CLAYTON SHONKWILER
CURRICULUM VITÆ

Education

2009: PhD in Mathematics, University of Pennsylvania
2003: B.S. in Mathematics, Sewanee: The University of the South

Academic Positions

Since 2026: Professor, Department of Mathematics, Colorado State University
2023–2026: Associate Chair, Department of Mathematics, Colorado State University
2020–2026: Associate Professor, Department of Mathematics, Colorado State University
2014–2020: Assistant Professor, Department of Mathematics, Colorado State University
2011–2014: Postdoctoral Associate, Department of Mathematics, University of Georgia
2009–2011: Visiting Assistant Professor, Department of Mathematics, Haverford College

Visits

Winter 2024: Isaac Newton Institute of Mathematical Sciences, Cambridge, UK.
Fall 2020: University of Georgia, Athens, GA.
Fall 2012: Isaac Newton Institute of Mathematical Sciences, Cambridge, UK.

Awards and Fellowships

2018–2019: Section NExT–RM Fellow, MAA Rocky Mountain Section
2017: 2016 Highlight of *J. Phys. A*, Journal of Physics A: Mathematical and Theoretical
2014: University of Georgia Postdoctoral Research Award, University of Georgia Research Foundation
2013: US Junior Oberwolfach Fellow, National Science Foundation
2008–2009: Center for Teaching and Learning Graduate Fellow, University of Pennsylvania
2006, 2007, 2008: Good Teaching Award, Department of Mathematics, University of Pennsylvania

Published Works

Refereed Journal Articles

39. Anthony Caine,[†] Tom Needham, and Clayton Shonkwiler, *Optimization and the Topology of Spaces of Parseval Frames*, SIAM Journal on Matrix Optimization and Applications **47** (2026), no. 3, 1375–1399.
38. Dongwei Chen, Emily J. King, and Clayton Shonkwiler, *Approximately Dual and Pseudo-Dual Probabilistic Frames*, Applied and Computational Harmonic Analysis **84** (2026), 101885.
37. Jason Cantarella, Tetsuo Deguchi, Henrik Schumacher, Clayton Shonkwiler, and Erica Uehara, *Random Knotting in Very Long Off-Lattice Self-Avoiding Polygons*, Journal of Physics A: Mathematical and Theoretical **59** (2026), no. 14, 145205.

[†]CSU graduate student

36. Clayton Shonkwiler and Kandin Theis,* *Direct Sampling of Confined Polygons in Linear Time*, SIAM Journal on Discrete Mathematics **40** (2026), no. 2, 505–535.
35. Jason Cantarella, Andrew Rechnitzer, Henrik Schumacher, and Clayton Shonkwiler, *New Upper Bounds for Stick Numbers*, Journal of Knot Theory and Its Ramifications **35** (2026), no. 8, 2650008.
34. Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Factoring the Laplacian to Understand Topological Polymers*, Europhysics Letters **152** (2025), no. 1, 12001.
33. Tom Needham and Clayton Shonkwiler, *Geometric Approaches to Matrix Normalization and Graph Balancing*, Forum of Mathematics, Sigma **13** (2025), e149.
32. Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *An Exact Formula for the Contraction Factor of a Subdivided Gaussian Topological Polymer*, Journal of Physics A: Mathematical and Theoretical **58** (2025), no. 35, 355201.
31. Samuel A. Ballas, Tom Needham, and Clayton Shonkwiler, *On the Existence of Parseval Frames for Vector Bundles*, Transactions of the American Mathematical Society, Series B **12** (2025), 395–416.
30. Jason Cantarella, Henrik Schumacher, and Clayton Shonkwiler, *A Faster Direct Sampling Algorithm for Equilateral Closed Polygons*, Journal of Physics A: Mathematical and Theoretical **57** (2024), no. 28, 285205.
29. Tom Needham and Clayton Shonkwiler, *Fusion Frame Homotopy and Tightening Fusion Frames by Gradient Descent*, Journal of Fourier Analysis and Applications **29** (2023), no. 4, 51.
28. Vail Baumer,† Erin Gunn,* Valerie Riegle,† Claire Bailey,† Clayton Shonkwiler, and David Prawel, *Robocasting of Ceramic Fischer–Koch S Scaffolds for Bone Tissue Engineering*, Journal of Functional Biomaterials **14** (2023), no. 5, 251 (**Selected as an Editor's Choice**).
27. Thomas D. Eddy† and Clayton Shonkwiler, *New Stick Number Bounds from Random Sampling of Confined Polygons*, Experimental Mathematics **31** (2022), no. 4, 1373–1395 (special issue on Illustration and Visualization in Mathematics Research).
26. Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Radius of Gyration, Contraction Factors, and Subdivisions of Topological Polymers*, Journal of Physics A: Mathematical and Theoretical **55** (2022), no. 47, 475202.
25. Clayton Shonkwiler, *New Superbridge Index Calculations from Non-Minimal Realizations*, Journal of Knot Theory and Its Ramifications **31** (2022), no. 10, 2250063.
24. Tom Needham and Clayton Shonkwiler, *Toric Symplectic Geometry and Full Spark Frames*, Applied and Computational Harmonic Analysis **61** (2022), 254–287.
23. Clayton Shonkwiler, *All Prime Knots Through 10 Crossings Have Superbridge Index* ≤ 5, Journal of Knot Theory and Its Ramifications **31** (2022), no. 4, 2250023.
22. Tom Needham and Clayton Shonkwiler, *Admissibility and Frame Homotopy for Quaternionic Frames*, Linear Algebra and its Applications **645** (2022), 237–255.
21. Brenden Balch,† Chris Peterson, and Clayton Shonkwiler, *Expected Distances on Manifolds of Partially Oriented Flags*, Proceedings of the American Mathematical Society **149** (2021), no. 8, 3553–3567.
20. Tom Needham and Clayton Shonkwiler, *Symplectic Geometry and Connectivity of Spaces of Frames*, Advances in Computational Mathematics **47** (2021), no. 1, 5.
19. Brenden Balch,† Chris Peterson, and Clayton Shonkwiler, *Distributions of Distances and Volumes of Balls in Homogeneous Lens Spaces*, Differential Geometry and its Applications **74** (2021), 101712.

