

# Sarah Brauner

## CONTACT

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Department of Mathematics  
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CV updated on June 24, 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

## 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,” [arXiv:2206.11406](https://arxiv.org/abs/2206.11406).
5. “A Type  $B$  analog of the Whitehouse representation,” *Submitted*. [arXiv:2203.09504](https://arxiv.org/abs/2203.09504).
4. “Eulerian representations for real reflection groups,” *Journal of the London Mathematical Society* (2022) 105(1): 412-444. [arXiv:2005.05953](https://arxiv.org/abs/2005.05953).
3. (With T. Friedmann) “A Simplified Presentation of Specht Modules,” *Journal of Pure and Applied Algebra* (2022) 226(7). [arXiv:1803.10918](https://arxiv.org/abs/1803.10918).
2. (With F. Glebe and D. Perkinson) “Enumerating Linear Systems on Graphs,” *Mathematische Zeitschrift* (2020) 296(3): 1101-1134. [arXiv:1906.04768](https://arxiv.org/abs/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” *To appear in Séminaire Lotharingien de Combinatoire* (2022). 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**).

## AWARDS AND HONORS

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- 2022 Best Graduate Student Paper (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  
*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 (received annually)

## GRANTS

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- 2022 MAA Tensor Grant for the Mathematics Project at Minnesota  
*With E. Banaian, P. Commins, M. Philbin, PI Max Engelstein; \$6000.*
- 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*

<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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- Oct. 2022 *AMS Northeast Fall Sectional Meeting: Geometric aspects of algebraic combinatorics*  
University of Massachusetts, Amherst, MA
- Sep. 2022 *AMS Central Fall Sectional Meeting: Algebraic, Geometric, and Topological Combinatorics*  
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. 2022 Colby College, Waterville, ME
- Mar. 2020 Reed College, Portland, OR
- April 2019 Smith College, Northampton, MA

## SEMINAR TALKS

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

## TEACHING

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- University of Minnesota**
- 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
- 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
- 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 — *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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- Research mentor*
- 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 Directed Reading Project (DRP) mentor with Sophie Perron on graph theory
- Advisor*
- 2021–2022 Habiba Heshmat
- 2021–2022 Marie Therese Guerrier
- 2021–2022 Mirta Hernandez Carrion

## OUTREACH

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2019           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