HEATHER ZINN BROOKS

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Homepage: HZINNBROOKS.GITHUB.IO
Google Scholar ◇ Github

RESEARCH INTERESTS

Dynamical systems, networks, complex systems, differential equations, math modeling

ACADEMIC APPOINTMENTS

Harvey Mudd College
Assistant Professor of Mathematics *2020 – . . .*
Barbara Stokes Dewey Assistant Professor in the Life Sciences *2022 – . . .*

University of California, Los Angeles
CAM Visiting Assistant Professor of Mathematics *2018 – 2020*
Mentor: Mason Porter

EDUCATION

Ph.D. Mathematics, University of Utah *2018*
Dynamics and structure: from microtubule networks to population networks
Advisor: Paul Bressloff

B.S. Applied Mathematics, University of Utah *2012*
Undergraduate Research Scholar
College of Science Research Award Finalist
Advisor: Alla Borisyuk

PUBLICATIONS

JOURNAL ARTICLES

- Topaz, C. M., **Brooks, H. Z.**, Kan, U., Sandstede, B., & Smith, C. M. (2025). Diversity, identity, and data. The American Mathematical Monthly 132 (1), 36-47.
- **Brooks, H.Z.**, & Porter, M.A. (2025). An "opinion reproduction number" for infodemics in a bounded-confidence content-spreading process on networks. Chaos: An Interdisciplinary Journal of Nonlinear Science 35 (1).
- **Brooks, H. Z.**, Chodrow, P. S., & Porter, M. (2024). Emergence of polarization in a sigmoidal bounded-confidence model of opinion dynamics. SIAM Journal on Applied Dynamical Systems 23 (2), 1442-1470.
- Hickok, A., Kureh, Y., **Brooks, H. Z.**, Feng, M., & Porter, M. A. (2022). A bounded-confidence model of opinion dynamics on hypergraphs. SIAM Journal on Applied Dynamical Systems, 21(1), 1–32.
- **Brooks, H. Z.**, & Porter, M. A. (2020). A model for the influence of media on the ideology of content in online social networks. Physical Review Research, 2(2), 023041.
- Carroll, S. R., **Brooks, H. Z.**, & Bressloff, P. C. (2020). Bifurcation analysis of pattern formation in a two-dimensional hybrid reaction–transport model. Physica D: Nonlinear Phenomena, 402, 132274.

- Wilson, S. N., Sindi, S. S., **Brooks, H. Z.**, Hohn, M. E., Price, C. R., Radunskaya, A. E., ... Fefferman, N. H. (2020). How emergent social patterns in allogrooming combat parasitic infections. Frontiers in Ecology and Evolution, 8, 54.
- **Brooks, H. Z.**, & Bressloff, P. C. (2017). Turing mechanism for homeostatic control of synaptic density during C. elegans growth. Physical Review E, 96(1), 012413.
- **Brooks, H. Z.**, & Bressloff, P. C. (2016). A mechanism for Turing pattern formation with active and passive transport. SIAM Journal on Applied Dynamical Systems, 15(4), 1823–1843.
- **Brooks, H. Z.**, & Bressloff, P. C. (2015). Quasicycles in the stochastic hybrid Morris–Lecar neural model. Physical Review E, 92(1), 012704.
- Lawley, S. D., Tuft, M., & **Brooks, H. Z.** (2015). Coarse-graining intermittent intracellular transport: Two-and three-dimensional models. Physical Review E, 92(4), 042709.