*CSU undergraduate student
†CSU graduate student
*CSU undergraduate student

18. Clayton Shonkwiler, *New Computations of the Superbridge Index*, Journal of Knot Theory and Its Ramifications **29** (2020), no. 14, 2050096.
17. Ryan Blair, Thomas D. Eddy,[†] Nathaniel Morrison, and Clayton Shonkwiler, *Knots with Exactly 10 Sticks*, Journal of Knot Theory and Its Ramifications **29** (2020), no. 3, 2050011.
16. Jason Cantarella, Tom Needham, Clayton Shonkwiler, and Gavin Stewart,[*] *Random Triangles and Polygons in the Plane*, The American Mathematical Monthly **126** (2019), no. 2, 113–134.
15. Laney Bowden,[*] Andrea Haynes,[*] Clayton Shonkwiler, and Aaron Shukert,[*] *Spherical Geometry and the Least Symmetric Triangle*, Geometriae Dedicata **198** (2019), 19–34.
14. Jason Cantarella, Kyle Chapman, Philipp Reiter, and Clayton Shonkwiler, *Open and Closed Random Walks With Fixed Edgelengths in* $\mathbb{R}^d$, Journal of Physics A: Mathematical and Theoretical **51** (2018), no. 43, 434002 (special issue in honor of Stuart Whittington's 75th birthday).
13. Frederick R. Cohen, Rafał Komendarczyk, Robin Koytcheff, and Clayton Shonkwiler, *Homotopy String Links and the* κ*-Invariant*, Bulletin of the London Mathematical Society **49** (2017), no. 2, 246–260.
12. Jason Cantarella, Bertrand Duplantier, Clayton Shonkwiler, and Erica Uehara, *A Fast Direct Sampling Algorithm for Equilateral Closed Polygons*, Journal of Physics A: Mathematical and Theoretical **49** (2016), no. 27, 275202 (**Selected as a 2016 Highlight of J. Phys. A**).
11. Jason Cantarella and Clayton Shonkwiler, *The Symplectic Geometry of Closed Equilateral Random Walks in 3-Space*, Annals of Applied Probability **26** (2016), no. 1, 549–596.
10. Jason Cantarella, Alexander Y. Grosberg, Robert Kusner, and Clayton Shonkwiler, *The Expected Total Curvature of Random Polygons*, American Journal of Mathematics **137** (2015), no. 2, 411–438.
9. Frederick R. Cohen, Rafał Komendarczyk, and Clayton Shonkwiler, *Homotopy Brunnian Links and the* κ*-Invariant*, Proceedings of the American Mathematical Society **143** (2015), no. 3, 1347–1362.
8. Jason Cantarella, Tetsuo Deguchi, and Clayton Shonkwiler, *Probability Theory of Random Polygons from the Quaternionic Viewpoint*, Communications on Pure and Applied Mathematics **67** (2014), no. 10, 1658–1699.
7. Dennis DeTurck, Herman Gluck, Rafał Komendarczyk, Paul Melvin, Haggai Nuchi, Clayton Shonkwiler, and David Shea Vela-Vick, *Generalized Gauss Maps and Integrals for Three-Component Links: Towards Higher Helicities for Magnetic Fields and Fluid Flows, Part 2*, Algebraic and Geometric Topology **13** (2013), no. 5, 2897–2923.
6. Clayton Shonkwiler, *Poincaré Duality Angles and the Dirichlet-to-Neumann Operator*, Inverse Problems **29** (2013), no. 4, 045007.
5. Dennis DeTurck, Herman Gluck, Rafał Komendarczyk, Paul Melvin, Clayton Shonkwiler, and David Shea Vela-Vick, *Generalized Gauss Maps and Integrals for Three-Component Links: Towards Higher Helicities for Magnetic Fields and Fluid Flows*, Journal of Mathematical Physics **54** (2013), no. 1, 013515.
4. Vladimir Sharafutdinov and Clayton Shonkwiler, *The Complete Dirichlet-to-Neumann Map for Differential Forms*, Journal of Geometric Analysis **23** (2013), no. 4, 2063–2080.
3. Clayton Shonkwiler and David Shea Vela-Vick, *Legendrian Contact Homology and Nondestabilizability*, Journal of Symplectic Geometry **9** (2011), no. 1, 33–44.
2. Clayton Shonkwiler and David Shea Vela-Vick, *Higher-Dimensional Linking Integrals*, Proceedings of the American Mathematical Society **139** (2011), no. 4, 1511–1519.
1. Dennis DeTuck, Herman Gluck, Rafał Komendarczyk, Paul Melvin, Clayton Shonkwiler, and David Shea Vela-Vick, *Triple Linking Numbers, Ambiguous Hopf Invariants and Integral Formulas for Three-Component Links*, Matemática Contemporânea **34** (2008), 251–283 (invited contribution to the special volume in honor of Manfredo do Carmo's 80th birthday).

