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### Regular Positions

**Associate Professor**, Claremont McKenna College, Claremont, California, 2018–present.

**Extended Faculty**, Claremont Graduate University, Claremont, California, 2019–present.

**Associate Professor**, Carleton College, Northfield, Minnesota, 2016–2018.

**Assistant Professor**, Carleton College, Northfield, Minnesota, 2009–2016.

**Postdoctoral Fellow**, Bowdoin College, Brunswick, Maine. 2007–2009.

### Visiting Positions

**von Neumann Fellow**, Institute for Advanced Study, Princeton, New Jersey, 2017–2018.

**Visiting Scholar**, University of Southern California, Los Angeles, California, Fall 2012.

### Education

**Ph.D. in Mathematics**, Yale University, New Haven, CT, May 2007.

Dissertation: “The  $SO(3)$  Quantum Invariants: Their Density and Topological Applications”.

Advisor: Andrew Casson.

**M. Phil. in Mathematics**, Yale University, New Haven, CT, December 2003.

**M.S. in Mathematics**, Yale University, New Haven, CT, May 2003.

**Fulbright Scholar**, Budapest Semesters in Mathematics, Hungary. 1999–2000.

**B.A. in Mathematics**, Pomona College, Claremont, CA. May 1999.

*Summa cum laude*, Distinction in major.

### Research Grants and Awards

**National Science Foundation Grants**, continuously funded as Principal Investigator since 2011.

- DMS-2305414: “RUI: Pure and Applied Knot Theory: Skeins, Hyperbolic Volumes, and Biopolymers”. Funded by NSF program: MPS/DMS-Topology. Requested: \$281,433, 2023-2026.
- DMS-1906323: “RUI: Knots in Three-dimensional Manifolds: Quantum Topology, Hyperbolic Geometry, and Applications”. Funded by NSF programs: MPS/DMS-Topology, BIO/MCB-Molecular Biophysics, MSPA-Interdisciplinary, and Office of Interdisciplinary Activities. \$229,315, 2019-2023.
- DMS-1510453 and DMS-1841221: “RUI: Skeins on Surfaces”. Funded by NSF programs: MPS/DMS-Topology, BIO/MCB-Genetic Mechanisms, and MSPA-Interdisciplinary. \$160,084, 2015-2021.

- DMS-1105692: “RUI: Relating quantum and classical topology and geometry”. Funded by NSF program: MPS/DMS-Topology. \$124,770, 2011-2016.

**Structured Quartet Research Ensemble (SQuaRE)**, American Institute of Mathematics, 2023-2025. Research on “New Topological Models of Knot Formation in Proteins” with Erica Flapan, Eric Rawdon, and Joanna Sulkowska.

**Simons Fellow in Mathematics**, Simons Foundation, \$110,245, 2021-22. Awarded for scientific accomplishments. Extends a one-term sabbatical leave to a full year.

**Joan and Joseph Birman Fellowship**, American Mathematical Society, \$50,000, 2021-22. Awarded to exceptionally talented women for extra research support during their mid-career years.

**Summer Collaborators**, Institute for Advanced Study, Princeton, New Jersey, July 2018. Research on “Locality and universality of topological quantum computing” with Shawn Cui, Kevin Tian, Jennifer Franko Vasquez, and Zhenghan Wang.

**von Neumann Fellow**, Institute for Advanced Study, Princeton, New Jersey, Fall 2017–Spring 2018. Awarded to outstanding early-career mathematicians who are 5–15 years post PhD.

**National Science Foundation Conference Grant**, DMS-11522850, \$40,000, July 2015. Co-principal investigator for “Classical and quantum hyperbolic geometry and topology”, providing funding for a conference at Orsay, France.

**GEAR Network Research Member**, 2014-2019. Nominated member of “RNMS: Geometric Structures and Representation Varieties”, National Science Foundation Grants DMS-1107452, 1107263, 1107367.

**Carleton College Eugster Fellowship and Class of '49 Fellowship**, 2012-13. Faculty Development Award for a full year of junior sabbatical leave.

**Association for Women in Mathematics Mentoring Travel Grant**, 2010-11. For research collaboration with Francis Bonahon, University of Southern California.

**Bowdoin College Faculty Research Award**, 2007-08.

**Association for Women in Mathematics Travel Grant**, 2007.

**Fulbright Student Research Fellowship**, US Department of State, 1999-2000. Full academic year grant at Budapest Semesters in Mathematics, Hungary.

## Teaching, Curricular, and other Academic Grants and Awards

**Faculty Fellow**, Presidential Initiative on Anti-Racism, Claremont McKenna College, 2024-26. Project on “Studying and Improving the Experiences of Underrepresented Students in Mathematics” with Sarah Cannon.

**Summer Curricular Grant**, Visualization of the Liberal Arts Initiative, Carleton College, 2010. For mathematical models for curricular use.

**Project NExT Fellowship**, Richard Good Fund, Mathematical Association of America, 2009-10.

**Prize Teaching Fellowship**, Yale University, 2007. One of seventeen graduate students campus-wide honored for excellence in undergraduate teaching.

**Bertha Clendenen McCord Memorial Prize, Barbara Sanford Allen Prize and Concerto Competition Winner**, Department of Music, Pomona College, 1999.

