

# Sarah Brauner

## CONTACT

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Department of Mathematics  
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CV updated on November 19, 2021

## EDUCATION

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- 2017— **University of Minnesota**  
PhD Candidate in Mathematics  
Advisor: Vic Reiner
- 2019 M.S. in Mathematics
- 2016-2017 **Smith College**  
Post-Baccalaureate Program for Women in Mathematics, GPA: 4.0
- 2012-2016 **Reed College**  
B.A. in Mathematics/Economics, GPA: 3.87

## RESEARCH INTERESTS

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Algebraic combinatorics and its intersection with representation theory, algebraic topology

## PUBLICATIONS AND PREPRINTS

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4. “[Eulerian representations for real reflection groups](#),” 2020. *To appear in the Journal of the London Mathematical Society*. [arXiv:2005.05953](#).
3. (With E. Banaian, H. Chandramouli, K. Klinger-Logan, A. Nadeau and M. Philbin.) “[A Workshop to Build Community and Broaden Participation in Mathematics: Reflections on the Mathematics Project at Minnesota](#),” *PRIMUS* (2021).
2. (With F. Glebe and D. Perkinson) “[Enumerating Linear Systems on Graphs](#),” *Mathematische Zeitschrift* (2020) 296(3): 1101-1134. [arXiv:1906.04768](#).
1. (With T. Friedmann) “[A Simplified Presentation of Specht Modules](#),” 2018. *Under review at the Journal of Pure and Applied Algebra*. [arXiv:1803.10918](#).

## REFEREED CONFERENCE PRECEEDINGS

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2. “[Eulerian representations for real reflection groups](#)” *Séminaire Lotharingien de Combinatoire* **85B** (2021), Article # 15. Formal Power Series and Algebraic Combinatorics (FPSAC), Ramat Gan, Israel. (Talk).
1. (With F. Glebe and D. Perkinson) “[Enumerating Linear Systems on Graphs](#)” *Séminaire Lotharingien de Combinatoire* **82B** (2019), Article # 17. Formal Power Series and Algebraic Combinatorics (FPSAC), Ljubljana, Slovenia. (Poster).

## IN PREPARATION

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2. “A Type  $B$  analog of the Whitehouse representation,” *Manuscript in preparation*.
1. (With A. Christiansen and N. Pham.) “Symmetries of complete linear systems on graphs.” *Manuscript in preparation*.

## AWARDS AND HONORS

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- 2021 UMN School of Mathematics Outstanding Service Award  
2021 UMN President's Student Leadership and Service Award  
2019-2023 NSF Graduate Research Fellowship  
2017-2023 UMN College of Science and Engineering Graduate Fellowship  
*Three year graduate fellowship*  
2017 UMN School of Mathematics Naresh Jain Fellowship  
*Travel and technology fellowship; \$1500.*  
2016 Phi Beta Kappa  
2016 Reed College Meier Award for Distinguished Thesis in Economics  
*Awarded to 1-2 graduating students annually*  
2012-2016 Reed College Commendation for Academic Excellence (awarded annually)

## GRANTS

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- 2021 MAA Tensor Grant for the Mathematics Project at Minnesota  
*With E. Banaian, M. Philbin, PI Paul Carter; \$6000.*  
2020 NSA Mathematical Sciences Program for Graduate Student Combinatorics Conference 2021  
*With E. Banaian, G. Dorpalen-Barry, E. Kelley, E. Stucky, L. Webster, PI Vic Reiner; \$25,000<sup>†</sup>.*  
2020 MAA Tensor Grant for the Mathematics Project at Minnesota  
*With E. Banaian, H. Chandramouli, M. Philbin, PI Paul Carter; \$6000<sup>†</sup>.*  
2019 UMN Campus Climate Grant for the Mathematics Project at Minnesota  
*With E. Banaian, H. Chandramouli, M. Philbin; \$500.*  
2017 Smith College Summer Research Fellowship Program  
*To conduct research with T. Friedmann; \$4500*  
2014 Reed College McGill Lawrence Grant  
*To conduct research in South Africa; \$3000*

## INVITED TALKS

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- A Type B analog of the Whitehouse representation**  
2021 CAGE (Combinatorics, Algebra, and Geometry) Seminar  
University of Pennsylvania, Philadelphia PA  
2021 *UMass Amherst Discrete Math Seminar*  
University of Massachusetts, Amherst, MA  
2021 *Cornell Discrete Geometry and Combinatorics Seminar*  
Cornell University, Ithaca, NY  
2021 *Dartmouth Combinatorics Seminar*  
Dartmouth College, Hanover, NH  
**Eulerian representations for real reflection groups**  
2021 *Women in Combinatorics and Representation Theory*  
UC Riverside Diversity and Excellence Workshop (online)  
2020 *Arrangements at Home III: Algebraic Aspects*  
Virtual Conference  
2020 *Graduate Online Combinatorics Colloquium*  
2020 *University of Minnesota Combinatorics Seminar (online)*

<sup>†</sup> Due to COVID-19, both conferences were made virtual and only a portion of the grants were used.

