

# Nicholas Proudfoot – Curriculum Vitae

Department of Mathematics  
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## Employment

Visiting Fellow, All Souls College, University of Oxford, 2024-25  
Professor, University of Oregon, 2017-present  
Associate Professor, University of Oregon, 2011-17  
Assistant Professor, University of Oregon, 2007-11  
Visiting Assistant Professor, Columbia University, 2006-07  
Bing Instructor, University of Texas, 2004-06

## Education

Ph.D. in Mathematics, U.C. Berkeley, 2004  
A.B. Magna cum Laude with Highest Honors in Mathematics, Harvard, 2000

## Grants

NSF grant DMS-2344861 (\$214,687), 2024-27  
NSF FRG grant DMS-2053243 (\$295,664), 2021-24  
NSF RTG grant DMS-2039316 (\$2,260,768, co-PI), 2021-26  
NSF grant DMS-1954050 (\$200,000), 2020-24  
NSF grant DMS-1565036 (\$200,000), 2016-20  
NSF conference grant DMS-1201580 (\$47,160), 2012  
NSF CAREER grant DMS-0950383 (\$400,000), 2010-16  
NSF grant DMS-0738335 (\$120,000), 2007-10

## Awards

Fund for Faculty Excellence, University of Oregon, 2018-19  
NSF Postdoctoral Research Fellowship, 2004-07  
Clay Mathematics Institute Summer Lift-Off Fellowship, 2004  
Runner-up, American Institute of Mathematics Five-Year Fellowship, 2004  
Herbert Alexander Prize for Outstanding Dissertation in Pure Mathematics, U.C. Berkeley, 2004  
Charles B. Morrey, Jr. Award, U.C. Berkeley, 2001  
Phi Beta Kappa, Harvard University, 2000  
Harvard University Certificate of Distinction in Teaching, 1998

## Postdoctoral Advisees

Colin Crowley (current)  
Galen Dorpalen-Barry (2023-24)  
George Nasr (2021-2023, tenure-track at Augustana University)  
Jacob Matherne (2019-2021, postdoc at University of Bonn and MPI, now tenure-track at NC State)  
Eric Ramos (2018-2021, tenure-track at Bowdoin College, now tenure track at Stevens)

## Ph.D. Students

Michael Feigen (current)  
Dane Miyata (2023, now a data scientist)  
Lorenzo Vecchi (visiting from the University of Bologna 2021-2022, now a postdoc at KTH)  
Jayden Wang (transferred to the University of Texas in 2021)  
Patrick Durkin (left in 2019)  
Katie Gedeon (2018, Senior Lecturer at the University of The Gambia)

Max Kutler (2017, postdoc at Yale University, now at Punahou School)  
Justin Hilburn (2016, postdoc at the University of Pennsylvania, now at the University of Waterloo)  
Christin Bibby (2015, postdoc at the University of Western Ontario, now tenure-track at LSU)  
Matthew Arbo (2015, Summit Benefit and Actuarial Services)  
Daniel Moseley (2012, tenure-track at Jacksonville University, now a data scientist at Crowley)

### **Undergraduate Students**

Chris Dunstan (supervised research 2023)  
Natalie Weaver (honors thesis 2020)  
Kevin Nguyen (supervised research 2019)  
Travis Scholl (honors thesis 2013)

### **Departmental Service**

2024-25: (full year sabbatical)  
2023-24: DH, PPA  
2022-23: DH  
2021-22: Department Head (**DH**), TE  
2020-21: ADH, EC, DGS, PPA, TE  
2019-20: ADH, EC, DGS, PPA, SC, Neuroscience Search  
2018-19: ADH, EC, DGS, PPA, SC  
2017-18: Associate Department Head (**ADH**), Teaching Effectiveness (**TE**), EC, PPA, DGS, SC  
2016-17: EC, PPA, DGS, SC, Undergraduate Advising  
2015-16: EC, PPA, DGS  
2014-15: (two quarter sabbatical), PPA, Director of Graduate Studies (**DGS**)  
2013-14: EC, PPA, PhD  
2012-13: EC, PPA, PhD  
2011-12: EC, Open Search, PPA, Ph.D. Committee (**PhD**)  
2010-11: CO, Pre-Ph.D. Advising (**PPA**)  
2009-10: EC, CO, Travel Committee, French Language Exams  
2008-09: Executive Committee (**EC**), Colloquium Organizer (**CO**)  
2007-08: Basic Notions Organizer, Scholarships Committee (**SC**)