BOOKS AND CHAPTERS

- **Brooks, H. Z.**, Feng, M., Porter, M. A., & Volkening, A. (Editors). (2025). Mathematical and Computational Methods for Complex Social Systems (Vol. 80). American Mathematical Society.
- Zhao, L., Kim, R., Oremland, L. S., Chowkwale, M., de Pillis, L. G., & **Brooks, H. Z.** (2024). A survey of mathematical modeling of hormonal contraception and the menstrual cycle. Mathematical Modeling for Women's Health: Collaborative Workshop for Women in Mathematical Biology, 51-82. Cham: Springer Nature Switzerland.
- **Brooks, H. Z.**, Hohn, M. E., Price, C. R., Radunskaya, A. E., Sindi, S. S., Williams, N. D., ... Fefferman, N. H. (2018). Mathematical analysis of the impact of social structure on ectoparasite load in allogrooming populations. In Understanding complex biological systems with mathematics (pp. 47–61). Springer.
- Williams, N. D., **Brooks, H. Z.**, Hohn, M. E., Price, C. R., Radunskaya, A. E., Sindi, S. S., ... Fefferman, N. H. (2018). How disease risks can impact the evolution of social behaviors and emergent population organization. In Understanding complex biological systems with mathematics (pp. 31–46). Springer.

EXPOSITORY ARTICLES & OUTREACH

- **Brooks, H. Z.** (2025). A tutorial on networks of social systems: A mathematical modeling perspective. Mathematical and Computational Methods for Complex Social Systems, 80, 115.
- Jones, Q., Meléndez, A. R. V., Mendible, A., Aminian, M., **Brooks, H. Z.**, Alexander, N., ... Chodrow, P. (2023). Data science and social justice in the mathematics community. Notices of the American Mathematical Society, 70(9), 1479-1489.
- **Brooks, H. Z.**, Chen, Y., Feng, M., Kureh, Y. H., Porter, M. A., & Volkening, A. (2020). How to move a SIAM minisymposium online from the comfort of your home. DSWeb: The Dynamical Systems Web.
- **Brooks, H. Z.**, Kanjanasaratool, U., Kureh, Y. H., & Porter, M. A. (2020). Disease detectives: Using mathematics to forecast the spread of infectious diseases. Frontiers for Young Minds, Vol. 8: 577741.

GRANTS AND FELLOWSHIPS

Innovation Accelerator Laboratory for Data Science and Social Impact *2025*
One of three projects selected for funding through the Harvey Mudd College Innovation Accelerator Initiative.
Project Lead, $240,000

NSF MRI-2408259 *2024*
Track 1 Acquisition of a High-Performance Computing Cluster for Interdisciplinary Research at the Claremont Colleges
Senior Personnel, $918,485

2022 Barbara Stokes Dewey Endowed Assistant Professorship in the Life Sciences *2022*
Designed to assist professors with their teaching and research interest at an early career stage.

NSF DMS-2109239 *2021–2024*
Advances in bounded-confidence models on networks
Principal Investigator, $208,684

OCAC Data Science Course Development Grant Award *2021*
$1,500

MAA Project NExT Fellowship *2019–2021*
$5,000

Stockham Medal for Conspicuously Effective Teaching nominee *2017*
$1,000

T. Benny and Gail T. Rushing Fellowship Award *2017*
$5,000

Center for Teaching and Learning Excellence Graduate Fellowship *2016*
$15,000

NSF Research Training Grant Fellowship RTG-1148230 *2014–2016*
$20,457 per year

STUDENT RESEARCH MENTORSHIP

Theo Rode (HMC '26), Inferring network structure of mathematical models of opinion dynamics.

Camilo Morales (HMC '25), Measuring the similarity between trees of different order.

Tian Dong (HMC '24), Exploring sigmoidal bounded-confidence models with mean field methods. *Placement: PhD Mathematics, University of Michigan*

Kerria Pang-Naylor (HMC '25), Generating opinion distributions from data using binary classification models. *Goldwater Scholar*

Robert Bowden (HMC '25), Opinion dynamics on hypergraphs using sheaf-based techniques. *Placement: MS Mathematics, Cambridge University*

Emme McMullen (HMC '23), Network models of gender homophily in professional hierarchies. *Placement: PhD Applied Mathematics, University of Washington*

Julianna Schalkwyk (HMC '23) and Hector Tierno (HMC '23), Quantile Deffuant–Weisbuch model of opinion dynamics (co-mentor Jamie Haddock). *Placements: PhD CS, Georgia Tech; PhD Information and Computer Sciences, University of Massachusetts Amherst*

Ian de Marcellus (HMC '23), Numerical simulations for mean-field models of opinion dynamics. *Placement: Mathematics and Computer Science Tutor, Education Solutions*

Jasper Bown (HMC '24), Methods for inferring network parameters from cascade models of opinion dynamics.

