Julie Sherman

Curriculum Vitae

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Summary

Currently a PhD candidate at the University of Utah, I am a passionate student with diverse skills and interests pursuing a meaningful career in applied mathematics. I have a strong background in research, with a focus on exploring ecological and climate related questions using data, statistics, and dynamical systems.

Education

Expected 2025 — **PhD**, *University of Utah*, Salt Lake City.
Mathematics

May 2022 — **M.S.**, *University of Utah*, Salt Lake City.
Statistics

May 2019 — **B.S.**, *University of Minnesota*, Twin Cities, Summa Cum Laude(GPA: 3.86).
Mathematics, Statistics

Minors, *University of Minnesota*, Twin Cities.
Computer Science, Astrophysics, and Environmental Science, Policy, and Management

Awards and Honors

2019 - 2020 — **Center for Quantitative Biology Fellowship Recipient**, For incoming graduate students to pursue mathematical biology via seminars. Funding throughout year including for summer lab experience.

2015 - 2019 — **Clifford I. and Nancy J. Anderson Scholarship Recipient**, Merit-based scholarship for STEM students.

2015 - 2019 — **University of Minnesota Honors Student**, Invited by University Honors Program. Average honors student in 99^{th} high school rank percentile.

2014 - 2019 — **Dean's List**, Maintained GPA greater than 3.666 each semester.

Publications

- **J. Sherman**, C. Sampson, E. Fleurantin, Z. Wu, and C.K.R.T. Jones (2024). A data-driven study of the drivers of stratospheric circulation via reduced order modeling and data assimilation. *Meteorology* 3, no. 1: 1-35. https://doi.org/10.3390/meteorology3010001.
- **J. Sherman**, C. Strong, and K.M. Golden. (2024). Evolution of the fractal geometry of the Arctic marginal ice zone. *Scientific Reports* (under review).

- **J. Sherman**, K. St. Claire, B.R. Gray, and D. Larson. (2024). Predicting a continuous causal variable given ordinal outcomes and structural zeros with application to submersed aquatic vegetation biomass. *Environ. Ecol. Stat.* (in preparation).
- **J. Sherman**, L. Kim, M. Smith, and J.F. Gutiérrez. (2023). Quantitative analysis of mathematical word problems in the Estelle Reel Papers collection. *Proc. Third Annu. Meet. Int. Soc. Learn. Sci.*
- J. David, A. Nolte, and **J. Sherman**. (2018). A Boundary-Value Problem for 3-D Fractional Wave Equation with Singularity. *Bull. Inst. Math., Uzb. Acad. Sci.* (2), 28-52. http://mib.mathinst.uz/en/archive.html
- A.K. Shaw, **J. Sherman**, F.K. Barker, M. Zuk. (2018). Metrics matter: the effect of parasite richness, intensity and prevalence on the evolution of host migration. *Proc. R. Soc. B* 285: 20182147. http://dx.doi.org/10.1098/rspb.2018.2147

Conferences and Presentations

- "Data Assimilation with a Reduced Order Model of the Polar Vortex"
  - SIAM Conference on Mathematics of Planet Earth (August 2020)
  - SIAM Conference on Computational Science and Engineering Poster Session (March 2021)
- "An Application of Abel's Method to the Inverse Radon Transform", Joint Mathematics Meetings Undergraduate Poster Session (January 2019)
- "Constraints on the Oceanic Carbon Sink Using Atmospheric Oxygen Data"
  - Midwest Dynamical Systems Conference Poster Session (November 2018)
  - Joint Mathematics Meetings Undergraduate Poster Session (January 2018)
  - Nebraska Conference for Undergraduate Women in Mathematics (January 2018)
  - University of Minnesota Undergraduate Math Research Seminar Inaugural Meeting (January 2018)
- "Crabby Consequences of Ocean Acidification", University of Minnesota Student Poster Fair (April 2016)

Projects

August 2022–Present **Signs of Power and Dominance: The Role of Mathematics Curricula in U.S. Assimilationist Policies and Practices in Indian Boarding Schools, 1879-1932**.
Analysing of a collection of first-hand documents regarding mathematics curriculum for use in federal boarding schools for Native American children under superintendent Estelle Reel. Research and discuss historical context and lasting implications.

May 2022–Present **Predicting a continuous causal variable given ordinal outcomes and structural zeros with application to submersed aquatic vegetation biomass**.
Developing and testing a statistical model combining ordinal logistic regression with a compound lognormal-normal predictor conditional on a with-zeroes process with clustering. Application of the model to prediction of submersed aquatic vegetation biomass from the Upper Mississippi River. Project sponsored through ORISE/ORAU MSGI.

Aug. 2021–Present **Mathematical analyses of the marginal ice zone**.
1. MIZ boundary fractal dimension over time is computed 2. The spectral measure of the MIZ is computed and used to calculate homogenized coefficients for mesoscale models

May 2020–Sept. 2021 **Nematode modeling in extreme environments**.
Literature review of experiments and models determining effects of physical environment on the invertebrate community of the McMurdo Dry Valleys. In Summer 2021 with collaborators from BYU, ice cores from the Weddell Sea were analyzed for their crystalline structure and biotic communities.

