

SARAH CASSIE BURNETT

PERSONAL INFORMATION

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GOAL

To perform fundamental fluids research and teach in a field of Applied Mathematics & Statistics and Scientific Computing.

EDUCATION

2016-2021 The University of Maryland, College Park · GPA: 3.952
Doctor in Philosophy in Applied Mathematics and Scientific Computing Program
Dissertation : Predicting the magnetic field of the three-meter spherical Couette experiment

2011-2015 The University of North Carolina, Chapel Hill · GPA: 3.320
Bachelors of Science in Applied Mathematics, Bachelors of Arts in Physics

RESEARCH EXPERIENCE

2022- Hedrick Assistant Adjunct Professor — University of California in Los Angeles

Bertozzi Lab

- Studying models of polydisperse particle-laden flows in channels.
- Plans for this work include:
 - applying the suspension balance model,
 - studying experiments with particles of different radii, and
 - modeling the shock formation in the polydisperse flows.

Mentors: Andrea BERTOZZI bertozzi@math.ucla.edu · Marcus ROPER mroper@math.ucla.edu

2017-2021 Researcher — University of Maryland at College Park

Lathrop Lab

- Studying 3D numerical simulations, XSHELLS, of a mechanical MHD device.
- Developed data assimilation code that can be implemented on XSHELLS.
- Tested machine learning techniques on surface magnetic field data.
- Collaborated with Nathanaël Schaeffer and Henri-Claude Nataf at ISTERre in Grenoble France during the Fall 2019 semester.

Advisors: Daniel LATHROP lathrop@umd.edu · Kayo IDE ide@umd.edu

2015-2018 Computational Physicist — Department of Energy

*Los Alamos
National Lab*

- Derived Noh shock solutions using Lie group theory for different equations of state.
- Performed verification studies of the Noh problem for different equations of state.
- Ran quantum molecular dynamics simulations of liquid and liquid/gas Aluminum.

Reference: Kevin HONNELL kgh@lanl.gov

2014, 2015 Lab Assistant — University of California in Los Angeles

*Applied Math
Fluids Lab*

- Analysis of separation in particle-laden flow driven by gravity down an incline.
- Analysis of shock front formations at high angle of inclination and concentration.
- Validation of analytic models with experiments.

Reference: Andrea BERTOZZI bertozzi@math.ucla.edu

2013-2015 Lab Assistant — University of North Carolina at Chapel Hill

*Joint Applied
Math and Marine
Sciences Fluids
Lab*

- Image analysis of the Taylor Pipe Flow experiment by solving an inverse problem.
- Highest honors in a senior thesis.

Reference: Roberto CAMASSA · +1 (919) 962 8476 · camassa@amath.unc.edu · Rich McLAUGHLIN · rmm@email.unc.edu

TEACHING

- Win 2022* Program in Computing Instructor, MATH DEPT. — UCLA
- Introduction to Programming* Lecturer for the fundamentals of C++. Topics include basics of coding, control flow, user input, vectors and functions, passing by value and by reference, classes, arrays, pointers and other data structures. The class is currently online.
- Sum 2020* Lecturer, MATH DEPARTMENT — UMD
- Multivariable Calculus* Sole contact for multivariable calculus, also known as Calc 3. Led 80-minute online lectures every weekday going over theory and examples. Created open book take home exams and assignments. The class has both a theoretical and numerical (MATLAB) component.
- Spr 2020* Teaching Assistant, MATH DEPARTMENT — UMD
- Linear Algebra* Teaching assistant and grader for Introduction to Linear Algebra. Led 50-minute discussions twice 2 times a week going over examples and theory. The class has both a theoretical and numerical (matlab) component.
Reference: Archana KHURANA · akhurana@umd.edu
- Fall 2018* Teaching Assistant, MATH DEPARTMENT — UMD
- Differential Equations* Teaching assistant and grader for Differential Equations for Engineers and Scientists. Led 50-minute discussions once a week going over examples and theory. The class has both a theoretical and numerical (matlab) component.
Reference: Michael JAKOBSON · jakobson@umd.edu
- Spr 2018* Lecturer, MATH DEPARTMENT — UMD
- Math Modeling and Probability* Sole contact for college Algebra applied to Managerial, Life and Social Sciences for a 28-student class. Responsibilities include making lesson plans, making assignments, and administering exams.
Reference: Julie DABERKOW · jdab@umd.edu
- Spr 2017* Teaching Assistant, MATH DEPARTMENT — UMD
- Calculus 2* Teaching assistant and grader for Calculus 2. Led 80-minute discussions twice a week on conceptual calculus problems.
Reference: Greg CHADWICK · sgc@umd.edu
- 2012-2013* Math Tutor, MATH TUTORING CENTER — UNC

