

Eric Marberg

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Education

Massachusetts Institute of Technology <i>Ph.D. in Mathematics</i> (advisor: David Vogan)	9/2008–6/2013
Stanford University <i>B.S. in Electrical Engineering, B.S. in Mathematics</i> (advisor: Persi Diaconis)	9/2004–6/2008

Experience

Hong Kong University of Science and Technology , Department of Mathematics <i>Assistant Professor</i>	1/2017–Present
Expansive (formerly Qadium), San Francisco, California, USA <i>Software Engineer</i>	10/2015–1/2017
Stanford University , Department of Mathematics <i>Postdoctoral Researcher</i>	7/2013–8/2016

Awards

Hong Kong RGC Grant GRF 16306120	2020–2023
Hong Kong RGC Grant ECS 26305218	2018–2021
HKUST Initiation Grant IGN 16SC11	2017–2018
NSF Mathematical Sciences Postdoctoral Research Fellowship (~40 awards annually)	2013–2016
Charles W. and Jennifer C. Johnson Prize (best paper by MIT math graduate student)	2013
National Defense Science and Engineering Graduate Fellowship	2008–2011
Frederick Emmons Terman Engineering Award (top 25 undergraduates in engineering)	2008
J. E. Wallace Sterling Award (top 25 undergraduates in sciences and humanities)	2008
Stanford Mathematics Department Undergraduate Research Award	2008
Tau Beta Pi Engineering Honors Society (top 1/8 of junior class)	2007
Highbridge Book Award for Mathematical Problem Solving	2006
Stanford President's Award for Excellence in the Freshman Year	2005

Preprints

1. Involution pipe dreams.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Preprint (2019), [arXiv:1911.12009](https://arxiv.org/abs/1911.12009).
2. Bumping operators and insertion algorithms for queer supercrystals.
Preprint (2019), [arXiv:1910.02261](https://arxiv.org/abs/1910.02261).
3. Enriched set-valued P -partitions and shifted stable Grothendieck polynomials.
Coauthored with Joel Brewster Lewis.
Preprint (2019), [arXiv:1907.10691](https://arxiv.org/abs/1907.10691).
4. Affine transitions for involution Stanley symmetric functions.
Coauthored with Yifeng Zhang.
Preprint (2018), [arXiv:1812.04880](https://arxiv.org/abs/1812.04880).
5. Linear compactness and combinatorial bialgebras.
Preprint (2018), [arXiv:1810.00148](https://arxiv.org/abs/1810.00148).
6. Atoms for signed permutations.
Coauthored with Zachary Hamaker.
Preprint (2018), [arXiv:1802.09805](https://arxiv.org/abs/1802.09805).

Published papers

1. Principal specializations of Schubert polynomials in classical types.
Coauthored with Brendan Pawlowski.
Algebraic Combinatorics, to appear, [arXiv:2002.00303](https://arxiv.org/abs/2002.00303).
2. K -theory formulas for orthogonal and symplectic orbit closures.
Coauthored with Brendan Pawlowski.
Advances in Mathematics, to appear, [arXiv:1906.00907](https://arxiv.org/abs/1906.00907).
3. On some properties of symplectic Grothendieck polynomials.
Coauthored with Brendan Pawlowski.
Journal of Pure and Applied Algebra **225** (2021), 106463.
4. A symplectic refinement of shifted Hecke insertion.
Journal of Combinatorial Theory, Series A **173** (2020), 105216.
5. Bialgebras for Stanley symmetric functions.
Discrete Mathematics **343** (2020), no. 4, 111778.
6. Fixed-point-free involutions and Schur P -positivity.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Journal of Combinatorics **11** (2020), no. 1, 65–110.
7. On some actions of the 0-Hecke monoids of affine symmetric groups.
Journal of Combinatorial Theory, Series A **161** (2019), 178–219.
8. Stanley symmetric functions for signed involutions.
Coauthored with Brendan Pawlowski.
Journal of Combinatorial Theory, Series A **168** (2019), 288–317.

