

Public Curriculum Vitae

NATHAN WILLIAMS

The University of Texas at Dallas
Mathematical Sciences FO 35
800 West Campbell Road, Richardson, Texas 75080-3021
(972) 883-2161

Educational History

- 2008–2013 University of Minnesota, Ph.D. in Mathematics received 30 August, 2013.
Advisor: Dennis Stanton
- 2004–2008 Carleton College, B.A. in Mathematics (*magna cum laude*).
Spring 2006 spent at the Budapest Semesters in Mathematics.

Professional Experience

- 2017– University of Texas at Dallas, Assistant Professor of Mathematical Sciences. (Dallas, Texas.)
- 2016–2017 University of California, Santa Barbara, Visiting Assistant Professor of Mathematics. (Santa Barbara, California.)
- 2013–2016 Laboratoire de Combinatoire et d'Informatique Mathématique, Postdoctoral Researcher. (Université du Québec à Montréal, Canada.)

Research Interests

Algebraic combinatorics arising within reflection groups, geometric group theory, and representation theory.

Publications

Peer-reviewed journal articles

- 2017 10. (with A. Schilling, N. Thiéry, and G. White) *Braid moves in commutation classes of the symmetric group*, *European Journal of Combinatorics*, **62**, 15–34.
- 9. (with M. Thiel) *Strange expectations and simultaneous cores*, *Journal of Algebraic Combinatorics*, **46**, 219–261.
- 8. *W-Associahedra have the non-face-leaving property*, *European Journal of Combinatorics*, **62**, 272–285.
- 2016 7. (with P. Nadeau and C. Hohlweg) *Automata, reduced words, and Garside shadows in Coxeter groups*, *Journal of Algebra*, **457**, 431–456.
- 6. (with T. Gobet) *Noncrossing partitions and Bruhat order*, *European Journal of Combinatorics*, **53**, 8–34.
- 5. (with C. Berg and M. Zabrocki) *Symmetries of the k -bounded partition lattice*, *Annals of Combinatorics*, **20**(2), 251–281.
- 2013 4. (with D. Armstrong and B. Rhoades) *Rational associahedra and noncrossing partitions*, *Electronic Journal of Combinatorics* **20**(3), P54.
- 3. (with M. Visontai) *Stable multivariate W -Eulerian polynomials*, *Journal of Combinatorial Theory Series A* **120**(7), 1929–1945.
- 2012 2. (with H. Thomas) *Cyclic Symmetry of the Scaled Simplex*, *Journal of Algebraic Combinatorics* **39**(2), 225–246.
- 1. (with J. Striker) *Promotion and Rowmotion*, *European Journal of Combinatorics* **33**, 1919–1942.

Peer-reviewed conference proceedings

- 2017 10. (with H. Thomas) *Sweeping up Zeta*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), London, England.

- 2016 9. (with C. Stump and H. Thomas) *Cataland: Why the Fuss?*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Vancouver, Canada.
- 8. (with M. Thiel) *Strange Expectations*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Vancouver, Canada.
- 2015 7. (with Z. Hamaker) *Subwords and Plane Partitions*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Daejeon, South Korea.
- 6. (with H. Mühle) *Tamari Lattices for Parabolic Quotients of the Symmetric Group*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Daejeon, South Korea.
- 2014 5. *Bijactions in Cataland*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Chicago, USA, 597–608.
- 2013 4. (with D. Armstrong and B. Rhoades) *Rational associahedra and noncrossing partitions*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Paris, France, 933–944.
- 2012 3. (with J. Striker) *Promotion and Rowmotion*, DMTCS Proceedings (Formal Power Series and Algebraic Combinatorics), Nagoya, Japan, 271–283.
- 2. (with M. Visontai) *Les polynômes eulériens stables de type B*, Proceedings FPSAC (Formal Power Series and Algebraic Combinatorics), Nagoya, Japan, 297–306.
- 1. (with M. Visontai) *A Proof of the Dendrodistinguishability Conjecture for $m = 3$* , Proceedings GAS-Com, Bordeaux, France.

Submitted articles, preprints, and work in progress

Submitted articles

- 2017 2. (with H. Thomas) *Sweeping up Zeta*, arXiv preprint, arXiv:1512.01483, *accepted to Selecta Mathematica*.
- 1. (with Z. Hamaker, R. Patrias, and O. Pechenik) *Doppelgängers: Bijections of Plane Partitions*, arXiv preprint, arXiv:1602.05535, *revisions submitted to International Mathematics Research Notices*.

