

Curriculum Vitae

Alexander Woo
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Positions Held:

Associate Professor, Dept. of Mathematics, University of Idaho, 2017–.

Assistant Professor, Dept. of Mathematics, University of Idaho, 2011–2017.

Visiting Assistant Professor, Dept. of Mathematics, Statistics and Computer Science, Saint Olaf College, 2008–2011.

VIGRE Visiting Research Assistant Professor, Dept. of Mathematics, University of California at Davis, 2005–2008.

Education:

Ph.D., Mathematics, University of California at Berkeley, December, 2005.

Dissertation: Ideals of the Polynomial Ring Generated by Irreducible Symmetric Group Representations and Ellingsrud-Strømme Cells on the Hilbert Scheme.

Advisor: Mark Haiman.

B.A., Mathematics (highest honors) and Music, Williams College, June 1997.

Publications and Preprints:

(with Ed Richmond and William Slofstra) The Nash blow-up of a cominuscule Schubert variety. Submitted. Preprint available at arXiv: 1808.05918

(with Erik Insko and Julianna Tymoczko) A formula for the cohomology and K -class of a regular Hessenberg variety. To appear in *J. Pure Appl. Algebra*. Preprint available at arXiv: 1808.01719

(with Alexander Yong) Tropicalization, symmetric polynomials, and complexity. To appear in *J. Symb. Comput.* Preprint available at arXiv: 1710.03312

(with Alex Fink and David E Speyer) A Gröbner basis for the graph of the reciprocal plane. To appear in *J. Commut. Algebra*. Preprint available at arXiv: 1703.05967

Hultman elements for the hyperoctahedral groups. *Electron. J. Combin.* **25** (2018) no. 2 Research Paper 2.41. 25pp.

(with Benjamin J. Wyser and Alexander Yong) Governing singularities of symmetric orbit closures. *Algebra Number Theory* **12** (2018), 173–225.

(with John Wiltshire-Gordon and Magdalena Zajaczkowska) Specht polytopes and Specht matroids. In *Combinatorial algebraic geometry*, Fields Institute Communications **80**, Springer-Verlag, New York, 2017, 201–228.

(with Eli Bagno, Riccardo Biagioli, and Mordechai Novik) Depth in classical Coxeter groups. *J. Algebraic Combin.* **44** (2016), 645–676.

(with Benjamin J. Wyser) Combinatorial results on $(1, 2, 1, 2)$ -avoiding $GL(p, \mathbb{C}) \times GL(q, \mathbb{C})$ -orbit closures on $GL(p+q, \mathbb{C})/B$. *Int. Math. Res. Not. IMRN* **2015** (2015), 13148–13193.

(with Christopher Conklin) Bruhat graphs and pattern avoidance. *J. Combin.* **6** (2015), 91–102.

(with Zach Teitler) Power sum decompositions of defining equations of reflection arrangements. *J. Algebraic Combin.* **41** (2015), 365–383.

(with Allen Knutson and Alexander Yong) Singularities of Richardson varieties. *Math. Res. Letters*. **20** (2013), 391–400.

(with Henning Ulfarsson) Which Schubert varieties are local complete intersections? *Proc. Lon. Math. Soc.* **107** (2013), 1004–1052.

(with Brant Jones) Mask formulas for cograssmannian Kazhdan–Lusztig polynomials. *Ann. Comb.* **17** (2013), 151–203.

(with Alexander Yong) A Gröbner basis for Kazhdan–Lusztig ideals. *Amer. J. Math.* **134** (2012), 1089–1137.

(with Victor Reiner and Alexander Yong) Presenting the cohomology of a Schubert variety. *Trans. Amer. Math. Soc.* **363**, (2011) 521–543.

Permutations with Kazhdan–Lusztig polynomial $P_{id,u}(q) = 1 + q^h$ (with an appendix by Sara Billey and Jonathan Weed). *Electron. J. Combin.* **16** (2009) no. 2, Research Paper 10, 32 pp.

Interval Pattern Avoidance for Arbitrary Root Systems. *Canad. Math. Bull.* **53** (2010), 757–762.

(with Alexander Yong) Governing Singularities of Schubert Varieties. *J. Algebra* **320** (2008), 495–520.

(with Mark Haiman) Geometry of q and q, t -analogs in combinatorial enumeration. (Lecture notes from Haiman’s lectures at the PCMI Graduate Summer School in Geometric Combinatorics.) In *Geometric Combinatorics*, IAS/Park City Mathematics Series **13**, Amer. Math. Soc., Providence, RI, 2007.

(with Alexander Yong) When is a Schubert variety Gorenstein? *Adv. Math.* **207** (2006), 205–220.

(with Colin Adams, Bevin Brennan, and Deborah Greilsheimer) Stick numbers and composition of knots and links, *J. Knot Theory Ramifications* **6** (1997), 149–161.

Course Teaching Experience:

University of Idaho, Dept. of Mathematics, 2011–

Business Calculus, Calculus II, Discrete Mathematics, Linear Algebra, Differential Equations, Introduction to Higher Mathematics, Theory of Computation, Design and Analysis of Algorithms, Abstract Algebra II, Modern Geometry, Transformational Geometry, and graduate courses in combinatorics, algebra, commutative algebra, and algebraic geometry.

