

# Curriculum Vitae

**Name** Clayton Shonkwiler

**Address** Colorado State University  
Department of Mathematics  
1874 Campus Delivery  
Fort Collins, CO 80523–1874

**Phone** (970).491.1822

## Education

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

## Academic Positions

since 2014: 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

16. Jason Cantarella, Tom Needham, Clayton Shonkwiler, and Gavin Stewart\*, *Random Triangles and Polygons in the Plane*, The American Mathematical Monthly, to appear.
15. Laney Bowden\*, Andrea Haynes\*, Clayton Shonkwiler, and Aaron Shukert\*, *Spherical Geometry and the Least Symmetric Triangle*, *Geometriae Dedicata* (2018), <https://doi.org/10.1007/s10711-018-0327-4>.
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).

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\*CSU undergraduate student

13. Frederick R. Cohen, Rafal 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, Rafal 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, Rafal 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, Rafal 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, Rafal 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

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

### Published Abstracts

- Tom Needham and Clayton Shonkwiler, *Symplectic Geometry and Frame Theory*, Oberwolfach Reports (2018), to appear
- Martin Ehler, Milena Hering, Christopher Manon, Tom Needham, and Clayton Shonkwiler, *The Paulsen Problem Made Symplectic*, Oberwolfach Reports (2018), to appear

- Clayton Shonkwiler, *The Symplectic Geometry of Polygon Space*, Oberwolfach Reports **10** (2013), no. 2, 1347–1350

### Theses

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

### Submitted Papers

- Tom Needham and Clayton Shonkwiler, *Symplectic Geometry and Connectivity of Spaces of Frames*, 2018, arXiv:1804.05899 [math.FA]
- 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*, 2018, arXiv:1808.01079 [math.DS]

### Contracts and Grants

#### Externally-Funded Projects as PI

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.

### Recent Papers Presented/ Symposia/ Invited Lectures/ Professional Meetings/ Workshops

2018: Pure Math Seminar, Montana State University

2018: Applied Math Seminar, Montana State University

2018: Topology Geometry Seminar, University of Oregon

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

2018: 33rd Summer Conference on Topology and its Applications, Bowling Green, KY, invited special session speaker

2018: AMS Special Session, Boston, MA, invited speaker

2018: MAA Sectional Meeting, Greeley, CO, Section NExT–RM workshop participant

2018: AMS Special Session, Columbus, OH, invited speaker

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

2017: Probability Seminar, University of Colorado Boulder

2017: AMS Special Session, Denton, TX, invited speaker

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

2017: SIAM Conference on Applied Algebraic Geometry, Atlanta, GA, invited minisymposium speaker

2017: AMS Special Session, Charleston, SC, invited speaker

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<sup>†</sup>CSU graduate student

2017: Joint Mathematics Meetings, Atlanta, GA, organizer of MAA Invited Paper Session

2016: Mathematics in Science and Society Colloquium, University of Illinois

2016: Geometry, Groups, and Dynamics/GEAR Seminar, University of Illinois

2016: AMS Special Session, Minneapolis, MN, invited speaker

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

2016: Geometry–Topology Seminar, University of Pennsylvania

2016: SIAM Conference on the Life Sciences (LS16), Boston, MA, invited minisymposium speaker

2016: Workshop on Illustrating Mathematics, ICERM, Providence, RI, invited speaker

2016: IUTAM Symposium on Helicity: Structures and Singularity in Fluid and Plasma Dynamics, Venice, Italy, refereed talk

2016: Geometry Seminar, University of Georgia

2015: Virtual/Topology Seminar, Louisiana State University

2015: Graduate Student Colloquium, Louisiana State University

2015: Workshop on Symplectic and Algebraic Geometry in the Statistical Physics of Polymers, Simons Center for Geometry and Physics, organizer

2015: Mathematics Colloquium, Wake Forest University

2015: BK21 Seminar, Korea Advanced Institute for Science and Technology (KAIST), Daejeon, South Korea

2015: SIAM Conference on Applied Algebraic Geometry (AG15), Daejeon, South Korea, invited minisymposium speaker

2015: Joint Center for Computational Math and Discrete Math Seminar, University of Colorado Denver

2015: Geometry Seminar, University of Georgia

2014: AMS Special Session, Greensboro, NC, invited speaker

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

2014: Geometry, Mathematical Physics, and Computer Algebra Seminar, Utah State University

