

Curriculum Vitae

EZRA MILLER

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 Mathematics Department Email Address: ezra@math.duke.edu
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Date of Birth: 1974 (Maryland, USA) Date of CV: January 2022

Education/Employment

2015 – Professor of Statistical Science, Duke University
2009 – Professor of Mathematics, Duke University
2006 – 2008 Associate Professor of Mathematics, University of Minnesota
2002 – 2006 Assistant Professor of Mathematics, University of Minnesota
2002 – 2003 MSRI Postdoc, Mathematical Sciences Research Institute
2000 – 2002 NSF Postdoc, Massachusetts Institute of Technology (mentor: Richard Stanley)
2000 Ph.D. University of California, Berkeley, Mathematics (advisor: Bernd Sturmfels)
1995 Sc.B. Brown University, Providence, RI, Mathematics (with Honors)
1995 A.B. Brown University, Providence, RI, Music

Appointments / Visiting positions

2018 Fall Simons CRM Professor, Centre de Recherches Mathématiques (CRM), Montréal
2015 – 2016 Faculty Fellow, SAMSI program on Computational Neuroscience
2011 – 2014 Associate Director, SAMSI (Statistical and Applied Mathematical Sciences Institute)
2010 – 2011 Faculty Fellow, SAMSI program on Analysis of Object Data
2007 – 2008 Member, Institute for Math and its Applications (IMA): Molecular and Cell Biology
2006 – 2007 Visiting Faculty, University of Michigan

Scientific/Academic honors, grants (see 'Organizing activities' & 'University service' for more grants)

2017 – 2020 NSF Grant DMS-1702395 (3 years, \$122,474)
2014 Duke SciComm Fellow (Duke Science & Society program on science communication)
2012 Fellow of the American Mathematical Society
2012 – 2017 NSF Grant DMS-1127914 (\$17,525,600 to fund SAMSI), co-PI: Richard Smith (UNC-CH Stat), Pierre Gremaud (NCSU Math), Ilse Ipsen (NCSU Math), Alan Karr (NISS)
2010 – 2016 NSF Grant DMS-1001437 (6 years, \$415,804)
2010 – NSF & NSA conference grants (6 grants, \$100,000 total; see *Organizing Activities*, p.13)
2007 – 2009 University of Minnesota McKnight Presidential Fellow (comes with \$45,000 grant)
2007 U of M Institute of Technology Guillermo E. Borja Award (comes with \$3,500 grant)
2005 – 2010 NSF Faculty Early Career Development (CAREER) Award (5 years, \$400,860 grant)
2005 – 2007 Univ. of Minnesota McKnight Land-Grant Professorship (comes with \$90,000 grant)
2003 – 2006 National Science Foundation Grant (3 years, \$126,385)
2000 – 2002 National Science Foundation Postdoctoral Research Fellowship
1999 – 2000 Alfred P. Sloan Doctoral Dissertation Fellowship
1997 , 1999 Julia B. Robinson Fellowship (Berkeley Math Department)
1997 Charles B. Morrey, Jr. Award (Berkeley Math Department)
1995 David Howell Premium for Outstanding Achievement (Brown Math Dept, highest honor)
—— Phi Beta Kappa (nationwide honor awarded by Brown University chapter)
—— Sigma Xi (nationwide honor awarded by Brown University chapter)
1994 Manning Calculus Prize (Brown University)
1993 Intern for Research and Training, National Institutes of Health [NIH]*
1991 – 1992 Howard Hughes Medical Institute Scholar*
1990 Sobel Scholar*

Nonscientific academic awards

1995 Arlan R. Coolidge Premium for Musical Excellence (Brown University Music Dept.)
1994 Buxtehude Premium for Excellence in Music (Brown University Music Dept.)

Research interests

Geometry, algebra, topology, combinatorics, algorithms, statistics, probability, biology & other applications

*Laboratory biochemistry researcher chosen from nationwide search to work summers at the NIH in Bethesda, Maryland

Publications

Books, expository articles, and edited volumes

- 2018 12. (book edited with Viviana Ene) *Multigraded Algebra and Applications: NSA 24, Moieciu de Sus, Romania, ugust 2016*, commutative algebra and computer algebra, Mangalia, Romania, Springer Proceedings in Mathematics & Statistics vol. 238, Springer, New York, 2018. (xi + 167 pages) doi:10.1007/978-3-319-90493-1
- 2016 11. (journal volume edited with Arkady Berenstein, Maxim Braverman, Vladimir Retakh, and Jonathan Weitsman) *Special volume honoring Andrei Zelevinsky*, Advances in Mathematics **300** (2016), 868 pages.
- 2015 10. *Fruit flies and moduli: interactions between biology and mathematics*, Notices of the American Math. Society **62** (2015), no. 10, 1178–1184. doi:10.1090/noti1290 arXiv:q-bio.QM/1508.05381
- 2011 9. *Theory and applications of lattice point methods for binomial ideals*, in Combinatorial Aspects of Commutative Algebra and Algebraic Geometry, Proceedings of Abel Symposium held at Voss, Norway, 1–4 June 2009, Abel Symposia, vol. 6, Springer Berlin Heidelberg, 2011, pp. 99–154.
- 2009 8. (book edited with Viviana Ene) *Combinatorial aspects of commutative algebra*, Exploratory workshop on combinatorial commutative algebra and computer algebra, Mangalia, Romania, May 29–31, 2008, Contemporary Math, vol. 502, AMS, Providence, RI, 2009. (vii+184 pages)
- 2008 7. *What is ... a toric variety?* Notices of the American Mathematical Society **55** (2008), no. 5 (May), 586–587.
- 2007 6. (book with Srikanth Iyengar, Graham Leuschke, Anton Leykin, Claudia Miller, Anurag Singh, and Uli Walther) *Twenty-four hours of local cohomology*, Graduate Studies in Mathematics, vol. 87, American Mathematical Society, Providence, RI, 2007. (xvi+282 pages)
5. (book edited with Vic Reiner and Bernd Sturmfels) *Geometric Combinatorics*. Lectures from the Graduate Summer School of the Institute for Advanced Study/Park City Mathematics Institute, Park City, UT, July 11–31, 2004. IAS/Park City Math Series, vol. 13, American Math Society, Providence, RI; Institute for Advanced Study (IAS), Princeton, NJ, 2007. (xvi+691 pages)
4. (with Vic Reiner) *What is geometric combinatorics?* In Geometric combinatorics (Park City, UT, 2004), IAS/Park City Math. Series, vol. 13, American Math. Soc., Providence, RI, pp. 1–17.
- 2004 3. (book with Bernd Sturmfels) *Combinatorial Commutative Algebra*, Graduate Texts in Mathematics, vol. 227, Springer–Verlag, New York, 2004. (xiv+417 pages)
2. *Hilbert schemes of points in the plane*, Appendix to *Commutative algebra of N points in the plane*, by Mark Haiman, in Luchezar Avramov et al., (eds.), *Trends in Commutative Algebra*, MSRI Publications Vol. 51, Cambridge University Press, New York, 2004, pp. 153–180.
- 2001 1. (with David Perkinson) *Eight lectures on monomial ideals*, in Queen’s Papers in Pure and Applied Mathematics, no. 120, 3–105. [Not in MathSciNet—I know not why; I’ve tried to fix it.]

Peer-reviewed research articles

- preprint 53. (with Jim Davis and Patricia Hersh) *Fibers of maps to totally nonnegative spaces*, 27 pages. arXiv:math.CO/1903.01420
- submitted 52. (with Nathan Geist) *Global dimension of real-exponent polynomial rings*, 8 pages, submitted, 2021. arXiv:math.AC/2109.04924
51. *Essential graded algebra over polynomial rings with real exponents*, 73 pages, submitted, 2020. arXiv:math.AT/2008.03819
50. *Stratifications of real vector spaces from constructible sheaves with conical microsupport*, 15 pages, submitted, 2020. arXiv:math.AT/2008.00091
49. *Primary decomposition over partially ordered groups*, 13 pages, submitted, 2020. arXiv:math.AC/2008.00093