Refereed Proceedings

4. Clayton Shonkwiler, *Looping Animations Using the Modular Flow and Elliptic Functions*, Martin Skrodzki, Kerry Mitchell, Katherine Seaton, and Eve Torrence, editors, *Proceedings of Bridges 2026: Mathematics and the Arts*, Tessellations Publishing, Phoenix, AZ, USA, 2026, 533–536.
3. Henry Adams, Manuchehr Aminian, Elin Farnell, Michael Kirby, Chris Peterson, Joshua Mirth,[†] Rachel Neville, and Clayton Shonkwiler, *A Fractal Dimension for Measures via Persistent Homology*, Nils Baas, Gunnar Carlsson, Marius Thaule, Gereon Quick, and Markus Szymik, editors, *Topological Data Analysis: The Abel Symposium 2018*, volume 15 of *Abel Symposia*, Springer, Cham, 2020, 1–31.
2. Clayton Shonkwiler, *Stiefel Manifolds and Polygons*, Susan Goldstine, Douglas McKenna, and Kristóf Fenyvesi, editors, *Proceedings of Bridges 2019: Mathematics, Art, Music, Architecture, Education, Culture*, Tessellations Publishing, Phoenix, AZ, USA, 2019, 187–194.
1. Clayton Shonkwiler, *The Geometry of Constrained Random Walks and an Application to Frame Theory*, 2018 IEEE Statistical Signal Processing Workshop (SSP), Freiburg, Germany, 343–347.

Refereed Book Chapters

2. Dustin G. Mixon, Tom Needham, Clayton Shonkwiler, and Soledad Villar, *Three Proofs of the Benedetto–Fickus Theorem*, Stephen D. Casey, M. Maurice Dodson, Paulo J.S.G. Ferreira, and Ahmed Zayed, editors, *Sampling, Approximation, and Signal Analysis: Harmonic Analysis in the Spirit of J. Rowland Higgins*, Applied and Numerical Harmonic Analysis, Birkhäuser, Cham, 2023, 371–391.
1. Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Exact Evaluation of the Mean Square Radius of Gyration for Gaussian Topological Polymer Chains*, Yasuyuki Tezuka and Tetsuo Deguchi, editors, *Topological Polymer Chemistry: Concepts and Practices*, Springer, Singapore, 2022, 37–63.

Non-Refereed Proceedings

3. Tom Needham and Clayton Shonkwiler, *Symplectic Geometry and Frame Theory*, Oberwolfach Reports **15** (2018), no. 4, 2786–2789.
2. Martin Ehler, Milena Hering, Christopher Manon, Tom Needham, and Clayton Shonkwiler, *The Paulsen Problem Made Symplectic*, Oberwolfach Reports **15** (2018), no. 4, 2790–2794.
1. Jason Cantarella and Clayton Shonkwiler, *The Symplectic Geometry of Polygon Space*, Oberwolfach Reports **10** (2013), no. 2, 1347–1350.