**Phi Beta Kappa**, Pomona College, inducted 1999.

**Sigma Xi**, Pomona College, inducted 1997.

**Jaeger Prize**, Department of Mathematics, Pomona College, 1996.

## Research Interests

### GEOMETRIC TOPOLOGY AND QUANTUM TOPOLOGY

Topology and hyperbolic geometry of low-dimensional manifolds  
 Topological quantum field theories, Jones polynomial for links, quantum invariants of 3-manifolds  
 Kauffman bracket skein algebra, Quantizations of Teichmüller space, Volume Conjecture

### APPLICATIONS OF TOPOLOGY AND GEOMETRY.

Topological quantum computation  
 Knotting in DNA and proteins

## Publications

### *Articles in Refereed Journals*

(Authors are listed alphabetically in mathematics. \* denotes a student.)

1. Erica Flapan, Alireza Mashaghi, Helen Wong. A tile model of circuit topology for self-entangled biopolymers. *Nature: Scientific Reports* Volume 13 (2023), Article number: 8889.
2. Han-Bom Moon, Helen Wong. The Roger-Yang Kauffman skein algebra and the decorated Teichmüller space. *Quantum Topology* Volume 12, Issue 2 (2021), 265–308.
3. Shawn Cui, Kevin Tian, Jennifer Franko Vasquez, Helen Wong, Zhenghan Wang. The search for leakage-free, entangling Fibonacci braiding gates. *Journal of Physics A: Mathematical and Theoretical* Volume 52, Number 45 (2019), 455301.
4. Francis Bonahon, Helen Wong. Representations of the Kauffman bracket skein algebra III: closed surfaces and naturality. *Quantum Topology* Volume 1, Issue 2 (2019), 325-398.
5. Erica Flapan, Adam He\*, Helen Wong. Topological descriptions of protein folding. *Proceedings of the National Academy of Sciences* Volume 116, Number 19 (2019), 9360-9369.
6. Francis Bonahon, Helen Wong. Representations of the Kauffman bracket skein algebra II: Punctured surfaces. *Algebraic & Geometric Topology* Volume 17, Number 6 (2017), 3399–3434.
7. Jennifer Franko Vasquez, Helen Wong, Zhenghan Wang. Qubit representations of the braid groups from generalized Yang-Baxter matrices. *Quantum Information Processing*, Volume 15, Number 7 (2016), 3035-3042.
8. Martin Bobb\*, Stephen Kennedy, Dylan Peifer\*, Helen Wong. Presentations of Kauffman bracket arc algebra for small surfaces. *Involve: A Journal of Mathematics*, Volume 9, Number 4 (2016), 689-698.
9. Martin Bobb\*, Stephen Kennedy, Dylan Peifer\*, Helen Wong. The Kauffman bracket arc algebra is finitely generated. *Journal of Knot Theory and its Ramifications*, Volume 25, Number 6 (2016), 1650034, 14pp.
10. Francis Bonahon, Helen Wong. The Witten-Reshetikhin-Turaev representation of the Kauffman bracket skein algebra. *Proceedings of the American Mathematical Society*, Volume 144, Number 6 (2016), 2711-2724.

11. Francis Bonahon, Helen Wong. Representations of the Kauffman bracket skein algebra I: Invariants and miraculous cancellations. *Inventiones Mathematicae*, Volume 204, Number 1 (2016), 195-243.
12. Erica Flapan, Jeremy Grevet\*, Qi Li\*, Daisy Sun\*, Helen Wong. Knotted and linked products of recombination on  $T(2, n) \# T(2, m)$  substrates. *Journal of the Korean Mathematics Society*, Volume 51, Number 4 (2014), 817–836.
13. Francis Bonahon, Helen Wong. Quantum traces for representations of surface groups in  $SL_2$ . *Geometry & Topology*, Volume 15, Number 3 (2011), 1569-1615.
14. Nathan Dunfield, Helen Wong. Quantum invariants of random Heegaard splittings. *Algebraic & Geometric Topology* Volume 11, Number 4 (2011), 2191-2205.
15. Helen Wong. Quantum invariants can provide sharp Heegaard genus bounds. *Osaka Journal of Mathematics*, Volume 48, Number 3 (2011), 709-718.
16. Helen Wong.  $SO(3)$  quantum invariants are dense in  $\mathbb{C}$ . *Mathematical Proceedings of the Cambridge Philosophical Society*, Volume 148, Number 2 (2010), 289-295.

