

Sarah Cannon

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APPOINTMENTS

Assistant Professor of Mathematics, July 2019-present

Department of Mathematical Sciences
Claremont McKenna College

NSF Mathematical Sciences Postdoctoral Research Fellow, August 2018 – June 2019

Computer Science Division, Department of Electrical Engineering and Computer Science
University of California, Berkeley

Supervisor: Alistair Sinclair

Project: Mathematical Foundations of Markov Chains

EDUCATION

Georgia Institute of Technology, Atlanta, GA

PhD in Algorithms, Combinatorics, and Optimization (ACO), 2018

Adviser: Dana Randall

Dissertation: "Markov Chains and Emergent Behavior for Problems from Discrete Geometry."

University of Oxford, Oxford, UK

MSc with Distinction, Mathematics and the Foundations of Computer Science (MFoCS), 2013

Adviser: Andreas Döring

Dissertation: "The Spectral Presheaf of an Orthomodular Lattice: some steps towards generalized Stone duality."

Tufts University, Medford, MA

BA in Mathematics, Summa Cum Laude with Highest Thesis Honors, 2012

Advisers: Diane Souvaine, Todd Quinto

FUNDING

- **"CRII: AF: RUI: Markov Chains and Random Sampling on Graphs."** National Science Foundation, Division of Computing and Communication Foundations, Research Initiation Initiative (CRII). \$174,583, 2021-2023.
- **"Connections between computational and physical phase transitions."** American Institute of Mathematics SQuaRE (Structured Quartet Research Ensemble), 2021-2023. Funding for an in-person, one week research meeting with all six participants, once per year.
- **"Mathematical Foundations of Markov Chains."** National Science Foundation, Division of Mathematical Sciences, Postdoctoral Research Fellowship. \$150,000. 2018-2022.

PUBLICATIONS

Publications marked with • have authors listed alphabetically, as is standard practice; publications marked with ○ have authors listed in order of contribution, with lab directors listed last.

- A. Blanca, S. Cannon, and W. Perkins. “**Fast and perfect sampling of subgraphs and polymer systems.**” Submitted. <https://arxiv.org/abs/2202.05907>.
- S. Cannon, A. Goldbloom-Helzner, V. Gupta, JN Matthews, and B. Suwal. “**Voting Rights, Markov Chains, and Optimization by Short Bursts.**” Submitted. <https://arxiv.org/abs/2011.02288>.
- S. Li, B. Dutta, S. Cannon, J. J. Daymude, R. Avinery, E. Aydin, A. W. Richa, D. I. Goldman, and D. Randall. “**Programming Active Cohesive Granular Matter with Mechanically Induced Phase Changes.**” *Science Advances*, Vol. 7, No. 17, eabe8494, pp. 1-12, 2021.
- S. Cannon and W. Perkins. “**Counting Independent Sets in Unbalanced Bipartite Graphs.**” *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 1456-1466, 2020.
- S. Cannon, J.J. Daymude, C. Gokmen, D. Randall, and A.W. Richa. “**A local stochastic algorithm for separation in heterogeneous self-organizing particle systems.**” *23rd International Workshop on Randomization and Computation (RANDOM)*, pp. 54:1--54:22, 2019. Preliminary results appeared as “Brief Announcement: A local stochastic algorithm for separation in heterogeneous self-organizing particle systems” in: *Proceedings of the 2018 ACM Principles of Distributed Computing (PODC '18)*, pp. 483-485, 2018.
- S. Cannon, D.A. Levin, and A. Stauffer. “**Polynomial Mixing of the Edge-Flip Markov Chain for Unbiased Dyadic Tilings.**” *Combinatorics, Probability, and Computing* 28(3), pp. 365-387, 2019. Conference version in: *21st International Workshop on Randomization and Computation (RANDOM)*, pp. 34:1-34:21, 2017.
- W. Savoie, S. Cannon, J.J. Daymude, R. Warkentin, S. Li, A.W. Richa, D. Randall, and D.I. Goldman. “**Phototactic Supersmarticles.**” *Artificial Life and Robotics* 23(4), pp. 459-468, 2018. Conference version in: *The 2nd International Symposium on Swarm Behavior and Bio-Inspired Robotics (SWARM)*, pp. 377-384, 2017.
- M. Andrés Arroyo, S. Cannon, J.J. Daymude, D. Randall, and A.W. Richa. “**A Stochastic Approach to Shortcut Bridging in Programmable Matter.**” *Natural Computing* 17(4): 723-741, 2018. Conference version in: *23rd International Conference on DNA Computing and Molecular Programming (DNA)*, pp. 122-138, 2017.
- S. Cannon, S. Miracle and D. Randall. “**Phase Transitions in Random Dyadic Tilings and Rectangular Dissections.**” *SIAM Journal on Discrete Mathematics* 32(3), pp. 966-1992, 2018. Conference version in: *26th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 1573-1589, 2015.
- S. Cannon, T.G. Fai, J. Iwerks, U. Leopold, and C. Schmidt. “**Combinatorics and complexity of guarding polygons with edge and point 2-transmitters.**” *Computational Geometry*, vol. 68, pp. 89-100, 2018. Previously as “Combinatorics of edge 2-transmitter art gallery problems,” *European Conference on Computational Geometry (EuroCG)*, 2015, and as “NP-hardness of the minimum point and edge 2-transmitter cover problem,” *24th Fall Workshop on Computational Geometry (FWCG)*, 2014.