2013: Mathematics Colloquium, Wichita State University

2013: Mathematics Colloquium, Fordham University

2013: Mathematics Colloquium, Georgia Southern University

2013: Geometry Seminar, University of Georgia

2013: Geometry–Topology Seminar, University of Pennsylvania

2013: Georgia Topology Conference, Athens, GA, organizer and minicourse lecturer

2013: Analysis, Geometry and Stochastics Seminar, Friedrich-Schiller-Universität, Jena, Germany

2013: Workshop on Geometric Knot Theory, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, invited speaker

2013: Topology/Virtual Seminar, Louisiana State University

2013: AMS Session, Joint Math. Meetings, San Diego, CA, contributed talk

2012: Geometry Seminar (two talks), University of Manchester, Manchester, UK

2012: Quantized Flux in Tightly Knotted and Linked Systems, INI, Cambridge, UK, invited speaker  
2012: Tangled Magnetic Fields in Astro- and Plasma Physics, ICMS, Edinburgh, UK, refereed talk  
2012: Topological Dynamics Programme Seminar, INI, Cambridge, UK  
2012: Topology Seminar, University of Georgia  
2012: Inverse Problems Conference in Honor of Gunther Uhlmann, Irvine, CA, invited minisymposium speaker  
2012: AMS Special Session, Tampa, FL, invited speaker  
2011: Geometry–Topology Seminar, Georgia Tech  
2011: AMS Special Session, Winston-Salem, NC, invited speaker (2 different sessions)  
2011: Workshop on Entanglement and Linking, CRM, Pisa, Italy, invited speaker  
2011: Southeast Geometry Conference, Columbia, SC, invited speaker  
2011: Geometry and Topology Seminar, Tulane University  
2011: AMS Special Session, Joint Math. Meetings, New Orleans, LA, invited speaker  
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, Caltech  
2009: Geometry/Topology Seminar, Duke University  
2009: Lehigh University Geometry and Topology Conference, Bethlehem, PA, refereed talk  
2009: Bi–Co Math Colloquium, Bryn Mawr College  
2008: Geometry–Topology Seminar, Temple University  
2008: Sewanee Homecoming Lecture, Sewanee: The University of the South  
2008: Graduate Student Topology Conference, Champaign–Urbana, IL, refereed talk

## **Undergraduate Students**

**Undergraduate Research:** Nikolai Sannikov (2017–present), Laney Bowden (2017–2018), Aaron Shukert (2017–2018), Andrea Haynes (2017), Gavin Stewart (2015–2016)

**Independent Study:** Tucker Manton (2016)

## **Graduate Students**

**Current Graduate Advisees:** Brenden Balch (PhD), Thomas Eddy (MS), Colin Roberts (PhD)

## **Postdoctoral Fellows**

**Current Postdoc:** Harrison Chapman

## Professional Affiliations and Activities

**Member:** American Mathematical Society

### Miscellaneous Editorial:

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

**Manuscript Refereeing:** Arnold Mathematical Journal, Differential Geometry and its Applications, Discrete Mathematics, Algorithms and Applications, Experimental Mathematics, Journal of Geometry and Physics, Journal of Knot Theory and its Ramifications, Journal of Physics: Conference Series, Molecular Based Mathematical Biology, SIAM Review, Symmetry, Topology and its Applications.  
Reviewer for *Mathematical Reviews*, *Zentralblatt*

## Organization

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.

## Graduate Student Outreach

Fall 2015: Geometry and Topology Today Video on Random Polygons and Polymers, (Sci|State), <https://youtu.be/PewQCJnmDaQ>

## Undergraduate Outreach

Spring 2017: Panel discussion facilitator, Calculating Your Career event, Colorado State University

Spring 2016–2017: Judge for Multicultural Undergraduate Research, Art & Leadership Symposium (MURALS), Colorado State University

Fall 2016: Invited guest lecture, Math 192, CSU

Fall 2015: Invited Student Colloquium Speaker, 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, CSU

Fall 2014: Invited Math Club talk, CSU

Fall 2013: Invited Undergraduate Colloquium talk, University of Pennsylvania

## K–12 Outreach

Fall 2016–2018: 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>

## Mathematical Visualization and Artistic Activities

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 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, 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 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)