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Education.

2001-2005 Massachusetts Institute of Technology, Cambridge, USA.
Ph.D. in Mathematics, June, 2005.
Thesis title: Combinatorics of Ribbon Tableaux.
Thesis advisor: Richard Stanley.

1998-2001 University of New South Wales, Sydney, Australia.
B.Sc. in Advanced Science (Pure Mathematics with Honours), May 2001.
Honours Thesis title: Graphs without cycles of even length.
Honours Thesis advisor: Terence Tao.
Awarded University Medal.

Employment.

2007–now American Institute of Mathematics – National Science Foundation Postdoctoral Fellow.

2005–now Benjamin Peirce Assistant Professor, Harvard University.

2005 Clay Liftoff Fellow.

Research Interests.

Algebraic combinatorics, particularly aspects related to representation theory or to geometry.

Grants, Awards and Fellowships.

2007-2010 *NSF Focused Research Group grant DMS-0652641*, National Science Foundation.

2006-2009 *NSF 3 year grant DMS-0600677*, National Science Foundation.

2005 *Clay Liftoff Fellowship*, Clay Mathematical Institute.

2005 *Best Presentation by a Graduate Student (for the paper "Affine Stanley symmetric functions")*, FPSAC 2005, Taormina, Italy.

2005 *Charles W. and Jennifer C. Johnson Prize (for the paper "Ribbon tableaux and the Heisenberg algebra")*, MIT Department of Mathematics.

2001 *University Medal*, University of New South Wales, Sydney, Australia.

1997 *Gold Medal*, 38th International Mathematical Olympiad, Mar del Plata, Argentina.

Preprints.

1. *Quantized dual graded graphs*, preprint, 2008; `arxiv/0808.0345`.

2. (with Nantel Bergeron and Huilan Li) *Combinatorial Hopf algebras and towers of algebras*, preprint, 2007; `arXiv/0710.3744`.

3. (with Anne Schilling and Mark Shimozono) *Schubert Polynomials for the affine Grassmannian of the symplectic group*, preprint, 2007; `arXiv/0710.2720`.

Accepted papers.

1. (with Mark Shimozono) *Quantum cohomology of G/P and homology of affine Grassmannian*, Acta. Math., to appear; `arXiv/0705.1386`.

2. (with Cédric Bonnafé, Meinolf Geck and Lacri Iancu) *On domino insertion and Kazhdan-Lusztig cells of type B_n*, to appear in Prog. in Math. (Lusztig birthday volume), Birkhäuser; `math.RT/0609279`.

3. (with Luc Lapointe, Jennifer Morse and Mark Shimozono) *Affine insertion and Pieri rules for the affine Grassmannian*, Memoirs of the AMS, to appear; `math.CO/0609110`.

Published papers.

1. (with Pavlo Pylyavskyy) *Temperley-Lieb Pfaffinants and Schur Q-positivity conjectures*, Adv. Math., **218** (2008), 1654–1684.

2. *Signed differential posets and sign-imbalance*, J. Combin. Theory Ser. A, **115** (2008), 466–484.

3. (with Pavlo Pylyavskyy) *P-partition products and fundamental quasi-symmetric function positivity*, Adv. in Appl. Math., **40** (2008), 271–294.

4. (with Lauren Williams) *Total positivity for cominuscule Grassmannians*, New York J. Math., **14** (2008), 53–99.

5. *Schubert polynomials for the affine Grassmannian*, J. Amer. Math. Soc., **21** (2008), 259–281.

6. *Ribbon Schur operators*, European J. Combin., **29** (2008), 343–359.

7. (with Mark Shimozono) *Dual graded graphs for Kac-Moody algebras*, Algebra and Number Theory, **1** (2007), 451–488.

8. (with Alex Postnikov and Pavlo Pylyavskyy) *Schur positivity and Schur log-concavity*, Amer. J. Math., **129** (2007), 1611–1622.