### **Random walks and hyperplane arrangements**

2020 *Reed College Mathematics Colloquium*  
Reed College, Portland, OR

### **Enumerating Linear Systems on Graphs**

2019 *AMS Central Fall Sectional Meeting: Combinatorial Algebraic Geometry*  
University of Wisconsin, Madison WI

2019 *CAGE (Combinatorics, Algebra, and Geometry) Seminar*  
Drexel University, Philadelphia PA

2019 *AMS Northeast Spring Sectional Meeting: Chip Firing and Divisor Theory*  
University of Hartford, Hartford CT

2019 *Smith College Mathematics Colloquium Lunch Talk*  
Smith College, Northampton MA

### **On Specht Modules and the CataLANKe Theorem**

2018 *AMS Central Fall Sectional Meeting: Combinatorics in Algebra and Geometry*  
University of Michigan, Ann Arbor MI

## TEACHING

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### **BEAM (Bridge to Enter Advanced Mathematics)**

2021 Junior Faculty: Designed and taught intensive 2-week course on discrete geometry to rising eighth graders

2018 Junior Faculty: Designed and taught 6-week course on Logical Reasoning to rising seventh graders

### **University of Minnesota**

2019-2020 TA, UMTYMP Calculus II (year-long course covering introduction to proofs and basic linear algebra) for UMN Talented Youth in Mathematics Program (UMTYMP)

2019 TA, UMN REU in Combinatorics

2021 Instructor of record for Senior Capstone Project (Maxwell McKinney)

### **Smith College**

2016-2017 TA in Tutoring Center, Calculus I, II, III and Linear Algebra

### **Reed College**

2014-2016 TA in Tutoring Center, Calculus I, II, III and Linear Algebra

## ORGANIZING

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### **2018 — Mathematics Project at Minnesota (MPM)**

Co-organizer of an annual 4-day workshop for undergraduates from underrepresented groups to increase participation and success in mathematics. As co-organizer I obtain funding, recruit 30+ undergraduate participants and oversee 10-15 graduate student volunteers to plan and implement each workshop session.

### **2021-2022 Graduate Online Combinatorics Colloquium (GOCC)**

Weekly seminar highlighting the work of graduate students in combinatorics.

### **April 2021 Graduate Student Combinatorics Conference (GSCC) 2021**

Weekend conference organized by and for graduate students. The conference featured over 80 graduate student talks, three plenary talks and community building activities. Held online due to COVID-19.

- 2018-2020    **UMN Math Club**  
 Weekly club for undergraduate math majors to build community and foster mathematical curiosity
- Fall 2019    **Hyperplane arrangement seminar and reading group**
- 2018-2019    **UMN Graduate Student Combinatorics and Algebra Seminar**

## MENTORING

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- Fall 2021    Directed reading project (DRP) mentor with Abigail Goldman-Nagel on chip-firing  
 2021—        Advisor for Habiba Heshmat, Marie Therese Guerrier, and Mirta Hernandez Carrion  
 2020—        Research mentor for undergraduate Maxwell McKinney  
                   *Directing research project on combinatorics of McKay-Cartan quivers*  
                   *Served as official UMN Senior Capstone Advisor Spring 2021*
- 2019—        Research mentor for undergraduates Nhung Pham and Annika Christiansen  
                   *Directing research project on chip-firing; paper forthcoming*  
                   *Assisted both students in obtaining University funding*
- Fall 2018    Directed Reading Project (DRP) mentor with Sophie Perron on graph theory  
 2018—        Mentor for undergraduate math majors through MPM  
                   *Assist with application materials for fellowships, REUs and graduate school*
- 2018-2019    Mentor and host for incoming graduate students
- 2017-2019    UMN Women in Science and Engineering Graduate Mentor  
                   *Mentor for UMN undergraduates interested in STEM*
- 2013         Reed College International Student Mentor

## OUTREACH

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- 2019         Teacher at Saturday Enrichment for MathCEP, University of Minnesota  
                   *Logic Games and Puzzles (grades 5-6)*
- 2018         *Fractals and Chaos (grades 5-6)*
- 2018         *Graph Theory (grades 7-8)*
- 2017         *Cryptology (grades 5-6)*
- 2017-2019    Volunteer math tutor for adults seeking GED, *Franklin Public Library*
- 2016         MathFest Teaching Assistant: Platonic Solids (grades 6-8), *Reed College*
- 2012-2016    Volunteer tutor for low-income youth (grades 9-12), *Friends of the Children*

## BIOGRAPHY

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- BORN:         January 9, 1993 in New York, NY
- CITIZENSHIP:    United States