Book Reviews

1. Reviewed by Clayton Shonkwiler, *Visual Differential Geometry and Forms: A Mathematical Drama in Five Acts*, The American Mathematical Monthly **129** (2022), no. 8, 795–800.

Theses

- Clayton Shonkwiler, *Poincaré Duality Angles for Riemannian Manifolds with Boundary*, Ph.D. thesis, University of Pennsylvania, 2009.

[†]CSU graduate student

Submitted Papers

- Emily Tibor, Elizabeth M. Annoni, Erin Brine-Doyle, Nicole Kumerow, Madeline Shogren, Jason Cantarella, Clayton Shonkwiler, and Eric J. Rawdon, *Performance of the Uniform Closure Method for open knotting as a Bayes-type classifier*, 2020, `arXiv:2011.08984 [math.GT]`.
- Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Random Graph Embeddings With General Edge Potentials*, 2022, `arXiv:2205.09049 [cond-mat.stat-mech]`
- Jason Cantarella, Henrik Schumacher, and Clayton Shonkwiler, *On the Average Squared Radius of Gyration of a Family of Embeddings of Subdivision Graphs*, 2024, `arXiv:2409.18767 [math.CO]`
- Mason Faldet[†] and Clayton Shonkwiler, *Sampling Finite Unit Norm Tight Frames Using Symplectic Geometry*, 2025, `arXiv:2505.22847 [math.FA]`
- Dongwei Chen, Emily J. King, and Clayton Shonkwiler, *A Land of Oblique Duality for Frames and Probabilistic Frames*, 2026, `arXiv:2601.08028 [math.FA]`
- Jason Cantarella, Henrik Schumacher, and Clayton Shonkwiler, *Hard Unknots are Often Easy from a Different Perspective*, 2026, `arXiv:2607.28772 [math.GT]`

Contracts and Grants

Externally-Funded Projects as PI

2021–2025: Standard Grant, National Science Foundation, $223,999.
2020–2025: Collaboration Grant, Simons Foundation, $42,000. (Declined after year 1 due to receiving an NSF grant)
2015–2020: Collaboration Grant, Simons Foundation, $35,000.
2013–2015: AMS–Simons Travel Grant, American Mathematical Society, $4800.

Externally-Funded Projects as Co-PI

2014–2015: Workshop on Symplectic and Algebraic Geometry in the Statistical Physics of Polymers, Simons Center for Geometry and Physics, $30,000.

Talks and Presentations

Invited Conference and Workshop Talks

2026: 9th International Conference on Computational Harmonic Analysis, Nashville, TN
2026: AMS Special Session on Applications of Knot Theory, AMS Spring Southeastern Sectional Meeting, Savannah, GA
2026: AMS Special Session on Geometric Methods for Data Science, AMS Spring Southeastern Sectional Meeting, Savannah, GA
2025: Workshop on Geometric Analysis Celebrating Heiko von der Mosel's Birthday, Steinfeld, Germany
2025: CREST Mini-Workshop on Polymer Models, Ochanomizu University, Tokyo, Japan
2025: AMS Special Session on Results on Curves and Surfaces Inspired by Experiment, Joint Mathematics Meetings, Seattle, WA
2024: Minisymposium on Interactions Among Analysis, Optimization and Network Science, 9th Annual Meeting of the SIAM Central States Section, Kansas City, MO