### **University Service**

2024-25: (full year sabbatical)  
2023-24: HP, SAIL  
2022-23: HP, Summer Session Revisioning Project, SAIL volunteer (**SAIL**)  
2021-22: University Hall Heritage Project (**HP**)  
2020-21: Graduate School Slate Project Champions Team  
2019-20: SGC  
2018-19: SGC, GC  
2017-18: GC, Honorary Degree Committee, GTFF Faculty Workgroup, Grad School Dean Search  
2016-17: LC (chair), Ombudsman Advisory Committee, Graduate Council (**GC**), Academic Council  
2015-16: Library Committee (**LC**)  
2014-15: (two quarter sabbatical) SGC  
2013-14: SGC, Faculty Personnel Committee  
2012-13: SGC (chair)  
2011-12: SGC  
2010-11: US, Off-Campus Scholarships and Grants Committee (**SGC**)  
2009-10: University Senate (**US**)  
2008-09: SCCSC  
2007-08: Student Conduct and Community Standards Committee (**SCCSC**)

## Extramural Service

Referee for various journals

Reviewer for *Mathematical Reviews*

Panelist for the NSA, the NSF, and the SRNSF (Republic of Georgia)

Instructor and Guest Lecturer at USA/Canada Mathcamp for high school students, 2009 and 2011

Instructor at the Columbia Science Honors Program for high school students, 2006-07

## Workshops Organized

Combinatorial aspects of algebraic geometry, Summer Research Institute in Algebraic Geometry, Colorado State University, 2025 (scheduled)

Western Algebraic Geometry Symposium, University of Oregon, 2018

Representation Theory and Symplectic Algebraic Geometry, Luminy, 2012

WARTHOG (Workshop on Algebra and Representation Theory Held on Oregonian Grounds): I have organized a workshop at the University of Oregon since 2010, with Ben Elias taking over as the lead organizer in 2016. A list of topics for these workshops can be found at <https://pages.uoregon.edu/belias/WARTHOG/index.html>.

## Invited Talks

COW Seminar, Queen Mary University of London, 2024

Plenary Lecture at FPSAC'24, Ruhr-Universität Bochum, 2024

Suzhou Workshop on Matroid Theory, Suzhou University, 2024 (canceled due to passport problems)

BLT Seminar (Zoom), 2024

TATERS Seminar, Boise State University (Zoom), 2024

Seminar, Nankai University Center for Combinatorics, 2023

Algebraic Aspects of Matroid Theory, Banff, 2023

Representation and Number Theory Seminar, Chinese University of Hong Kong (Zoom), 2023

LMS-Bath Symposium on Combinatorial Algebraic Geometry, University of Bath (Zoom), 2022

Arrangements and Symmetries Oberseminar, Ruhr-Universität Bochum (Zoom), 2021

Colloquium, University of Minnesota (Zoom), 2021

$\mathcal{P}$ -positivity in Matroid Theory and Related Topics (two lectures), RIMS (Zoom), 2021

TAPIRS Seminar (Zoom), 2021

Topology Seminar, Northeastern (Zoom), 2021

Categorification Learning Seminar (Zoom), 2021

Geometry Seminar, University of Texas (Zoom), 2020

Suzhou Workshop on Geometry, Combinatorics and Representation Theory, Suzhou Univ, 2020 (canceled)

Algebra and Topology Seminar, Australian National University, 2020

Colloquium, Australian National University, 2020

Configuration Spaces of Graphs, American Institute of Mathematics, 2020

Geometric, Algebraic, and Topological Combinatorics, Oberwolfach, 2019

KIAS Workshop on Algebra-Geometry-Combinatorics, Korea Institute for Advanced Study, 2019

Colloquium, U.C. Riverside, 2019

Texas Algebraic Geometry Symposium, University of Texas, 2019

Summer School on Geometric Representation Theory (three lectures), IST Austria, 2018

Summer School on Combinatorics and Hodge Theory (six lectures), Nordfjordeid, 2018

Topology Seminar, University of Minnesota, 2018

AMS special session on Toric Geometry, Northeastern, 2018

AMS special session on Arrangements of Hypersurfaces, Northeastern, 2018

Algebra and Geometry Seminar, University of Toronto, 2018

Algebraic Geometry Seminar, University of British Columbia, 2018

Algebraic Geometry Seminar, U.C. Davis, 2017

Advances in Geometric Representation Theory, University of Michigan, 2016

Representation Theory and Geometry of Symplectic Resolutions, Northeastern, 2015

Combinatorial Methods Seminar, Université de Fribourg, 2015

Geometry Working Group (four lectures), École Polytechnique Fédérale de Lausanne, 2015

