

Wade Bloomquist

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EMPLOYMENT / EDUCATION **Morningside University**, Sioux City, Iowa
Assistant Professor
Department of Natural & Mathematical Sciences 08/15/2023–Present

Georgia Institute of Technology, Atlanta, Georgia
Visiting Assistant Professor
School of Mathematics 08/01/2019–8/15/2023

MAA Project NExT (New Experiences in Teaching),
Gold 21' Fellow 08/01/2021–Present

Project NExT is a program for early career mathematicians that focuses on innovative strategies in teaching, supporting students in underrepresented groups, involving undergraduates in research, and other topics related to professional development.

University of California Santa Barbara, Santa Barbara, California
Ph.D., Mathematics, 09/01/2014–06/01/2019
• Dissertation:
Quantum representations of MCGs and their applications to quantum computing
• Advisor: Zhenghan Wang

University of Iowa, Iowa City, Iowa
B.S., Mathematics 08/01/2010–05/01/2014

TEACHING EXPERIENCE **Instructor of Record at Morningside University**
• Transition to Abstract Mathematics (Math 300) Spring 2024
• Calculus & Analytic Geometry 2 (Math 206) Spring 2024
• Modern Algebra 2 (Math 416) Spring 2024
• Calculus & Analytic Geometry 1 (Math 205) Fall 2023
• Modern Algebra 1 (Math 315) Fall 2023

Instructor of Record at Georgia Tech
• SABIC Calculus 2 (Math 1552) Summer 2023
• Abstract Algebra 1 (Math 4107) Summer 2023
• Honors Multivariable Calculus (Math 2561) Spring 2023
• Discrete Mathematics (Math 2603) Fall 2022
• Introduction to Number Theory (Math 4150) Summer 2022
• Multivariable Calculus (Math 2552) Spring 2022
• Survey of Calculus (Math 1712) Fall 2021
• Graduate Topics: Topological Quantum Computing (Math 8803) Spring 2021
• Foundations of Mathematical Proof (Math 2106) Fall 2020
• Integral Calculus (Math 1552) Spring 2020
• Linear Algebra (Math 1554) Fall 2019

Instructor of Record at the University of California Santa Barbara
• Mathematics for Elementary Teachers 2 (Math 100B) Summer 2018

- Calculus for the Social and Biological Sciences (Math 34A) Summer 2017
- Multivariable Calculus (Math 6A) Summer 2016

Teaching Assistant at the University of California Santa Barbara

- Methods of Analysis (Math 117) Fall 2018
- Calculus for the Social and Biological Sciences (Math 34A) Fall 2018
- Mathematics for Elementary Teachers 1 (Math 100A) Summer 2018
- Mathematics for Elementary Teachers 2 (Math 100B) Spring 2018
- Mathematics for Elementary Teachers 1 (Math 100A) Winter 2018
- Multivariable Calculus (Math 6A) Fall 2017
- Advanced Linear Algebra 2 (Math 108B) Winter 2017
- Advanced Linear Algebra 1 (Math 108A) Fall 2016
- Calculus 1 (Math 3A) Spring 2016
- Graph Theory (Math 137A) Fall 2016
- Non-Euclidean Geometry (Math 113) Fall 2016
- Transition to Higher Math (Math 8) Summer 2015
- Calculus 1 (Math 3A) Fall 2015

OUTREACH

- **Georgia Tech High School Math Day Organizer-** Formerly known as the Georgia Tech Math Competition, this day was rebranded from previous years to be more open and inclusive to a wider audience (both in terms of the number of students and the number of total high schools). Different versions of exams ranging from more puzzle/riddle based questions in a team setting up to a proof-based exam. Additionally, there were math-centric board games and an invited speaker. This event occurred on April 15th 2023.

Fall 2022-Spring 2023

- **Science Night at Morningside Elementary-** This event gave elementary school students an opportunity to hear about science. I assisted with a presentation on fractals (that included the clip from Frozen using “fractal” as a lyric). This was followed up by an activity where students made a large Sierpinski triangle on poster board.

Spring 2020, Spring 2023

- **Emory Math Circle-** In general, a math circle is a weekly recreational mathematics experience. I helped with the middle school B class, which was composed primarily of students in fifth grade.

Spring 2020

- **Project Change: STEM Teachers at Tech Day-** This event was designed to give high school teachers a look at STEM research that could be brought back to their classrooms. Together with a partner, I led an activity about fractals that involved measuring a coastline with progressively smaller measuring sticks.

Spring 2020

- **Undergraduate “Boot Camp”-** This program was designed to give students from underrepresented backgrounds preparation and help in applying for graduate school. My role was to prepare participants for the math portion of the general GRE.

