

# Sarah Brauner

## CONTACT

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University of Minnesota - Twin Cities  
Department of Mathematics  
Pronouns: she / her / hers

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CV updated on December 1, 2022

## EDUCATION

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2017—2023    **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

## AWARDS AND HONORS

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2022            FPSAC Conference [Best Graduate Student Paper Award](#) (*for FPSAC 2021*)

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 (*3 years of support*)

2017            UMN School of Mathematics Naresh Jain (travel) Fellowship

2016            Phi Beta Kappa

2016            Reed College Meier Award for Distinguished Thesis in Economics

2012-2016    Reed College Commendation for Academic Excellence (*received annually*)

## PUBLICATIONS AND PREPRINTS

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6.    (With P. Commins and V. Reiner) "Invariant theory of the free left-regular band and a  $q$ -analogue," *Submitted*. [arXiv:2206.11406](#).
5.    "A Type  $B$  analog of the Whitehouse representation," *Submitted*. [arXiv:2203.09504](#).
4.    "[Eulerian representations for real reflection groups](#)," *Journal of the London Mathematical Society* (2022) 105(1): 412-444. [arXiv:2005.05953](#).
3.    (With T. Friedmann) "[A Simplified Presentation of Specht Modules](#)," *Journal of Pure and Applied Algebra* (2022) 226(7). [arXiv:1803.10918](#).
2.    (With F. Glebe and D. Perkinson) "[Enumerating Linear Systems on Graphs](#)," *Mathematische Zeitschrift* (2020) 296(3): 1101-1134. [arXiv:1906.04768](#).
1.    (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* (2022) 32:6, 738-754.

## REFEREED CONFERENCE PRECEEDINGS

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3. “A Type  $B$  analog of the Whitehouse representation” *Séminaire Lotharingien de Combinatoire* **86B** (2022), Article # 12. Proceedings of the 34th Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Bangalore, India. **(Talk)**.
2. “Eulerian representations for real reflection groups” *Séminaire Lotharingien de Combinatoire* **85B** (2021), Article # 15. Proceedings of the 33rd Conference on 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. Proceedings of the 31st Conference on Formal Power Series and Algebraic Combinatorics, Ljubljana, Slovenia. **(Poster)**.

## IN PREPARATION

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3. (With G. Dorpalen-Barry, S. Kara, C. Klivans, and L. Schneider) “A three-regime theorem for flow-firing.”
2. (With M. Aguiar and V. Reiner) “On configuration space invariants and the peak algebra.”
1. (With J. Bastidas and F. Saliola) “Left regular bands of groups and the Mantaci–Reutenauer algebra.”

## GRANTS

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|------|---|
| 2022 | MAA Tensor Grant for the Mathematics Project at Minnesota<br><i>With E. Banaian, P. Commins, M. Philbin, PI Max Engelstein; \$6000.</i>   |
| 2021 | MAA Tensor Grant for the Mathematics Project at Minnesota<br><i>With E. Banaian, M. Philbin, PI Paul Carter; \$6000.</i>  |
| 2020 | NSA Mathematical Sciences Program for Graduate Student Combinatorics Conference 2021<br><i>With E. Banaian, G. Dorpalen-Barry, E. Kelley, E. Stucky, L. Webster, PI Vic Reiner; \$25,000<sup>†</sup>.</i> |
| 2020 | MAA Tensor Grant for the Mathematics Project at Minnesota<br><i>With E. Banaian, H. Chandramouli, M. Philbin, PI Paul Carter; \$6000<sup>†</sup>.</i>   |
| 2019 | UMN Campus Climate Grant for the Mathematics Project at Minnesota<br><i>With E. Banaian, H. Chandramouli, M. Philbin; \$500.</i>  |
| 2017 | Smith College Summer Research Fellowship Program<br><i>To conduct research with T. Friedmann; \$4500</i>  |
| 2014 | Reed College McGill Lawrence Grant<br><i>To conduct research in South Africa; \$3000</i>  |

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

## CONFERENCE TALKS

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|-----------|---|
| Jan. 2023 | <i>The JMM: Research Communities in Algebraic Combinatorics</i><br>Boston, MA   |
| Nov. 2022 | <i>Northeast Discrete Math Workshop</i><br>Smith College, Amherst, MA   |
| Oct. 2022 | <i>AMS Northeast Fall Sectional Meeting: Young Voices in Combinatorics</i><br>University of Massachusetts, Amherst, MA                        |
| Oct. 2022 | <i>AMS Northeast Fall Sectional Meeting: Geometric aspects of algebraic combinatorics</i><br>University of Massachusetts, Amherst, MA         |
| Sep. 2022 | <i>AMS Central Fall Sectional Meeting: Algebraic, Geometric, and Topological Combinatorics</i><br>University of Texas at El Paso, El Paso, TX |