- S. Cannon and A. Döring. “**A Generalisation of Stone Duality to Orthomodular Lattices.**” *Nagoya Winter Workshop: Reality and Measurement in Algebraic Quantum Theory*. Springer Proceedings in Mathematics & Statistics, vol 261, pp. 3-65, 2018.
- S. Cannon, J.J. Daymude, D. Randall, and A.W. Richa. “**A Markov Chain Algorithm for Compression in Self-organizing Particle Systems.**” In: *ACM Symposium on Principles of Distributed Computing (PODC)*, pp. 279-288, 2016. Journal version in preparation.
- S. Cannon and D. Randall. “**Sampling on Lattices with Free Boundary Conditions Using Randomized Extensions.**” In: *27th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pp. 1952-1971, 2016.
- G. Barequet, S. Cannon, E. Fox-Epstein, B. Hescott, D.L. Souvaine, C.D. Tóth and A. Winslow. “**Diffuse Reflections in Simple Polygons.**” *Discrete Applied Mathematics*, vol. 210, pp. 123-132, 2016. Conference version: *Latin American Algorithms, Graphs, and Optimization Symposium (LAGOS)*, Electronic Notes in Discrete Mathematics, vol. 44, pp. 354-350, 2013.
- V. Bucaj, S. Cannon, M. Dorff, J. Lawson and R. Viertel. “**Embeddedness for singly periodic Scherk surfaces with higher dihedral symmetry.**” *Involve: a journal of mathematics*, 6(4), pp. 383-392, 2013.
- S. Cannon, E.D. Demaine, M.L. Demaine, S. Eisenstat, M.J. Patitz, R. Schweller, S.M. Summers and A. Winslow. “**Two Hands Are Better Than One (up to constant factors): Self-Assembly In The 2HAM vs. aTAM.**” In: *30th International Symposium on Theoretical Aspects of Computer Science (STACS)*, pp. 172-184, 2013. Journal version under review, submitted to *Theoretical Computer Science* in February 2021.
- S. Cannon, D.L. Souvaine and A. Winslow. “**Hidden Mobile Guards in Simple Polygons.**” In: *Abstracts of the 24th Canadian Conference on Computational Geometry (CCCG)*, pp. 161-166, 2012. Preliminary results presented at the *Fall Workshop on Computational Geometry (FWCG)*, 2011.
- S. Cannon, M. Ishaque and C.D. Tóth. “**Conflict-free Graph Orientations with Parity Constraints.**” In: *6th International Conference on Fun with Algorithms (FUN)*, pp. 57-68, 2012. Preliminary results presented at the *Fall Workshop on Computational Geometry (FWCG)*, 2010.

TEACHING

- **Mathematics of Political Districting (Math 195)**, Claremont McKenna College, Fall 2022
- **Foundations of Data Science (CSCI 036)**, Claremont McKenna College, Fall 2021, Spring 2022
- **Graph Algorithms (CSCI 148)**, Claremont McKenna College, Fall 2020
- **Discrete Mathematics (Math 55)**, Claremont McKenna College, Spring 2020, Fall 2020, Spring 2021
- **Probability (Math 151)**, Claremont McKenna College, Fall 2019, Spring 2020, Spring 2021, Fall 2022
- **Design and Analysis of Algorithms (CS 3510)**, Georgia Tech, Summer 2017.
- **Teaching Assistant, Honors Discrete Mathematics (CS 2051)**, Georgia Tech, Spring 2017.
- **Teaching Assistant, Advanced Algorithms (CS 4540)**, Georgia Tech, Fall 2015.

