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NATHAN READING
North Carolina State University

RESEARCH INTERESTS

Algebraic and geometric combinatorics.

EDUCATION

University of Minnesota, 1996 to 2002. Ph.D. Mathematics, April, 2002.

Thesis Title: On the structure of Bruhat order

Adviser: Victor Reiner

Stanford University, 1989 to 1990, 1992 to 1995. B.S., Physics, 1995.

EMPLOYMENT

Assistant Professor, North Carolina State University, August 2006 to present.

Postdoctoral Assistant Professor, University of Michigan, September 2002 to June 2006.

Graduate Teaching Assistant, University of Minnesota, September 2001 to June 2002.

Graduate Fellow (Shevlin Fellowship), University of Minnesota, September 2000 to June 2001.

Graduate Teaching Assistant, University of Minnesota, September 1996 to June 2000.

Math Teacher, Pinewood School, Los Altos Hills, CA, September 1995 to June 1996.

FELLOWSHIPS AND AWARDS

NSF Research Grant, August 2011 to July 2014.

Simons Foundation Collaboration Grant, July 2011 to June 2016.

NSF Conference Grant, "Triangle Lectures in Combinatorics," March 2010 to February 2012.

NSA Young Investigator Grant, January 2009 to July 2011.

NCSU Faculty Research Professional Development Grant, July 2008 to August 2009.

NSF Research Training Grant (RTG) Fellowship, September 2005 to August 2006.

NSF Postdoctoral Research Fellowship, June 2002 to May 2005.

Thesis Prize, University of Minnesota, School of Mathematics, 2002.

Excellence in Teaching Award, University of Minnesota, School of Mathematics, 2001.

Thomas H. Shevlin Fellowship, University of Minnesota, September 2000 to June 2001.

University of Minnesota Graduate School Fellowship, September 1996 to June 1997.

AWU/DOE Fellowship, Lawrence Livermore National Laboratory, Summer 1993.

David Starr Jordan Scholar, Stanford University, 1989.

PUBLICATIONS AND PREPRINTS

24. "Combinatorial frameworks for cluster algebras" (with David Speyer), in progress, 2011.

23. "Generic rectangulations," preprint, 2011.

22. "The Hopf algebra of rectangulations" (with Shirley Law), preprint, 2010.

21. “Coarsening polyhedral complexes,” preprint, 2010 (arXiv:1004.4194). To appear in *Proc. Amer. Math. Soc.*
20. “Noncrossing partitions and the shard intersection order,” *J. Algebraic Combin.* **33** (2011), no. 4, 483–530.
19. “Sortable elements for quivers with cycles” (with David Speyer), *Electron. J. Combin.* **11(1)** (2010), Research Paper 90, 19 pp.
18. “Sortable elements in infinite Coxeter groups” (with David Speyer), *Trans. Amer. Math. Soc.* **363** (2011), 699–761.
17. “Noncrossing partitions, clusters and the Coxeter plane,” *Sém. Lothar. Combin.* **63** (2010), Article B63b.
16. “Chains in the noncrossing partition lattice,” *SIAM J. Discrete Math.* **22** (2008), no. 3, 875–886.
15. “Cambrian fans” (with David Speyer) *J. Eur. Math. Soc. (JEMS)*, **J.11** (2009), no. 2, 407–447.
14. “Sortable elements and Cambrian lattices,” *Algebra Universalis* **56** (2007) no. 3–4, 411–437.
13. “Clusters, Coxeter-sortable elements and noncrossing partitions,” *Trans. Amer. Math. Soc.* **359** (2007), 5931–5958.
12. “Generalized cluster complexes and Coxeter combinatorics” with Sergey Fomin, *Int. Math. Res. Notices*, **2005** no. 44, 2709–2757.
11. “Root systems and generalized associahedra” with Sergey Fomin, *IAS/Park City Math. Ser.* **13**, 63–131.
10. “Cambrian lattices,” *Adv. Math.*, **205** (2006), no. 2, 313–353.
9. “Lattice congruences, fans and Hopf algebras,” *J. Combin. Theory Ser. A*, **110** (2005) no. 2, 237–273.
8. “Lattice congruences of the weak order,” *Order*, **21** (2004) no. 4, 315–344.
7. “The order dimension of Bruhat order on infinite Coxeter groups” with Debra J. Waugh, *Electron. J. Combin.* **11(2)** (2005), Research Paper 13, 26 pages (electronic).
6. “The order dimension of the poset of regions in a hyperplane arrangement,” *J. Combin. Theory Ser. A*, **104** (2003) no. 2, 265–285.
5. “Lattice and order properties of the poset of regions in a hyperplane arrangement,” *Algebra Universalis*, **50** (2003), 179–205.
4. “The cd-index of Bruhat intervals,” *Electron. J. Combin.* **11(1)** (2004), Research Paper 74, 25 pages (electronic).
3. “Order Dimension, Strong Bruhat Order and Lattice Properties for Posets,” *Order*, **19** (2002) no. 1, 73–100.
2. “Non-negative cd-coefficients of Gorenstein* posets,” *Discrete Math*, **274** (2004) no. 1–3, 323–329.
1. “Nim-Regularity of Graphs,” *Electron. J. Combin.* **6** (1999) no. 1, Research paper 11, 8 pages (electronic).