48. *Homological algebra of modules over posets*, 43 pages, submitted 2020. arXiv:math.AT/2008.00063
47. (with John Eagon and Erika Ordog) *Minimal resolutions of monomial ideals*, 30 pages, submitted, 2020. arXiv: math.AC/1906.08837v2
- 2018 46. (with Lukas Katthän and Mateusz Michałek) *When is a polynomial ideal binomial after an ambient automorphism?*, Foundations of Computational Mathematics, 23 pages. doi:10.1007/s10208-018-9405-0 arXiv:math.AC/1706.03629
- 2016 45. (with Thomas Kahle and Chris O’Neill) *Irreducible decomposition of binomial ideals*, Compositio Math. **152** (2016), 1319–1332. doi:10.1112/S0010437X16007272 arXiv:math.AC/1503.02607
44. (with Paul Bendich, Steve Marron, Alex Pieloch, and Sean Skwerer) *Persistent homology analysis of brain artery trees*, Annals of Applied Statistics **10** (2016), no. 1, 198–218. doi:10.1214/15-AOAS886 arXiv:stat.AP/1411.6652
- 2015 43. (with Stephan Huckemann, Jonathan C. Mattingly, and James Nolen) *Sticky central limit theorems at isolated hyperbolic planar singularities*, Electronic J. Probability **20** (2015), no. 78, 1–34. doi:10.1214/EJP.v20-3887 arXiv:math.PR/1410.6879
42. (with Christine Berkesch and Stephen Griffeth) *Systems of parameters and holonomicity of hypergeometric systems*, Pacific Journal of Mathematics, **276** (2015), no. 2, 281–286. doi:10.2140/pjm.2015.276.281 arXiv:math.AG/1302.0048
41. (with Megan Owen and Scott Provan) *Polyhedral computational geometry for averaging metric phylogenetic trees*, Advances in Applied Math. **15** (2015), 51–91. doi:10.1016/j.aam.2015.04.002 arXiv:math.MG/1211.7046
- 2014 40. (with Thomas Kahle) *Decompositions of commutative monoid congruences and binomial ideals*, Algebra & Number Theory **8** (2014), no. 6, 1297–1364. doi:10.2140/ant.2014.8-6 arXiv:math.AC/1107.4699v5
39. (with Manoj Gopalkrishnan and Anne Shiu) *A geometric approach to the Global Attractor Conjecture*, SIAM J. on Applied Dynamical Systems (SIADS) **13** (2014), no. 2, 758–797. doi:10.1137/130928170 arXiv:math.DS/1305.5303
38. Sean Skwerer, Elizabeth Bullitt, Stephan Huckemann, Ezra Miller, Ipek Oguz, Megan Owen, Vic Patrangenaru, Scott Provan, and J.S. Marron, *Tree-oriented analysis of brain artery structure*, J. Mathematical Imaging & Vision **50**, no. 1–2 (2014), 126–143. doi:10.1007/s10851-013-0473-0
- 2013 37. (with Thomas Hotz, Stephan Huckemann, Huiling Le, J. S. Marron, Jonathan C. Mattingly, James Nolen, Megan Owen, Vic Patrangenaru, and Sean Skwerer) *Sticky central limit theorems on open books*, Ann. of Applied Probability **23** (2013), no. 6, 2238–2258. doi:10.1214/12-AAP899 arXiv:math.PR/1202.4267
36. (with Manoj Gopalkrishnan and Anne Shiu) *A projection argument for differential inclusions, with applications to persistence of mass-action kinetics*, SIGMA [Symmetry, Integrability, and Geometry: Methods and Applications] **9** (2013), 025, 25 pages. doi:10.3842/SIGMA.2013.025 arXiv:math.DS/1208.0874
35. *Affine stratifications from finite misère quotients*, Journal of Algebraic Combinatorics **37** (2013), 1–9. doi:10.1007/s10801-012-0355-3 arXiv:math.CO/1009.2199
34. (with Alan Guo) *Algorithms for lattice games*, International Journal of Game Theory **42** (2013), no. 4, 777–788. doi:10.1007/s00182-012-0319-9 arXiv:math.CO/1105.5413
- 2012 (on parental leave)
- 2011 33. (with Isabella Novik and Ed Swartz) *Face rings of simplicial complexes with singularities*, Mathematische Annalen **351** (2011), 857–875. arXiv:math.AC/1001.2812
32. (with Alan Guo) *Lattice point methods for combinatorial games*, Advances in Applied Mathematics **46** (2011), 363–378. doi:10.1016/j.aam.2010.10.004 arXiv:math.CO/0908.3473; Corrigendum: ibid. **48** (2012), 269–271. arXiv:math.CO/1105.5420

31. (with Dave Anderson and Stephen Griffeth) *Positivity and Kleiman transversality in equivariant K -theory of homogeneous spaces*, J. European Math Society **13** (2011), 57–84. doi:10.4171/JEMS/244 arXiv:math.AG/0808.2785
- 2010 30. (with Alicia Dickenstein and Laura Matusevich) *Binomial D -modules*, Duke Mathematical Journal **151**, no. 3 (2010), 385–429. arXiv:math.AG/0610353
29. (with Alicia Dickenstein and Laura Matusevich) *Combinatorics of binomial primary decomposition*, Mathematische Zeitschrift **264**, no. 4 (2010), 745–763. doi:10.1007/s00209-009-0487-x arXiv:math.AC/0803.3846
- 2009 28. *Topological Cohen–Macaulay criteria for monomial ideals*, in #8 listed above under Books and expository items, pp. 137–156. arXiv:math.AC/0809.1458
27. (with Allen Knutson and Alex Yong) *Gröbner geometry of vertex decompositions and of flagged tableaux*, J. für die reine und angewandte Mathematik **630** (2009), 1–31. arXiv:math.CO/0502144
- 2008 26. (with Allen Knutson and Alex Yong) *Tableau complexes*, Israel Journal of Mathematics **163** (2008), 317–343. arXiv:math.CO/0510487
25. (with Shin-Yao Jow) *Multiplier ideals of sums via cellular resolutions*, Mathematical Research Letters **15** (2008), no. 2, 359–373. arXiv:math.AG/0703299
24. (with Ning Jia) *Duality of antidiagonals and pipe dreams*, Séminaire Lotharingien de Combinatoire, B58e [the fifth paper in Issue 58] (2008), 6 pages. arXiv:math.CO/0706.3031
23. (with Igor Pak) *Metric combinatorics of convex polyhedra: cut loci and nonoverlapping unfoldings*, Discrete and Computational Geometry **39** (2008), no. 1–3, 339–388. doi:10.1007/s00454-006-1249-0 arXiv:math.MG/0312253
22. (with David Speyer) *A Kleiman–Bertini theorem for sheaf tensor products*, Journal of Algebraic Geometry **17** (2008), no. 2, 335–340. arXiv:math.AG/0601202
- 2007 (see Books and expository articles, above)
- 2006 21. (with Allen Knutson and Mark Shimozono) *Four positive formulae for type A quiver polynomials*, Inventiones Mathematicae **166** (2006), no. 2, 229–325. arXiv:math.AG/0308142
20. (with Laura Matusevich) *Combinatorics of rank jumps in simplicial hypergeometric systems*, Proceedings of the American Math Society **134** (2006), 1375–1381. arXiv:math.AC/0402071
19. (with Vic Reiner) *Stanley’s simplicial poset conjecture, after M. Masuda*, Communications in Algebra **34** (2006), no. 3, 1049–1053.
- 2005 18. (with Laura Matusevich and Uli Walther) *Homological methods for hypergeometric families*, Journal of the American Math Society **18** (2005), no. 4, 919–941. arXiv:math.AG/0406383
17. *Alternating formulas for K -theoretic quiver polynomials*, Duke Math Journal **128** (2005), 1–17. arXiv:math.CO/0312250
16. (with Allen Knutson) *Gröbner geometry of Schubert polynomials*, Annals of Mathematics **161** (2005), 1245–1318. arXiv:math.AG/0110058
15. (with David Helm) *Algorithms for graded injective resolutions and local cohomology over semigroup rings*, Journal of Symbolic Computation **39** (2005), 373–395. arXiv:math.AC/0309256
14. (with Mikhail Kogan) *Toric degeneration of Schubert varieties and Gelfand–Tsetlin polytopes*, Advances in Mathematics **193** (2005), no. 1, 1–17. arXiv:math.AG/0303208
- 2004 13. (with Vic Reiner) *Reciprocal domains and Cohen–Macaulay d -complexes in \mathbb{R}^d* , The Electronic Journal of Combinatorics **11(2)** (2004), #N1 (9 pages). arXiv:math.CO/0408169
12. (with Allen Knutson) *Subword complexes in Coxeter groups*, Advances in Mathematics **184** (2004), 161–176. arXiv:math.CO/0309259
- 2003 11. (with David Helm) *Bass numbers of semigroup-graded local cohomology*, Pacific Journal of Mathematics **209** (2003), no. 1, 41–66. arXiv:math.AG/0010003