Fall 2018

PROFESSIONAL SERVICE

- **Organizer for MAA Session on Quantum Computation in the Undergraduate Curriculum**

This contributed paper session will bring together mathematicians across various career stages to share progress and ideas on how to incorporate concepts used in quantum computation into the undergraduate curriculum. As this field continues to develop we hope to address ways to introduce undergraduate students to key ideas as early as possible. The session will focus on attempts that have been made and

goals for the future.

August 2024 (planned)

- **Morningside Faculty Secretary-** I record minutes of the faculty meetings and mark attendance to ensure a quorum is met for any votes.

Fall 2023–Present

- **Organizer for the Tech Topology Conference-** This annual conference brings together senior, junior, and future researchers in the field of topology. For 2020 I was in charge of “lightning talks”, which are five-minute talks designed to give a wide range of participants the opportunity to give a conference talk.

December 2019, December 2020, December 2022

- **Organizer for the Georgia Tech DRP-** A DRP (directed reading program) matches graduate mentors with an undergraduate student mentee for a guided semester long reading. Organizing involves assigning pairs together based on topics of interest at the start of the semester, and (this term in particular) navigating the switch away from in person meetings.

Fall 2020–Spring 2023

- **Organizer AMS Special Session on Skein Theory and Quantum Algebra-** Organized a special session bringing together members of the research community. This session consisted of 19 talks over two days. Although originally planned to be an in-person event this was moved to a fully remote format.

April 2022

- **Organizer for Remote Rendezvous for Quantum Topologists-**

This asynchronous conference was held in August of 2021. A pre-recorded playlist of talks was sent to participants prior to the beginning of the conference, and synchronous virtual office hours were held by each speaker during the week of the conference. Additional socializing and networking events were held virtually.

August 2021

- **Organizer for Tech Topology Summer School-** This summer school was held in the summer of 2021 and is designed to introduce mathematicians to the study of 4–manifolds. There will be mini-courses, research talks, and problem sessions that will help graduate students make the jump into research level mathematics.

August 2021

- **Mentor for the Twoples Program-** Twoples is an entirely online program that matches mentors to mentees for a guided reading. This is similar to a DRP, but as it is not tied to specific university it allows for mentees from a wider range of backgrounds.

Fall 2020

- **Ph.D Committee Member-** I was a member of Jonathan Paprocki’s Ph.D dissertation committee at Georgia Tech. He defended in the Fall 2019 semester with a dissertation titled *Quantum torus methods for Kauffman bracket skein modules*.

Fall 2019

- **Organizer/Founder of the UCSB DRP-** A DRP (directed reading program), as mentioned above, matches graduate mentors with an undergraduate student mentee for a guided semester long reading. I was part of a group of graduate students who started and chartered a UCSB branch of the DRP network. This provided the program with funding to cover food at events and pay for the purchasing of one book for each mentor-mentee pairing.

2018-2019 Academic Year

- **Organizer of the UCSB Hypatian Seminar-** The goal of the Hypatian Seminar is to explore the contributions of underrepresented groups to the field of mathematics and to provide a forum to discuss the additional challenges they face in academia.

Fall 2016–Fall 2018

- **Graduate Committee Student Representative-** Provide input from the graduate student community during math department graduate committee meetings

as needed.

November 2016–October 2018

- **Lead Teaching Assistant-** I assisted in the training the incoming class of graduate students in mathematics as teaching assistants. Additionally, this involved being available for any questions related to TAing that arose during the year.

2017-2018 Academic Year

STUDENT MENTORING

- Advisor Fall 2023–Present
 - Phuong Tran (high school student)
 - The search for exotic periodics in mapping class groups
- Advisor Fall 2023–Present
 - Eein McKinley
 - Combinatorics of paths on fusion graphs
- Advisor for research for credit Fall 2023–Present
 - Kelsey Schieffer
 - Minimal embedding numbers of groups
- Mentor for the NSF Sponsored Georgia Tech REU Summer 2023
 - Sophie Gardner and Alyssa McPoyle
 - A non-simple arc graph
- Mentor for the NSF Sponsored Georgia Tech REU Summer 2023
 - Sami Aurin and Darrion Thornburgh
 - Hyperbolicity in arc graphs of punctured spheres
- Advisor for research for credit Fall 2022–Spring 2023
 - Akash Narayanan
 - Abelianization of the mixed braid groups
- Advisor Fall 2020–Spring 2023
 - Adele Payman
 - Testing the strength of the DFib invariant
- Mentor for the NSF Sponsored Georgia Tech REU Summer 2021
 - Elyssa Cirillo, Jiamin Li, Alice Ponte
 - Filling pairs of curves on surfaces
- Advisor for research for credit Fall 2020
 - Noah Caplinger (and Katie Gravel not for credit)
 - Generating the level 4 braid group
- Mentor for the NSF Sponsored Georgia Tech REU (virtual) Summer 2020
 - Andrea Barton, Jose Guzman, Hannah Moon
 - Untwisted Dijkgraaf-Witten string nets
- Mentor for the NSF Sponsored Georgia Tech REU Summer 2019
 - Jessica Appel, Katie Gravel, Annie Holden
 - On quotients of congruence subgroups of braid groups
- Mentor for Jones-Fitzgerald Summer Research Program Summer 2018
 - Gulnoza Bobokalonova, Emma Lennen, Jose Zavala
 - Graph Theory and Quantum Error Correcting Codes
- Advisor for an Honors Senior Thesis (UC Santa Barbara) Spring 2018
 - Richard Carini
 - The Golden Chain Hamiltonian
- Mentor for the NSF Sponsored UC Santa Barbara REU Summer 2017
 - Andres Mejia - On the Structure of the C_2 Spider

