LIAFA, Université Paris Diderot

Conference Organization

- 2020 12/05–12/08 CMS Winter Meeting scientific session on enumerative combinatorics, online
- 2018 10/20–10/21 AMS Sectional special session on combinatorics in algebra and algebraic geometry, University of Michigan

Seminar Organization

- Fall 2016–Spring 2017 Combinatorics seminar, University of California, Berkeley
- Spring 2014 Combinatorics student seminar, University of California, Berkeley
- Spring 2013–Fall 2013 Many Cheerful Facts seminar, University of California, Berkeley

Teaching

University of Notre Dame

- Fall 2022 Introduction to probability (Math 30530)

University of Michigan

- Winter 2019 Linear algebra (Math 217)
- Fall 2018 Linear algebra (Math 217), 2 sections
- Winter 2018 Algebraic combinatorics (Math 566)
- Fall 2017 Calculus I (Math 115), 2 sections

University of California, Berkeley (Graduate student instructor)

- Spring 2017 Calculus (Math 1B)
- Spring 2016 Multivariable calculus (Math 53)
- Fall 2015 Linear algebra (Math 110)
- Fall 2013 Multivariable calculus (Math 53)
- Spring 2013 Calculus (Math 1B)
- Fall 2012 Calculus (Math 1A)

Updated August 2022