10. *Mitosis recursion for coefficients of Schubert polynomials*, Journal of Combinatorial Theory, Series A **103** (2003), 223–235. arXiv:math.CO/0212131
- 2002 9. *Cohen–Macaulay quotients of normal semigroup rings via irreducible resolutions*, Mathematical Research Letters **9** (2002), no. 1, 117–128. arXiv:math.AC/0110096
8. *Graded Greenlees–May duality and the Čech hull*, Local cohomology and its applications (Guanajuato, 1999), Lecture Notes in Pure and Appl. Math., vol. 226, Dekker, New York, 233–253.
7. *Planar graphs as minimal resolutions of trivariate monomial ideals*, Documenta Mathematica **7** (2002), 43–90. (electronically published: <http://www.math.uiuc.edu/documenta/vol-07/03.html>)
- 2000 6. *Resolutions and duality for monomial ideals*, Ph.D. thesis, University of California at Berkeley.
5. *The Alexander duality functors and local duality with monomial support*, Journal of Algebra **231** (2000), 180–234.
4. (with Bernd Sturmfels and Kohji Yanagawa) *Generic and cogeneric monomial ideals*, Journal of Symbolic Computation **29** (2000), 691–708.
3. *Icosahedra constructed from congruent triangles*, Discrete and Computational Geometry **24** (2000), no. 2–3, 437–451.
- 1999 2. (with Bernd Sturmfels) *Monomial ideals and planar graphs*, in Applied Algebra, Algebraic Algorithms and Error-Correcting Codes, [M. Fossorier, H. Imai, S. Lin and A. Poli, eds.], Proceedings of AAECC-13 (Honolulu, Nov. 1999), *Springer Lecture Notes in Computer Science* **1719**, 19–28.
- 1998 1. *Multiplicities of ideals in noetherian rings*. Beiträge zur Alg. und Geom. **39** (1998), no. 1, 47–51.
- Conference abstracts (peer-reviewed and/or invited)
- 2018 9. *Stratified spaces, fly wings, and multiparameter persistent homology*, in *Statistics for data with geometric structure*, abstracts from 21–26 Jan. 2018 workshop, organized by A. Feragen, T. Hotz, S. Huckemann, E. Miller, Oberwolfach Rep. No. 3/2018, pp. 43–45. doi:10.4171/OWR/2018/3
- 2017 8. (with Justin Curry and Ashleigh Thomas) *Non-noetherian modules from persistent homology*, in *Algebraic Statistics*, abstracts from 17–21 April 2017, organized by Matthias Drton, Bernd Sturmfels, and Caroline Uhler, Oberwolfach rep. no. ?? (2017), p.???. doi:10.4171/OWR/2017/??
- 2014 7. (with Stephan Huckemann, Jonathan Mattingly, and James Nolen) *Topological definition of stickiness for means in arbitrary metric spaces*, in *Mini-Workshop: Asymptotic Statistics on Stratified Spaces*, abstracts from 29 September – 3 October 2014, organized by Aasa Feragen, Stephan Huckemann, J.S. Marron, and Ezra Miller, Oberwolfach rep. no. 44 (2014), p.2510. doi:10.4171/OWR/2014/44
- 2009 6. (with Alan Guo and Mike Weimerskirch) *Potential applications of commutative algebra to combinatorial game theory*, in *Kommutative Algebra*, abstracts from April 19–25, 2009 workshop, organized by W. Bruns, H. Flenner, and C. Huneke, Oberwolfach rep. **6**, no. 2 (2009), pp. 1180–1183.
- 2007 5. (with Alicia Dickenstein and Laura Matusevich) *Extended abstract: Binomial D -modules*, Proceedings MEGA (Effective Methods in Algebraic Geometry), Strobl, Austria, 2007, 13 pages. <http://www.ricam.oeaw.ac.at/mega2007/electronic/electronic.html>
4. (with Shin-Yao Jow) *Extended abstract: Cellular resolutions of multiplier ideals of sums*, in *Topological and geometric combinatorics*, abstracts from the Jan. 28–Feb. 3, 2007 workshop, organized by A. Björner, G. Kalai, and G. Ziegler, Oberwolfach rep. **4** (2007), no. 1, 195–271, (3 pages).
- 2006 3. (with Laura Matusevich and Uli Walther) *Extended abstract: Homological methods for hypergeometric families*, in *Convex and algebraic geometry*, abstracts from the workshop held January 29–February 4, 2006, organized by K. Altmann, V. Batyrev, and B. Teissier, Oberwolfach reports **3** (2006), no. 1, 253–316, (3 pages).

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- 2003 2. (with David Helm) *Extended abstract: Algorithms for graded injective resolutions and local cohomology over semigroup rings*, Proceedings MEGA (Effective Methods in Algebraic Geometry), Kaiserslautern, Germany, 2003, 5 pages.
- 2002 1. (with Allen Knutson) *Extended abstract: Gröbner geometry of Schubert polynomials*, Proceedings FPSAC (Formal Power Series and Algebraic Combinatorics), Melbourne 2002, 10 pages.

Other publications

- 2017 2. *Data structures for real multiparameter persistence modules*, 107 pages. [arXiv:math.AT/1709.08155](https://arxiv.org/abs/math/1709.08155)
- 2009 1. *Alexander duality for monomial ideals and their resolutions*, *Rejecta Mathematica* **1** (2009), no. 1, 18–57. [arXiv:math.AC/0912095](https://arxiv.org/abs/math/0912095)

Lecture series, lectures, and presentations (247 total)

Lecture series

- 2019 Sep. Toulouse, France: Sampling from stratified spaces [5 hours of lectures]
 2018 Nov. Guanajuato, Mexico (CIMAT): Resolving persistent homology [4.5 hours of lectures]
 — Sep. Montréal, Canada (LaCIM): From quiver & poset reps to appl. comm. alg [3 hours of lectures]
 2016 Aug. Moieciu de Sus, Romania: Real applied multigraded commutative algebra [5 hours of lectures]
 2010 Sep. İstanbul, Turkey: Decompositions of monoids and binomial ideals [5 hours of lectures]
 — Jan. Sevilla, Spain: Primary decomposition of binomial ideals [8 hours of lectures]
 2009 June (canceled due to political unrest) IPM Tehran, Iran: Binomial ideals [4 hours of lectures]
 2007 May CRM Montréal, Canada: Hypergeometric series and binomial ideals [5 hours of lectures]
 2006 Sep. Constanța, Romania: Multigraded commutative algebra [9 hours of lectures]
 — July Lincoln, Nebraska (IMMERSE program): Irreducible decomposition [3 hours of lectures]
 2005 Sep. UNAM, Mexico City: Gröbner geometry of quiver polynomials [3 hours of lectures]
 — June Snowbird, Utah: Local cohomology and combinatorics [3 hours of lectures]
 2004 Aug. Kyoto, Japan (RIMS workshop): Gröbner geometry of quiver polynomials [3 hours of lectures]
 — May Trieste, Italy (ICTP workshop): Combinatorial commutative algebra [4 hours of lectures]
 1998 Aug. Berkeley, CA (MSRI Summer Program): Alexander duality [3 hours of lectures]

Invited (international audience)

- 2021 Aug. Texas A&M (SIAM AG plenary): Computational algebra and geometry of multipersistence
 — Jul. Tehran, Iran (IPM): Multigraded algebra over polynomial rings with real exponents
 — Jul. Leiden, Netherlands (Lorentz Center): Endpoints for multiparameter persistence
 — May Berkeley (MSRI: Topol. insights in Neurosci): Persistent homology with multiple parameters
 — Apr. U. Chicago (TDA @ IMSI): Endpoints for multiparameter persistence
 2020 Dec 3 Talca, Chile (Colloquium—online): Algebra over polynomial rings with real exponents
 — Dec 3 Bombay, India (IIT Facets of CACAAG—online): Minimal resolutions of monomial ideals
 — Nov. Leipzig, Germany (Nonlinear Algebra Seminar Online): Non-integer multigraded algebra
 — Jan. Halifax, NS (Comb.Alg/Alg.Comb): Minimal resolutions of monomial ideals
 2019 Aug. Oslo, Norway (biology workshop on Evolvability): Mathematics of phenotype variation
 — Jul. Bern, Switzerland: Primary distance for multipersistence
 — Jun. Quy Nhon, Vietnam (AMS–VMS): Spanning trees and lattice paths for monomial resolutions
 — Jun. Hanoi, Vietnam (IMH Colloquium): Algebraic structures for topological summaries of data
 — May U. Chicago: Primary distance for multipersistence
 2018 Sep. Montréal, Canada (CRM): Subword complexes as totally nonnegative parametrization fibers
 — Aug. Oaxaca, Mexico (BIRS-CMO): What makes primary decomposition minimal?
 — Jul. U. Edinburgh: Algebraic structures for topological summaries of data
 — Jul. Rabat, Morocco: Homological and geometric finiteness for real-exponent multigraded
 — Jun. Vienna, Austria (ATMCS8): Real multiparameter persistent homology
 — May Ohio State (TRIPODS): Real multiparameter persistent homology
 — Jan. Oberwolfach, Germany: Stratified spaces, fly wings, and multiparameter persistent homology
 2017 Aug. Banff (BIRS): What is a QR code?
 — July Banff (BIRS): What is a barcode for persistent homology with multiple parameters?
 — July Montréal (Math Congress of Americas): Algebraic data structures for topological summaries
 — June Toronto (CanaDAM): Fruit fly wing veins as embedded planar graphs
 — May Max Planck (Leipzig): Algebra for topology in biology and statistics
 2016 Sep. Columbus, Ohio (MBI): Data structures for real multiparameter persistence
 — July Herstmonceux, UK: Poset encodings of modules with actions of real cones
 — June Cortona, Italy: Homological algebra for real multigraded modules
 — May Albuquerque, NM (SIAM Imaging Sci): Effective alg & geom for images with varied topology
 2015 Sep. Oxford, UK: Biological apps of persistent homology: interactions with stat, geom, and alg