*Preprints and Articles in Preparation*

1. Maciej Sikora<sup>†</sup>, Erica Flapan<sup>†</sup>, Helen Wong<sup>†</sup>, Pawel Rubach<sup>†</sup>, Wojciech Garstka, Szymon Niewieczermal, Mai Lan Nguyen, Dawid Uchal, Eric Rawdon, Joanna Sulkowska, Proteins containing 6-crossing knots and their folding pathways, bioRxiv 2023.06.16.54515, 9 pages. Submitted.
2. Han-Bom Moon, Helen Wong. Compatibility of skein algebra and cluster algebra on surfaces and applications, arXiv:2201.08833, 30 pages. Submitted.
3. Francis Bonahon, Helen Wong, Tian Yang. Asymptotics of quantum invariants of surface diffeomorphisms I: Conjecture and algebraic computations, arXiv:2112.12852, 45 pages. Preprint posted December 2021 and awaiting completion of Part III in the series before submission.
4. Francis Bonahon, Helen Wong, Tian Yang. Asymptotics of quantum invariants of surface diffeomorphisms II: Figure-eight knot complement, arXiv:2203.05730, 30 pages. Preprint posted March 2022 and awaiting completion of Part III in the series before submission.
5. Francis Bonahon, Helen Wong, Tian Yang. Asymptotics of quantum invariants of surface diffeomorphisms III: Case of one-punctured torus, *draft*, 49 pages. In preparation.
6. Siki Wang\*, Helen Wong. Fast multiplication for skein algebra of a punctured torus, *draft*, 10 pages.
7. Erica Flapan, Aryamun Gulati\*, Noah Haig\*, Matthew Hines\*, Frederick Qin\*, Eric Rawdon, Helen Wong, and Hannah Zhang\*. Further analysis of the loop-flipping pathway, *draft*, 10 pages.

*Co-authored Books*

1. Erica Flapan, with Helen Wong and other members of the Park City Mathematics Institute Undergraduate Faculty Program. Knots, Molecules, and the Universe: An Introduction to Topology. American Mathematical Society, 2015

*Co-edited Volumes*

1. Erica Flapan, Helen Wong (Ed.) Topology of Biopolymers. Contemporary Mathematics, Volume 746. American Mathematical Society, 2020.

*Chapters in Books*

1. Rhea Palak Bakshi, Jozef Przytycki, and Helen Wong. Skein modules. C. Adams, E. Flapan, A. Heinrich, L. Kauffman, L. Ludwig, S. Nelson (Ed.) Encyclopedia of Knot Theory (Chapter 63, pp.617–624). CRC Press, 2021.
2. Rhea Palak Bakshi, Jozef Przytycki, and Helen Wong. Kauffman bracket skein modules and algebras. C. Adams, E. Flapan, A. Heinrich, L. Kauffman, L. Ludwig, S. Nelson (Ed.) Encyclopedia of Knot Theory (Chapter 69, pp.667–666). CRC Press, 2021.
3. Helen Wong. Protein knots, links, and non-planar graphs. C. Adams, E. Flapan, A. Heinrich, L. Kauffman, L. Ludwig, S. Nelson (Ed.) Encyclopedia of Knot Theory (Chapter 90, pp.911–918). CRC Press, 2021.
4. Helen Wong. The  $SL_2$ -character variety and representations of the Kauffman bracket skein algebra. Hamenstadt, U., Masbaum, G., Reid, A.W., and Venkataramana, T.N. (Ed.) New Perspectives on the Interplay between Discrete Groups in Low-Dimensional Topology and Arithmetic Lattices. (pp.1741–17420). *Oberwolfach Reports* Volume 12 (2016), 170-11.
5. Francis Bonahon, Helen Wong. Kauffman brackets, character varieties, and triangulations of surfaces. *Topology and geometry in dimension three* (Proceedings of JacoFest), 179-194. Contemporary Mathematics Series, Volume 560, American Mathematical Society, Providence, RI, 2011.

#### *Other Publications*

1. Review of Lectures on the Topology of 3-manifolds, second edition, by N. Saveliev. MAA Reviews, available at <http://mathdl.maa.org/mathDL/19/?pa=reviews&sa=viewBook&bookId=72936>.
2. Contributions to the publications of the Girls' Angle: A Math Club for Girls, Boston.
  - i. An Interview with Helen Wong. *Girls' Angle Bulletin*, Volume 3, Number 5, July 2010.
  - ii. Adding the Numbers from 1 to 100. *Women in Mathematics Video Series*, available at [http://www.girlsangle.org/page/video\\_clips.html](http://www.girlsangle.org/page/video_clips.html).
  - iii. Summer Fun: Adding Up Numbers. *Girls' Angle Bulletin*, Volume 3, Number 5, July 2010.
3. Anna Dragonova, Helen Wong. Instructor's Manual. J. Pommersheim, T. Marks, and E. Flapan. Number Theory: A Lively Introduction with Proofs, Applications, and Stories Wiley, 2010.
4. Helen Wong. The  $SO(3)$  quantum invariants: their density and topological applications. Ph.D. thesis, Yale University, under the direction of Andrew Casson, 2007. 80pp.

## Research Presentations

#### *Conference Presentations* (Plenary addresses are in bold.)

1. AMS Special Session: Knots, Skein Modules and Categorification, Georgia Tech, March 2023.
2. AMS Special Session: Applied Topology, Joint Mathematics Meetings, Boston, January 2023.
3. **Quantum Symmetries: Tensor Categories, Topological Quantum Field Theories, Vertex Algebras**, Centre de Recherches Mathematiques, Universite de Montreal, Canada, October 2022.
4. AMS Special Session: Applied Knot Theory, University of Tennessee, Chattanooga, October 2022.
5. The Interdisciplinary World of Tangling, University of Potsdam, September 2022.