INVITED WORKSHOPS AND LONG-TERM VISITS

- **Quantitative Investigations of Gerrymandering and Redistricting**, Duke University, March 2-4, 2020.
- **Japanese-American-German Frontiers of Science Symposium**, Kyoto, Japan, September 26-29, 2019. Invited by the National Academy of Sciences.
- **Faculty, Voting Rights Data Institute**, Tufts University, Medford, MA and Massachusetts Institute of Technology, Cambridge, MA, June 17-July 26, 2019.
- **Geometry of Polynomials**, Simons Institute, Berkeley, CA, Spring Semester 2019.
- **Rising Stars in EECS**, Massachusetts Institute of Technology, Cambridge, MA, October 28-30, 2018.
- **Working Group: Limits to Inference in Networks and Noisy Data**, Santa Fe Institute, Santa Fe, NM, April 2-6, 2018.
- **Seminar on Computational Counting**, Schloss Dagstuhl – Leibniz Center for Informatics, Germany, August 21-25, 2017.
- **China Theory Week**, Institute of Theoretical Computer Science and Communications, The Chinese University of Hong Kong, Hong Kong, August 22-26, 2016.
- **Seminar on Algorithmic Foundations of Programmable Matter**, Schloss Dagstuhl – Leibniz Center for Informatics, Germany, July 4-8, 2016.
- **Workshop on Markov Chain Mixing Times**, American Institute of Mathematics, San Jose, CA, June 6-10, 2016.
- **Invited Speaker, 30th Clemson Mini-Conference on Discrete Mathematics**, Clemson University, SC, October 23rd, 2015.
- **3rd Heidelberg Laureate Forum**, Heidelberg, Germany, August 23-28, 2015.
- **Women in Theory**, New York University, NY, May 28-30, 2014.
- **27th Bellairs Winter Workshop on Computational Geometry**, February 11-17, 2012.
- **Women in Theory**, Princeton University, NJ, June 19-23, 2010.

SELECTED HONORS AND AWARDS

- **National Science Foundation Graduate Research Fellowship**, 2013-2018.
- **Simons Award for Graduate Students in Theoretical Computer Science**, 2015-2017. Awarded to at most 10 students at US and Canadian universities each year.
- **Clare Boothe Luce Outstanding Graduate Fellow**, Georgia Tech, for “exceptional promise for making significant contributions to the worldwide advancement of science and technology” and an ability “to serve as a role model for younger generations,” 2013-2015.
- **Algorithms, Combinatorics, and Optimization Fellowship**, Georgia Tech, 2013-2015.
- **Computing Research Association’s Outstanding Undergraduate Researcher Award** 2012.
- **Norbert Wiener Award in Mathematics**, Tufts University, “given on those rare occasions when a student exhibits such prodigious strength in mathematics as to recall the highly unusual talents of Norbert Wiener [19]09, who went on to become one of the giants of twentieth-century mathematics,” 2012.
- **Finalist, Rhodes Scholarship**, 2011.

SERVICE

- **Workshop Presenter, “Overcoming Imposter Syndrome,”** Pomona Research in Mathematics Experience (PRiME), July 2022
- **Advisory Board/Judge,** 2022 Science Ambassador Scholarship
- **National Science Foundation Panelist,** Division of Computing and Communication Foundations, Directorate for Computer and Information Science and Engineering, 2020
- **Program Committee,** RANDOM 2021 (International Conference on Randomization and Computation)
- **External Reviewer for:**
 - Theoretical Computer Science
 - Information and Computation
 - Combinatorics, Probability, and Computing
 - SIAM Journal on Applied Mathematics
 - Multiscale Modelling and Simulation
 - FOCS 2021, 2020, 2019 (IEEE Symposium on Foundations of Computer Science)
 - SIAM Journal on Discrete Mathematics
 - SODA 2021, 2020, 2014 (ACM-SIAM Symposium on Discrete Algorithms)
 - Electronic Journal of Probability
 - RANDOM 2020 (International Conference on Randomization and Computation)
 - STOC 2020 (ACM Symposium on Theory of Computing)
 - Journal of Statistical Physics
 - Journal of Parallel and Distributed Computing
 - Annales de l’Institut Henri Poincaré (B) Probabilités et Statistiques
 - DISC 2018 (32nd International Symposium on Distributed Computing)
 - ICALP 2017 (44th International Colloquium on Automata, Languages and Programming)
 - CPM 2015 (26th Annual Symposium on Combinatorial Pattern Matching)
- **Girls Who Code Summer Immersion Program Speaker,** Alpharetta, GA, June 19, 2018.
- **Panelist, IEEE/WIE Women’s Leadership Summit,** panel “Inspiring Lessons And Success Stories For The Undergrad,” November 4, 2016.
- **Georgia Tech Graduate Women in the College of Computing,** organizing committee 2015-2018; member 2013-2018.
- **Georgia Tech Computer Science Visit Days for Prospective Ph.D. Students,** student volunteer coordinator 2015-2017.
- **Georgia Tech Algorithms, Combinatorics, and Optimization Student Seminar,** co-organizer 2015-2016.