9. Transition formulas for involution Schubert polynomials.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Selecta Mathematica **24** (2018), 2991–3025.
10. Involution words: counting problems and connections to Schubert calculus for sym. orbit closures.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Journal of Combinatorial Theory, Series A **160** (2018), 217–260.
11. Schur P -positivity and involution Stanley symmetric functions.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
International Mathematics Research Notices (2017), rnx274.
12. Involution words II: braid relations and atomic structures.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Journal of Algebraic Combinatorics **45** (2017), 701–743.
13. Variations of the Poincaré series for affine Weyl groups and q -analogues of Chebyshev polynomials.
Coauthored with Graham White.
Advances in Applied Mathematics **82** (2017), 129–154.
14. Bar operators for quasiparabolic conjugacy classes in a Coxeter group.
Journal of Algebra **453** (2016), 325–363.
15. Strong forms of self-duality for Hopf monoids in species.
Transactions of the American Mathematical Society **368** (2016), 5433–5473.
16. Strong forms of linearization for Hopf monoids in species.
Journal of Algebraic Combinatorics **42** (2015), 391–428.
17. Positivity conjectures for Kazhdan-Lusztig theory on twisted involutions: the finite case.
Journal of Algebra **413** (2014), 198–225.
18. Positivity conjectures for Kazhdan-Lusztig theory on twisted involutions: the universal case.
Representation Theory **18** (2014), 88–116.
19. Isomorphisms, automorphisms, and generalized involution models of projective reflection groups.
Coauthored with Fabrizio Caselli.
Israel Journal of Mathematics **199** (2014), 433–483.
20. Crossings and nestings in colored set partitions.
Electronic Journal of Combinatorics **20** (2013), no. 4, Research Paper 6, 30 pp.
21. How to compute the Frobenius-Schur indicator of a unipotent character of a finite Coxeter system.
Advances in Mathematics **240** (2013), 484–519.
22. Actions and identities on set partitions.
Electronic Journal of Combinatorics **19** (2012), no. 1, Research Paper 28, 31 pp.
23. Heisenberg characters, unitriangular groups, and Fibonacci numbers.
Journal of Combinatorial Theory, Series A **119** (2012) 882–903.
24. Exotic characters of unitriangular matrix groups.
Journal of Pure and Applied Algebra **216** (2012), 239–254.
25. Generalized involution models for wreath products.
Israel Journal of Mathematics **192** (2012), 157–195.

26. Superclasses and supercharacters of normal pattern subgroups.
Journal of Algebraic Combinatorics **35** (2012), 61–92.
27. Supercharacters, symmetric functions in noncommuting variables, and related Hopf algebras.
Coauthored with Marcelo Aguiar, Carlos André, Carolina Benedetti, Nantel Bergeron, Zhi Chen, Persi Diaconis, Anders Hendrickson, Samuel Hsiao, I. Martin Isaacs, Andrea Jedwab, Kenneth Johnson, Gizem Karaali, Aaron Lauve, Tung Le, Stephen Lewis, Huilan Li, Kay Magaard, Jean-Christophe Novelli, Amy Pang, Franco Saliola, Lenny Tevlin, Jean-Yves Thibon, Nathaniel Thiem, Vidya Venkateswaran, C. Ryan Vinroot, Ning Yan, and Mike Zabrocki.
Advances in Mathematics **229** (2012), 2310–2337.
28. Combinatorial methods of character enumeration for the unitriangular group.
Journal of Algebra **345** (2011), 295–323.
29. Iterative character constructions for algebra groups.
Advances in Mathematics **228** (2011), 2743–2765.
30. Automorphisms and generalized involution models of finite complex reflection groups.
Journal of Algebra **334** (2011), 295–320.
31. A supercharacter analogue for normality.
Journal of Algebra **332** (2011), 334–365.
32. Superinduction for pattern groups.
Coauthored with Nathaniel Thiem.
Journal of Algebra **321** (2009), 3681–3703.

Book chapters

1. Comparing and characterizing some constructions of canonical bases from Coxeter systems.
Representations of Reductive Groups, Progress in Mathematics **312** (2015), 399–436.
2. Generalized Involution Models of Projective Reflection Groups.
Coauthored with Fabrizio Caselli.
Combinatorial Methods in Topology and Algebra, Springer INdAM Series (2015), 19–23.