- July Osaka, Japan: Multigraded moduli from fruit flies via stratified space statistics
- June U. Chicago: Persistent interactions between biology, topology, and statistics
- 2014 Oct. Oberwolfach, Germany: Topological definition of sticky means in arbitrary metric spaces
- May Chicago, IL (Alg. Stat @ IIT): Applying persistent homology to brain artery and vein imaging
- May Durham, NC (SAMSI LDHD Transition): Topological analysis of geometrically stratified data
- Mar. Göttingen, Germany: Applying persistent homology to brain artery imaging
- Mar. Ulm, Germany: Asymptotics of sampling from topologically stratified spaces
- Jan. Halifax, NS (Comb.Alg/Alg.Comb): Binomial irreducible decomposition
- 2013 July Luminy, France (CIRM): Binomial irreducible decomposition.
- Apr. Boston, MA: How do quivers and stratifications apply to biology?
- 2012 Dec Berkeley (MSRI): Alexander duality and total positivity: a cluster/commutative connection
- Oct. Sandbjerg, Denmark: Geometry for samples of metric branched structures
- May Columbus, Ohio (MBI): Sticky central limit theorems at singularities
- 2011 Aug. Prague, Czech Rep.: Sticky central limit theorems at singularities
- Aug. Miami Beach (JSM): Sticky central limit theorems at singularities
- Jan. Oslo, Norway: Statistics on data sampled from stratified spaces
- 2010 Nov. Luminy, France: Decompositions of commutative monoid congruences and binomial ideals
- June Berkeley (AMS–SMM meeting): Face rings of simplicial complexes with singularities
- 2009 July Halifax, Nova Scotia (Games-at-Dal): Lattice games
- June Voss, Norway (Abel Symposium): Applications of binomial commutative algebra
- Apr. Oberwolfach, Germany: Potential apps. of commutative algebra to combinatorial game theory
- Mar. MSRI, Berkeley: Equivariant transversality and K -theoretic positivity
- Mar. Thessaloniki, Greece: Geometry of flags and permutations
- Mar. Thessaloniki, Greece: Unfolding polyhedra
- Mar. Ioannina, Greece: Unfolding polyhedra
- 2008 May Mangalia, Romania: Cellular resolutions of multiplier ideals of sums
- 2007 Dec American Institute of Mathematics, Palo Alto: Nonoverlapping unfolding of polyhedra
- July Medellín, Colombia: Old hypergeometric mysteries and new toric algebra
- July Tianjin, China (FPSAC plenary speaker): Combinatorics of Horn hypergeometric series
- May CRM Montréal, Canada: Kleiman–Bertini theorems for sheaf tensor products
- Feb. Oberwolfach, Germany: Cellular resolutions of multiplier ideals of sums
- 2006 June Snowbird, Utah: Binomial D -modules and lattice point geometry
- May Luminy, France: Lattice basis ideals and Horn systems
- Feb. Oberwolfach, Germany: Homological methods for hypergeometric families
- 2005 Dec. Taichung, Taiwan (AMS–TMS): Positivity by degeneration
- July Seattle (Algebraic Geometry Warmup Week): Combinatorial positivity in algebraic geometry
- July Lisbon, Portugal (workshop on D -modules): Homological methods for hypergeometric families
- 2004 July Park City, Utah (IAS/PCMI): Overview of geometric combinatorics
- 2003 June Seville, Spain (AMS–RSME meeting): Positive combinatorial formulae for quiver polynomials
- June Kaiserslautern, Germany (MEGA): Computing injective resolutions over semigroup rings
- May Banff, Canada (BIRS workshop): Positive combinatorial formulas for quiver polynomials
- Apr. Oberwolfach, Germany (Topological Combinatorics workshop): Unfolding polyhedra
- Apr. Banff, Canada (BIRS workshop): Minors in products of matrices
- 2002 Sep. MSRI Introductory workshop (Berkeley): Hilbert schemes of points in the plane
- July Melbourne, Australia (FPSAC one-hour talk): Gröbner geometry of Schubert polynomials
- June Trento, Italy (workshop): Gröbner geometry of Schubert polynomials via determinantal ideals
- 2001 May Morelia, Mexico (AMS–SMM meeting): Embedding planar graphs in staircases
- 1999 Dec. Guanajuato, Mexico (Local Cohomology workshop): The Čech hull
- June Essen, Germany (special seminar): Alexander duality & local duality with monomial support
- 1998 Apr. Kyoto, Japan (RIMS): Alexander duality for arbitrary monomial ideals

Invited (domestic audience; not including seminars)

- 2020 Sep. El Paso (AMS—online): Minimal resolutions of monomial ideals
- 2019 Feb. El Paso (SW Local Alg Meeting): Multigraded algebra over polynomial rings with real exponents
- Feb. U Texas El Paso (Math Colloquium): Algebra for geometric data
- 2018 Apr. Boston (AMS): Data structures for real multiparameter persistence modules
- Apr. UNC-Greensboro (Math Colloquium): Algebra for geometric data
- 2016 Nov. NC State (AMS): Data structures for real multiparameter persistence
- Nov. U. Florida (Informatics Institute): Lessons in topology from statistics of brain arteries
- Nov. U. Florida (Math Colloquium): Algebraic data structures for topological summaries
- May U. Wisconsin (Applied Algebra Days 3): Data structures for real multiparameter persistence
- 2015 Dec. U. Minnesota (Math colloquium): Interactions between topology, biology, and imaging
- Nov. Texas A&M (Math Colloquium): Lessons in topology from statistics of brain arteries
- Sep. UNC-Greensboro (Helen Barton Lecture Series): Persistent homology for biological images
- Mar. NC State (Grad Math Wkshp): Applying persistent homology to brain artery and vein imaging
- Jan. San Antonio (JMM): Persistent homology analysis of brain artery trees
- 2014 Nov. U. Georgia (Stat & Math): Applying persistent homology to brain artery and vein imaging
- Jun. Winthrop U.: Topology for statistical analysis of brain artery images
- 2013 Nov. Columbia, SC (CommAlg in the SE): Binomial irreducible decomposition
- Oct. Philadelphia, PA (AMS meeting): Binomial irreducible decomposition
- Mar. U. Arizona (math colloquium): Geometric statistics on stratified spaces
- Feb. UNC-CH (math colloquium): Biological applications of geometric statistics on stratified spaces
- Feb. NC State (SUM Series): Statistics without addition or division
- 2011 Sep. Wake Forest (AMS): Subword complexes and fibers of totally nonnegative parametrizations
- June MSRI: How primary decomposition in commutative monoids is wrong
- May SAMSI: Stratified statistics for evolutionary biology
- Apr. Rice U.: Contractibility via subword complexes in the context of homogeneous spaces
- Mar. Columbia, SC: How primary decomposition in commutative monoids is wrong
- Mar. Statesboro, GA (AMS meeting, 1-hour): Sticky central limit theorems on polyhedral spaces
- Feb. George Mason (math colloquium): Unfolding polyhedra
- 2010 July NSA (math colloquium): Unfolding convex polyhedra
- May U. Maryland (math colloquium): Unfolding convex polyhedra
- Apr. Texas State (CombinaTexas): Lattice point methods for combinatorial games
- Mar. George Mason (WCEIT): Lattice point methods for combinatorial games
- 2009 Oct. Raleigh, NC (SE Lie Theory): Equivariant transversality and K -theoretic positivity
- Sep. NC State (SUM Series): Unfolding polyhedra
- Apr. Raleigh, NC (AMS meeting): Equivariant positivity via transversality in K -theory of G/P
- Apr. Raleigh, NC (AMS meeting): Topological Cohen–Macaulay criteria for monomial ideals
- Apr. Raleigh, NC (AMS meeting): Combinatorial primary decomposition of binomial ideals
- Jan. UNC Chapel Hill (math colloquium): Positivity from transversality and transitivity
- 2008 Dec. U. Minnesota (math colloquium): Transversality in homogeneous spaces
- Feb. UC San Diego: Metric geometry and unfoldings of polyhedra
- Feb. UT Austin: Gröbner geometry of Schubert polynomials
- Jan. Duke U.: Metric geometry and unfoldings of polyhedra
- 2007 Oct. Rutgers U. (AMS meeting): Cellular resolutions of multiplier ideals of sums
- Apr. U. Nebraska (math colloquium): Unfolding polyhedra
- Apr. U. Kansas (math colloquium): Unfolding polyhedra
- 2006 Dec. Indiana U. (math colloquium): Combinatorics in convexity, cohomology, and complex analysis
- Oct. Cincinnati, Ohio (AMS meeting plenary speaker): Unfolding polyhedra
- Oct. Ann Arbor, Michigan (Ohio State–UMichigan Alg. Geom. Workshop): Binomial schemes
- 2005 Dec. Reed College (math colloquium): Unfolding polyhedra

