

# GEORGE H. SEELINGER—CV

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## RESEARCH INTERESTS

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Algebraic combinatorics: symmetric functions, Macdonald polynomials, Schubert calculus

## APPOINTMENTS

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**University of Michigan**

*NSF Postdoctoral Assistant Professor*

*Postdoctoral Assistant Professor and Research Fellow*

Ann Arbor, Michigan

*July 2023–current*

*August 2021–June 2023*

## EDUCATION

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**Doctor of Philosophy, Mathematics**

*Advisor: Jennifer Morse*

Dissertation title: *K-theoretic Catalan functions*

University of Virginia, Charlottesville, Virginia

*May 2021*

**Master of Science, Mathematics**

Loyola University Chicago, Chicago, Illinois

*August 2015*

**Bachelor of Science, summa cum laude**

*Major: Mathematics and Computer Science*

*Interdisciplinary Honors*

Loyola University Chicago, Chicago, Illinois

*May 2015*

## HONORS, AWARDS, AND FELLOWSHIPS

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- NSF Postdoctoral Fellowship, 2023–2026
- B. Alan Taylor Outstanding Postdoctoral Teaching Award, University of Michigan, Spring 2024
- Collaborate@ICERM (Brown University), Summer 2024
- AMS-Simons Travel Grant, \$5000, 2022–2023
- Dorothy M. Batten Jefferson Fellowship, 2016–2021, by the Jefferson Scholars Foundation, UVa
- Phi Beta Kappa Honor Society, inducted May 7, 2015
- Alpha Sigma Nu Honor Society, inducted October 14, 2014

## PUBLICATIONS

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**A raising operator formula for Macdonald polynomials**

arxiv:2307.06517

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Submitted (2024). Preprint available on arXiv.org

**Dens, nests, and the Loehr-Warrington Conjecture**

arxiv:2112.07070

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Submitted (2022). Preprint available on arXiv.org

**LLT polynomials in the Schiffmann algebra**

arxiv:2112.07063

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Journal für die reine und angewandte Mathematik (Crelles Journal), Issue 811 (2024).

**A proof of the Extended Delta Conjecture**

arxiv:2102.08815

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Forum of Mathematics, Pi, Volume 11 (2023).

**A shuffle theorem for paths under any line**

arxiv:2102.07931

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Forum of Mathematics, Pi, Volume 11 (2023).

**$K$ -theoretic Catalan functions**

arxiv:2010.01759

*Joint with Jonah Blasiak and Jennifer Morse*

- Advances in Mathematics, Volume 404, Part B (2022).

**Canonical idempotents of multiplicity-free families of algebras**

arxiv:1606.08900

*Joint with Stephen Doty and Aaron Lauve*

- L'Enseignement Mathématique, **64** (2018) 23–63.

## CONFERENCE PROCEEDINGS

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**A Catalan formula for Macdonald polynomials**

*Joint with J. Blasiak, M. Haiman, J. Morse, and A. Pun*

- Séminaire Lotharingien de Combinatoire, Issue 89B (2023)
- Proceedings of the 35th International Conference on “Formal Power Series and Algebraic Combinatorics.”
- This work is an extended abstract for *A raising operator formula for Macdonald polynomials*.

## TEACHING EXPERIENCE

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**Instructor of Record**

University of Michigan

- Math 565: Combinatorics and Graph Theory *Fall 2024*
- Math 115: Calculus I (flipped classroom) *Fall 2024*
- Directed Reading/Research (Graduate): Symmetric functions and affine combinatorics *Fall 2024*
- Math 566: Combinatorial Theory (Algebraic Combinatorics) *Winter 2023*
- Independent study: Representation theory of symmetric groups and symmetric functions *Winter 2023*
- Math 215: Multivariable and Vector Calculus *Fall 2022*
- Math 417: Matrix Algebra *Winter 2022*
- Math 115: Calculus I (flipped classroom) *Fall 2021*

**Instructor of Record**

University of Virginia

- MATH 1310: Calculus I (flipped classroom) *Fall 2019*
- MATH 1220: Survey of Calculus II *Spring 2018*
- MATH 1210: Survey of Calculus I *Fall 2017*

## SERVICE AND OUTREACH

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**Department**

- **Co-organizer, Learning Seminar in Algebraic Combinatorics** *Fall 2021–present*
- **Lab of Geometry Project Mentor** *Fall 2023*
- **Lab of Geometry Admissions Committee Member** *Fall 2023, Winter 2024*
- **Panelist, Grants Writing Panel** *Fall 2023*
- **Member & Webmaster, UVa Association for Women in Mathematics** *Fall 2018–Spring 2021*  
*Help maintain the UVa AWM chapter's website and developed a blog for other members to post content.*
- **Mentor, Directed Reading Program at University of Virginia** *Fall 2018*  
*Guided my undergraduate DRP mentee through a machine learning textbook and helped him prepare for a presentation at UVa's Math Club.*

- **UVa Math Ambassador** Fall 2017– Spring 2019  
*UVa's Mathematics outreach program to Albemarle County and Charlottesville city schools.*
- **Panelist, Prospective Graduate Student Open House** Spring 2018