Refereed conference proceedings

1. Stanley symmetric functions for signed involutions.
Coauthored with Brendan Pawlowski.
Séminaire Lotharingien de Combinatoire (FPSAC 2019), no. 82B, article 29.
2. Involution pipe dreams.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Séminaire Lotharingien de Combinatoire (FPSAC 2019), no. 82B, article 63.
3. Affine transitions for involution Stanley symmetric functions.
Coauthored with Yifeng Zhang.
Séminaire Lotharingien de Combinatoire (FPSAC 2019), no. 82B, article 66.
4. Actions of the 0-Hecke Monoids of Affine Symmetric Groups.
Séminaire Lotharingien de Combinatoire (FPSAC 2018), no. 80, article B.65.

5. Involution Schubert-Coxeter Combinatorics.
Coauthored with Zachary Hamaker and Brendan Pawlowski.
Séminaire Lotharingien de Combinatoire (FPSAC 2017), no. 78, article B.51.
6. Supercharacters, Symmetric Functions in Noncommuting Variables.
Coauthored with Marcelo Aguiar, Carlos André, Carolina Benedetti, Nantel Bergeron, Zhi Chen, Persi Diaconis, Anders Hendrickson, Samuel Hsiao, I. Martin Isaacs, Andrea Jedwab, Kenneth Johnson, Gizem Karaali, Aaron Lauve, Tung Le, Stephen Lewis, Huilan Li, Kay Magaard, Jean-Christophe Novelli, Amy Pang, Franco Saliola, Lenny Tevlin, Jean-Yves Thibon, Nathaniel Thiem, Vidya Venkateswaran, C. Ryan Vinroot, Ning Yan, and Mike Zabrocki.
Discrete Mathematics and Theoretical Computer Science (FPSAC 2011), AO, pages 3–14.

Presentations

<i>Atoms for signed permutations</i> (poster) Permutation Patterns Virtual Workshop	6/2020
<i>Quasisymmetric Hopf algebras for K-theory</i> Pure Mathematics Seminar, University of Queensland	3/2020
<i>K-theory formulas for orthogonal and symplectic orbit closures</i> New Interactions between Geometry and Combinatorics, Osaka City University	10/2019
<i>Enumerating involution words for signed permutations</i> (poster) Formal Power Series and Algebraic Combinatorics, University of Ljubljana	7/2019
<i>Involution pipe dreams</i> (poster) Formal Power Series and Algebraic Combinatorics, University of Ljubljana	7/2019
<i>Stanley symmetric functions for affine involutions</i> (poster) Formal Power Series and Algebraic Combinatorics, University of Ljubljana	7/2019
<i>Shifted stable Grothendieck polynomials for symplectic orbit closures</i> AMS Sectional Meeting, University of Hawaii at Manoa	3/2019
<i>Insertion algorithms for cohomology and K-theory</i> Combinatorics Seminar, University of Southern California	2/2019
<i>Actions of the 0-Hecke monoids of affine symmetric groups</i> Formal Power Series and Algebraic Combinatorics, Dartmouth College	7/2018
<i>From Klyachko models to involution words</i> Combinatorics Seminar, University of Southern California	4/2018
<i>From Klyachko models to representations of extended Hecke algebras</i> Representation Theory and Number Theory Seminar, University of Utah	4/2018
<i>Some conjectures about q-Chebyshev polynomials and affine symmetric groups</i> Seminar on Pure Mathematics, HKUST	3/2018
<i>Automating the proof of an analogue of Matsumoto's theorem</i> Sage Days 88, Institute for Mathematics and its Applications, Minneapolis	8/2017
<i>Some open problems related to Bruhat order on involutions in Coxeter groups</i> Pacific Rim Mathematical Association Congress, Instituto Tecnológico de Oaxaca	8/2017