- Nov. U. Washington (math colloquium): Unfolding polyhedra
- Nov. Eugene, OR (AMS meeting): Duality of antidiagonals and pipe dreams
- Oct. Lincoln, NE (AMS meeting): Encoding injective resolutions
- Mar. U. Texas, Austin (math colloquium): Combinatorics in cohomology and convexity
- Jan. Columbia U. (math colloquium): Combinatorics from geometry
- 2004 Sep. Michigan State (math colloquium): Combinatorial positivity by geometric degeneration
- Apr. Durham, NC (Duke Math Journal conf.): Combinatorial positivity by geometric degeneration
- 2003 Oct. Binghamton, NY (AMS meeting): Unfolding convex polyhedral manifolds
- Apr. Western Alg. Geom. Seminar (at Stanford): Positivity of universal cohomological formulae
- Mar. Bay Area Discrete Math Day (UC Davis): Unfolding polyhedra in many dimensions
- Feb. UC Berkeley (math colloquium): Combinatorial positivity by geometric degeneration
- 2002 Nov. Lubbock, TX (Red Raider Symposium): Combinatorial positivity by orbit degeneration
- Oct. Northeastern U. (AMS meeting): Positivity of quiver cycles via deformation
- Oct. Berkeley, CA (MSRI workshop): Positivity via Gröbner degeneration
- Apr. SUNY Albany (math colloquium): Determinants, permutations, and flags
- Jan. San Diego (AMS meeting): Determinantal ideals and combinatorics of Schubert polynomials
- 2001 Sep. George Wash. (math colloq.): Geometry and combinatorics of flag manifolds via Gröbner bases
- 2000 Sep. Toronto, Canada (AMS meeting): Gröbner geometry of formulae for Schubert polynomials
- Jan. Brown U. (math colloquium): Monomial ideals and duality
- 1999 Nov. New Mexico State (math colloq.): Equivariant K -theory of flag manifolds and Gröbner bases
- Sep. U. Utah (AMS meeting): The Alexander duality functors
- Sep. U. Kansas (math colloquium): Resolutions of monomial ideals
- Feb. Reed College (math colloquium): Algebra and topology with alphabet blocks

Seminars and other specialized topics talks

- 2018 Dec. Applied Alg. Topology Research Network (online): Real multiparameter persistent homology
- 2017 Jan. Florida State (Algebra & Applications): Algebraic data structures for topological summaries
- 2015 Dec. U. Minnesota (Commutative Algebra): Irreducible decomposition of binomial ideals
- Nov. NC State (Algebra & Combinatorics): Multigraded modules from fruit flies
- Nov. Texas A&M (Algebra & Combinatorics): Multigraded modules from fruit flies
- Nov. Clemson (AG/NT + Applied Discrete Math): Multigraded moduli from fruit flies
- Jan. Duke (MathBio Colloquium): Applying persistent homology for brain artery and vein imaging
- 2013 Mar. U. Arizona (Probability): Sticky central limit theorems at singularities
- 2012 May Columbus, OH (OSU Combinatorics): Combinatorics and topology of fibers in total positivity
- Apr. Duke U. Data Seminar: Sticky central limit theorems at singularities
- 2011 Mar. Duke U. Recruitment: Geometric statistics: sampling from singular spaces
- 2010 Dec. Duke U. MathBio: Statistics on spaces of phylogenetic trees
- Dec. Duke U. Brown Bag: Combinatorics of phylogenetic trees
- May MIT Combinatorics: Lattice point methods for combinatorial games
- Feb. Duke U. Algorithms: Unfolding convex polyhedra
- 2009 Dec. Duke U. Algebraic Geometry: K -theory of toric varieties
- Oct. Duke U. (CTMS): Biological and chemical applications of polyhedral geometry and algebra
- Sep. Duke U. Algebraic Geometry: Combinatorics in cohomology of toric varieties
- Sep. Duke U. Algebraic Geometry: What is a toric variety?
- 2008 Oct. U. Minnesota Schubert seminar: Cohomology rings of flag and toric varieties
- Sep. U. Minnesota Combinatorics: Topological Cohen–Macaulay criteria for monomial ideals
- Apr. U. Minnesota Combinatorics: Combinatorics of Horn hypergeometric series
- Feb. U. Minnesota Junior Colloquium: Unfolding convex polyhedra
- 2007 Oct. U. Minnesota Math Club: Unfolding polyhedra
- Apr. Kansas U. Combinatorics: Combinatorics of permutations from determinantal ideals
- Apr. U. Nebraska Algebra: Multiplier ideals of sums via cellular resolutions

- Apr. Michigan Geom. Rep. Thy: Kazhdan–Lusztig conjecture via intersection cohomology (overview)
- 2006 Dec. Purdue Algebraic Geometry: Old mysteries about multivariate hypergeometric systems
- Nov. Northeastern GASC: Horn hypergeometric systems and binomial D -modules
- Nov. MIT Combinatorics: Hypergeometric series and binomial primary decomposition
- Oct. U. Michigan Algebraic Geometry: Toric primary decomposition and hypergeometric series
- Feb. U. Minnesota Combinatorics: h -vectors of Gorenstein polytopes
- 2005 Nov. U. Washington Combinatorics: Simplicial complexes whose facets are Young tableaux
- Nov. MIT Combinatorics: Tableau complexes
- Feb. UC Berkeley Representation theory/geom./combinatorics: Families of hypergeometric systems
- Feb. U. Minnesota Combinatorics: Stanley’s simplicial poset conjecture
- 2004 Sep. U. Michigan Combinatorics: Unfolding polytopes
- Mar. U. Michigan Noncommutative algebra: Homological methods for hypergeometric families
- Feb. U. Minnesota Topology: Gelfand–Tsetlin patterns via toric degeneration of flag manifolds
- 2003 Apr. UC Davis Combinatorics: Combinatorics of quiver polynomials
- Mar. Northeastern U. Algebra: Quiver polynomials and Schubert varieties
- Mar. MIT Combinatorics: Combinatorics of quiver polynomials
- Jan. U. Michigan Algebraic geometry: Positive formulae for quiver polynomials
- 2002 Sep. U. Michigan Combinatorics: Gröbner geometry of Schubert polynomials
- Mar. Columbia U. Algebraic geometry: Gröbner geometry of flag varieties
- Mar. U. Michigan Combinatorics: Subword complexes in Coxeter groups
- Feb. U. Minnesota Combinatorics: Words and subwords in symmetric groups
- 2001 Oct. Cornell U. Algebra: Determinantal ideals and the combinatorics of Schubert polynomials
- Sep. George Wash. U. Algebra: Embedding planar graphs in staircases to resolve monomial ideals
- May UC Berkeley special seminar: Planar graphs in 3-dimensional staircases
- Apr. Harvard–MIT Algebraic Geometry: An open problem on determinantal loci
- Feb. MIT Combinatorics: Subword complexes in Coxeter groups and Schubert varieties
- 2000 Nov. UMass Amherst (Valley Geometry Seminar): Gröbner geometry of Schubert polynomials
- Sep. MIT Combinatorics: Gröbner geometry of formulae for Schubert polynomials
- Aug. UC Berkeley workshop: Haiman’s proof of the $n!$ conjecture
- May UC Berkeley Algebra: Gröbner bases for determinantal ideals and K-theory of flag manifolds
- 1999 Nov. New Mexico State U. Algebra: Injective resolutions
- Sep. UC Berkeley Algebra: Projective dimension versus support-regularity
- Sep. U. Kansas Algebra: The canonical Čech complex
- Feb. UC Berkeley Grad Student Seminar: Combinatorial commutative algebra
- Feb. UC Berkeley Algebra: Generic and cogeneric monomial ideals
- 1998 Sep. U. Michigan Combinatorics: Cellular homology and duality in the study of monomial ideals
- Sep. MIT Combinatorics: Alexander duality for monomial ideals and their resolutions
- Aug. UC Berkeley Algebra: The cohull resolution
- 1997 May UC Berkeley Algebra: Degrees on graded modules
- Mar. Rutgers U. Algebra: Characterization of multiplicity functions of ideals
- 1996 Nov. UC Berkeley Abelian Varieties: Multiplying points on group schemes
- Oct. UC Berkeley Grad Student Seminar: Where is the geometry in schemes?
- July MSRI Summer Program: Gröbner bases over PIDs

Outreach talks, panels, and other presentations

- 2019 Jun. SWiM (for female HS seniors): Topology for statistical analysis of brain artery images
- Jun. Duke (Clinical Research STEM for HS students): Topological brain statistics
- 2018 Jul. Duke (STEM for HS students): Topological brain statistics
- 2017 Aug. Ohio State (Young Math Conference): Topology for statistical analysis of brain artery images
- Jun. SWiM (for female HS seniors): Topology for statistical analysis of brain artery images

- 2016 Jun. SWiM (for female HS seniors): Topology for statistical analysis of brain artery images
- 2015 Oct. SAMSI (Undergrad Workshop): Topology for statistical analysis of brain artery images
- 2014 May Green Hope High School (AP Stat): Topology for statistical analysis of brain artery images
- Apr. Duke U. (Noyce Learning Conference): Topology for statistical analysis of brain artery images
- 2012 Sep. Duke Postdoc Services / School of Medicine panel: NSF Funding from the Inside
- 2006 Mar. ITCEP Family Fun Fair: Unfolding polyhedra

Organizing activities (conferences, meetings, annual programs, public lectures, etc.)