University of Illinois at Urbana–Champaign, 2017

Linear Programming.

Saint Olaf College, MSCS Department, 2008–2011

Calculus I and II, Linear Algebra, Differential Equations, and Gateways to Mathematics (a non-technical course for students majoring outside the sciences). Supervised independent studies in algebraic geometry and mathematical music theory.

UC–Davis, Department of Mathematics, 2005–2008

Calculus I and III, Coding Theory, Convex Geometry, Differential Equations, and a graduate course in algebraic combinatorics.

Advising and Mentoring activities:

PhD Advisor, U. Idaho for Masaki Ikeda (graduated 2016) and Kevin Meek (expected to graduate in 2020).

Directed Undergraduate Research, U. Idaho, 2018 Ran research seminar with 6 undergraduate students.

Putnam Seminar, U. Idaho, 2011–2015, 2018– Helped undergraduate students prepare for the Putnam Exam.

Academic Advisor, U. Idaho, 2013–2016 Advised approximately 20 mathematics majors on course selection and general academic issues.

Graduate committee member, U. Idaho for 4 other mathematics PhD students.

Undergraduate Summer Research Advisor, Saint Olaf College, Summer 2010

Advised one student for 10 weeks of summer research.

Academic Advisor, St. Olaf College, 2010–11 Advised 5 students on course selection and general academic issues.

Undergraduate Summer Research Advisor, UC–Davis, Summer 2007

Advised 4 students for 2 months of summer research.

Organizer, Research Focus Group on Combinatorics in Algebra and Geometry, UC–Davis, Fall 2007–Spring 2008

Organized reading seminars for graduate students.

Prelim Exam Review Leader, UC–Davis, Summer 2005 and Summer 2007

Helped lead review sessions for graduate students preparing for their preliminary exams in algebra.

Grants

Simons Foundation Collaboration Grant for “Collaborations around Schubert geometry”, Simons Foundation, 2015–2020 (\$35,000).

Young Investigators Grant for research on “Combinatorics and geometry on generalized flag manifolds”, National Security Agency, 2013–2015 (\$38,445).

(as Co-PI with Lara Pudwell (PI) and Alex Burstein (co-PI)) **Group travel grants** for travel to Permutation Patterns 2013 by mathematicians based in the United States, National Science Foundation Division of Mathematical Sciences and National Security Agency, 2013.

Departmental and professional service:

Search Committee Member, Dept. of Mathematics, University of Idaho, 2012–2013 (applied algebra), 2013–2014 (mathematical biology), and 2015 (lecturer).

Graduate Committee Member, Dept. of Mathematics, University of Idaho, 2013–2016. Advised on graduate program and graduate admissions. Revised handbook for graduate students.

Math Program Committee, MSCS Department, Saint Olaf College, Fall 2008–2010
Contributed to discussions on various curricular issues for the department.

Panel Reviewer, Division of Mathematical Sciences, National Science Foundation.

Grant Reviewer for Icelandic Research Fund, NSA Mathematical Sciences Grant Program.

Program Committee Member for Formal Power Series and Algebraic Combinatorics (FPSAC), 2018.

Referee (last 5 years) for *Advances in Mathematics*, *Electronic Journal of Combinatorics*, *Journal of Algebraic Combinatorics*, *Journal of Combinatorial Theory Series A*, *Illinois Journal of Mathematics*, *Australasian Journal of Combinatorics*, *Bulletin of the London Mathematical Society*, *Journal of Pure and Applied Algebra*, *Discrete Math and Theoretical Computer Science*, *Algebras and Representation Theory*, *Selecta Mathematica*, *Journal of Algebra and its Applications*, *Involve*, *Mathematische Nachrichten*.

Local Organizer, Western Algebraic Geometry Symposium, Moscow, ID, 2014.

Co-organizer, Special Sessions at AMS sectional meetings, 2013, 2014, 2016, 2017.

Seminar and Conference talks (last 5 years):

Ohio State University Workshop on Schubert Calculus, *Nash blowups of cominuscule Schubert varieties*, May 2018.

Colloquium, Washington University in St. Louis, *Singularities from geometric representation theory and combinatorial pattern avoidance*, October 2017.

Special Session on Algebraic Combinatorics of Flag Manifolds, AMS Central Sectional Meeting, *Another formula for the cohomology and K -theory classes of regular Hessenberg varieties*, September 2017.

Session on Combinatorial Algebraic Geometry, Canadian Mathematical Society Winter Meeting, *Interval pattern avoidance for K -orbit closures*, December 2016.

Special Session on Algebraic Combinatorics, AMS Western Sectional Meeting, *Hultman elements for finite reflection groups*, April 2016.

Combinatorics Seminar, University of Washington, *Hultman elements for finite reflection groups*, February 2016.

Special Session on Combinatorics and Algebraic Geometry, AMS Eastern Sectional Meeting, *Hultman elements for the hyperoctahedral group*, November 2015.

Special Session on Patterns in Permutations and Words, AMS Eastern Sectional Meeting, *Depth for signed permutations*, March 2015.