COLLOQUIA, PLENARY TALKS, AND LECTURE SERIES

Cluster algebras and Coxeter combinatorics, Minicourse (5 lectures, 1.5 hours each) for the MSRI Graduate Workshop on Cluster Algebras and Cluster Combinatorics, August, 2011.

- Coxeter groups and cluster algebras*, UNC Charlotte Mathematics Colloquium, April, 2011.
- Cluster algebras and infinite associahedra*, Plenary talk, Combinatexas Conference, El Paso, TX, April 2008.
- Catalan combinatorics of finite Coxeter groups*, Texas A&M Mathematics Colloquium, February, 2006.
- Catalan combinatorics of finite Coxeter groups*, University of South Carolina Mathematics Colloquium, February, 2006.

CONFERENCE PRESENTATIONS

- Cambrian models for cluster algebras*, AMS Sectional Meeting, Special Session on Combinatorial Algebraic Geometry, Wake Forest University, September 2011.
- Generic rectangulations and pattern-avoiding permutations*, AMS Sectional Meeting, Special Session on Species and Hopf Algebraic Combinatorics, Cornell University, September 2011.
- The Hopf algebra, lattice and polytope of rectangulations*, SIAM Conference on Discrete Mathematics, Minisymposium on Enumerative Combinatorics, Austin, TX, June 2010.
- Coarsening polyhedral complexes*, CMS Summer Meeting, Session on Algebraic Combinatorics, University of New Brunswick, June 2010.
- A Cambrian approach to cluster algebras*, AMS Sectional Meeting, Special Session on Combinatorial Representation Theory, Macalester College, St. Paul, MN, April 2010.
- The Hopf algebra, lattice and polytope of rectangulations*, AMS Sectional Meeting, Special Session on Advances in Algebraic & Geometric Combinatorics, University of Kentucky, March 2010.
- Coarsening polyhedral complexes*, Workshop on Combinatorics, Enumeration and Invariant Theory, George Mason University, March 2010.
- Noncrossing partitions and the shard intersection order*, Ulam Centennial Conference, University of Florida, March 2009.
- Clusters, noncrossing partitions and the Coxeter plane*, FPSAC, Nankai University, Tianjin, China, July 2007.
- Dual combinatorics of clusters*, AMS Sectional Meeting, Special Session on Geometric and Combinatorial Methods in Representation Theory, Davidson, NC, March 2007.
- Lattice theory of the poset of regions, with applications to W -Catalan combinatorics*, AMS Winter Meetings, Special Session on Arrangements, New Orleans, LA, January 2007.
- The algebra and geometry of sortable elements*, AMS Sectional Meeting, Special Session on Algebraic Combinatorics, Fayetteville, AR, November 2006.
- The combinatorics (and “dual” combinatorics) of clusters*, NSF/CBMS Regional Conference on Cluster Algebras and Applications, Raleigh, NC, June 2006.
- Clusters, Coxeter-sortable elements and noncrossing partitions*, FPSAC, San Diego, CA, June 2006.
- Clusters, diminishing elements and noncrossing partitions*, AIM Workshop on Braid Groups, Clusters and Free Probability, Palo Alto, CA, January, 2005.
- Lattice congruences and Hopf algebras*, BIRS Workshop on Combinatorial Hopf Algebras, Banff, Canada, September 2004.
- Cambrian lattices and generalized associahedra*, PCMI/IAS Research Program in Geometric