- July 2022 *34th Conference on Formal Power Series and Algebraic Combinatorics (FPSAC)*  
Indian Institute of Science, Bangalore, India
- Jan. 2022 *33rd Conference on Formal Power Series and Algebraic Combinatorics (FPSAC)*  
Bar-Ilan University, Ramat-Gan, Israel (Online).
- Nov. 2021 *Northeast Women in Algebra and Combinatorics Celebrating the 50th anniversary of the Association for Women in Mathematics (NEWAC50AWM)*  
Hosted by University of Albany and the AWM (Online).
- May 2021 *Women in Combinatorics and Representation Theory*  
UC Riverside Diversity and Excellence Workshop (Online).
- Aug. 2020 *Arrangements at Home III: Algebraic Aspects*  
Virtual Conference
- Sep. 2019 *AMS Central Fall Sectional Meeting: Combinatorial Algebraic Geometry*  
University of Wisconsin, Madison WI
- April 2019 *AMS Northeast Spring Sectional Meeting: Chip Firing and Divisor Theory*  
University of Hartford, Hartford CT
- Oct. 2018 *AMS Central Fall Sectional Meeting: Combinatorics in Algebra and Geometry*  
University of Michigan, Ann Arbor MI

## COLLOQUIUM TALKS

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- Feb. 2023 University of San Diego, San Diego, CA
- Feb. 2022 Colby College, Waterville, ME
- Mar. 2020 Reed College, Portland, OR
- April 2019 Smith College, Northampton, MA

## SEMINAR TALKS

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- Feb. 2023 *UC Berkeley Combinatorics Seminar*  
UC Berkeley, Berkeley, CA
- Feb. 2023 *UC San Diego Combinatorics Seminar*  
UC San Diego, La Jolla, CA
- Nov. 2022 *Brown Combinatorics Seminar*  
Brown University, Providence, RI
- May 2022 *Le Séminaire du LACIM*  
UQAM, Montreal, Quebec, Canada
- April 2022 *MIT/Harvard Combinatorics Seminar*  
Harvard University, Cambridge, MA
- Feb. 2022 *RTG seminar in Combinatorics, Geometry, Representation Theory and Topology*  
University of Oregon, Eugene, OR
- Jan. 2022 *Algebra and Discrete Mathematics Seminar*  
UC Davis, Davis, CA
- Dec. 2021 *CAGE (Combinatorics, Algebra, and Geometry) Seminar*  
University of Pennsylvania, Philadelphia PA
- Dec. 2021 *UMass Amherst Discrete Math Seminar*  
University of Massachusetts, Amherst, MA
- Nov. 2021 *ICERM Research Communities in Algebraic Combinatorics*  
Online as part of an ICERM Workshop
- Oct. 2021 *Cornell Discrete Geometry and Combinatorics Seminar*  
Cornell University, Ithaca, NY

Sep. 2021	<i>Dartmouth Combinatorics Seminar</i> Dartmouth College, Hanover, NH
Sep. 2021	<i>University of Minnesota Combinatorics Seminar</i> University of Minnesota, Minneapolis, MN
Oct. 2020	<i>Graduate Online Combinatorics Colloquium</i> Virtual Seminar
Oct. 2020	<i>University of Minnesota Combinatorics Seminar</i> (online) University of Minnesota, Minneapolis, MN
April 2019	<i>CAGE (Combinatorics, Algebra, and Geometry) Seminar</i> Drexel University, Philadelphia PA

## TEACHING

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	<b>University of Minnesota</b>
2022	Mentor for UMN REU in Combinatorics and Algebra: designed research problem and mentored team of undergraduates
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
	<b>BEAM (Bridge to Enter Advanced Mathematics)</b>
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
	<b>Smith College</b>
2016-2017	TA in Tutoring Center, Calculus I, II, III and Linear Algebra
	<b>Reed College</b>
2014-2016	TA in Tutoring Center, Calculus I, II, III and Linear Algebra

## ORGANIZING

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2018 —	<i>Mathematics Project at Minnesota (MPM)</i> Co-organizer of an annual week long 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—	<i>Graduate Online Combinatorics Colloquium (GOCC)</i> Weekly seminar highlighting the work of graduate students in combinatorics.
April 2021	<i>Graduate Student Combinatorics Conference (GSCC) 2021</i> 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	<i>UMN Math Club</i> Weekly club for undergraduate math majors to build community and foster mathematical curiosity
2018-2019	<i>UMN Graduate Student Combinatorics and Algebra Seminar</i>

## MENTORING

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### *Research mentor*

- 2022 — Ilani Axelrod-Freed, Judy Chiang, and Veronica Lang: directed research through UMN Combinatorics REU
- 2019–2021 Nhung Pham: directed research funded through UMN UROP grant
- 2019–2021 Annika Christensen: directed research funded through UMN UROP grant
- 2020–2021 Maxwell McKinney: Served as official UMN Senior Capstone Advisor

### *Directed reading project (DRP) mentor*

- Fall 2021 Abigail Goldman-Nagel, chip-firing
- Fall 2018 Sophie Perron, graph theory

### *Advisor*

- 2021–2022 Habiba Heshmat
- 2021–2022 Marie Therese Guerrier
- 2021–2022 Mirta Hernandez Carrion

## ACADEMIC SERVICE

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- 2022— Referee for *Annals of Combinatorics*

## OUTREACH

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- Teacher at Saturday Enrichment for MathCEP, University of Minnesota
- 2019 *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*

## BIOGRAPHY

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