Aug. 2019–Present **Data assimilation for a low order model of the polar vortex**.
A low dimensional model of mid-latitude stratospheric dynamics was considered. A particle filter was used to incorporate data into the model and deduce parameters. Twin experiments investigated particle filter performance in regions of bistability. Work completed with members of MCRN.

June 2018–Sept. 2018 **An application of Abel's method to the inverse Radon transform**.
A method of regularizing the inverse Radon transform was investigated. Convergence theorems were proven and Gibbs phenomena were ruled out. Suggestions were made for applications and an example was presented. Work completed as a part of IRES in Uzbekistan. Published in arXiv

June 2018–Sept. 2018 **Boundary-Value Problem for 3-D Fractional Wave Equation with Singularity**.
The boundary value problem for a three-dimensional wave equation related to the Bessel functions and the operator of the Caputo fractional derivative is investigated. Under certain conditions on the given functions existence, uniqueness, and continuous dependence on initial conditions of the solution are proven. Work completed as a part of IRES in Uzbekistan.

May 2017–March 2018 **Constraints on the Oceanic Carbon Sink Using Atmospheric Oxygen Data**.
This study develops a simple model of the global carbon-oxygen budget, incorporating data from the Scripps Carbon Dioxide and Oxygen Programs. The results are obtained from derivative free optimization techniques and gives minimum fluxes from the biosphere and the oceans necessary to replicate atmospheric observations. Funded by a UROP grant.

May 2016–Nov. 2018 **Metrics matter: the effect of parasite richness, intensity and prevalence on the evolution of host migration**.
This project aims to better understand the link between parasites and migration. A mathematical model was constructed and analyzed. To supplement the model, empirical support was collected from a database of fish. Relied heavily on use of Python, R, and SQL.

2015–2016 **The Model Male: Gender in *Science***.
This project examines gender bias in scientific communities. Images in every issue of *Science* from the year 2013 through 2015 were surveyed and appearances of men and women were recorded, as well as the type of image. While overall representation was approximately equal across genders, cartoons and drawings portrayed significantly more males than females. Social implications are discussed.

Jan.–Apr. 2016 **Crabby Consequences of Ocean Acidification**.
The effects of acidic water on Portunus gibbesii was measured. Tanks with historic and predicted ocean pH levels, 8.2 and 7.9, respectively, each held four crabs for six weeks. The water chemistry was monitored and kept constant.

Teaching Experience

Aug. 2020–May 2023 **Lecturer**, *University of Utah*.
Teaching classes on Introductory Statistical Inference and Business Algebra of up to 80 students. Preparing and lecturing on material from a textbook. Developing and grading homework, quizzes, and tests.

Sept. 2017–May 2022 **Teaching Assistant**, *University of Minnesota - Twin Cities, University of Utah*.
Leading a discussion section and holding office hours for classes of up to 30 students studying courses including Precalc II, Calc II, Introductory R, and graduate functional analysis. Developing supplementary worksheets, expanding on topics from the textbook, and leading the class through example problems.

June 2016–Aug. 2017 **Grader**, *University of Minnesota - Twin Cities*.
Providing feedback and grades on homework and quizzes for several math courses such as Chaos and Dynamical Systems, Cryptology and Number Theory, Applied Linear Algebra, and Calculus.

Extra-Curricular Involvement and Service

Aug. 2022 - Present **President**, *Association for Women in Mathematics - Utah Student Chapter*, Salt Lake City, UT.
Coordinating a team of 8-14 committee chairs dedicated to maintaining an active AWM chapter through social events, mentorship programs, outreach, and speaker series.

Aug. 2020 - May 2022 **Events Committee Chair**, *Association for Women in Mathematics - Utah Student Chapter*, Salt Lake City, UT.
Very similar role to below. Actively participating and helping plan events for the AWM chapter at my new institution.

Sept. 2016 - Dec. 2018 **Lead Undergraduate Officer**, *Association for Women in Mathematics - UMN Student Chapter*, Minneapolis, MN.
Organizing, planning, and advertising math-related events. Encouraging women to pursue math in all levels of education. Fostering a welcoming community of women with similar interests.

Nov. 2017 - Jan. 2019 **Planner and Counselor**, *Mathematics Project at Minnesota*, Minneapolis, MN.
Developing workshops and team building activities for a four day camp aimed at undergraduate women majoring in mathematics. This project is intended to build an inclusive community for undergraduate women in an academic setting, and increase their understanding of career paths and diversity

July 2017 **Workshop Leader**, *Girls Solve It! With Mathematical Biology*, Minneapolis, MN.
Leading a group of high school women interested in mathematical biology through a half day workshop concerning the applied problem of sea turtle conservation.

Jan. 2017 - Aug. 2017 **Adult Homework Helper**, *Sumner Public Library*, Minneapolis, MN.
Providing help and feedback for adults with high school and early college level homework assignments and projects. Allowing for free and friendly opportunities to further the education of members of the community.

Additional Skills

Programming