- Combinatorics, Park City, UT, July 2004.
- Cambrian lattices and generalized associahedra*, FPSAC, Vancouver, Canada, 2004.
- The order dimension of the poset of regions in a hyperplane arrangement* (Poster), FPSAC, Vadstena, Sweden, 2003.
- Order dimension, strong Bruhat order and lattice properties for posets*, AMS Winter Meetings, Special Session on Lattice Theory, San Diego, CA, January 2002.
- Bases for the flag f -vectors of Eulerian posets* (Poster), FPSAC, Arizona State University, June 2001.
- Bases for the flag f -vectors of Eulerian posets*, AMS Sectional Meeting, Special Session on Polytopes, Lawrence, KS, March 2001.
- Problem Session, Victor Klee 75th Birthday Conference, University of Washington, August 2000.

SEMINAR TALKS

- Generic rectangulations and pattern-avoiding permutations*, Georgia Tech Combinatorics Seminar, April 2011.
- Noncrossing partitions and the shard intersection order*, University of Washington Combinatorics and Geometry Seminar, May 2009.
- Noncrossing partitions and the shard intersection order*, University of California at Davis Algebra and Discrete Mathematics Seminar, March 2009.
- Noncrossing partitions and the shard intersection order*, University of California at Santa Barbara Discrete Geometry Seminar, March 2009.
- Noncrossing partitions and intersections of shards*, University of Kentucky WILDCATS (Work, Interactions, and Leading Developments in Combinatorics, Algebra, Topology, and Statistics) Seminar, November 2008.
- Noncrossing partitions and intersections of shards*, University of Michigan Combinatorics Seminar, October 2008.
- Noncrossing partitions and intersections of shards*, MIT Combinatorics Seminar, September 2008.
- Sortable elements and Cambrian fans*, University of Michigan Combinatorics Seminar, September 2006.
- Catalan combinatorics of finite Coxeter groups*, NC State Mathematics Seminar, January, 2006.
- Catalan combinatorics of finite Coxeter groups*, BYU Mathematics Seminar, January, 2006.
- Clusters, Coxeter-sortable elements and noncrossing partitions*, University of Washington Combinatorics Seminar, March 2005.
- Clusters, c -sortable elements and noncrossing partitions*, UC Berkeley Combinatorics Seminar, March 2005.
- Noncrossing partitions and the Coxeter plane*, UC Santa Barbara Discrete Geometry and Combinatorics Seminar, November 2004.
- Noncrossing partitions and the Coxeter plane*, Texas A&M Algebra and Combinatorics Seminar, October 2004.
- Cambrian Lattices*, University of Minnesota Combinatorics Seminar, September 2003.
- The order dimension of the poset of regions in a hyperplane arrangement*, University of Min-

nesota Combinatorics Seminar, March 2003.

Cambrian Lattices, Michigan State University Combinatorics Seminar, March 2003.

Order dimension of supersolvable arrangements, University of Michigan Combinatorics Seminar, February, 2002.

The cd-index of an Eulerian poset, York University Applied Algebra Seminar, May, 2001.

TALKS AT HOME INSTITUTIONS

Releasing your Inner Polynomial, SUM Series (Society for Undergraduate Mathematics), February 2011.