6. **From Subfactors to Quantum Topology** (in memory of Vaughn Jones), University of Geneva, Switzerland, June 2022.
7. **Quantum Topology and Geometry** (in honor of Vladimir Turaev), Institut Henri Poincaré, Paris, June 2022.
8. **Non-commutative algebras, representation theory and special functions**, Centre de Recherches Mathématiques, Université de Montréal, Canada, June 2022.
9. AMS Special Session: Skein Theory and Quantum Algebra, Joint Mathematics Meetings, Seattle, Virtual, April 2022.
10. AMS Special Session: Quantum Algebra and Quantum Topology, Purdue University, Virtual, March 2022.
11. **N+11th Southern California Topology Conference**, Virtual, March 2021.
12. AMS Special Session: Algebraic Structures Related to Knot Theory, Joint Mathematics Meetings, Virtual, January 2021.
13. **Geometry and Representation Theory**, UC Riverside, December 2019.
14. AMS Special Session: Invariants of Knots and Spatial Graphs, Riverside, November 2019.
15. **Biology, Analysis, Geometry, Energies, Links [bagel19]: A Program on Low-dimensional Topology, Geometry, and Applications**, Institute for Mathematics and its Applications, Minneapolis, June 2019.
16. **Quantum Topology and Hyperbolic Geometry Conference**, Da Nang, Vietnam, May 2019.
17. **Graduate Student Conference in Algebra, Geometry, and Topology**, Temple University, Philadelphia, June 2018.
18. **Cornell Topology Festival**, Cornell University, Ithaca, May 2018.
19. AMS Special Session: Symplectic Geometry and Contact Geometry, Minneapolis, October 2016.
20. **Classical and quantum hyperbolic geometry and topology** (in honor of Francis Bonahon), Université Paris-Sud, Orsay, France, July 2015.
21. **New Perspectives on the Interplay between Discrete Groups in Low-Dimensional Topology and Arithmetic Lattices**, Oberwolfach Workshop, Mathematisches Forschungsinstitut, Oberwolfach, Germany, June 2015.
22. AMS Special Session: Geometric Aspects of 3-Manifold Invariants, St. Louis, October 2013.
23. AMS Special Session: Combinatorial Methods in Knot Theory, New Orleans, October 2012.
24. **Moab Topology Conference** (research talk and introductory talk for graduate students), May 2012.
25. AMS Special Session: Low-Dimensional Topology and Geometry, Winston-Salem, September 2011.
26. **Conference on Quantum Geometry and Topology**, Centre International de Rencontres Mathématiques, Luminy, France, July 2010.
27. AMS Special Session: Quantum Invariants of 3-manifolds and Modular Categories, St. Paul, April 2010.
28. **Conference on Knot Theory and its Applications to Physics and Biology**, Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, May 2009.
29. **Program for Women in Math: More Examples of Groups**, Ohio State University, May 2009.
30. AMS Special Session: Low Dimensional Topology and Geometry, Raleigh, April 2009.

31. AMS Special Session: Geometric Group Theory, Middletown, October 2008.
32. AMS Mathematical Research Communities in Teichmüller Theory and Low-dimensional Topology, Snowbird, June 2008.
33. AMS Special Session: Knot and 3-Manifold Invariants, Baton Rouge, March 2008.
34. AMS Session: Geometry and Topology III, San Diego, January 2008.
35. AMS Special Session: Heegaard Splittings, Bridge Positions, and Low Dimensional Topology, Joint Mathematics Meetings, San Diego, January 2008.

*Colloquia and Research Seminars*

1. Algebra / Number Theory / Combinatorics Seminar, Claremont Colleges, December 2023.
2. Topology Seminar, Claremont Colleges, April 2023.
3. Geometry and Topology Seminar, University of Iowa, December 2022.
4. Geometry/Topology Seminar, UC Davis, November 2021.
5. Topology Seminar, Claremont Colleges, November 2021.
6. Claremont Colleges Mathematics Colloquium, November 2021.
7. Australian Geometric Topology Webinar, November 2021.
8. Algebra / Number Theory / Combinatorics Seminar, Claremont Colleges, September 2021.
9. Colloquium, CUNY Medgar Evers College, March 2021.
10. Topology Seminar, George Washington University, December 2020.
11. Topology Seminar, UC Riverside, November 2019.
12. Applied Math Seminar, Claremont Colleges, May 2019.
13. Topology Seminar, Claremont Colleges, January 2019.
14. Colby College Colloquium, October 2018.
15. Claremont Colleges Mathematics Colloquium, September 2018.
16.  $L^2$  Geometry-Topology Seminar, sponsored by Lafayette College and Lehigh University, April 2018.
17. Mathematical Conversations, Institute for Advanced Study, March 2018.
18. Topology Seminar, Princeton University, March 2018.
19. Geometry and Topology Seminar, Rutgers University, February 2018.
20. Member's Seminar, Institute for Advanced Study, November 2017.
21. Geometry and Topology Seminar, Temple University, November 2017.
22. Philadelphia Area Topology Contact/Hyperbolic (PATCH) Seminar, sponsored by Bryn Mawr, Haverford, UPenn, and Temple, Philadelphia, April 2015.
23. Colloquium, Summer Mathematics Program for Women, Carleton College, July 2014.
24. Duke-UNC Topology Seminar, University of North Carolina, Chapel Hill, February 2013.
25. Claremont Topology Seminar, Claremont Colleges, December 2012.