### Professional

- **Referee for various journals** Spring 2022–current  
Algebraic Combinatorics, Compositio, Electronic Journal of Combinatorics, International Math Research Notices, Transactions of the AMS
- **TA for ICERM Workshop session on Affine Schubert Calculus** February 3, 2021
- **Organizing committee, Mid-Atlantic Algebra, Geometry, and Combinatorics Workshop** Spring 2020  
*Cancelled due to Covid-19*
- **Contributor, SageMath (Open-Source Computer Algebra Software)** 2013, 2015, 2018

### University

- **Valentas Scholar Selection Committee Interviewer, Jefferson Scholars Foundation, UVa** Winter 2024
- **Jefferson Scholar Selection Weekend Seminar Planner and Leader, Jefferson Scholars Foundation, UVa** Spring 2020  
*Cancelled due to Covid-19*
- **Jefferson Scholar Selection Weekend Seminar Planner, Jefferson Scholars Foundation, UVa** Spring 2019
- **Panelist, Institute for Leadership and Citizenship Graduate School Panel Jefferson Scholars Foundation, UVa** Summer 2018
- **Member, Sujack Teaching Award Committee, Loyola University Chicago** Spring 2015

## RESEARCH TALKS

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- **Michigan State University Combinatorics and Graph Theory Seminar** January 30, 2025  
*Michigan State University*
  - Title: *Raising operator formulas for Macdonald polynomials and other related families*
  - **Important Papers in Algebraic Combinatorics Seminar (IPAC)** June 25, 27 & July 2, 2024  
*Online*
  - Title: *A raising operator formula for Macdonald polynomials*
  - **York University Applied Algebra Seminar** February 5, 2024  
*York University*
  - Title: *Raising operator formulas for Macdonald polynomials and other related families*
  - **Pisa Seminar on Combinatorics, Lie Theory, and Topology** October 12, 2023  
*Università di Pisa*
  - Title: *A raising operator formula for Macdonald polynomials*
  - **Loyola Topology Algebra Combinatorics and Operators Seminar** October 4, 2023  
*Loyola University Chicago*
  - Title: *A raising operator formula for Macdonald polynomials via LLT polynomials in the elliptic Hall algebra*
  - **Purdue Mathematical Physics Seminar** September 13, 2023  
*Purdue University*

- Title: *A raising operator formula for Macdonald polynomials via LLT polynomials in the Schiffmann algebra*
- Formal Power Series and Algebraic Combinatorics (FPSAC)** July 17, 2023  
*University of California, Davis*
- Title: *A Catalan animal formula for Macdonald polynomials*
- Canadian Mathematical Association Summer Meeting**  
**Special session in equivariant Schubert calculus and beyond** June 5, 2023  
*University of Ottawa*
- Title: *K-theoretic Catalan functions*
- University of Michigan Combinatorics Seminar** March 27, 2023  
*University of Michigan*
- Title: *Dens, nests, and Catalan animals: a walk through the zoo of shuffle theorems*
- Illinois State University Algebra Seminar** October 27, 2022  
*Illinois State University*
- Title: *Diagonal Harmonics and Shuffle Theorems*
- University of Michigan Combinatorics Seminar** February 4, 2022  
*University of Michigan*
- Title: *A raising operator formula for nabla on an LLT polynomial*
- OIST Representation Theory Seminar** October 25, 2021  
*Okinawa Institute of Science and Technology*
- Title: *Diagonal harmonics and shuffle theorems*
- University of Virginia Algebra Seminar** April 5, 2021  
*University of Virginia*
- Title: *K-theoretic Catalan functions*
- LACIM Seminar** March 19, 2021  
*Université du Québec à Montréal*
- Title: *K-theoretic Catalan functions*
- Junior Mathematician Research Archive** December 1, 2020
- Title: *K-theoretic Catalan functions*
- Philadelphia Area Combinatorics and Algebraic Geometry Seminar** February 6, 2020  
*University of Pennsylvania*
- Title: *K-theoretic Catalan functions*
- Garsiafest 90: Future Directions in Algebraic Combinatorics** June 18, 2019  
*The Scripps Seaside Forum, San Diego, CA. Lightning Talk*
- Title: *Raising operators in Schubert calculus*
- Mid-Atlantic Algebra, Combinatorics, and Geometry Workshop** May 4, 2019  
*Drexel University. Poster*
- Title: *K-theoretic Catalan functions*

- Title: *Orthogonal idempotents in semisimple Brauer algebras*

## MATHEMATICAL SOFTWARE CONTRIBUTIONS

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### **Contributions to SageMath**

<http://sagemath.org>

- Implementation of Young's Raising Operators (ticket #26939) Fall 2018
- Implement Jucys-Murphys elements for Brauer algebra (ticket #18798) Summer 2015
- Major improvement to usability of diagram algebras (tickets #18707,18720,18762) Summer 2015
- Initial implementation of diagram algebras (ticket #14234) Spring 2013

### **$k$ -Combinat for Sage**

[https://github.com/MareoRaft/k\\_combinat\\_for\\_sage/](https://github.com/MareoRaft/k_combinat_for_sage/)

- Maintain and improve code relating to Catalan functions