OUTREACH

- Girls Talk Math* **Director** of Virtual Girls Talk Math Summer Program · July 19-30, 2021 – UMD
- Led the Girls Talk Math summer event with Dr. Angela Robinson from NIST, Victoria Whitley, and JJ Guan.
 - Students met every day for a couple hours to learn about topics of Quantum Computing, Finance, Patterns & Fractals, Network Models and Algorithms or RSA Cryptography.
 - Weekends held special events including interviews and talks with mathematicians and a perseverance panel.
- Director** of Virtual Girls Talk Math Spring Event · May 22, 2021 – UNC, UMD
- Led the Girls Talk Math spring Saturday event with Dr. Angela Robinson, Victoria Whitley, and JJ Guan.
 - Activities included an algebra talk by Dr. Melinda Lanius and cryptography activity by Moemi Glaeser.
- Organizer** of National Virtual Girls Talk Math Summer Program · July 6-August 2, 2020 – UNC, UMD, UCLA, University of Minnesota

- Students met Tuesday/Thursday for a couple hours to learn about topics of RSA Cryptography, Patterns & Fractals, or Knot Theory.
- Weekends held special events including interviews with mathematicians and college panels.
- Hosted the imposter syndrome workshop, and co-led a virtual lab tour during the program.

Director of Girls Talk Math · February 8, 2020 – University of Maryland

- Led the Girls Talk Math winter Saturday event with Dr. Angela Robinson from NIST.
- Activities included a Wikipedia edit-a-thon, mentor lunch, keynote speaker Talitha Washington, and mathematical escape rooms.

Director of Girls Talk Math · June 17-28, 2019 – University of Maryland

- Directed the Girls Talk Math 2-week Summer Enrichment Program at the University of Maryland.
- Led curriculum development, where we made 6 new sets of material tailored to studies at UMD. I created the Patterns and Fractals packet (Github, DOI: 10.5281/zenodo.4106703).
- Coordinated 30 volunteers and 40 participants, maintained the website, and applied for the grant from MAA which gave us full funding.

Director of Girls Talk Math · July 9-20, 2018 – University of Maryland ·

- Co-organized the first Girls Talk Math 2-week Summer Enrichment Program at the University of Maryland.
- Coordinated 30 volunteers and 40 participants, maintained the website, and raised money internally at UMD.
- Girls work in groups to understand mathematical topics outside of their usual high school curriculum as well as research and record a podcast about a famous female mathematician. Blog posts and links to the podcasts we published can be found on the website I created, <http://gtm.math.umd.edu/>

Mentor of Girls Talk Math · June 19-30, 2017 – University of North Carolina ·

- Full-time Scientific Computing (Dynamical Systems) group leader at this 2-week summer day camp for high school girls.
- Studied the structure and material of the camp and with the permission and support of the founders, Dr. Francesca Bernardi and Katrina Morgan, brought it to Maryland the following year.

STEM Outreach Events

Maryland Day · Apr. 29, 2017 · Apr. 28, 2018 – University of Maryland · Launched a vortex ring cannon and explained to physics to visitors.

EYH Conference Workshop · Mar. 4, 2016 – Santa Fe · Performed fluids demonstrations in two 90-minute presentations for groups of 5th-8th grade girls.

Conference for Undergraduate Women in Physics · Jan. 15, 2016 – Old Dominion University · Invited to speak about working in the industry and recruitment for LANL.

UNC Science Expo · Spring 2015 & 2014 · Allowed kids to run through a pit of cornstarch mixture so they could experience the effects of non-Newtonian fluid.

Women and Math Mentoring Program presents Marjorie Lee Browne Day · Mar. 13, 2015 – North Carolina Central University · Invited to lead physics demonstrations for a group of 8th grade girls.

AWARDS AND RECOGNITION

American Women in Mathematics Student Chapter Award for Fundraising & Sustainability · September 2020 · This award is given to me for the support I raised for the Girls Talk Math Camp.

George A. Snow Memorial Award · March 2020 · This award is given to a student, staff, or faculty member in the Department of Physics who has personally helped to advance the representation of women in the field of physics.

The Ann G. Wylie Dissertation Fellowship · March 2020 · Fellowship supports students with excellent qualifications who are in the latter stages of writing their dissertations.

The Mathematical Association of America (MAA) Tensor Women and Mathematics Grant · March 2020 · Grant awarded to fully fund the 2021 Girls Talk Math Summer Program.