Rectangulations and Pattern-avoiding permutations, SUM Series (Society for Undergraduate Mathematics), February 2011.

What's a determinant, really?, SUM Series (Society for Undergraduate Mathematics), September 2010.

Knots, Surfaces and the Fundamental Group, SUM Series (Society for Undergraduate Mathematics), February 2010.

Cayley's formula, SUM Series (Society for Undergraduate Mathematics), September 2009.

Hey! That's not my hat! Derangements and the number e, SUM Series (Society for Undergraduate Mathematics), September 2009.

The shape of space, SUM Series (Society for Undergraduate Mathematics), March 2009.

Regular Polytopes and Tessellations: Why life is more interesting in low dimension, SUM Series (Society for Undergraduate Mathematics), January 2009.

Tiling the Aztec Diamond with Dominos, SUM Series (Society for Undergraduate Mathematics), September 2008.

Noncrossing partitions and intersections of shards, NC State Algebra and Combinatorics Seminar, September 2008.

Counting chains in noncrossing partition lattices, NC State Algebra Seminar, November 2007.

Some interesting lattice congruences of the weak order, NC State Algebra Seminar, October 2006.

Lattice congruences of the weak order, NC State Algebra Seminar, September 2006.

Tropical linear spaces with constant coefficients, University of Michigan Tropical Geometry Study Seminar, September 2005.

Regular polytopes and tessellations, University of Michigan Undergraduate Math Club, March 2005.

Clusters, diminishing elements and noncrossing partitions, University of Michigan Combinatorics Seminar, January 2005.

Cambrian Lattices, University of Michigan Combinatorics Seminar, September 2003.

Nonnegativity of the cd -index, University of Michigan VIGRE Open Problems Seminar, 2003(?).

Tiling the Aztec Diamond with Dominos, University of Michigan Undergraduate Math Club, 2003.

Left cells—a continuation, Combinatorial Kazhdan-Lusztig Study Seminar, April 2002.

The Kazhdan-Lusztig P -polynomials, Combinatorial Kazhdan-Lusztig Study Seminar, March 2002.

The order dimension of finite distributive lattices, ATaC Student Seminar, University of Minnesota, February 2002.

Lattice properties for simplicial hyperplane arrangements, University of Minnesota Combinatorics Seminar, November 2001.

Order dimension of strong Bruhat order, University of Minnesota Combinatorics Seminar, March 2001.

Tiling the Aztec Diamond with Dominos, ATaC Student Seminar, University of Minnesota, September 2000.

Easy proofs of Cayley's theorem, ATaC Student Seminar, University of Minnesota, April 2000.

A different proof that Bruhat intervals are spheres, University of Minnesota Combinatorics Seminar, February 2000.

Two-dimensional lattices, ATaC Student Seminar, University of Minnesota, March 1999.

What is a cd-index?, University of Minnesota Combinatorics Seminar, February 1999.

Nim-regularity of graphs, University of Minnesota Combinatorics Seminar, November 1998.

Playing Nim on a simplicial complex, ATaC Student Seminar, University of Minnesota, February 1998.

STUDENTS

Shirley Law. Ph.D. expected Summer 2013.

Erin Bancroft. Ph.D. Summer 2011.

PROFESSIONAL SERVICE

Program Committee: FPSAC, June 2011, Reykjavik, Iceland.

Steering committee member: Triangle Lectures in Combinatorics (TLC), 2010–present.

Co-organizer: TLC Spring 2010 meeting, Raleigh, NC, February 2010.

Founding organizer: SUM Series undergraduate seminar, Fall 2008–present.

Special Session Co-organizer: Rings, Algebras, and Varieties in Combinatorics, AMS South-eastern Sectional Meeting, Raleigh, NC, April 2009.

Program Committee: FPSAC, June 2008, Valparaiso, Chile.

Seminar Co-organizer: University of Michigan Combinatorics Seminar, September 2004–April 2006.

Seminar Organizer: ATaC Student Seminar, University of Minnesota, January–December 1999.