[†]CSU graduate student

2024: Workshop on Recent Progress on Optimal Point Distributions and Related Fields, ICERM, Providence, RI
2024: Workshop on Knot Theory Informed by Random Models and Experimental Data, Banff International Research Station, Banff, Canada
2024: Special Session on Geometry and Symmetry in Data Science, AMS Spring Southeastern Sectional Meeting, Tallahassee, FL
2023: Special Session on Applied Knot Theory, AMS Fall Central Sectional Meeting, Omaha, NE
2023: Minisymposium on Aspects of Flag Manifolds with a View Towards Applications, SIAM Conference on Applied Algebraic Geometry, Eindhoven, Netherlands.
2023: Special Session on Harmonic Analysis and its Applications to Signals and Information, AMS Spring Central Sectional Meeting, Cincinnati, OH
2022: Minisymposium "Geometric Methods in Inverse Problems", dedicated to the 75th anniversary of Professor Vladimir Sharafutdinov, Quasilinear Equations, Inverse Problems and Their Applications (QIPA 2022), virtual
2022: Special Session on Presenting Research Mathematics Through Visual Storytelling: Slides Without Words and Equations, Joint Mathematics Meetings, virtual
2021: Minisymposium on Interactions Among Analysis, Optimization and Network Science, SIAM Central States Sectional Meeting, virtual
2021: Wolfram Summer School 2021, Educational Innovation Track, virtual
2020: Special Session on Applied Knot Theory, AMS Fall Southeastern Sectional Meeting, virtual
2020: Special Session on Group Actions in Harmonic Analysis, Joint Mathematics Meetings, Denver, CO
2019: Minisymposium on Interactions Among Analysis, Optimization and Network Science, SIAM Northern States Sectional Meeting, Laramie, WY
2019: Minisymposium on Algebra, Geometry, and Combinatorics of Subspace Packings, SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland
2019: Tensors: Algebra–Computation–Applications (TACA 2019), Boulder, CO
2019: Southeast Center for Mathematics and Biology Annual Symposium, Atlanta, GA
2018: Symposium of Physics and Mathematics, Morelia, Mexico
2018: Mini-Workshop on Algebraic, Geometric, and Combinatorial Methods in Frame Theory, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany
2018: Session on Applications of Knot Theory to Physical Sciences, 33rd Summer Conference on Topology and its Applications, Bowling Green, KY
2018: Special Session on Topology of Biopolymers, AMS Spring Eastern Sectional Meeting, Boston, MA
2018: Special Session on Geometric Methods in Shape Analysis, AMS Spring Central Sectional Meeting, Columbus, OH
2017: CMO–BIRS Workshop on the Geometry and Topology of Knotting and Entanglement in Proteins, Oaxaca, Mexico
2017: Special Session on Differential Geometry of Smooth and Discrete Surfaces in Euclidean and Lorentz Spaces, AMS Fall Central Sectional Meeting, Denton, TX
2017: International Workshop on Knots and Polymers, Tokyo, Japan
2017: Minisymposium on Polyhedral and Combinatorial Biology, SIAM Conference on Applied Algebraic Geometry, Atlanta, GA
2017: Special Session on Knot Theory and its Applications, AMS Spring Southeastern Sectional Meeting, Charleston, SC
2016: Special Session on Knotting in Physical Systems, in celebration of Kenneth C. Millett's 75th birthday, AMS Fall Central Sectional Meeting, Minneapolis, MN

2016: Geometry for Signal Processing and Machine Learning, Estes Park, CO
2016: Minisymposium on Molecular Biosciences and Biophysics – Macromolecular Structures and Interactions, SIAM Conference on the Life Sciences (LS16), Boston, MA
2016: Workshop on Illustrating Mathematics, ICERM, Providence, RI
2015: Workshop on Symplectic and Algebraic Geometry in the Statistical Physics of Polymers, Simons Center for Geometry and Physics
2015: Minisymposium on Aspects of Grassmann Manifolds With a View Towards Applications, SIAM Conference on Applied Algebraic Geometry (AG15), Daejeon, South Korea
2014: Special Session on Knot Theory and Its Applications, AMS Fall Southeastern Sectional Meeting, Greensboro, NC
2013: Georgia Topology Conference, Athens, GA
2013: Workshop on Geometric Knot Theory, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany
2012: Quantized Flux in Tightly Knotted and Linked Systems, Isaac Newton Institute, Cambridge, UK
2012: Mini-Symposium on Inverse Problems in Geometry, Inverse Problems Conference in Honor of Gunther Uhlmann, Irvine, CA
2012: Special Session on Low-Dimensional Topology, AMS Spring Southeastern Section Meeting, Tampa, FL
2011: Special Session on Geometric Knot Theory and Its Applications, AMS Fall Southeastern Section Meeting, Winston-Salem, NC
2011: Special Session on Low-Dimensional Topology and Geometry, AMS Fall Southeastern Section Meeting, Winston-Salem, NC
2011: Workshop on Entanglement and Linking, Centro di Ricerca Matematica Ennio de Giorgi, Pisa, Italy
2011: Southeast Geometry Conference, Columbia, SC
2011: Special Session on Knots, Links, 3-Manifolds, and Physics, Joint Mathematics Meetings, New Orleans, LA

Refereed Conference and Session Talks

2026: Bridges 2026, Galway, Ireland
2022: Workshop on Topological Methods in Mathematical Physics, International School of Mathematics, «Ettore Majorana» Foundation and Centre for Scientific Culture, Erice, Italy
2019: Bridges 2019, Linz, Austria
2016: IUTAM Symposium on Helicity: Structures and Singularity in Fluid and Plasma Dynamics, Venice, Italy
2013: AMS Session on Geometry and Differential and Hyperbolic Geometry, Joint Mathematics Meetings, San Diego, CA
2012: Tangled Magnetic Fields in Astro- and Plasma Physics, International Centre for Mathematical Sciences, Edinburgh, UK
2009: Lehigh University Geometry and Topology Conference, Bethlehem, PA
2008: Graduate Student Topology Conference, Champaign–Urbana, IL