Algebra Seminar, University of Virginia, 2015  
Algebraic Geometry Seminar, Columbia University, 2015  
Workshop on Geometric Representation Theory (two lectures), MSRI, 2014  
Lie Theory Workshop, University of Oregon, 2013  
Algebraic Geometry Seminar, University of Colorado, 2012  
Minicourse at Columbia University (two lectures), 2012  
Lie Groups Seminar, Cornell University, 2012  
Colloquium, Cornell University, 2012  
Western Algebraic Geometry Seminar, University of Washington, 2012  
Advances in Hyperkähler and Holomorphic Symplectic Geometry, Banff, 2012  
Algebra Seminar, University of Washington, 2011  
Minicourse at Higher Structures in China II, Jilin University, 2011  
Geometry Seminar, Boston University, 2010  
Algebraic Geometry Seminar, Colorado State University, 2010  
Algebraic Geometry Seminar, University of British Columbia, 2009  
Southern Ontario Groups and Geometry Workshop, Fields Institute, 2009  
Representation Theory, Geometry, and Combinatorics Seminar, UC Berkeley, 2009  
AMS special session on Matroids in Algebra and Geometry, San Francisco State University, 2009  
Western Algebraic Geometry Seminar, University of Utah, 2008  
Colloquium, Reed College, 2008  
Geometry Seminar, University of Texas, 2008  
Undergraduate Math Club, University of Texas, 2008  
Geometry and String Theory Seminar, University of Texas, 2008  
Workshop on Moment Maps, Centre Interfacultaire Bernoulli, Lausanne, 2008  
Colloquium, Northern Arizona University, 2008  
Bellingham Algebraic Geometry Seminar, Western Washington University, 2008  
Algebraic Geometry Seminar, University of Oxford, 2007  
Workshop on D-bundles and Integral Hierarchies, University of Michigan, 2007  
Undergraduate Math Club, University of Connecticut, 2007  
AMS special session on Combinatorial Algebraic Geometry, Stevens Institute of Technology, 2007  
Colloquium, Swarthmore College, 2007  
Colloquium, City College of New York, 2007  
Topology Seminar, University of Oregon, 2007  
Colloquium, University of Oregon, 2007  
Algebra Seminar, Ottawa University, 2007  
Colloquium, Ottawa University, 2007  
Colloquium, Wesleyan University, 2007  
Colloquium, University of Illinois, 2007  
Colloquium, University of Notre Dame, 2007  
Colloquium, University of Western Ontario, 2007  
Symplectic Geometry Seminar, University of Toronto, 2007  
Colloquium, UC San Diego, 2006  
Topology Seminar, University of Oregon, 2006  
AMS special session on Equivariant Topology, University of Connecticut, 2006  
Algebraic Geometry Seminar, Princeton University, 2006  
International Conference on Toric Topology, Osaka University, 2006  
Colloquium, Northeastern University, 2006  
Colloquium, Texas Christian University, 2006  
GRASP Seminar, University of Texas, 2006  
AMS special session on Combinatorics and Algebraic Geometry, UC San Diego, 2005  
Representation Theory, Geometry, and Combinatorics Seminar, UC Berkeley, 2005  
Symplectic Geometry Seminar, University of Toronto, 2005  
Workshop on Moment Maps in Various Geometries, Banff, 2005  
Valley Geometry Seminar, University of Massachusetts, 2004

Moment Maps and Surjectivity in Various Geometries, American Institute of Mathematics, 2004  
 IAS/Park City Mathematics Institute in Geometric Combinatorics, Park City, UT, 2004  
 Presentations by Young Researchers in Algebraic Geometry, Snowbird, UT, 2004  
 16th Annual International Conference on Formal Power Series and Algebraic Combinatorics, UBC, 2004  
 Geometry Seminar, University of Texas, 2003  
 Combinatorics Seminar, University of North Carolina, 2003  
 Algebraic Geometry Seminar, University of Michigan, 2003  
 Geometry and Topology Seminar, Université de Genève, 2003  
 AMS special session on Algebraic and Topological Combinatorics, New York University, 2003  
 Conference on Quotients in Symplectic and Algebraic Geometry, University of Arizona, 2002