Preprints

- 2015 1. (with C. Stump and H. Thomas) *Cataland: Why the Fuss?*, arXiv preprint, arXiv:1503.00710.

Other

- 2013 3. *Cataland*. Ph.D. dissertation.
- 2012 2. *Rational Catalan Combinatorics*. Notes from the Rational Catalan Combinatorics AIM Workshop, 13 pages, available on my website.
- 2008 1. *An Alternating Sum of Alternating Sign matrices*. Rose Hulman Undergraduate Mathematics Journal **9** (2), 6.

Work in progress

7. *The cycle lemma*.
We interpret the cycle lemma as a manifestation of the cyclic symmetry of the affine Dynkin diagram of type A . This approach allows us to extend the cycle lemma to other Cartan types.
6. (with M. Thiel) *Uniformly Strange Expectations*.
Continuing our work from *Strange expectations and simultaneous cores*, we give a uniform formula for all Cartan types for the expectation of a coroot inside a certain dilation of the fundamental alcove.
5. (with M. Thiel) *Fixed Points of Parking Functions*.
We find the expected norm of a weight in a highest-weight representation of a simple complex Lie algebra using a decomposition of the algebra into mutually orthogonal Cartan subalgebras (with respect to the Killing form) in types other than A and C . For types A and C , we rely on explicit combinatorial arguments.

4. (with J. McCammond H. Thomas) *Fixed Points of Parking Functions*, 30 pages.
We invert the zeta map on rational parking functions using the Brouwer fixed-point theorem.
3. (with C. Stump and H. Thomas) *Cataland: Bijactions*, 20 pages.
A uniform bijection (checked up to rank 8) between W -noncrossing and W -nonnesting partitions is conjectured.
2. (with H. Mühle) *Tamari Lattices for Parabolic Quotients of the Symmetric Group*, 30 pages.
We extend several classes of Catalan objects to parabolic quotients of Coxeter groups.
1. (with H. Thomas) *Crystals and Weak Order*, 10 pages.
We propose a new combinatorial crystal model for highest-weight ρ in type A .

Professional Societies

Association for Women in Mathematics
American Mathematical Society

Scientific/Academic Honors

2008 Phi Beta Kappa
— Sigma Xi

Refereed Lectures Given

- 2017 July *Sweeping up Zeta* Formal Power Series and Algebraic Combinatorics (London, England).
2016 July *Cataland - Why the Fuss?* Formal Power Series and Algebraic Combinatorics (Vancouver, Canada).
2015 July *Subwords and Plane Partitions*, Formal Power Series and Algebraic Combinatorics (Daejeon, South Korea).
2012 July *Promotion and Rowmotion*, Formal Power Series and Algebraic Combinatorics (Nagoya, Japan).

Other Lectures Given

- 2017 Jun. *Parkour: Inverting Parking Zeta*, Centre de Recherches Mathématiques.
— Jun. *Why the Fuss?*, University of California, Santa Barbara, Topology seminar.
— Feb. *Sweeping up Zeta*, The University of Texas at Dallas.
— Feb. *Sweeping up Zeta*, California State University, Fresno.
— Feb. *Doppelgängers: Bijections of Plane Partitions*, University of California, Santa Barbara, Discrete Geometry and Combinatorics Seminar.
— Jan. *Sweeping up Zeta*, The College of William and Mary.
— Jan. *Sweeping up Zeta*, Texas A & M University.
2016 Dec. *Sweeping up Zeta*, University of Massachusetts Amherst
— Oct. *Sweeping up Zeta*, University of California, Santa Barbara, Discrete Geometry and Combinatorics Seminar.
— Mar. *Sweeping up Zeta*, University of California, Davis, Combinatorics Seminar.
— Jan. *Why the Fuss?*, Brandeis University, Special Seminar.
— Jan. *Sweeping up Zeta*, Massachusetts Institute of Technology, Combinatorics Seminar.
2015 Dec. *Sweeping up Zeta*, University of California, San Diego, Combinatorics Seminar.
— Dec. *Coincidental Types and their Minuscule Doppelgängers*, CMS Winter Meeting (Montréal, Québec).
— Apr. *Why the Fuss?* AMS Sectional Meeting (Las Vegas, Nevada).
— Mar. *Why the Fuss?* Institut Camille Jordan.
— Mar. *Cataland* AIM Workshop: Dynamical Algebraic Combinatorics (San Jose, California).