Andy Liu (HMC '23), Heterogeneous topic interdependencies in opinion dynamics. *Placement: PhD Language and Information Technology, Carnegie Mellon*

Madelyn Andersen (HMC '22), *2021 Giovanni Borrelli Fellowship Recipient.* Graphon varieties. *Placement: PhD CS, MIT (NSF GRFP Award Recipient)*

Christina Catlett (Scripps '22), Multilayer bounded-confidence models with synchronous and asynchronous updating. *Placement: PhD ESAM, Northwestern University*

Phousawanh Peaungvongpakdy (HMC '22), Media impact on opinion dynamics in adaptive social networks. *Placement: PhD Mathematics, Washington State University*

Solomon Valore-Caplan (HMC '22), The effects of homophily and community structure on consensus in bounded-confidence models. *Placement: PhD ESAM, Northwestern University*

Ruixiao Wang (UCLA '22), Dynamics of the glass ceiling on networks (co-mentor Mason Porter). *Placement: PhD Statistics and Data Science, Yale University*

Georgia Pope (HMC '21), Stability analysis of a mathematical model of hormonal contraception. *Placement: MS Epidemiology, University of Washington*

Sneha Sambandam (UCLA '21) and Annie Zhang (UCLA '21), Spread of competing content on networks with bounded-confidence dynamics. *Placement: PhD CS, University of British Columbia (Sambandam) and MS Applied Math, University of Vermont (Zhang)*

Gabrielle Lorenzi (UCLA '21), Networks, bias, and self-segregation of women and minorities in academia (co-mentor Mason Porter). *Placement: Data Scientist, T. Rowe Price*

Siqiao Mu (Caltech '21), *Summer Undergraduate Research Fellowship program at Caltech.* SEIR models on networks (co-mentors Mason Porter and Franca Hoffmann). *Placement: PhD ESAM, Northwestern University*

Sujai Hiremath (Caltech '23), *Summer Undergraduate Research Fellowship program at Caltech.* Opinion formation on networks (co-mentors Mason Porter and Franca Hoffmann).

Zehan Chao (UCLA graduate student), Zheyuan Cui (UCLA '21), Avery Edson (UCLA '20), Cesar Guajardo (Santa Monica College '20), Yihuan Huang (UCLA '21), Xingjia Wang (UCLA '20), Zhanyuan Yin (UCLA '21), *California Research Training Program in Computational and Applied Math.* Evaluating effectiveness of the Gang Reduction and Youth Development Program with dynamic mode decomposition and machine learning techniques.

Alex Pan (Caltech '22), *Summer Undergraduate Research Fellowship program at Caltech.* Opinion formation on networks (co-mentors Mason Porter and Franca Hoffmann).

Marie Tuft (Utah '15), Quantitative analysis of virus trafficking in a biological cell (co-mentor Sean Lawley).

Oliver Richardson (Utah '17), Modeling learning on neural networks (co-mentor Sean Lawley).

Braden Schaer (Utah '15) and Anand Singh (Utah '16), Modeling diffusion of neurotransmitters (co-mentor Sean Lawley).

