

# 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 2020: 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.  
2012: Visiting Researcher, Isaac Newton Institute of Mathematical Sciences, Cambridge, UK.  
2009–2011: Visiting Assistant Professor, Department of Mathematics, Haverford College.

## 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

26. Clayton Shonkwiler, *New Superbridge Index Calculations from Non-Minimal Realizations*, Journal of Knot Theory and Its Ramifications, doi: 10.1142/S0218216522500638.
25. Tom Needham and Clayton Shonkwiler, *Toric Symplectic Geometry and Full Spark Frames*, Applied and Computational Harmonic Analysis **61** (2022), 254–287.
24. Clayton Shonkwiler, *All Prime Knots Through 10 Crossings Have Superbridge Index  $\leq 5$* , Journal of Knot Theory and Its Ramifications **31** (2022), no. 4, 2250023.
23. Tom Needham and Clayton Shonkwiler, *Admissibility and Frame Homotopy for Quaternionic Frames*, Linear Algebra and its Applications **645** (2022), 237–255.
22. Thomas D. Eddy<sup>†</sup> and Clayton Shonkwiler, *New Stick Number Bounds from Random Sampling of Confined Polygons*, Experimental Mathematics (2021), DOI: 10.1080/10586458.2021.1926000.
21. Brenden Balch,<sup>†</sup> 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.

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<sup>†</sup>CSU graduate student

19. Brenden Balch,<sup>†</sup> Chris Peterson, and Clayton Shonkwiler, *Distributions of Distances and Volumes of Balls in Homogeneous Lens Spaces*, *Differential Geometry and its Applications* **74** (2021), 101712.
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,<sup>†</sup> 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  $\kappa$ -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  $\kappa$ -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.

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\*CSU undergraduate student

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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

3. Henry Adams, Manuchehr Aminian, Elin Farnell, Michael Kirby, Chris Peterson, Joshua Mirth,<sup>†</sup> 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*, Proceedings of Bridges 2019: Mathematics, Art, Music, Architecture, Education, Culture, Linz, Austria, 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

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* (2022), DOI: 10.1080/00029890.2022.2094677.

### Theses

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

### Submitted Papers

- Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Gaussian Random Embeddings of Multigraphs*, 2020, arXiv:2001.11709 [cond-mat.stat-mech].

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<sup>†</sup>CSU graduate student

- Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Radius of Gyration, Contraction Factors, and Subdivisions of Topological Polymers*, 2020, arXiv:2004.06199 [cond-mat.stat-mech].
- 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].
- Dustin G. Mixon, Tom Needham, Clayton Shonkwiler, and Soledad Villar, *Three Proofs of the Benedetto–Fickus Theorem*, 2021, arXiv:2112.02916 [math.MG]
- Jason Cantarella, Tetsuo Deguchi, Clayton Shonkwiler, and Erica Uehara, *Random graph embeddings with general edge potentials*, 2022, arXiv:2205.09049 [cond-mat.stat-mech]

## Contracts and Grants

### Externally-Funded Projects as PI

2021–2024: 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 Talks

2019: Southeast Center for Mathematics and Biology Annual Symposium, Atlanta, GA

2018: Symposium of Physics and Mathematics, Morelia, Mexico

2017: International Workshop on Knots and Polymers, Tokyo, Japan

2012: Quantized Flux in Tightly Knotted and Linked Systems, Isaac Newton Institute, Cambridge, UK

2011: Southeast Geometry Conference, Columbia, SC

### Invited Workshop Talks

2021: Wolfram Summer School 2021, Educational Innovation Track, virtual

2019: Tensors: Algebra–Computation–Applications (TACA 2019), Boulder, CO

2018: Mini-Workshop on Algebraic, Geometric, and Combinatorial Methods in Frame Theory, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany

2017: CMO–BIRS Workshop on the Geometry and Topology of Knotting and Entanglement in Proteins, Oaxaca, Mexico

2016: Geometry for Signal Processing and Machine Learning, Estes Park, CO

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

- 2013: Workshop on Geometric Knot Theory, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany
- 2011: Workshop on Entanglement and Linking, Centro di Ricerca Matematica Ennio de Giorgi, Pisa, Italy

### **Invited Special Session and Minisymposium Talks**

- 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
- 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
- 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: Special Session on Differential Geometry of Smooth and Discrete Surfaces in Euclidean and Lorentz Spaces, AMS Fall Central Sectional Meeting, Denton, TX
- 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: Minisymposium on Molecular Biosciences and Biophysics – Macromolecular Structures and Interactions, SIAM Conference on the Life Sciences (LS16), Boston, MA
- 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
- 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: Special Session on Knots, Links, 3-Manifolds, and Physics, Joint Mathematics Meetings, New Orleans, LA

### **Refereed Conference and Session Talks**

- 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**

- 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**

- 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

### **Poster Presentations**

2018: IEEE Statistical Signal Processing Workshop, Freiburg, Germany

### **Mentorship**

#### **Undergraduate Students**

**Undergraduate Research:** Erin Gunn (2021–), 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:** Anthony Caine (PhD), Brian Collery (PhD), Tristan Neighbors (PhD), Colin Roberts (PhD)

**Graduate Degrees completed under my Supervision:** Thomas Eddy (MS 2019)

#### **Postdoctoral Fellows**

**Former Postdocs:** 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

**Manuscript Refereeing:** Aequationes Mathematicae, Arnold Mathematical Journal, 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, Molecular Based Mathematical Biology, SIAM Review, Symmetry, Topology and its Applications.

Reviewer for *Mathematical Reviews*, *Zentralblatt*

## Organization

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

Winter 2021: Animator for “The Riemann Hypothesis, Explained,” Quanta Magazine, <https://youtu.be/z1m1aaJH6gY> (2,200,000+ views)

Summer 2019: CSU Math Circles session on Visualizing Higher Dimensions, session creator and facilitator

Fall 2016–2019: 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> (7000+ views)

### Undergraduate Outreach



Fall 2021: Invited guest lecture, Math 192, Colorado State University  
 Summer 2021: Mentor for Educational Innovation track at Wolfram Summer School 2021  
 Spring 2016, 2017, 2019: Judge for Multicultural Undergraduate Research, Art & Leadership Symposium (MURALS), Colorado State University  
 Spring 2017: Panel discussion facilitator, Calculating Your Career event, Colorado State University  
 Fall 2016: Invited guest lecture, Math 192, 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 guest lecture, Math 192, Colorado State University  
 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), <https://youtu.be/PewQCJnmDaQ> (2800+ views)  
 Fall 2014: Panel on Applying for Jobs, student SIAM chapter, Department of Mathematics, Colorado State University

### **Mathematical Visualization and Artistic Activities**

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](http://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)