SELECTED TALKS

- *Quantum Traces and Degenerations* NYC Noncommutative Geometry Seminar, St Johns University, New York City (Online), October 2023.

- *LRY skein algebras: Why?* Michigan State Geometry and Topology Seminar, Lansing Michigan, March 2022
- *LRY skein algebras: States and Filtrations* University of Iowa Topology Seminar, Iowa City Iowa, December 2021.
- *The quantum trace for LRY skein algebras* AMS Sectional Meeting, Special Session on Recent advances in low-dimensional topology, November 2021 (Virtual).
- *Generalizations and properties of stated skein algebras* Indiana University Quantum Topology Seminar, Bloomington Indiana, November 2021 (Virtual).
- *Stated skein modules and algebras*, Categorification Learning Seminar, <https://sites.google.com/view/categorification/home>, April 2021 (Virtual)
- *Quantum representations of mapping class groups coming from pre-metric groups.*, AMS Spring Southeastern Sectional Meeting, Special Session on Groups, Geometry, and Topology. March 2021 (Virtual)
- *Stated skein modules of marked 3-manifolds*, University of Georgia Topology Seminar, Athens Georgia, March 2021 (Virtual).
- *The Chebyshev-Frobenius homomorphism of stated skein modules*, UC Santa Barbara Quantum Topology and Quantum Algebra Seminar, (Virtual) November 2020.
- *Applications of quantum mapping class group representations*, Special Session on Hopf Algebras and Tensor Categories, Joint Math Meeting, Baltimore Maryland, January 2019.
- *Spiders and asymptotic faithfulness* AMS Sectional Meeting, Special Session on Tensor Categories: Bridging Topology, Algebra and Physics, Riverside California, November 2017.
- *Asymptotic faithfulness of quantum $SU(3)$ via skein theory*, Knots in Hellas, Olympia Greece, July 2016.

PAPERS

- *Splitting and bases for string-net spaces*, Joint with Anup Poudel and Sanjay Kumar. In preparation.
- *Degenerations of skein algebras and quantum traces*, Joint with Hiroaki Karuo and Thang Le. Submitted. (<https://arxiv.org/abs/2308.16702>).
- *Asymptotic faithfulness of quantum $SP(4)$ mapping class group representations*, Submitted for publication/rewrites in progress. (<https://arxiv.org/abs/1801.01268>)
- *Quotients of braid groups by their congruence subgroups*, Joint with Peter Patzt and Nancy Scherich. Accepted to Proceedings of the American Mathematical Society (2023).
- *The Chebyshev-Frobenius homomorphism for stated skein modules of 3-manifolds*, Joint with Thang Lê, *Mathematische Zeitschrift* (2022) 301:1063–1105..
- *On topological quantum computing with mapping class group representations*, with Zhenghan Wang, *Journal of Physics A: Mathematical and Theoretical*, Volume 52, Number 1 (2018).
- *Comparing skein and quantum group representations and their applications to asymptotic faithfulness*, with Zhenghan Wang, *Pure and Applied Mathematics Quarterly*, Vol. 12, No. 4 (2016), pp. 473-492

Joint with Undergraduates

- *A complex of non-simple arcs*. Joint with Sophie Gardner and Alyssa McPoyle. In

preparation.

- *On quotients of congruence subgroups of the braid group*, Joint with Jessica Appel, Katie Gravel, and Annie Holden. Submitted for publication.
(<https://arxiv.org/abs/2011.13876>)
- *Admissibility and the C_2 spider*, Joint with Andres Mejia.
(<https://arxiv.org/abs/1801.00953>)