- 2022 Mar. Organizer (with Håvard Bjerkevik and Maggie Regan), AMS Special Session (Charlottesville, VA): Multiparameter persistence in theory and practice
- 2022 Feb. Organizer (with Stephan Huckemann and Zhigang Yao), IMS Singapore Workshop: Interactions of Statistics and Geometry (ISAG)
- 2018 Jan. Organizer (with Aasa Feragen, Thomas Hotz, and Stephan Huckemann), Oberwolfach Workshop: Statistics for data with geometric structure
- 2016 Dec. Technical Program Committee: IEEE International Conference on Big Data, Workshop on High-Dimensional Big Data
- 2016 Aug. Director (with Viviana Ene): Summer school on Applicable Combinatorial Commutative Algebra, Romania
- 2016 Jul. Scientific Committee Member (with François Bergeron, Patricia Hersh, Gregor Kemper, Peter Symonds, Jerzy Weyman): Conference on algebraic combinatorics and group actions, Herstmonceux Castle, England
- 2015 – 2016 Local Scientific Coordinator, SAMSI year-long program on Challenges in Computational Neuroscience
- 2014 Sep. Organizer, Oberwolfach mini-workshop: Asymptotic statistics on stratified spaces (with Aasa Feragen, Stephan Huckemann, J.S.Marron)
- 2014 Sep. Advisory Board, Meeting on Combinatorial Commutative Algebra [MOCCA 2014], Trentino, Italy (other board members: Alicia Dickenstein, Winfried Bruns; organizers: Alexandru Constantinescu, Thomas Kahle, Matteo Varbaro)
NSF DMS-1439356: \$12,000 (sole PI)
- 2014 May Organizer, Fields Institute workshop: Geometric topological and graphical model methods in statistics (with Peter Kim and Hélène Massam)
- 2013 Dec. Organizer, SAMSI Public Lecture by Greg Fishel (WRAL-TV Chief Meteorologist): “The changing climate of weather prognostication: the irony of uncertainty leading to better forecasts”
- 2013 – 2014 Directorate Organizer, SAMSI year-long program on Low-Dimensional Structure in High-Dimensional Systems (LDHD)
- 2013 June Scientific Committee Member (with Viviana Ene and others): Experimental and theoretical methods in algebra, geometry, and topology, Mangalia, Romania.
- 2013 June Directorate Organizer, SAMSI Summer Program on Neuroimaging Data Analysis (NDA)
- 2012 – 2013 Organizer, MSRI year-long program on Commutative Algebra (with David Eisenbud, Srikanth Iyengar, Anurag Singh, and Karen Smith).
- 2012 May Lead Organizer, MBI workshop on statistics, geometry, and combinatorics on stratified spaces arising from biological problems (co-organizers: Stephan Huckemann, Huiling Le, Megan Owen, Victor Patrangenaru)
- 2012 Feb. Organizer, Triangle Lectures in Combinatorics (with Sonja Mapes, Christine Berkesch)
- 2011 June Program Committee Member: Formal Power Series and Algebraic Combinatorics (FPSAC), Reykjavik, Iceland.
- 2010 – 2011 SAMSI Working Group leader: Analysis of data on stratified sample spaces (with Victor Patrangenaru)
- 2010 – Steering Committee member (currently with Patricia Hersh, Ricky Liu, Cynthia Vinzant, Gabor Pataki) and occasional organizer: Triangle Lectures in Combinatorics [TLC]
- 2018–2020 NSF DMS-1758187: \$30,800
- 2014–2016 NSA: \$20,000
- 2014–2016 NSF DMS-1400355: \$20,800
- 2012–2014 NSA: \$28,000
- 2012–2014 NSF DMS-1202691: \$8,000
- 2010–2012 NSF DMS-1000130: \$10,600

- 2009 Oct. Working group session organizer (with William Graham): Combinatorial Lie theory and applications, first installment of Southeastern Lie Theory Workshop Series, Raleigh, NC.
- 2009 July Program Committee Member: Formal Power Series and Algebraic Combinatorics (FP-SAC), Research Institute for Symbolic Computation (RISC), Linz, Austria.
- 2008 May Scientific Committee Member, with Jürgen Herzog, Gerhard Pfister, and Dorin Popescu: Exploratory workshop on combinatorial commutative algebra and computer algebra, Mangalia, Romania.
- 2008 Jan. Organizer, with Michael Albert, Elwyn Berlekamp, Martin Mueller, Richard Nowakowski, and David Wolfe: Workshop on Combinatorial Game Theory, Banff International Research Station (BIRS), Banff, Canada.
- 2007 Dec. Organizer, with Bob Connelly and Igor Pak: AIM Research Conference Center Workshop on Rigidity and Polyhedra, American Institute of Mathematics, Palo Alto, CA.
- 2006 Oct. Invited organizer, with Igor Pak: Special session on Geometric Combinatorics at the regional American Mathematical Society meeting in Cincinnati, OH.
- 2006 Sep. Organizer, with Mircea Becheanu, Viviana Ene, Cristodor Ionescu, Dorin Popescu, Mirela Ștefănescu: 15th Romanian National School of Algebra, Constanța, Romania
- 2005 Aug. Invited organizer, with William Fulton: “Algebraic Geometry and Combinatorics” session at the Summer Institute in Algebraic Geometry (Seattle, WA). This international meeting takes place once every ten years; our session along with the two others during the second week (of the three-week meeting) attracted the largest-ever gathering of algebraic geometers anywhere in the world, around 450 participants.
- 2004 Oct. Organizer, with Frank Sottile: Special session on Modern Schubert Calculus at the regional American Mathematical Society meeting in Evanston, IL. Our special session had around 30 participants.
- 2004 July Organizer and Steering Committee member, with Bernd Sturmfels and Victor Reiner: 2004 IAS/Park City Math Institute Summer Session on Geometric Combinatorics. 300 participants range from high school teachers through undergraduate students and faculty. Organizing duties included the Graduate Summer School (100 students) as well as the international Research Program (60 researchers).
- 2003 May Organizer, with Serkan Hoşten: Special session on Combinatorial Commutative Algebra and Algebraic Geometry at the regional American Mathematical Society meeting in San Francisco, CA. Our special session had around 25 participants.

Editorial activities

- 2020 – Advisory Editor, Combinatorial Theory
- 2020 – Editorial Board Member, Journal of Machine Learning Research
- 2018 – Editorial Board Member, Journal of Applied and Computational Topology
- 2011 – Editorial Board Member, Discrete Mathematics
- 2009 – Editorial Board Member, Advances in Mathematics
- 2009 – 2017 Editorial Board Member, SIAM Journal on Discrete Mathematics
- 2008 – Editorial Board Member, Beiträge zur Algebra und Geometrie
- 2014 – 2020 Editorial Board Member, Journal of Combinatorial Theory, Series A (JCTA)
- 2007 – 2010 Associate Editor, Discrete Mathematics

Professional committees

- 2021 – 2023 AMS Nominating Committee
- 2013 – 2015 AMS Fellows Selection Committee
- 2012 – 2015 AMS Short Course Subcommittee
- 2012 – 2014 AMS Southeastern Section Program Committee
- 2007 AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences (committee was disbanded after 2007 due to lack of funding)

External review service

- 2014 Nov External Review Committee: Discrete Mathematics Doctoral Programme (for Austrian Science Fund)
- 2010 Apr External Review Committee: University of Southern California

Advisory boards

- 2014 – 2017 Duke U. Middle Grades
 Summary: NSF capacity-building grant (funded in summer 2014) designed to explore the institutionalization of a middle-grades MAT strand for STEM subjects. Other board members included the Superintendent of Durham Public Schools as well as some school Principals and teachers, along with a few Arts & Sciences faculty and Program in Education PIs.
- 2013 – America’s Amazing Teen Project <http://prezi.com/-y4ofsndc3mg/americas-amazing-teens>
 Summary: brilliant teenagers across America will upload a short video presenting their ground-breaking project, research, invention, or technological breakthrough. After an extensive vetting process, the best and brightest teens will be placed into the competition. Members from our esteemed advisory board, as well as the online voting public, will vote for the 12 monthly finalists.
 Length of contest: 12 month online campaign
 Who can enter: teenagers (13-19 years old) across the country
- 2013 – Duke U. Noyce Program http://web.duke.edu/MAT/fellowships-robert_noyce_fellows.html
 Summary: the program recruits and prepares highly successful STEM graduates to become highly effective middle school science and math teachers. Run by Duke University Program in Education in collaboration with Durham Public Schools and the STEM departments in Trinity College of Arts and Sciences. See ‘University Service’ on p. 20 for NSF grant information.