26. Geometry Topology Seminar, University of Southern California, Los Angeles, October 2012.
27. Claremont Topology Seminar, Claremont Colleges, September 2012.
28. Topology Seminar, University of California, Riverside, April 2012.
29. Claremont Topology Seminar, Claremont Colleges, April 2012.
30. RTG Geometry/Topology Seminar, Michigan State University, November 2011.
31. Low-dimensional Topology Seminar, Michigan State University, November 2011.
32. Joint Mathematics Colloquium, Claremont Colleges, December 2010.
33. Claremont Topology Seminar, Claremont Colleges, November 2010.
34. Topology Seminar, University of Southern California, Los Angeles, March 2010.
35. Topology Seminar, University of Minnesota, Minneapolis, February 2010.
36. Mathematics seminar, St. Olaf College, October 2009.
37. Colloquium, Summer Mathematics Program for Women, Carleton College, June 2009.
38. Mathematics Seminar, College of the Holy Cross, February 2009.
39. Colloquium, College of the Holy Cross, February 2009.
40. Colloquium, Carleton College, February 2009.
41. Mathematics seminar, Bowdoin College, February 2009.
42. Mathematics seminar, Bucknell University, February 2009.
43. Geometric group theory seminar, University of Bristol, England, January 2009.
44. Topology and geometric group theory seminar, Cornell University, December 2008.
45. Geometric group theory and topology seminar, Tufts University, November 2008.
46. Haverford-Bryn Mawr Joint Mathematics Colloquium, Bryn Mawr College, October 2008.
47. Colby-Bowdoin-Bates Joint Mathematics Colloquium, Colby College, April 2008.
48. Mathematics seminar, Bowdoin College, March 2008.
49. Topology seminar, Boston College, January 2008.
50. Undergraduate mathematics lunchtime talk, Bowdoin College, November 2007.
51. Colloquium, Bowdoin College, April 2007.
52. Topology seminar, University of California, Santa Barbara, March 2007.
53. Topology seminar, Yale University, February 2007.
54. Topology seminar, Claremont Colleges, February 2007.
55. Graduate student seminar, Yale University, October 2006.

*General Audience and Other Invited Presentations*

1. "Kauffman Bracket Skein Algebra." Association of Women in Mathematics Student Chapter, UC Santa Barbara, October 23.



2. “An Algebra of Arcs and Knots on a Surface.” Fifth Panorama of Topology and Geometry, University of Iowa, December 2022.
3. “Knotting in DNA and proteins.” Atul-Vyas Memorial Lecture, Claremont McKenna College, November 2019.
4. “My Mathematics Community.” Ninetta Runnals Dinner for Women in Mathematics, Colby College, October 2018.
5. “Mathematics or (k)not?” After Hours Conversations, Institute for Advanced Study, March 2018.
6. “Mathematical Models.” Faculty Presentations on Creativity, Visuality, and the Liberal Arts, Reunion Weekend, Carleton College, June 2011.
7. “Mathematical Models.” Faculty Workshop on Showing and Knowing: How Exhibits, Displays, and Posters Teach, Carleton College, December 2010.
8. “Chaos in Tom Stoppard’s *Arcadia*.” Pre-play Student Event, Carleton College, May 2010.
9. “What is knot theory?” Science and Math Faculty Lunchtime Talk, Carleton College, April 2010.
10. “Imagining a 3-dimensional sphere.” New Faculty Workshop, Carleton College, December 2009.

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## Undergraduate Teaching

### *Calculus and Introductory Level*

Calculus I (Claremont Math 30), Fall 2018, Spring 2019.  
 Differential Calculus with Laboratory (Bowdoin Math 161), Fall 2007, Fall 2008.  
 Single-variable Calculus (Yale Math 112), Fall 2002 and Fall 2003.  
 Calculus III (Claremont Math 32) Spring 2020 (pandemic), Spring 2021 (online).  
 Honors Seminar in Calculus III (Claremont Math 32H), Fall 2018.  
 Multivariable Calculus (Carleton Math 211), 2 sections in Fall 2009, Spring 2010, 2 sections in Fall 2010, 2 sections in Fall 2011, Spring 2014, 2 sections in Fall 2014, Fall 2015, Fall 2016.  
 Multivariable Calculus (Yale Math 120), Fall 2004, Fall 2005, and Spring 2007.

### *Intermediate Level*

Discrete Structures (Claremont Math/CSCI 55), Fall 2019, Spring 2019, Fall 2023.  
 Mathematical Structures (Carleton Math 245), Spring 2012, Winter 2015, Spring 2017.  
 Linear Algebra (Claremont Math 60), Fall 2019, Spring 2020 (pandemic).  
 Linear Algebra (Carleton Math 232), Spring 2010, 2 sections in Winter 2011, Winter 2012.  
 Linear Algebra with Laboratory (Bowdoin Math 201), Spring 2009.  
 Ordinary Differential Equations (Claremont Math 111), 2 sections in Fall 2020 (online), Fall 2021.