Colloquium and General Audience Talks

2024: Mathematics Colloquium, Creighton University
2021: Mathematics Colloquium, United States Naval Academy

2016: Mathematics in Science and Society Lecture Series, University of Illinois
2015: Graduate Student Colloquium, Louisiana State University
2015: Mathematics Colloquium, Wake Forest University
2014: Mathematics Colloquium, Colorado State University
2014: Mathematics Colloquium, Saint Louis University
2014: Mathematics Colloquium, California State University, Fullerton
2014: Mathematics Colloquium, Ball State University
2014: Mathematics Colloquium, Gettysburg College
2014: Mathematics Colloquium, Amherst College
2014: Mathematics Colloquium, Butler University
2014: Mathematics Colloquium, University of Rochester
2014: Mathematics Colloquium, Utah State University
2013: Mathematics Colloquium, Wichita State University
2013: Mathematics Colloquium, Fordham University
2013: Mathematics Colloquium, Georgia Southern University
2009: Bi–Co Math Colloquium, Bryn Mawr College
2008: Sewanee Homecoming Lecture, Sewanee: The University of the South

Seminar Talks

2026: CodEx Seminar, Virtual
2025: Polymer Physics Seminar, Ochanomizu University, Tokyo, Japan
2023: Seminar GEOTOP-A, Virtual
2022: Algebraic Geometry and Geometric Topology Seminar, Tulane University
2022: Geometric Analysis Seminar, Iowa State University
2021: Codes and Expansions (CodEx) Seminar, Virtual
2021: Geometric Structures Seminar, SISSA, Trieste, Italy
2021: Geometry/Topology Seminar, University of California, Davis
2020: RTG Seminar, School of Mathematical and Statistical Sciences, Arizona State University
2019: Geometry Seminar, University of Georgia
2018: Pure Math Seminar, Montana State University
2018: Applied Math Seminar, Montana State University
2018: Topology Geometry Seminar, University of Oregon
2017: Probability Seminar, University of Colorado Boulder
2016: Geometry, Groups, and Dynamics/GEAR Seminar, University of Illinois
2016: Geometry–Topology Seminar, University of Pennsylvania
2016: Geometry Seminar, University of Georgia
2015: Virtual/Topology Seminar, Louisiana State University
2015: BK21 Seminar, Korea Advanced Institute for Science and Technology (KAIST), Daejeon, South Korea
2015: Center for Computational Math Seminar, University of Colorado Denver
2015: Geometry Seminar, University of Georgia
2014: Geometry, Mathematical Physics, and Computer Algebra Seminar, Utah State University
2013: Geometry Seminar, University of Georgia
2013: Geometry–Topology Seminar, University of Pennsylvania
2013: Analysis, Geometry and Stochastics Seminar, Friedrich-Schiller-Universität, Jena, Germany

2013: Topology/Virtual Seminar, Louisiana State University
2012: Geometry Seminar (two talks), University of Manchester, Manchester, UK
2012: Topological Dynamics Programme Seminar, Isaac Newton Institute, Cambridge, UK
2012: Topology Seminar, University of Georgia
2011: Geometry–Topology Seminar, Georgia Institute of Technology
2011: Geometry and Topology Seminar, Tulane University
2010: Geometry–Topology Seminar, University of Pennsylvania
2010: VIGRE Colloquium, University of Georgia
2010: Geometry and Topology Seminar, Tulane University
2010: Geometry Seminar, University of Rochester
2009: Geometry–Topology Seminar, University of Pennsylvania
2009: Geometry and Topology Seminar, California Institute of Technology
2009: Geometry/Topology Seminar, Duke University
2008: Geometry–Topology Seminar, Temple University

Refereed Posters

2018: IEEE Statistical Signal Processing Workshop, Freiburg, Germany

Mentorship

Undergraduate Students

Undergraduate Research: Kandin Theis (2024–2025), Erin Gunn (2021–2023), Yekaterina Aimukanova (2019–2020), Nikita Lavrenov (2019–2020), Bogdan Vasilchenko (2019–2020), Nikolai Sannikov (2017–2019), Laney Bowden (2017–2018), Aaron Shukert (2017–2018), Andrea Haynes (2017), Gavin Stewart (2015–2016)
Independent Study: Leah Gibson (2020), Tucker Manton (2016)
Honors Thesis: Jillian Eddy (2021)