9. (with Alex Postnikov) *Alcoved Polytopes I*, Discrete Comput. Geom., **38** (2007), 453–478.

10. (with Pavlo Pylyavskyy) *Combinatorial Hopf algebras and K-homology of Grassmannians*, Int. Math. Res. Not., **2007** (2007), rnm 125, 48 pages.

11. (with Pavlo Pylyavskyy) *Cell transfer and monomial positivity*, J. Alg. Combin., **26**(2) (2007), 209–224.

12. *Affine Stanley symmetric functions*, Amer. J. Math., **128** (2006), 1553–1586.

13. (with Mark Shimozono) *A Little bijection for affine Stanley symmetric functions*, Seminaire Lotharingien de Combinatoire, **54**A (2006), B54Ai.

14. *A combinatorial generalization of the Boson-Fermion Correspondence*, Math. Res. Lett. **13** (2006), 377–392.

15. (with Jacques Verstraete) *A note on graphs without short even cycles*, Electron. J. Combin., **12**/1 (2005), N5.

16. *On symmetry and positivity for domino and ribbon tableaux*, Ann. Combin., **9** (2005), 293–300.

17. *Ribbon Tableaux and the Heisenberg Algebra*, Math. Z., **250** (2005), 685–710.

18. *A result on $2k$-cycle-free bipartite graphs*, Australas. J. Comb., **32** (2005), 163–170.

19. *Growth diagrams, Domino insertion and Sign-imbalance*, J. Combin. Theory Ser. A., **107** (2004), 87–115.

20. *Graphs without cycles of even length*, Bull. Austral. Math. Soc., **63** (2001), 435–440.

Refereed Proceedings of Conferences.

1. (with Lauren Williams) *Total positivity for cominuscule Grassmannians*, Proceedings of the 20-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'08), Valparaiso, Chile, 2008.

2. (with Nantel Bergeron and Huilan Li) *Combinatorial Hopf algebras and towers of algebras*, Proceedings of the 20-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'08), Valparaiso, Chile, 2008.

3. *Dual graded graphs for Kac-Moody algebras*, Proceedings of the 19-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'07), TianJin, China, 2007.

4. *Schubert polynomials for the affine Grassmannian*, Proceedings of the 18-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'06), San Diego, 2006.

5. (with Alex Postnikov and Pavlo Pylyavskyy) *Schur positivity and Schur log-concavity*, Proceedings of the 18-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'06), San Diego, 2006.

6. *Affine Stanley symmetric functions*, Proceedings of the 17-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'05), Taormina, Italy, 2005.

7. *Pieri and Cauchy formulae for ribbon tableaux*, Proceedings of the 16-th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC'04), Vancouver B.C., 2004.

Theses, survey articles, and unpublished manuscripts.

1. *Tiling with commutative rings*, Harvard College Mathematics Review, **2** (2008), 55–60.
2. *On Sjostrand's skew sign-imbalance identity*, 2006; `math.CO/0607516`.
3. *Combinatorics of Ribbon Tableaux*, Massachusetts Institute of Technology Ph.D Thesis, 2005.
4. *Graphs without cycles of even length*, University of New South Wales Honours Thesis, 2001.

Recent Invited Talks.