### *Upper Level*

Modern Geometry (Claremont Math 140), Fall 2023.  
 Quantum Computation (Claremont Math 162), Spring 2023.  
 Advanced Topics: Quantum Computation (Claremont Math 195), Spring 2021.  
 Real Analysis (Carleton Math 331), 2 sections in Winter 2017.

Topology (Carleton Math 354), Winter 2010, Winter 2012, Spring 2014.

Seminar in Low-dimensional Topology (Carleton Math 295), Fall 2016.

Topics in Topology (Bowdoin Math 227) Spring 2008.

Surfaces (Carleton senior seminar Math 395), Spring 2011.

Knot Theory (Carleton senior comps seminar Math 395), Winter 2015.

### *Independent Studies*

Senior Thesis in Mathematics (Claremont XMath 190), 1 student, Spring 2022.

Directed Research in Quantum Topology (Claremont Graduate University Math 398), 1 student, Spring 2022.

Topological Quantum Computing (Claremont Math 199/Claremont Graduate University Math 398), 1 student, Fall 2021, and 2 students, Spring 2022.

Directed Research in Mathematics (Claremont Math 197), 4 students, Spring 2019.

Fundamental Group of Surfaces (Carleton Math 392), 3 students, Spring 2017.

Geometry of Surfaces (Carleton Math 392), 3 students, Fall 2015.

Math of Structural Geology (Carleton Math 291), 1 student, Spring 2015.

Applied Calculus (Carleton Math 291), 1 student, Fall 2014.

Kauffman Skein Algebra (Carleton Math 392), 2 students, Spring 2012.

Senior Integrative Exercise (Carleton Math 400), 3 students, 2009-10; 3 students, 2010-11; 2 students, 2013-14; 9 students, 2015-16; 4 students, 2016-17.

## Undergraduate Project Supervisions

### *Directed research while at Claremont McKenna College*

1. Robert Bowden (HMC), Claire Chang (HMC): “Jones-Wenzl Idempotents in the Roger-Yang skein algebra”, Spring and Summer 2023. Robert gave a one-hour talk at the Claremont Topology Seminar, September 2023. Preprint in preparation.
2. Siki Wang (CMC, CGU): “Multiplicative structure of the Kauffman Bracket Skein Algebra of a One-Punctured Torus”, Fall 2021, Spring and Summer 2022. Siki gave a 20-minute talk at Binghamton University Graduate Combinatorics, Algebra, and Topology Conference, November 2022. Preprint in preparation.
3. Miriam Caron (Pitzer), Madeline Brown (Scripps, CGU): “Topological Quantum Computation”, Fall 2021 and Spring 2022.
4. Noah Haig, Matthew Hines, Fred Qin, Hannah Zhang (CMC): “Slipknotting in Proteins”, Spring and Fall 2019, Spring and Summer 2020. Four first-year students.

### *Senior theses supervised while at Claremont McKenna College*

1. Aryaman Gulati: “Knot Theory and Applications to Protein Folding”, 2022.

### *Other projects while at Claremont McKenna College*

1. Ruth Efe (math and economics major): “Economics applications using Differential Equations”, Summer 2020. Developed worksheets and special projects for calculus and differential curriculum.

2. Ryan Burton and Ruth Efe (mathematics-economics dual majors): “Economic applications in Calculus”, Spring 2019. Developed worksheets presenting unusual examples of how calculus can be applied in economics.
3. Samuel Harrison and Annika Ozizmir: “3D-printing”, Spring 2019. Learned how to use a 3D-printer, with goal of developing projects suitable for mathematics classes at all levels.

*Senior comprehensive exercises supervised while at Carleton College*

1. (co-advised with Prof. Joshua Davis) Nathan Bern, Nate Osher, Thomas Redding: “Persistence Homology Applied to Structural Geology”, 2017–2018. Using data consisting of orientations of spinel crystals at a fault site in New Caledonia obtained by Sarah Titus et al. Nathan and Nate continued the project with NSF-funding in Summer 2018.
2. Crystal Lai, Julian Skotheim, Matt Sikkink Johnson: “Finite Generators for the Muller Arc Algebra”, 2015. Julian and Matt each gave a 10-minute presentation at the Joint Mathematics Meetings in Seattle, January 2016.
3. Ross Jennings, Bibek Pokharel, Ken Schiller: “Approximating the Jones polynomial using a Topological Quantum Computer”, 2015.
4. Sarah Milstein, Rachel Schuh, Nora White: “Product-to-Sum Formula for the Roger-Yang Arc Algebra”, 2015.
5. (co-advised with Prof. Stephen Kennedy) Martin Bobb, Dylan Peifer: “Finite Generators for the Roger-Yang Arc Algebra”, 2013-15. Martin and Dylan continued the project with NSF-funding in Summer 2014. Martin and Dylan each gave a 10-minute presentation at the Joint Mathematics Meetings in San Antonio, January 2015. Dylan presented at Binghamton University Graduate Conference in Algebra and Topology, November 2015. Led to two articles, in *Involve* and in *J. of Knot Theory and its Ramifications*.
6. Jonathan Hahn, Collin Hazlett: “Product-to-Sum Formula for a Punctured Torus”, 2012-14. Jon and Collin presented at the Unknot Conference in Denison University, summer 2012.
7. Jeremy Grevet, Qi Li, Daisy Sun: “Products of Site-specific Recombination on Torus Knot Substrates”, 2010-11. Led to an article with Erica Flapan in *J. of the Korean Mathematics Society*.
8. Alex Fisher, Rosemary Phelps, Danny Wells: “On Torus Knots”, 2010.