Other community outreach

- 2013 – 2018 Consultant for WRAL-TV weather: helped Greg Fishel (WRAL-TV Chief Meteorologist) with display of data uncertainty for primetime on-air public consumption
- 2014 Fall Duke Science & Society SciComm Fellow. The program teaches faculty to develop skills in communicating with the public, the media, and lawmakers by putting those skills into action; Fall 2014 was the inaugural class of fellows for this competitive program
- 2014 Mar WGHP-TV nightly news, interviewed by Bob Buckley regarding the \$1 billion Warren Buffett offered for a perfect NCAA bracket (<http://myfox8.com/2014/03/18/odds-of-winning-warren-buffetts-billion-dollar-ncaa-bracket-challenge>)
- 2014 Jan Consultant for LA Times and CBS Evening News: regarding the \$1 billion Warren Buffett offered for a perfect NCAA bracket (<http://www.latimes.com/business/la-fi-buffett-basketball-bet-20140122,0,7653962.story#axzz2r8uphac>)
- 2006 – Lecturer to general audiences on scientific topics (see Outreach talks on p.4)
- high-school students, particularly girls; audience sizes from a dozen to hundreds
 - undergraduates; audience sizes from a dozen to many dozens
 - middle- and high-school science teachers
 - middle school students and their families; see next item
- 2006 Mar ITCEP Family Fun Fair presenter: Led interactive session for middle school and high school students (and their families) on “Unfolding polyhedra”. Students built models of polyhedra, learning about connections with math research and applied problems like robot motion-planning
- 2004 Mar Judge for the Minnesota Academy of Sciences State Science Fair (high school and junior high levels)

Referee and review activities

Journals and AMS publications refereed

Acta Mathematica	Journal of Algebraic Combinatorics
Advances in Applied Mathematics	Journal of the American Mathematical Society
Advances in Mathematics	Journal of Applied and Computational Topology
Algebra & Number Theory	Journal of Combin. Math & Combin. Computing
Algebraic & Geometric Topology	Journal of Combinatorial Algebra
Algorithms	Journal of Combinatorial Theory, Series A
American Journal of Mathematics	Journal of Commutative Algebra
American Mathematical Monthly	Journal of the European Math Society
AMS Graduate Texts in Mathematics	Journal of Graph Theory
Annals of Combinatorics	Journal of the London Mathematical Society
Appl. Alg. in Engin. Commun. and Comput.	Journal of Machine Learning Research
Applied and Computational Topology	Journal of Mathematical Biology
Asian Journal of Mathematics	Journal of Mathematical Imaging and Vision
Australasian Journal of Combinatorics	Journal of Mathematics
Beiträge zur Algebra und Geometrie	Journal of Pure and Applied Algebra
Bulletin of the London Math Society	Journal of Symbolic Computation
Canadian Mathematical Bulletin	Journal of Topology
Collectanea Mathematica	Linear Algebra and its Applications
Compositio Mathematica	Math Proceedings of Cambridge Phil. Society
Computational and Mathematical Biophysics	Mathematical Research Letters
Contemporary Mathematics	Mathematics of Computation
Contributions to Discrete Mathematics	Mathematische Annalen
Crelle's Journal	Mathematische Zeitschrift
Designs, Codes, and Cryptography	Memoirs of the American Mathematical Society
Discrete Applied Mathematics	Michigan Mathematical Journal
Discrete and Computational Geometry	Nagoya Mathematical Journal
Discrete Mathematics	Neural Computing and Applications
Documenta Mathematica	Notices of the American Math Society
Duke Mathematical Journal	Pacific Journal of Mathematics
Electronic Journal of Combinatorics	Portugaliae Mathematica
Experimental Mathematics	Proceedings of the American Math Society
Foundations of Computational Mathematics	Proceedings A of the Royal Society of Edinburgh
Games of No Chance	PLOS ONE [Public Library of Science]
Geometriae Dedicata	Quarterly Journal of Pure and Applied Math
International Electronic Journal of Algebra	Representation Theory
International Mathematics Research Notices	Rocky Mountain Journal of Mathematics
Illinois Journal of Mathematics	Selecta Mathematica
International Journal of Game Theory	SIAM Journal of Discrete Mathematics
International Journal of Mathematics	SIAM Journal on Applied Dynamical Systems
Inventiones Mathematicae	Springer Lecture Notes in Mathematics
Israel Journal of Mathematics	Transactions of the American Math Society
Journal of Algebra	Transformation Groups
Journal of Algebra and its Applications	

Conferences refereed

Applied Algebra, Algebraic Algorithms and Error Correcting Codes (AAECC)
 Effective Methods in Algebraic Geometry (MEGA)
 Formal Power Series and Algebraic Combinatorics (FPSAC)
 IEEE Conference on Decision and Control
 International Congress on Mathematical Software (ICMS)
 International Symposium on Symbolic and Algebraic Computation (ISSAC)
 Symposium on Computational Geometry (SoCG)

Granting agencies refereed

Simons Foundation
 National Science Foundation [NSF] (panels and individual review of conference proposals)
 National Security Agency [NSA] Mathematical Sciences Program
 Natural Sciences and Engineering Research Council [NSERC], Canada

Miscellaneous review activities

- External evaluator, Discrete Mathematics Doctoral Programme (for Austrian Science Fund, 2014)
- External evaluator, University of Southern California Math Department (2010)
- Referee for Isaac Newton Institute program development
- Referee for various countries' national level prizes or awards
- Consultation for JSAGE (publisher of free open source refereed math software implementations)
- External Ph.D. dissertation review (for Sangjib Kim, student of Roger Howe, Yale University, 2005)
- *Math Reviews* reviewer

Teaching awards

2004 Feb. Award from the “Thank a Teacher” program run by the University of Minnesota Center for Teaching and Learning Services, “In appreciation of [my] teaching style and dedication to helping students learn” Calculus I (Math 1271)

Teaching activities

Curriculum development at Duke

2016–2017 Advanced Linear Algebra (Math 403): second semester linear algebra to bridge the gap between standard first semester and applications; topics include grassmannians, matrix groups, homology, convexity, singular value decomposition and principal component analysis, matrix perturbation theory, matrices with positive entries, and exterior algebra

2011–2014 Math Everywhere (Math 181), with Ingrid Daubechies and Jonathan Mattingly: a course for undergraduate students who might not otherwise take any math courses at all but who want a broad overview of what modern mathematics is about

Courses taught at Duke

2021 Fall Linear Algebra (Math 221)
 2021 Spring Advanced Linear Algebra (Math 403)
 2020 Fall Linear Algebra (Math 221—course coordinator and lecturer)
 2020 Spring Algebraic Geometry (Math 627)
 2019 Fall Linear Algebra (Math 221)
 2018 Spring Advanced Linear Algebra (Math 403)
 2017 Fall Algebraic Structures, I (Math 501)
 2017 Fall Linear Algebra (Math 221)
 2017 Spring Advanced Linear Algebra (Math 403) + course development
 2016 Fall Linear Algebra (Math 221)
 2016 Spring Commutative algebra (Math 602)
 2015 Spring Vector Calculus (Math 222) $\times 2$

- 2014 Fall Linear Algebra (Math 221)
- 2014 Spring Math Everywhere (Math 181)
- 2013 Spring Math Everywhere (Math 181)
- 2012 Spring Math Everywhere (Math 181)
- 2010 Fall Algebraic geometry (Math 273)
- 2010 Spring Commutative algebra (Math 252)
- 2009 Fall Rings, modules, and Galois theory (Math 251)
- 2009 Spring Current research in algebra: combinatorial commutative algebra (Math 358)

Courses taught at Minnesota

- 2008 Fall Honors Abstract Algebra (Math 5285H)
- 2006 Spring Calculus of one variable (Math 1271)
- 2006 Spring Topics in Combinatorics: Polytopes (Math 8680)
- 2005 Spring Graph theory and nonenumerative combinatorics (Math 5707)
- 2005 Spring Calculus of one variable (Math 1271)
- 2004 Fall Topics in Algebra: Combinatorics, algebra, and geometry of determinants (Math 8300)
- 2004 Spring Graph theory and nonenumerative combinatorics (Math 5707)
- 2003 Fall Calculus of one variable (Math 1271)
- 2003 Fall Calculus of one variable (Math 1271)

Recitations led at MIT (as postdoctoral instructor)

- 2002 Spring Differential Equations (18.03)

Recitations led at UC Berkeley (as graduate student instructor)

- 1996 Fall Linear algebra (Math 53W: workshop section)
- 1996 Spring Multivariable calculus (Math 35)
- 1995 Fall Calculus of one variable (Math 1B)

Special tutorials

- 2005 July Mentor, Algebraic Geometry Warmup Workshop (Seattle, WA)
- 1999 June Computer tutorial leader, COCOA VI Summer School (Turin, Italy)
- 1995 Study group facilitator for honors multivariable calculus at Brown University
- 1995 Counselor, PROMYS summer program in number theory at Boston University. Lived in dorm for 6 weeks with high-school student participants, helping with math questions
- 1994–1995 Tutor for Brown University Mathematics Department

Seminars organized (at Duke unless otherwise specified)

