Joshua Mundinger

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Education

University of Chicago, Chicago, IL **2018-2023**
Ph.D., Mathematics.
Adviser: Victor Ginzburg.
Thesis: On Deformation Quantization and Differential Operators in Positive Characteristic.

Swarthmore College, Swarthmore, PA **2014-2018**
B.A., Mathematics and Music. Highest Honors. Phi Beta Kappa.

Employment

University of Wisconsin-Madison, Madison, WI **2023-2026**
Van Vleck Visiting Assistant Professor.

Publications

Publications

4. "Twisting the Infinitesimal Site." International Mathematics Research Notices, 2024(19):12904-12918 (2024).

3. "Hochschild cohomology of differential operators in positive characteristic." Journal of Algebra 650:367-376 (2024).

2. "Almost All Wreath Product Character Values are Divisible by Given Primes." (with B. Dong, H. Graff, S. Rothstein, L. Vescovo.) Algebraic Combinatorics 6(6):1519-1531 (2023).

1. "Quantization of restricted Lagrangian subvarieties in positive characteristic." Advances in Mathematics 410:108760 (2022).

Preprints

3. "On the differentials of the Hochschild-Kostant-Rosenberg spectral sequence." arXiv: 2410.01894

2. "Dieudonné theory for n-smooth group schemes." (with C. Kothari) arXiv: 2408.15333

1. "Higher Congruences in Character Tables" (with N. Harman) arXiv: 2402.02312

Undergraduate publications

6. appendix to "Projective hypersurfaces in tropical scheme theory I: the Macaulay ideal," by A. Fink, J. Giansiracusa, N. Giansiracusa. Research in the Mathematical Sciences 12(30) (2025).

5. "The Image of a Tropical Linear Space." Electronic Journal of Combinatorics 32(1):#P1.45 (2025).

4. "A Module-Theoretic Approach to Matroids." (with C. Crowley, N. Giansiracusa) Journal of Pure and Applied Algebra 224(2):894-916 (2020).

3. "The MMS Parameter of Graphs and Degree Sequences." (with Z. Király, N. Kulkarni, I. McMeeking) Egerváry Research Group, Budapest, Technical Report 2018-11 (2018).

2. "Quantum State Transfer in Coronas." (with E. Ackelsberg, Z. Brehm, A. Chan, C. Tamon.) Electronic Journal of Combinatorics 24(2):2-24 (2017).

1. "Laplacian State Transfer in Coronas." (with E. Ackelsberg, Z. Brehm, A. Chan, C. Tamon.) Linear Algebra and its Applications 506:154-157 (2016).

Physics publications

2. "Dynamics of interacting fermions in spin-dependent potentials". (A. Koller, M. Wall, J. Mundinger, A. Rey.) Phys. Rev. Lett. 117:195302 (2016).

1. "Demagnetization dynamics of non-interacting trapped fermions". (A. Koller, J. Mundinger, M. Wall, A. Rey.) Phys. Rev. A 92:033608 (2015).

Honors and Awards

Mathematical Sciences Postdoctoral Research Fellowship **2025-2028**
(National Science Foundation)

Simons Travel Grant (*American Mathematical Society*) **2024-2026**

Graduate Research Fellowship (*National Science Foundation*) **2018-2023**

Radix Trading Prize (*University of Chicago*) **2022**
Awarded to "an outstanding student in the final stages of their degree."

Lang Award (*Swarthmore College*) **2018**
Awarded to "a graduating senior in recognition of outstanding academic accomplishment."

Heinrich W. Brinkman Mathematics Prize **2018**
(Swarthmore College Mathematics and Statistics Department)
In recognition of exemplary service.

Conference Talks

- "On the differentials of the Hochschild-Kostant-Rosenberg spectral sequence."
  - "Gone Fishing" Poisson Geometry, Washington University in St. Louis, 07 March 2025.
- "Twisting the infinitesimal site."
  - AMS Western Sectional Meeting, UC Riverside, 27 October 2024.
  - "Gone Fishing" Poisson Geometry, Northwestern University, 13 April 2024.
- "Quantization of restricted Lagrangian subvarieties in positive characteristic."
  - AMS Central Sectional Meeting, Cincinatti, 15 April 2023.
  - "Gone Fishing" Poisson Geometry, Amherst College, 16 March 2023.
  - Joint Mathematics Meetings, Boston, January 2023.
  - AMS Central Sectional Meeting, Virtual, March 2022.
- "A Module-Theoretic Approach to Matroids."
  - AMS Central Sectional Meeting, The Ohio State University, March 2018.

Seminar Talks

- "Dieudonné theory for n-smooth group schemes."
  - University of Wisconsin-Madison, 21 November 2024.
- "On the differentials of the Hochschild-Kostant-Rosenberg spectral sequence."
  - Louisiana State University, 21 April 2025.
  - University of Chicago, 12 January 2025.
  - Purdue University, 19 November 2024.
  - University of Wisconsin-Madison, 27 September 2024.
  - Universität Münster, 15 July 2024.
- "Quantization of restricted Lagrangian subvarieties in positive characteristic."
  - University of Wisconsin-Madison, 15 September 2023.
  - Notre Dame Algebraic Geometry/Commutative Algebra seminar, 4 October 2022.
  - Higher School of Economics, Moscow, 18 June 2021.

Service

Conferences and seminars organized

- Co-organizer, AMS Special Session "Geometric Methods in Representation Theory," Milwaukee, 20-21 April 2024.
- Algebra and Algebraic Geometry Seminar, University of Wisconsin-Madison, co-organizer.
- Student Representation Theory Seminar, University of Chicago:
  - Spring 2022: Topics in Representation Theory
  - Fall 2021: Hilbert schemes of points in the plane

WOMP (Warmup Program) **September 2022**

Co-organized the week-long orientation for first-year graduate students at UChicago.

Teaching

University of Wisconsin-Madison **2023-present**

Instructor:

- Modern Algebra II, Spring 2025
- Representation Theory (graduate topics course), Fall 2024
- Linear Algebra, Fall 2024
- Modern Number Theory, Spring 2024
- Elementary Matrix and Linear Algebra, Fall 2023

University of Chicago **2019-2022**

Instructor of record:

- Mathematical Methods for Social Sciences, Spring 2022
- Calculus III, Winter 2022
- Calculus II, Fall 2021

Grader/TA:

- Graduate Algebra I, Fall 2020
- Honors IBL Calculus III, Spring 2020
- Algebraic Geometry, Winter 2019
- Representation Theory of Finite Groups, Fall 2019

MathILy-EST REU **Summer 2022**

Research mentor at eight-week NSF-funded REU. Co-mentored ten students across three projects in combinatorial representation theory. *Program director:* Nate Harman.

Mathematical Staircase Inc., MathILy **Summers 2017-2021**

Instructor at five-week intensive summer math program for high school students. Cotaught a two-week Root curriculum on linear algebra and discrete math and two-week Branch courses on topological graph theory, chip-firing, and polytopes. Designed and taught one-week courses on abstract algebra, representation theory, algebraic geometry, the fundamental group, the Combinatorial Nullstellensatz, and matroids. *Program director:* sarah-marie belcastro