*Other projects supervised while at Carleton College*

1. Jackson van Fleet Brown (geology major): “Geology applications in Multivariable Calculus”, Spring 2015. Developed calculus curriculum in consultation with geology faculty.
2. Krissy Lunz, Jacque Oman (studio art majors): Carleton Visuality Initiative Grant Project on “Art in Topology and Geometry”, Summer 2010. Created mathematical models for curricular use; later exhibited in Carleton’s Gould Library in Fall 2011.

### Course-related Mathematical Exhibitions

“If It’s Knot Theory, What Is It?” Gould Library, Carleton College, Spring and Summer 2015. Collaboratively designed with students in *Senior Seminar: Knot Theory* and library curator Margaret Pezalla-Granlund. Exhibit was featured in *Northfield News* and selected items were showcased at the University of

Minnesota Women in Math's booth at the Minnesota State Fair 2015.

“Quilting, Copper, and Yarn: Math with Models.” Gould Library, Carleton College, Fall 2011. Featuring models by two studio art majors and wall-cards by students in *Senior Seminar: Surfaces*. Photos and description available at <https://apps.carleton.edu/campus/viz/exhibitions/library/math.with.models/>

“Curating Across Disciplines: Intersections between Mathematics and Art.” Becker Gallery, Bowdoin College Museum of Art, Spring 2008. Collaboratively designed with museum curator Diana Tuite.

### Professional Memberships

Mathematical Association of America (MAA)  
American Mathematical Society (AMS)  
Association for Women in Mathematics (AWM)

Phi Beta Kappa  
Sigma Xi

### Professional Programs

**Invited Participant**, *K3: A new problem list in low-dimensional topology*, Workshop, American Institute of Mathematics, Pasadena, California. October 2023.

**Invited Participant**, *Topological Quantum Computation*, Workshop, International Center for Mathematical Sciences, Edinburgh, Scotland. October 2023.

**Faculty Participant**, *Topological Quantum Computing*, Undergraduate Faculty Program, Park City Mathematics Institute/Institute of Advanced Study. July 2023.

**Faculty Participant**, *Mathematics of Topological Phases of Matter*, Summer School, Institute for Pure & Applied Mathematics, August 2021.

**Short-term Visitor**, Microsoft Station Q, University of California Santa Barbara, March 2019.

**Faculty Participant**, *Elementary Topology in the Undergraduate Curriculum*, Undergraduate Faculty Program, Park City Mathematics Institute/Institute of Advanced Study. July 2011.

**Faculty Fellow**, Green Dot, Project NExT, Mathematics Association of America. 2009-10.

**Postdoctoral Participant**, American Mathematical Society Research Communities in Teichmüller Theory & Low-dimensional Topology, Snowbird, Utah. July 2008.

**Postdoctoral Participant**, Women and Mathematics Program in Knots, Surfaces, the Curve Complex, and Foliations, Institute for Advanced Studies. May 2008.

**Graduate Intern**, Division of Macroeconomic Analysis and Quantitative Studies, United States Federal Reserve Board, Washington, DC. Summer 2001.

**Undergraduate Researcher**, Matrix theory, Research Experience for Undergraduates, College of William and Mary. Summer 1998.

**Study Abroad Student**, University College, Oxford University. Michaelmas 1997.

**Undergraduate Research Assistant**, Department of Chemistry, Pomona College. Summer 1997.

**Undergraduate Participant**, Summer Institute in Mathematical Sciences for Undergraduate Women, UC Berkeley. Summer 1997.

## Service to the Profession

### *Research Conference Organizer*

1. (with Effie Kalfagianni, Christine Lee and Tian Yang) *Workshop on Quantum Invariants and Low-Dimensional Topology*, American Institute of Mathematics, 2023.
2. (with Ko Honda, Aaron Lauda and Yi Ni) *N + 11th Southern California Topology Conference*, held virtually, March 2021.
3. (with Colleen Delaney and Jennifer Franko Vasquez) *Braid Groups and Quantum Computing*, Special Session, AWM Research Symposium, Rice University, April 2019.
4. (with Erica Flapan) *Topology of Biopolymers*, Special Session, AMS sectional meeting, Northeastern University, Boston, MA, April 2018.
5. (with Charles Frohman) *Topological Representation Theory*, Special Session, AMS national meeting (Joint Meetings), Seattle, WA, January 2016.
6. (with Michel Boileau, Louis Funar, Dave Futer, Francois Guéritaud, Ko Honda, Frédéric Paulin) *Classical and quantum hyperbolic geometry and topology: A conference in honor of Francis Bonahon*, Université Paris-Sud (Orsay), France, July 2015. Funded in part by National Science Foundation Conference Grant DMS-11522850, Centre National de la Recherche Scientifique, and Ambassade de France aux États-Unis.
7. (with David Damiano and Scott Taylor) *Topological, Geometric, and Quantum invariants of 3-manifolds*, Special Session, AMS sectional meeting, College of the Holy Cross, Worcester, MA, April 2011.