Graduate Students

Current Graduate Advisees: Joe Geisz (PhD), Page Wilson (PhD; MS 2025)
Graduate Degrees completed under my Supervision: Tristan Neighbors (PhD 2026, MS 2023), Page Wilson (MS 2025), Anthony Caine (PhD 2024), Brian Collery (PhD 2024), Colin Roberts (PhD 2022), Thomas Eddy (MS 2019)

Postdoctoral Fellows

Former Postdocs: Dongwei Chen (2024–2026), Harrison Chapman (2017–2019)

Professional Affiliations and Activities

Member: American Mathematical Society, Mathematical Association of America

Miscellaneous Editorial:

- Reporter ("Berichterstatter") for Oberwolfach Report 22/2013
- Founding Editorial Board Member, AMS Graduate Student Blog

Grant Reviews:

- NSF Panel: 2023
- Individual Grant Review: US–Israel Binational Science Foundation (2019)

Manuscript Refereeing: Aequationes Mathematicae, Arabian Journal of Mathematics, Arnold Mathematical Journal, The American Mathematical Monthly, Cambridge University Press, Contemporary Mathematics, Discrete Mathematics, Algorithms and Applications, Differential Geometry and its Applications, Experimental Mathematics, Journal of Applied Probability, Journal of Geometry and Physics, Journal of Knot Theory and its Ramifications, Journal of Physics: Conference Series, Journal of Physics A: Mathematical and Theoretical, Journal of Topology and Analysis, Linear Algebra and its Applications, Linear and Multilinear Algebra, Macromolecular Theory and Simulations, Molecular Based Mathematical Biology, SIAM Review, Symmetry, Topology and its Applications, Transactions of the American Mathematical Society.
Reviewer for *Mathematical Reviews*, *Zentralblatt*

Organization

Fall 2025: Special Session on Recent Progress in Frame Theory and Harmonic Analysis, AMS 2025 Fall Western Sectional Meeting, Denver, CO.

Summer 2023: Minisymposium on Aspects of Flag Manifolds with a View Towards Applications, SIAM Conference on Applied Algebraic Geometry (AG23), Eindhoven, Netherlands.

Spring 2023: Colorado Conference for Underrepresented Students in Mathematics, Fort Collins, CO.

Spring 2019: Section NExT workshop on Getting Started with Undergraduate Research, MAA Rocky Mountain Section Meeting, Durango, CO.

Winter 2017: MAA Invited Paper Session on Random Polygons and Knots, Joint Mathematics Meetings, Atlanta, GA.

Fall 2015: Workshop on Symplectic and Algebraic Geometry in the Statistical Physics of Polymers, Simons Center for Geometry and Physics, Stony Brook, NY.

2013–2014: VIGRE Seminar, University of Georgia.

Summer 2013: Georgia Topology Conference, Athens, GA.

Spring 2011: Geometry Festival, Philadelphia, PA.

2010: Bi-Co Mathematics Colloquium, Haverford and Bryn Mawr Colleges, PA.

Consulting

2018: OpenStax – Reviewed 2 chapters of proposed open-source Linear Algebra textbook.

2017–2018: Koppa Research – Reviewed differential geometry content of research reports.

Outreach

Public and K–12 Outreach

Spring 2024: Talk on careers in math, Math Club, Rocky Mountain High School
Winter 2021: Animator for "The Riemann Hypothesis, Explained," Quanta Magazine, `https://youtu.be/zlm1aajH6gY` (5,700,000+ views)
Summer 2019: CSU Math Jam session on Visualizing Higher Dimensions, session creator and facilitator
Fall 2016–2019, 2023: CSU Math Day team competition moderator
Fall 2016–2017: El Centro Math–Science–Tech Day session on Twisty Turny Knots, co-presenter
Fall 2015: Geometry and Topology Today Video on the Mathematics of Polygons and Polymers, ⟨Sci|State⟩, `https://youtu.be/wcHHRwAfwAo`

Undergraduate Outreach

Spring 2026: McNair Scholars Panel on Graduate School, Colorado State University
Spring 2016, 2017, 2019, 2026: Judge for Multicultural Undergraduate Research, Art & Leadership Symposium (MURALS), Colorado State University
Fall 2014, 2016, 2021, 2025: Invited guest lecture/activity, Math 192, Colorado State University
Fall 2023: Three-week minicourse on Knot Theory, Math 192, Colorado State University
Summer 2021: Mentor for Educational Innovation track at Wolfram Summer School 2021
Spring 2017: Panel discussion facilitator, Calculating Your Career event, Colorado State University
Fall 2015: Invited Student Colloquium talk, Louisiana State University
Fall 2015: Invited guest lecture, Math 331, Wake Forest University
Spring 2015: Invited Math Club talk, University of Georgia
Fall 2014: Invited Math Club talk, Colorado State University
Fall 2013: Invited Undergraduate Colloquium talk, University of Pennsylvania