University of Maryland Women of Influence Award · January 2020 · This award recognizes members of our community who have distinguished themselves by working with and for women on our campus and in our community on issues such as mentorship, work/life balance, social & political justice and prevention of sexual harassment.

Graduate Research Opportunities Worldwide (GROW) Award · July 2019 · Additional funding awarded to students with who apply through the NSF GRFP to study abroad. This grant is for studies of magnetohydrodynamics models at ISTERre in Grenoble, France.

Ruth Davis Fellowship for Math and Physics · April 2019 · Graduate student selected to be awarded for her achievements in Math and Physics.

Adele's Circle of Women Scholarship · April 2019 · Graduate student selected to be awarded for leadership and contributions to empowering women at the University of Maryland and beyond.

Jacob K. Goldhaber Travel Grant · April 2019 · UMD Graduate School.

The Mathematical Association of America (MAA) Tensor Women and Mathematics Grant · March 2019 · Grant awarded to fully fund the 2019 Girls Talk Math Summer Program.

Society for Industrial and Applied Mathematics (SIAM) Award of Recognition · April 2018 · SIAM College Park Chapter Award of Recognition

Applied Mathematics & Statistics and Scientific Computation (AMSC) Leadership Award · April 2018 · Award given for organization and leadership efforts in the Math Department.

National Science Foundation (NSF) Graduate Research Fellowships Program (GRFP) Fellowship · April 2016 · Graduate research fellowship lasting for 5 years starting Fall 2016

Honors for Applied Mathematics · August 2015 · Received Honors for completing a thesis and merit requirements

Highest Honors for Senior Thesis · April 2015 · Received Highest Honors after presenting a thesis and completing a report for the Taylor Pipe Flow experiment

LEADERSHIP

2018- · Director – Girls Talk Math, UMD

2018-2020 · Treasurer, Social Coordinator – AMSC Program Student Council, UMD

2018-2019 · Treasurer – Women in Math, UMD

2014-2015 · President – Society of Physics Students, UNC

2014-2015 · President – Women in Physics, UNC

2013-2014 · Treasurer – Women in Physics, UNC

SERVICE

Mentorship

High School students

Project on robotics and physics. · 2019-

Project on reservoir computing to predict DNA sequencing. · 2018

Project on Markov Chains to create language-based transition matrices. · 2018

Undergraduate students

Helena Yoest (Bucknell U.) · 2018 · TREND REU program · Project on dusty plasma tornadoes experiments

William Fines-Kested (Mass. College of Liberal Arts) · 2018 · TREND REU program · Project on reservoir computing

April Howard (Howard University) · 2016 · Los Alamos National Lab · Shock simulations studies of metals such as Aluminum, Copper, Iron, and Tungsten

Chloe Yorke' (Tuskegee University) · 2016 · Los Alamos National Lab · Shock simulations studies of metals such as Aluminum, Copper, Iron, and Tungsten

*Synergistic
Activities*

Reviewer for papers in the American Physical Society (APS) journal *Physics Review E*. · 2018-

Book Reviewer for *Association for Women in Mathematics: The First Fifty Years Reminiscences, Participant History, and Visions for the Future* · 2020

Judge for the JMM MAA Undergraduate Poster Session. · Jan. 19, 2020 – Denver, CO

Judge for the JMM MAA Undergraduate Poster Session. · Jan. 17, 2019 – Baltimore, MD

Invited Panelist

Graduate student panel for undergraduates in STEM · April 2021 · 2019 — UMD

Graduate student survival panel · August 21, 2018 — UMD

Undergraduate women in STEM panel · Apr. 13, 2015 — UNC

PUBLICATIONS

Burnett, S. C., K. G. Honnell, S. D. Ramsey, and R. L. Singleton Jr. "Verification Studies for the Noh Problem using Non-ideal Equations of State and Finite Strength Shocks." *J. Verif. Valid. Uncert.* 3.2 (2018).

Ramsey, S. D., Z. M. Boyd, and S. C. Burnett. "Solution of the Noh problem using the universal symmetry of the gas dynamics equations." *Shock Waves* 27.3 (2017): 477-485.

Burnett, S. C., Sheppard, D. G., Honnell, K. G., and Sjostrom, T. "Sesame-style decomposition of KS-DFT molecular dynamics for direct interrogation of nuclear models." *AIP Conference Proceedings*. Vol. 1979. No. 1. AIP Publishing, 2018.

Yorke, C. E., Howard, A. D., Burnett, S. C., Honnell, K. G., Ramsey, S. D., and Singleton Jr, R. L. "Extension of the planar Noh problem to aluminum, iron, copper, and tungsten." *AIP Conference Proceedings*. Vol. 1979. No. 1. AIP Publishing, 2018.