### *Career Development Support*

**Panelist** for *Career Arcs Panel*, Park City Mathematics Institute, July 2023.

**Panelist** for *Tips & Tricks for Collaboration*, Connection for Women: Quantum Symmetries, Mathematical Sciences Research Institute, January 2020.

**Mentor** for three postdoctoral fellows at Institute for Advanced Study, 2017-18.

**Panelist** for *Women in Science Career Panel*, Women and Mathematics Program, Institute for Advanced Study, May 2018.

**Panelist** for *Mentoring Matters*, sponsored by AWM and MAA, National meeting of MAA (Mathfest), Portland, August 2014.

**Facilitator** for *Topology, Set theory, Logic*, Project NExT small group discussion, National meeting of MAA (Mathfest), Pittsburgh, August 2010.

**Session Organizer** (with T. Mecham, D. Offner, and T. Wakefield) for *Preparing pre-tenure materials*, Project NExT session, National meeting of MAA (Mathfest), Pittsburgh, August 2010.

### *Professional Society Committees*

**AWM Mentoring Grant Selection Committee** 2021-22, committee chair 2023.

**MAA Committee on Merten Hesse Prize** 2020–24.

**MAA Committee on Memberships** 2013-16, 2017-20.

**MAA ad hoc Invited Addresses Committee** 2015-16.

*Editing, Refereeing and Thesis Committees, and other Contributions*

**Contributor** for K3: Problems List in Low-Dimensional Topology, 2023.

**Guest Co-editor** (with E. Flapan) for Special Issue “Topological Methods in Chemistry and Molecular Biology” of *Symmetry*, 2022.

**PhD Thesis Committee Member**, George Washington University, 2021.

**Grants Reviewer**, National Science Foundation, Division of Mathematical & Physical Sciences. Panelist in 2014, 2018, 2020, 2022, 2023; Ad hoc reviewer for Division of Molecular & Cellular Biosciences, 2017.

**Referee** for journals, conference proceedings, and books, including

(mathematics research) *Inventiones Mathematicae*, *J. Knot Theory Ramifications*, *Algebraic Geometry & Topology*, *Topology and Its Applications*, *Selecta Mathematica*, *International Journal of Quantum Information*, *American Journal of Mathematics*, *Journal of Pure and Applied Algebra*.

(general interest mathematics) *American Math. Monthly*, *Rose-Hulman Undergraduate Mathematics Journal*, *Notices of the American Mathematical Society*, *Association for Women in Mathematics Springer Books*, *American Mathematical Society Books*.

(science) *J. Mathematical Chemistry*, *Springer Books Japan*, *PeerJ—Life and Environmental Sciences*.

**Judge**, CCMS Student Poster Session, September 2019; MAA Undergraduate Poster Session, National meeting of the MAA (joint meetings), San Francisco, January 2010.

## Service to the College

*At Claremont McKenna College*

(Departmental)

**Departmental Review Self-Study Committee** 2022-23.

**Integrated Sciences Advisory Committee** 2021-23.

**Student Recruitment Representative** Spring 2023.

(M)Ath Tea Coordinator 2020-present.

**Hiring Committee** for two tenure-track positions, Mathematics and Statistics Department, 2018-19.

(Collegiate)

**Writing Committee**, 2019-21, Spring 2023, 2023-24.

**Faculty-Student Working Group**, Spring 2023.

**Field Investigative Subcommittees**, Spring 2021, Spring 2023.

**Global Education Committee**, Fall 2021.

**National Awards Committee**, Fall 2021.

**Lightning Presentation** on “Oral Exams in Math (and Beyond),” Teaching at CMC: Excellence, Innovation, and Technology, October 2020.

**Emergency Pandemic Child/Dependent Care Committee**, Summer 2020.

**Math Faculty Representative for Student Recruitment**, Preview Program for First-generation Students, October 2019, and Panel on Academic Life for Admitted Students, April 2020.

(Claremont Consortium)

**Claremont Colleges Topology Seminar Co-organizer**, 2018-present.

**Executive Committee**, Claremont Center for Mathematical Sciences, 2021-22.

**Claremont Colleges Mathematics Colloquium Co-chair**, 2019-21.

*At Carleton College*

(Departmental) **Hiring Committee Member**, Winter and Spring 2017. **Faculty Liaison for Mathematics Skills Center and Tutor Training Session Leader**, 2011-12, 2014-18. **Colloquium Coordinator**, 2010-12, 2014-17. **Community Builder**, 2009-10. **Tour of Mathematics Speaker**, Winters 2009-12, 2015, 2017.

(Collegiate) **Student Fellowship Competitions Interviewer** and **Fellowships Committee**, 2014-17. **Career Development Panelist**, *Research Support for Junior Faculty*, sponsored by Learning and Teaching Center, September 2016; and *Junior Sabbatical Info Session*, sponsored by Junior Faculty Affairs, February 2015, January 2017. **Faculty Tutor**, TRIO/Student Support Services, Fall 2010, Fall 2014. **Junior Faculty Affairs Committee Member**, 2010-12.