TEACHING

HMC

- **Math 118A: Introduction to Mathematical Biology**, Spring 2025
- **Math 198: Math Forum**, Spring 2025 (2 sections)
- **Math 198AI: Network Science**, Fall 2024
- **Math 181: Dynamical Systems**, Spring 2024
- **Math 180: Partial Differential Equations**, Fall 2022, Fall 2024
- **Math 189AB: Mathematics of Democracy**, Fall 2021
- **Math 73: Linear Algebra**, Spring 2021 (2 sections, online), Spring 2022 (2 sections), Spring 2023 (2 sections)
- **Math 131: Mathematical Analysis**, Fall 2020 (online), Fall 2022, Fall 2023 (2 sections), Spring 2024, Spring 2025

UCLA

- **Math 168: Introduction to Networks**, Spring 2020 (online)
- **Math 142: Mathematical Modeling**, Fall 2019
- **Math 197: Reading Course in Nonlinear Dynamics**, Spring 2019
- **Math 134: Linear and Nonlinear Systems of Differential Equations**, Fall 2018 and Winter 2019

UNIVERSITY OF UTAH

- **Math 3140: Vector Calculus and Partial Differential Equations**, Spring 2018
- **Math 1210: Calculus 1**, Fall 2017 (online)
- **Math 2270: Linear Algebra**, Spring 2017
- **Math 3150: Partial Differential Equations for Engineers**, Summer 2016 and Fall 2016
- **Math 1050: College Algebra**, Summer 2013
- **Math 1010: Intermediate Algebra**, Spring 2013 and Spring 2014
- **Math 1030: Intro to Quantitative Reasoning**, Fall 2012

INVITED TALKS

PLENARIES

2022 Interdisciplinary Workshop on Contagion on Complex Social Systems, University of Colorado Boulder

Dynamics Days, virtual

CONFERENCE TALKS

2025 Minisymposium on Dynamical Systems on Networks and Fractals — *SIAM Conference on Applied Dynamical Systems, Denver, CO*

Patterns, Dynamics, and Data in Complex Systems — *ICERM, Providence, RI*

2024 Expository Talk on Maximium Likelihood Estimation and Opinion Dynamics — *Practicum for Undergraduate Mathematicians in Inverse Problems and Data Assimilation, IPAM, Los Angeles, CA*

Minisymposium on Quantitative Justice through Applied Data Science — *SIAM Annual Meeting, Spokane, WA*

Lightning Talk on Dynamics and Drivers of Gender Representation in Academic Mathematics — *NetSci, Quebec, Canada*

Special Session on Mathematical Modeling of Complex Ecological and Social Systems — *AMS Western Sectional Meeting, San Francisco, CA*

2023 Session on Promoting Children's and Women's Health with Mathematical Modeling and Computational Approaches — *AWM Research Symposium, Atlanta, GA*

Minisymposium on Many-Agent Systems and Mean-Field Models for Socio-Economic and Life Sciences Dynamics — *International Conference on Industrial and Applied Mathematics, Tokyo, Japan*

Minisymposium on Dynamics of Decisions and Behavior in Social Systems — *SIAM Conference on Applied Dynamical Systems, Portland, OR*

Special Session on Little School Dynamics — *Joint Mathematics Meeting, Boston, MA*

2022 Special Session on Mathematical Modeling of Biological and Social Systems — *AMS Western Sectional Meeting, Salt Lake City, UT*

2021 Satellite on Higher-order Models in Network Science — *NetSci, virtual*

Minisymposium on Collective Behavior and Social Evolution — *Society for Mathematical Biology, virtual*

Minisymposium on Modeling Collective Behavior in Human Social Systems — *SIAM Conference on Applied Dynamical Systems, virtual*

Southern California Systems Biology Symposium, virtual

Special Session on Agent-based Dynamics and Self-Organization in Biology — *Joint Mathematics Meeting, virtual*

Tutorial on Networks in Social Systems — *AMS Short Course on Mathematical and Computational Methods for Complex Social Systems, virtual*

2019 Minisymposium on Mean-field Models for Large Interacting Agent Systems — *SIAM Conference on Analysis of PDEs, La Quinta, CA*

Session on Mathematical Biology: Multi-Scale Modeling of Complex Biological Systems — *AMS Western Sectional Meeting, Riverside, CA*