### Published or Accepted Papers

47. The combinatorics behind the leading Kazhdan–Lusztig coefficients of braid matroids (with Gao, Yang, and Zhang) To appear in *Electronic J. Comb.*
46. What is...the Dowling–Wilson Conjecture (with Braden and Matherne)  
To appear in *Not. Amer. Math. Soc.*
45. K-rings of wonderful varieties and matroids (with Larson, Li, and Payne)  
*Adv. Math.* 441 (2024), Paper No. 109554, 43 pp.
44. Equivariant cohomology and conditional oriented matroids (with Dorpalen-Barry and J. Wang)  
*Int. Math. Res. Not.* (2024), 9292-9322.
43. Equivariant Kazhdan–Lusztig theory of paving matroids (with Karn, Nasr, and Vecchi)  
*Alg. Comb.* 6 (2023), 677-688.
42. A semi-small decomposition of the Chow ring of a matroid (with Braden, Huh, Matherne, and B. Wang)  
*Adv. Math.* 409 (2022), Paper No. 108646, 49 pp.
41. A type B analogue of the category of finite sets with surjections  
*Electronic J. Comb.* 29(3) (2022), #P3.34.
40. The contraction category of graphs (with Ramos)  
*Representation Theory* 26 (2022), 673-697.
39. Equivariant log concavity and representation stability (with Miyata, Matherne, and Ramos)  
*Int. Math. Res. Not.* (2023), 3885-3906.
38. Equivariant incidence algebras and equivariant Kazhdan–Lusztig–Stanley theory  
*Alg. Comb.* 4 (2021), 675-681.
37. Stability phenomena for resonance arrangements (with Ramos)  
*Proc. Amer. Math. Soc. Ser. B* 8 (2021), 219-223.
36. The quantum Hikita conjecture (with Kamnitzer and McBreen)  
*Adv. Math.* 390 (2021), Paper No. 107947, 53 pp.
35. Functorial invariants of trees and their cones (with Ramos)  
*Selecta Math.* 25 (2019), 28pp.
34. Equivariant Kazhdan-Lusztig polynomials of  $q$ -uniform matroids  
*Alg. Comb.* 2 (2019), 613-619.
33. The algebraic geometry of Kazhdan-Lusztig-Stanley polynomials  
*EMS Surveys in Mathematical Sciences* 5 (2018), 99-127.
32. The  $Z$ -polynomial of a matroid (with Xu and Young)  
*Electronic J. Comb.* 25(1) (2018), #P1.26.
31. Configuration spaces,  $\text{FS}^{\text{op}}$ -modules, and Kazhdan-Lusztig polynomials of braid matroids (with Young)  
*New York Journal of Mathematics* 23 (2017), 813-832.
30. Kazhdan-Lusztig polynomials of matroids: a survey of results and conjectures (with Gedeon and Young)  
*Séminaire Lotharingien Combinatoire* 78B (2017), Art. 80, 12.
29. The equivariant Kazhdan-Lusztig polynomial of a matroid (with Gedeon and Young)  
*Journal of Combinatorial Theory, Series A* 150 (2017), 267-294.
28. The Orlik-Terao algebra and the cohomology of configuration space (with Moseley and Young)  
*Experimental Math.* 26 (2017), 373-380.
27. Quantizations of conical symplectic resolutions II: category  $\mathcal{O}$  and symplectic duality (with Braden, Licata, and Webster) *Astérisque* 384 (2016), 75-179.