- 2012 Spring Mathematical Biology Colloquium
- 2009 Fall Topics in algebraic geometry: toric varieties
- 2007–2008 Combinatorics seminar (at University of Minnesota)
- 2006 Fall Topics in algebraic geometry seminar (at University of Michigan)

Mentoring activities

Undergraduate students advised (while at Duke)

- 2021–2023 William He: Computing presentations of fly wing bipersistence
 2020 Zizai Cui: Classifying group actions on Abelian surfaces preserving symplectic structure
 2020–2021 Phoebe Klett: Computing sylvan minimal resolutions of monomial ideals
 2020 Joey Li: Indecomposable multipersistence modules and QR codes
 2019–2022 Nathan Geist: Experiments in probabilistic homology
 Homological algebra of real multipersistence
 Global dimension of real-exponent polynomial rings
 2018–2019 Cheryl Wang: Unfolding high-dimensional convex polyhedra
 2016–2019 David Geng: Creating musical rubato using deep learning
 2016–2018 Surabhi Beriwal: Computation of fruit fly wing vein topology [Fulbright semifinalist]
 2014 Aaron Park, Biomed Engineering / Math, summer research: Geometry of lung arteries
 2013 Victoria Cheng: Mathematical Biology
 2012–2015 Rowena (Jingxing) Gan, PRUV: Geometry of harmony in Impressionist music [PhD candidate, UPenn Wharton School: Operations, Information, and Decisions]
 2010 Ezgi Kantarcı (Bogaziçi University), summer research: Combinatorial Game Theory [postdoctoral fellow, Sabancı University]
 2009–2011 Alan Guo, PRUV: Lattice point methods for combinatorial games [Analyst, Weiss Asset Management; PhD, MIT CS AIL; Duke Faculty Scholar, Goldwater honorable mention]

Undergraduate students advised (while at Minnesota)

- 2008–2009 Nathaniel Born (CS), UROP: Implementing a nonoverlapping unfolding algorithm [Associate Engineer, Natural Resource Group, LLC]
 2007–2008 Matthew Coudron, honors program: Visualizing flows on polyhedra [Research Scientist, NIST and Adjunct Assistant Professor of Computer Science, University of Maryland]
 2003–2007 David Molitor, Math and Econ major [Associate Professor of Finance and RC Evans Data Analytics Fellow, UIUC; Goldwater scholar]

Ph.D. advisees (at Duke unless otherwise specified)

- 2019– Yupeng Li (combinatorial commutative algebra and algebraic geometry)
 2019– Shreya Arya (algebraic, geometric, and topological data analysis)
 2015–2020 Do Tran (geometric probability: sampling from stratified spaces)
 2015–2020 Erika Ordog (combinatorial commutative algebra)
 2014–2019 Dmitry Vagner: Diagrammatics in categorification and compositionality
 2013–2019 Ashleigh Thomas: Invariants and metrics for multiparameter persistent homology
 2011–2015 Kangkang Wang (joint w/Aspinwall): Determinant, wall monodromy and spherical functor
 2009–2014 Christopher O’Neill: Monoid congruences, binomial ideals, and their decompositions
 2004–2012 Patrick Byrnes (Minnesota, joint w/Vic Reiner): Structural aspects of differential posets
 2005–2015 Robert Edman (Minnesota, Vic Reiner took over after my departure from UMN): Diameter and coherence of monotone path graphs in low corank

Graduate students temporarily or informally mentored

- 2020– Xiaojun Zheng (Duke Statistical Science)
 2009 grad Dumitru Stamate (Bucharest; Fulbright scholar 2006–2008 at Minnesota) [Asistent Universitar, U. Bucharest]
 2008 grad Susan Sierra (at Michigan) [Senior Lecturer at University of Edinburgh]
 2008 grad Raman Sanyal (TU Berlin; mentored at UMN) [Professor, Goethe-Universität Frankfurt]

Postdocs mentored [last known status in brackets]

- 2020– Woojin Kim, Duke Math
- 2020– Margaret Regan, Duke Math
- 2017–2020 Greg Malen, Duke Math [Visiting Assistant Professor, Union College]
- 2016–2017 Justin Curry, Duke Math [Assistant Professor, University at Albany]
- 2015–2017 Adam Jaeger, Duke Stat and SAMSI [Assistant Professor, Wichita State]
- 2015–2016 Justin Allman, Duke Math [Assistant Professor, US Naval Academy]
- 2011–2013 Christine Berkesch, Duke Math [Associate Professor, U. Minnesota]
- 2010–2011 Anne Shiu, NSF Postdoc, Duke Math [Associate Professor, Texas A&M]
- 2010, Fall Manoj Gopalkrishnan, visitor to Duke Math [Associate Prof., Elec. Engin., IIT Bombay]
- 2009–2011 Sonja Mapes, Duke Math [Associate Professor of the Practice, Notre Dame]
- 2009–2010 Megan Owen, SAMSI/NCSU Math [Assistant Professor of CS, Lehman College]
- 2006–2009 Stephen Griffeth, Minnesota Math [Professor, U. Talca, Chile]
- 2006–2009 Drew Armstrong, Minnesota Math [Associate Professor, U. Miami]
- 2006–2008 Milena Hering, Minnesota Math [Lecturer, U. Edinburgh]
- 2005–2008 Alex Yong, Minnesota Math [Professor, U. Illinois, Urbana-Champaign]
- 2005–2008 Calin Chindris, Minnesota Math [Associate Professor, U. Missouri]
- 2003–2005 Jeremy Martin, Minnesota Math [Professor, U. Kansas]

University service

- 2019 – Math Department Liaison to Master of Arts in Teaching (MAT) Program
- 2014 – Master of Arts in Teaching (MAT) Program: Math Content Advisor
- 2014 – 2016 co-PI, Robert Noyce Teacher Fellowship Program, an \$800,000 initial NSF grant + subsequent capacity-building grant (NSF DUE-1439799: \$300,000; “Integrative Middle School STEM Teacher Preparation: A Collaborative Capacity Building Project at Duke University” with Jan Riggsbee, Jack Bookman, Kate Allman, Ronen Plesser), awarded through the Master of Arts in Teaching program at Duke; see ‘Advisory boards’ on p. 15 for additional program details

Departmental service

Departmental committees at Duke

(see online CV at <http://math.duke.edu/people/ezra-miller>)

Departmental committees at Minnesota

Tenure (2007–2008)

Undergraduate curriculum (2005–2006)

Honors Program (2005–2006)

Postdoc hiring (2004–2005)

Instruction evaluation (2004–2005, 2007–2008)

Social activities (2003–2004)

Departmental committees at Berkeley

Preliminary exam (1999)

Dissertation committees

Nicolas Berkouk (2020, École Polytechnique and Inria Saclay)

Erika Ordog (2020, Duke Math)

Do Tran (2020, Duke Math)

Ashleigh Thomas (2019, Duke Math)

Dmitry Vagner (2019, Duke Math)

Brendan Williamson (2019, Duke Math)

Sean Skwerer (2014, UNC-Chapel Hill, Stat/Operations Research)

Ruth Davidson (2014, NC State, Math)

Chris O’Neill (2014, Duke Math)

John Steenbergen (2013, Duke Math)

Elizabeth Munch (2013, Duke Math)

Kaisa Taipale (chair, 2010, Minnesota Math)

Meghan Allen (2009, Dalhousie University, Halifax, NS, Canada)

Andrew Berget (2009, Minnesota Math)

Jessica Striker (2008, Minnesota Math)

Molly Maxwell (chair, 2007, Minnesota Math)

Ning Jia (2007, Minnesota Math)

Oral prelim exam committees (Duke Math unless specified)

Wanyi Chen (2022)
Yupeng Li (2022)
Shreya Arya (2021)
Xiaojun Zheng (2021, Duke Stat)
Henry Kirveslahti (2019, Duke Stat)
Erika Ordog (2018)
Do Tran (2018)
Ashleigh Thomas (2016)
Dmitry Vagner (2016)
Brian Fitzpatrick (2013)
Sean Skwerer (2013, UNC Chapel Hill Stat/Operations Research)
Ruth Davidson (2013, NCSU Math)
Ben Gaines (2012)
Kangkang Wang (2012)
Chris O'Neill (2012)
John Steenbergen (2011)
Anil Venkatesh (2011)
Elizabeth Munch (2011)
Robert Edman (2008, Minnesota, Math)
Kaisa Taipale (2007, Minnesota, Math)
Brendon Rhoades (2007, Minnesota, Math)
Patrick Byrnes (2005, Minnesota, Math)
Molly Maxwell (2005, Minnesota, Math)
Jayashree Sadagopan (2005, Minnesota, Computer Science Department)
Sangwook Kim (2005, Minnesota, Math)
Ning Jia (2004, Minnesota, Math)
Dan Drake (2004, Minnesota, Math)

Oral qual committees (Duke Math)

Christopher O'Neill (2011)
Anil Venkatesh (2010)
Benjamin Gaines (2010)
Tatsunari Watanabe (2010)