Minisymposium on Dynamics of Democracy — *SIAM Conference on Applied Dynamical Systems, Snowbird, UT*

Session on Advances in Mathematical Biology — *Association for Women in Mathematics Research Symposium, Houston, TX*

Session on Agent-Based Modeling in Biological and Social Systems — *Joint Mathematics Meeting, Baltimore, MD*

2018 Minisymposium on Modeling Cell Motility and Cytoskeleton Interactions — *SIAM Conference on Life Sciences, Minneapolis, MN*

Session on Modeling Biological Rhythms — *MAA MathFest, Denver, CO*

Workshop Celebrating Diversity: Nonlinear Dynamics and Complex Systems — *SIAM Annual Meeting, Portland, OR*

Minisymposium on Spatial Dynamics: Local and Global Results — *SIAM Conference on Nonlinear Waves and Coherent Strutures*

Session on Modeling Disease and Biological Processes — *Joint Mathematics Meeting, San Diego, CA*

2017 Society for Mathematical Biology, Salt Lake City, UT

2015 Stochastic Neural Dynamics Workshop — *Organization for Computational Neuroscience, Prague, Czech Republic*

SEMINARS AND COLLOQUIA

2023 Applied Mathematics Colloquium, CU Boulder

Mathematics Colloquium, Colorado School of Mines

Mathematics Colloquium, UCLA

Applied and Computational Mathematics Seminar, Dartmouth

Mathematics Colloquium, Middlebury College

Applied Math Seminar, UC Riverside

Applied Math Seminar, UC Irvine

2022 Math Biology Seminar, Duke

2021 Little School Dynamics Colloquium, virtual

Mathematical Sciences Colloquium, Appalachian State University, virtual

Mathematics and Statistics Colloquium, College of the Holy Cross, virtual

ESAM Colloquium, Northwestern University, virtual

Mathematics Colloquium, Claremont Colleges, virtual

2020 Dynamics Seminar, CU Boulder, virtual

Women in Network Science Seminar, virtual

Joint Applied Math Seminar, Claremont Colleges and University of Utah, virtual

Networks Seminar, University of Houston, Houston, TX

2019 Probability Seminar, Tulane University, New Orleans, LA

Computational Math + X Seminar, Caltech, Pasadena, CA

2018 Applied Math Seminar, Claremont Colleges, Claremont, CA

Applied PDEs Seminar, Brigham Young University, Provo, UT

2017 Biophysics Seminar, UCLA, Los Angeles, CA

Howard Hughes Medical Institute Summer Research Program, Claremont, CA

WORKSHOPS

2022 Collaborative Workshop on Women in Mathematical Biology: Mathematical Approaches to Support Women's Health — *Institute for Mathematics and its Applications, Minneapolis, MN*

2021 Workshop on Mathematics and Racial Justice — *Mathematical Sciences Research Institute, virtual*

Mathematical and Computational Approaches to Social Justice — *ICERM workshop (virtual)*

SMB Workshop on Equity, Diversity, and Inclusion — *Society for Mathematical Biology, virtual*

2019 Applied Mathematical Modeling with Topological Techniques — *ICERM workshop, Providence, RI*

Learning in Networks — *NIMBioS/DySoC Working Group, University of Tennessee, Knoxville, TN*

2018 Cultural Analytics — *IPAM workshop, Lake Arrowhead Conference Center, CA*

Agent-Based Modeling in Biological and Social Systems — *AMS Mathematics Research Community, West Greenwich, RI*

2017 Women Advancing Mathematical Biology Workshop — *MBI at The Ohio State University, Columbus, OH*

SERVICE TO THE PROFESSION

ORGANIZATION OF CONFERENCES AND WORKSHOPS

2025 Collective Social Phenomena: Dynamics and Data — *Workshop, Casa Matemática Oaxaca*

SIAM Conference on Applied Dynamical Systems — *Organizing Committee Member*

2023 Complex Social Systems — *AMS Mathematics Research Community*

2022 Building Networks: Women in Complex & Nonlinear Systems — *Workshop, Banff International Research Station*

Data Science and Social Justice: Networks, Policy, and Education — *Summer Research Program, ICERM*