WORKSHOPS

SPP summer school on "Machine Learning in Geosciences" · 8 - 10 Sep 2020 – Neustadt/Weinstr. · Invited speaker presenting on machine learning in the modelling of the geodynamo.

CONFERENCES

American Geophysical Union (AGU) Fall Meeting · December 15, 2021 – New Orleans, LA · Evaluating Efficacy of Magnetic Probe Positions on the Three-Meter Spherical Couette Experiment (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

American Physical Society (APS) Division of Fluid Dynamics (DFD) Conference · Nov. 21, 2021 – Phoenix, AZ · Predicting Magnetic Fields for the Three-Meter Spherical Couette Experiment (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

European Geoscience Union (EGU) · May 8, 2020 – Vienna, Austria (moved virtual) · Exploring Alternative Instrumentation in the Three-Meter Spherical Couette Experiment (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

Joint Mathematics Meeting (JMM) · Jan. 19, 2020 – Denver, CO · Girls Talk Math: Providing a Path to Math-related Careers through Early Support and Media (Talk)

AGU Fall Meeting · Dec. 12, 2019 – San Francisco, CA · Exploring Alternative Instrumentation in the Three-Meter Spherical Couette Experiment (Poster) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

Royal Astronomical Society Specialist Discussion Meeting: Observing and simulating Earths core and the magnetic field · Nov. 8, 2019 – London, UK · Exploring Alternative Instrumentation in the Three-Meter Spherical Couette Experiment (Poster) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

Society for Industrial and Applied Mathematics (SIAM) Conference on Applications of Dynamical Systems · May 21, 2019 – Snowbird, UT · An Approach to Predicting and Estimating Earth's Core and Magnetic Fields (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

JMM · Jan. 17, 2019 – Baltimore, MD · Girls Talk Math: Pursuit of Representation through Media (Poster)

AGU Fall Meeting · Dec. 12, 2018 – Washington, D.C. · Local Ensemble Transform Kalman Filtering Implemented on Dynamo Flow (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

APS DFD Conference · Nov. 19, 2018 – Atlanta, GA · Local Ensemble Transform Kalman Filtering Implemented on Dynamo Flow (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

AGU Fall Meeting · Dec. 12, 2017 – New Orleans, LA · Semi-Numerical Studies of the Three-Meter Spherical Couette Experiment Utilizing Data Assimilation (Poster) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

APS DFD · Nov. 21, 2017 – Denver, CO · Semi-Numerical Studies of the Three-Meter Spherical Couette Experiment Utilizing Data Assimilation (Talk) · Co-authors: Nathanael Schaeffer, Kayo Ide, Daniel Lathrop

APS Shock Compression of Condensed Matter · Jul. 9, 2017 – St. Louis, MO · Sesame style decomposition of KS-DFT molecular dynamics for direct interrogation of nuclear models (Talk) · Co-authors: Daniel G. Sheppard, Kevin G. Honnell, and Travis Sjoström

Mid-Atlantic APS Conference · Oct. 15, 2016 – University of Delaware · Verification Studies for the Noh Problem using Non-ideal Equations of State and Finite Strength Shocks (Poster) · Co-authors: Kevin G. Honnell, Scott D. Ramsey, and Robert L. Singleton

American Society of Mechanical Engineers (ASME) Verification and Validation Symposium · May 18, 2016 – Las Vegas, NV · Verification Studies for the Noh Problem using Non-ideal Equations of State and Finite Strength Shocks (Talk) · Co-authors: Kevin G. Honnell, Scott D. Ramsey, and Robert L. Singleton

APS DFD · Nov. 24, 2015 – Boston, MA · Gravity-Driven Particle-Laden Flow on an Incline (Poster) · Co-authors: Jesse Kreger, Hanna Kristensen, Andrew Stocker, Jeffrey Wong, Li Wang, Andrea Bertozzi

APS Conference for Undergraduate Women in Physics (CUWiP) · Jan. 16, 2015 – Duke University · Passive scalar flow through in a circular pipe (Talk) · Co-authors: Francesca Bernardi, Manuchehr Aminian, Roberto Camassa, Richard McLaughlin

APS DFD · Nov. 23, 2014 – San Francisco, CA · Gravity driven particle-laden flow (Talk) · Co-authors: Andrew Li, Matthew Molinare, Katherine Varela

APS CUWiP · Jan. 17, 2014 – University of Maryland

OTHER INFORMATION

Languages

ENGLISH · Mother tongue

SPANISH · Conversational (Minor in Spanish)

Interests

Biking · Exotic Cooking · Nature · Knitting · Computers · Animals

January 17, 2022