- Mar. *Why the Fuss?* Sage Days 64 (University of California, Davis).
- Jan. *Why the Fuss?* Combinatorial Algebra Meets Algebraic Combinatorics (Kingston, Ontario).
- Jan. *Cristaux et L'Ordre Faible*, LaCIM, Combinatorics Seminar.
- 2014 Apr. *Why the Fuss?* LaCIM, Combinatorics Seminar.
- Feb. *Reduced Words and Plane Partitions in Type B*, LaCIM, Combinatorics Seminar.
- Jan. *Cataland*, Combinatorial Algebra Meets Algebraic Combinatorics (Halifax).
- 2013 Dec. *Cataland*, North Dakota State University, Department Colloquium.
- Dec. *Catalan Combinatorics for Parabolic Quotients*, North Dakota State University, Algebra and Discrete Math Seminar.
- Nov. *Cataland*, York University, Applied Math Seminar.
- Oct. *Cataland*, Freie Universität Berlin, Discrete Geometry Seminar.
- Sep. *Cataland*, LaCIM, Combinatorics Seminar.
- 2012 Nov. *Noncrossing and Nonnesting Partitions for Parabolic Quotients*, University of Minnesota, Combinatorics Seminar
- July *Cyclic Symmetry of the Scaled Simplex*, Summer School on Algebraic and Enumerative Combinatorics (S. Miguel de Seide, Portugal).
- Mar. *Towards a uniform description of a bijection between nonnesting and noncrossing partitions*, AMS Special Session on Combinatorics: Algebraic and Geometric (Tampa, Florida).
- Mar. *Promotion and Rowmotion*, University of Miami.
- Feb. *Suter's Surprising Cyclic Symmetry*, York University, Applied Math Seminar.
- Jan. *Cyclic Symmetry in Young's Lattice*, Combinatorial Algebra Meets Algebraic Combinatorics (Montréal).
- 2011 June *Promotion and Rowmotion*, Institut Camille Jordan.
- Apr. *Promotion and Rowmotion*, University of Minnesota, Combinatorics Seminar.
- 2010 Mar. *Cyclic Sieving in Young's Lattice*, University of Minnesota, Combinatorics Seminar.

Referee and review activities

Journals, Conferences, and AMS publications Refereed

- Annals of Combinatorics
- Electronic Journal of Combinatorics
- European Journal of Combinatorics
- Forum of Mathematics, Sigma
- Journal of Algebraic Combinatorics
- Journal of Combinatorial Theory, Series A
- Mathematical Structures in Computer Science
- Formal Power Series and Algebraic Combinatorics
- SIAM Journal on Discrete Mathematics
- The Royal Society of Edinburgh: Proceedings A
- Transactions of the AMS

Conferences and Seminars Organized

- 2017 AMS Special Session at the JMM in San Diego: Dynamical Algebraic Combinatorics
- 2016–2017 University of California, Santa Barbara: Discrete Geometry and Combinatorics Seminar
- 2015 AIM workshop: Dynamical Algebraic Combinatorics
- 2014–2016 LaCIM Departmental Seminar
- 2014 AMS Special Session in Halifax: Generalized Catalan Algebraic Combinatorics
- 2013 Graduate Student Combinatorics Conference
- 2010 Junior Colloquium at the University of Minnesota

Teaching Activities

Lectures at the University of Texas at Dallas

2017 Fall Calculus I (Math 2417; 45 students)

Lectures at the University of California, Santa Barbara

2017 Spring Calculus II (Math 3B; 150 students)

2017 Spring Linear Algebra (Math 4A; 150 students)

2016 Winter Mathematics for High School Teachers (Math 101B; 20 students)

2016 Fall Linear Algebra (Math 4A; 150 students)

Lectures at l'Université du Québec à Montréal and the University of Minnesota

2015 Fall Graduate Research Seminar in Combinatorics (Math 995B; 3 lectures)

2013 Fall Graduate Research Seminar in Combinatorics (Math 995B; 3 lectures)

2009 Fall Excursions in Mathematics (Math 1001; 8 lectures)

Recitations led at the University of Minnesota

2012 Fall Calculus II (Math 1272)

2012 Spring Short Calculus (Math 1142)

2011 Fall Linear Algebra and Differential Equations (Math 2373)

2010 Spring Calculus I (Math 1271)

2009 Fall Excursions in Mathematics (Math 1001)

2009 Spring Short Calculus (Math 1142)

2008 Fall Calculus I (Math 1271)

Additional Teaching

2012 Spring Preparation for Financial Mathematics II (Math 5002)

2011 Fall Preparation for Financial Mathematics I (Math 5001)

2011 Spring Preparation for Financial Mathematics II (Math 5002)

2010 Fall Preparation for Financial Mathematics I (Math 5001)