Interdisciplinary Network Analysis Methods for Analyzing Social Systems — *Workshop, ICERM*

Southern California Applied Math Symposium — *Conference, Harvey Mudd College*

2021 Mathematical and Computational Methods for Complex Social Systems — *AMS Short Course, Joint Mathematics Meeting (virtual)*

ORGANIZATION OF SESSIONS AND MINISYMPOSIA

2024 Complex and Nonlinear Systems — *AWM Workshop, SIAM Annual Meeting*

2023 Women in Network Science — *Minisymposium, SIAM Conference on Applied Dynamical Systems*

2022 Mathematics of Complex Systems — *SIAM Special Session, Joint Mathematics Meeting*

Women in Math Biology — *AMS Special Session, Joint Mathematics Meeting*

2021 Novel Techniques for Modeling Biological Systems in the Age of Data — *Minisymposium, SIAM conference on Applied Dynamical Systems (virtual)*

2020 Topological Data Analysis and Data-Driven Modeling in Complex Systems — *Minisymposium, SIAM conference on the Mathematics of Data Science (virtual)*

Women in Mathematical Biology — *AMS-AWM Special Session, Joint Mathematics Meeting*

Interactive Session on Fostering Equitable Classrooms — *Project NExT Session, Joint Mathematics Meeting*

2019 Disease Detectives: Stopping the Zombie Apocalypse with Mathematics – *Booth at the UCLA Exploring Your Universe science festival on the role of mathematics and networks in epidemiology for Targeted toward families and children in the Los Angeles community.*

Dynamics of Democracy — *Minisymposium, SIAM Conference on Applied Dynamical Systems*

Student and Postdoc Icebreaker Session — *Introductory session for creating an inclusive environment for young researchers, SIAM conference on Applied Dynamical Systems*

LEADERSHIP ROLES AND COMMITTEES

2025 Conference Organizing Committee, SIAM Activity Group on Dynamical Systems

2024 AWM SIAM Committee

2023 Nominating Committee, SIAM Activity Group on Dynamical Systems

2022 President, Southern California SIAM Regional Section

MENTORSHIP

2025 Mentoring Session, SIAM Conference on Applied Dynamical Systems

Red Sock Poster Judge, SIAM Conference on Applied Dynamical Systems

2024 Chair of AWM Minisymposterium, SIAM Annual Meetings

Poster Judge, Joint Mathematics Meetings

2023 Red Sock Poster Judge, SIAM Conference on Applied Dynamical Systems

Poster Judge, Joint Mathematics Meetings

2022 Guided Activity Group on Network Science, SIAM Conference on Math of Data Science

PEER REVIEW

AMS Notices
Chaos
La Matematica
Nonlinearity
Physica D
Physical Review E
PLoS ONE
Royal Society Open Science
SIAM Journal on Applied Mathematics
SIAM Journal on Applied Dynamical Systems
SIAM Review
National Science Foundation Grants Review Panelist

INSTITUTIONAL AND DEPARTMENTAL SERVICE

COLLEGE COMMITTEE SERVICE

Research Committee	*2025-. . .*
Data Science Emphasis Program Committee (Co-Chair)	*2023–. . .*
Assessment and Accreditation Committee	*2023–2024*
Academic Affairs Committee	*2021–2023*

DEPARTMENT AND CONSORTIAL SERVICE

Faculty Advisor, Graduate School Guidance	*2023–. . .*
Organizer, CCMS Applied Math Seminar	*2021–2023*
Faculty Advisor, Gender Equity in Math Club	*2021–2023*
Data Science Curricular Coherence Committee	*2020–2022*