Graduate Student Outreach

Spring 2021: Panel on Academia, Department of Mathematics, Colorado State University
Fall 2019: Panel on Collaboration, student AMS chapter, Department of Mathematics, Colorado State University
Fall 2015: Geometry and Topology Today Video on Random Polygons and Polymers, ⟨Sci|State⟩
Fall 2014: Panel on Applying for Jobs, student SIAM chapter, Department of Mathematics, Colorado State University

Mathematical Visualization and Artistic Activities

August 5–8, 2026: *Grid*, ink on paper, Bridges Conference Art Exhibition, Galway, Ireland (Juried exhibition)
Starting December 3, 2024: *Modular Flow*, digital animation, Mathematical Art Digital Exhibition at Queens College (MADE@QC), New York, NY and online (Juried exhibition)
February 28–April 8, 2022: *Light and Dark*, *Dawn*, and *Viewpoints Matter*, digital and analog media, Art and Science Exhibition, Curfman Gallery, Colorado State University, Fort Collins, CO (Juried exhibition)

January 15–18, 2020: *Light and Dark* and *Minimal*, mixed media, Joint Mathematics Meetings Art Exhibition, Denver, CO (Juried exhibition)

July 16–19, 2019: *A to Z* and *Truncation*, mixed media, Bridges Conference Art Exhibition, Linz, Austria (Juried exhibition)

June 26–August 11, 2019: *Part of the Journey*, *Rotation*, and *Unoriented*, digital media, Electronic Language International Festival (FILE) 2019, São Paulo, Brazil (Invited group exhibition)

May 18, 2019: *Allegory*, *Master Control Program*, and *Part of the Journey*, digital media, Rare Art Festival, Brooklyn, NY (Juried exhibition)

March 2019: *Icosa* in *JaamZIN Creative*, Mar. 2019, p. 22

February 26–March 27, 2019: *A to Z*, *Inside*, and *Truncation*, digital and analog media, Art and Science Exhibition, Curfman Gallery, Colorado State University, Fort Collins, CO (Juried exhibition)

2019: Designed 2019 t-shirt for SIAM Student Chapter, Department of Mathematics, Colorado State University, Fort Collins, CO

November 26–December 13, 2018: *Coalesce*, *My Destination*, and *Unoriented*, digital and analog media, Art and Science Pop-Up Exhibition, Colorado State University, Fort Collins, CO (Invited group exhibition)

2018: *Geometric Allegories* in Amber Young, Lucian Föhr, and Todd Berger (curators), *Make Good*, Hemlock Printers, p. 34

January 10–13, 2018: *Stereo Vision* and *Tangents*, digital prints, Joint Mathematics Meetings Art Exhibition, San Diego, CA (Juried exhibition)

Summer 2017: Jury member for FILE GIF 2017, São Paulo, Brazil

May 15–21, 2017: *Horizon*, digital media, MediaLive, Boulder Museum of Contemporary Art, Boulder, CO (Juried exhibition)

February 21–March 24, 2017: *Coalesce*, *My Destination*, and *Unoriented*, digital and analog media, Art and Science Exhibition, Curfman Gallery, Colorado State University, Fort Collins, CO (Juried exhibition)

Winter 2017: Created opening animation for Gathering 4 Gardner videos, `gathering4gardner.org`

January 4–7, 2017: *Rotation* and *My Destination*, digital media, Joint Mathematics Meetings Art Exhibition, Atlanta, GA (Juried exhibition)

July 11–August 28, 2016: *Coalesce*, *Come Along*, *Derange*, *Epicenter*, and *Reinvention*, digital media, Electronic Language International Festival (FILE) 2016, São Paulo, Brazil (Invited group exhibition)

Dec. 22, 2015: *Isometries*, digital media, winner of *Minimalissimo* minimalism contest

Sept. 23–25, 2015: *Rotation*, *Swing*, *Tetraplex*, and *Veil*, digital media, The Graphical Web 2015 Art Exhibition, Pittsburgh, PA (Juried exhibition)

July 29–August 1, 2015: *Threes*, print, Bridges Conference Art Exhibition, Baltimore, MD (Juried exhibition)

June 27–July 25, 2015: *Threes*, print, Bridges 2015: Connections Between Mathematics and Art, Center for the Arts, Towson University, Towson, MD (Juried exhibition)