1. *Total positivity and Schubert calculus for loop groups*, KAIST, Korea, 2008.
2. *Total positivity for loop groups*, International conference in Combinatorics and Representation Theory, Nagoya University, Japan, 2008.
3. *Schubert calculus on the affine Grassmannian*, Crystals and Tropical Combinatorics Conference, Kyoto, Japan, 2008.
4. *k-shapes and k-Schur functions*, AMS Sectional Meeting, Claremont McKenna College, 2008.
5. *Juggling patterns, affine permutations, and positroids*, MIT Combinatorics Seminar, 2008.
6. *Hopf algebras, Towers of Algebras and Dual graded graphs*, Workshop on topics in Combinatorial Representation Theory, MSRI, 2008.
7. *Combinatorial Hopf algebras and towers of algebras*, Basic Notions Seminar, Harvard University, 2008.
8. *k-Schur functions and the affine Grassmannian*, Workshop on Applications of Macdonald Polynomials, Banff, 2007.
9. *Dual graded graphs for Kac-Moody algebras*, FPSAC 2007, TianJin, China.
10. *Affine = Quantum Schubert calculus*, Institute of Mathematical Sciences Seminar, Hong Kong, 2007.
11. *Combinatorial Hopf algebras and affine Schurbert calculus*, CRM Workshop on combinatorial Hopf algebras and Macdonald polynomials, Montreal, 2007.
12. *Temperley-Lieb Pfaffinants*, University of Michigan Combinatorics Seminar, 2007.
13. *Affine Schubert calculus*, University of Michigan Algebraic Geometry Seminar, 2007.

14. *Affine = Quantum Schubert calculus*, Workshop on Contemporary Schubert Calculus and Schubert Geometry, Banff, 2007.

15. *First steps in affine Schubert calculus*, Duke University Algebraic Geometry Seminar, 2007.

16. *Schensted Insertion for Affine and Kac-Moody Algebras*, University of Pennsylvania Combinatorics and Probability Seminar, 2007.

17. *Tableaux and insertion for affine Schubert calculus*, MIT Combinatorics Seminar, 2006.

18. *Schubert polynomials for the affine Grassmannian*, AMS Sectional Meeting, Eugene, Oregon, 2005.

19. *Schubert polynomials for the affine Grassmannian*, Harvard University Basic Notions Seminar, 2005.

20. *Lascoux-Leclerc-Thibon ribbon functions*, AIM Workshop on Generalized Kostka polynomials, Palo Alto, 2005.

21. *Affine Stanley symmetric functions*, FPSAC 2005, Taormina, Italy.

22. *Affine Stanley symmetric functions*, UC San Diego Colloquium, 2005.

23. *Representations of Heisenberg algebras and symmetric functions*, Stanford University Representation Theory Seminar, 2004.

24. *Affine Stanley symmetric functions*, UC Berkeley Combinatorics Seminar, 2004.

25. *Pieri and Cauchy formulae for ribbon tableaux*, FPSAC 2004, Vancouver, Canada.

26. *Alcoved Polytopes*, MIT Combinatorics Seminar, 2003.

Undergraduate Research supervision.

Supervisor for Joel Brewster Lewis (2007) and Robin Walters (2008) for their undergraduate senior theses at Harvard University. Co-supervised Hana Kitasei for a summer research project (2007).

Teaching Experience.

2005–now Classes taught at Harvard University: Calculus (Math 21a, Math 21b), Linear Algebra (Math 121), Higher Algebra (Math 250), Algebraic Combinatorics (Math 192), Commutative Algebra (Math 221), Topological Spaces (Math 131).

2003–2004 Teaching Assistant at MIT: Recitation Instructor for 18.03 (Differential Equations).

2001–2004 Teaching Assistant and Grader for 18.701 (Algebra), 18.100A (Analysis), and 18.703 (Modern Algebra).

2000–2001 Class tutor at University of New South Wales. Classes taught: MATH1131 (First Year Mathematics), MATH1151 (Arcturial Mathematics), COMP1021 (Java/C).

1998-2001 Tutor at Australian Mathematical Olympiad training camps.

Other Professional Activities.

- Academy Fellow, Clay Research Academy, 2005.
- Referee for Adv. in Math., Discrete Math., Duke Math. J., Elec. J. Combin., European J. Combin., J. Alg., J. Alg. Combin., J. Autom. Lang. Comb., J. Combin. Theory, J. Math. Phys., Trans. Amer. Math. Soc.
- Reviewer for AMS Math Reviews.
- Served on qualifying exam committee (Harvard 2008), graduate admissions committee (Harvard 2005, 2007) and Math Table (undergraduate math club) committee (Harvard 2006, 2007).

References.

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