<i>Involution Schubert-Coxeter combinatorics</i> Formal Power Series and Algebraic Combinatorics, Queen Mary, University of London	7/2017
<i>Actions of Iwahori-Hecke algebras on involutions and connections to Schubert calculus</i> Colloquium, Hong Kong University of Science and Technology	1/2016
<i>Extending the theory of PSD algebras to Hopf monoids in species</i> AMS Sectional Meeting, Loyola University Chicago	10/2015
<i>Actions of Iwahori-Hecke algebras on involutions</i> Applied Representation Theory, University of Amiens	7/2015
<i>Random sorting networks</i> Stanford Undergraduate Mathematical Organization, Stanford University	4/2015
<i>A finiteness conjecture for characters of unitriangular groups</i> University of Lisbon	10/2014
<i>From 2-periodic functors in categories of Soergel bimodules to q-analogs of Chebyshev polynomials</i> Bay Area Discrete Math Day, Stanford University	9/2014
<i>Strongly self-dual Hopf monoids in species with applications to combinatorial Hopf algebras</i> Algebraic Lie Theory Seminar, University of Colorado Boulder	3/2014
<i>Canonical bases and deformations of Coxeter group representations</i> Lie Groups Seminar, MIT	11/2013
<i>Heuristic notions of Frobenius-Schur indicators for unipotent characters of finite Coxeter systems</i> Lie Groups and Representation Theory Seminar, University of Maryland	4/2013
<i>Combinatorics of the unipotent characters of a finite Coxeter system</i> AMS Sectional Meeting, University of Colorado Boulder	4/2013
<i>Positivity conjectures for Kazhdan-Lusztig theory on twisted involutions</i> Algebra and Topology Seminar, University of Copenhagen	2/2013
<i>Positivity conjectures from Kazhdan-Lusztig theory on twisted involutions</i> Quantum Algebra and Representation Theory Seminar, Stanford University	11/2012
<i>Multiplicity-free representations, generalized involution models, and twisted KL theory</i> Combinatorics Seminar, MIT	10/2012
<i>Supercharacters for algebra groups: applications and extensions</i> Colloquium, University of Wisconsin	9/2012
<i>Character constructions for finite algebra groups II</i> Lie Groups Seminar, MIT	10/2011
<i>Character constructions for finite algebra groups</i> Lie Groups Seminar, MIT	10/2011
<i>Supercharacters of normal pattern subgroups</i> Workshop on Supercharacters and Combinatorial Hopf Algebras, AIM	5/2010

Teaching

<i>MATH 4991: Capstone project in pure mathematics</i> , co-instructor at HKUST	Spring 2020
<i>MATH 6150I: Combinatorics of crystal bases</i> , instructor at HKUST	Spring 2020
<i>MATH 2121: Linear algebra</i> , instructor at HKUST	Fall 2017, 2018, 2019
<i>MATH 6150F: Coxeter systems and Iwahori-Hecke algebras</i> , instructor at HKUST	Spring 2017
<i>MATH 19: Single Variable Calculus I</i> , instructor at Stanford	Winter 2016
<i>MATH 109: Applied Group Theory</i> , instructor at Stanford	Winter 2016
<i>MATH 20: Single Variable Calculus II</i> , instructor at Stanford	Spring 2015
<i>MATH 159: Discrete Probabilistic Methods</i> , instructor at Stanford	Winter 2015
<i>Combinatorics of twisted involutions</i> , minicourse at the University of Bologna	October 2014
<i>Kazhdan-Lusztig theory</i> , minicourse at the University of Copenhagen	September 2013
Mathematics Directed Reading Program, mentor at MIT	Winter 2011, 2013
<i>18.01: Single Variable Calculus</i> (winter makeup course), instructor at MIT	January 2013
<i>18.01: Single Variable Calculus</i> , course administrator at MIT	Fall 2012
<i>18.024: Multivariable Calculus with Theory</i> , recitation instructor at MIT	Spring 2012
<i>CS 106B: Programming Abstractions in C++</i> , section leader at Stanford	Winter, Spring 2008
<i>CS 106A: Programming Methodology in Java</i> , section leader at Stanford	Fall 2007
Resident tutor in mathematics and physics, Ujamaa House, Stanford	2006–2007

Service

- Referee for various journals:
 - Advances in Mathematics; Algebraic Combinatorics; Annals of Combinatorics;
 - Canadian Journal of Mathematics; Communications in Algebra; Discrete Mathematics;
 - Electronic Journal of Combinatorics; European Journal of Combinatorics; Forum Mathematicum;
 - Journal of Algebra; Journal of Algebraic Combinatorics; Journal of Combinatorial Theory, Series A;
 - Journal of Combinatorics; Journal of Geometry and Physics; Journal of Group Theory;
 - Journal of Lie Theory; Nagoya Mathematical Journal; Representation Theory; Transformation Groups.
- Department services at HKUST:

HKUST Information Day	2017
Colloquium committee	2018–present
JUPAS SSCI Interview	2019
PhD thesis committee for Ho Man CHEUNG	2019
PhD thesis committee for Yupei ZHANG	2020
- Member of program committee, Formal Power Series and Algebraic Combinatorics 2020