26. Quantizations of conical symplectic resolutions I: local and global structure (with Braden and Webster)  
*Astérisque* 384 (2016), 1-73.
25. Hypertoric varieties and zonotopal tilings (with Arbo)  
*Int. Math. Res. Not.* 23 (2016), 7268-7301.
24. Intersection cohomology of the symmetric reciprocal plane (with Wakefield and Young)  
*J. Alg. Comb.* 43 (2016), 129-138.
23. The Kazhdan-Lusztig polynomial of a matroid (with Elias and Wakefield)  
*Adv. Math.* 299 (2016), 36-70.
22. Poisson-de Rham homology of hypertoric varieties and nilpotent cones (with Schedler)  
*Selecta Math.* 23 (2017), 179-202.
21. Intersection cohomology and quantum cohomology of symplectic resolutions (with McBreen)  
*Alg. Geom.* 2 (2015), 623-641.
20. Hypertoric Poisson homology in degree zero  
*Alg. Geom.* 1 (2014), 261-270.
19. Hypertoric category  $\mathcal{O}$  (with Braden, Licata, and Webster)  
*Adv. Math.* 231 (2012), 1487-1545.
18. Localization algebras and deformations of Koszul algebras (with Braden, Licata, Phan, and Webster)  
*Selecta Math.* 17 (2011), 533-572.
17. All the G.I.T. quotients at once  
*Trans. Amer. Math. Soc.* 363 (2011), 1687-1698.
16. Resolving toric varieties with Nash blow-ups (with Atanasov, Lopez, Perry, and Thaddeus)  
*Experimental Math.* 20 (2011), 288-303.
15. Gale duality and Koszul duality (with Braden, Licata, and Webster)  
*Adv. Math.* 225 (2010), no. 2, 2002-2049.
14. The hypertoric intersection cohomology ring (with Braden)  
*Inv. Math.* 177 (2009), no. 2, 337-380.
13. Moduli spaces for Bondal quivers (with Bergman)  
*Pacific J. Math.* 237 (2008), 201-221.
12. Intersection cohomology of hypertoric varieties (with Webster)  
*J. Alg. Geom.* 16 (2007), 39-63.
11. A non-Hausdorff model for the complement of a complexified arrangement  
*Proc. Amer. Math. Soc.* 135 (2007), 3989-3994.
10. A survey of hypertoric geometry and topology  
*Toric Topology*, Contemp. Math. 460, AMS, Providence, RI, 2006.
9. Moduli spaces for D-branes at the tip of a cone (with Bergman)  
*Journal of High Energy Physics* 03 (2006), 073.
8. A broken circuit ring (with Speyer)  
*Beitrage zur Algebra und Geometrie* 47 (2006), no. 1, 161-166.
7. Hyperplane arrangements and K-theory  
*Top. Appl.* 153 (2006), 2866-2875.
6. The equivariant Orlik-Solomon algebra  
*J. Algebra* 305 (2006), 1186-1196.
5. Abelianization for hyperkahler quotients (with Hausel)  
*Topology* 44 (2005), 231-248.
4. Geometric invariant theory and projective toric varieties  
*Snowbird Lectures in Algebraic Geometry*, Contemp. Math. 388, AMS, Providence, RI, 2005.
3. Hyperpolygon spaces and their cores (with Harada)  
*Trans. Amer. Math. Soc.* 357 (2005), 1445-1467.
2. Properties of the residual circle action on a hypertoric variety (with Harada)  
*Pacific J. Math.* 214 (2004), 263-284.
1. Parallel connections and bundles of arrangements (with Falk)  
*Topology and its Applications* 118 (2002), no. 1-2, 65-83.

## Preprints

Categorical valuative invariants of matroids (with Elias, Miyata, and Vecchi)  
Singular Hodge theory for combinatorial geometries (with Braden, Huh, Matherne, and B. Wang)  
On the enumeration of series-parallel matroids (with Xu and Young)

## In Preparation

Orlik-Terao algebras and internal zonotope algebras (with Crowley)  
The Salvetti complex of a conditional oriented matroid (with Dorpalen-Barry)  
The intersection cohomology of a matroid (with Braden, Huh, Matherne, and B. Wang)  
Local  $h$ -polynomials for matroids (with Braden, Huh, Matherne, and B. Wang)

## Courses Taught

I have taught 28 different courses at the University of Oregon, or 43 when counted with multiplicity.

231-2-3: Elements of Discrete Mathematics

241: Calculus for Business and Social Science I

261-2-3: Calculus with Theory ( $\times 2$ )

281: Several-Variable Calculus I

346: Fundamentals of Number Theory

411-2: Functions of a Complex Variable

456: Networks and Combinatorics ( $\times 4$ )

461: Introduction to Mathematical Methods of Statistics I

531: Introduction to Topology I ( $\times 3$ )

532: Introduction to Topology II ( $\times 4$ )

510: de Rham Cohomology

510: Introduction to Manifolds

544: Introduction to Abstract Algebra I

634-5-6: Algebraic Topology

692: What Every Topologist Should Know

607: Sheaf Theory ( $\times 3$ )

607: Symplectic Geometry ( $\times 2$ )

607: Toric Varieties ( $\times 2$ )

607: Combinatorial Commutative Algebra

607: Cluster Algebras and Canonical Bases

607: The Wonderful Geometry of Matroids