Stephen Williams

Department of Applied Mathematics, University of California, Merced
5200 N. Lake Road, Merced, CA 95343, USA

swilliams64@ucmerced.edu · swilliamsresearch.com

ORCID: 0000-0001-8848-6372 · Google Scholar · GitHub: StephWilleniams

Academic Appointments

Postdoctoral Research Scholar Apr 2023 – present
Department of Applied Mathematics, University of California, Merced, USA

NSF BII INSITE: The INstitute for Symbiotic Interactions, Training, and Education in the Face of a Changing Climate.
Supervisors: Prof. Erica Rutter, Prof. Shilpa Khatri

Postdoctoral Research Fellow Oct 2022 – Mar 2023
Soft Matter Physics Group, Department of Physics, University of Warwick, UK

Supervisor: Prof. Marco Polin

Research Technician Apr 2022 – Oct 2022
Soft Matter Physics Group, Department of Physics, University of Warwick, UK

Education

Ph.D., Physics 2018 – 2022
University of Warwick, UK

Thesis: *Mixed Active–Passive Systems in Confinement*
Advisor: Prof. Marco Polin

M.MathPhys., Master in Mathematics and Physics 2014 – 2018
University of Warwick, UK

Thesis: *Entropy Maximisation of Systems*
Advisor: Prof. Matthew Turner

Publications

Peer-reviewed journal articles

* Student I mentored.

4. Muffett, K. M., **Williams, S.**, MacVittie, S., Schwiesow, M. J. W., Mendoza, Su. A., Mendoza, Sa. A., Hatch-West, H., Sogin, E. M. "Low-abundance taxa drive host microbiome response to temperature stress." *Nature Communications*, in press (2026). Preprint on bioRxiv.

3. **Williams, S.**, Cheam, D.*, Nishiguchi, M. K., Sindi, S. S., Khatri, S., Rutter, E. M. "Identifiability, sensitivity, and genetic algorithms in bacterial biofilm selection models." *Bulletin of Mathematical Biology* **88**(7), 132 (2026). doi:10.1007/s11538-026-01693-5.

2. **Williams, S.**, Ruiz, K. A.*, Heath-Heckman, E., Rutter, E. M., Khatri, S. "Thermal stress disrupts symbiotic fluid dynamics in bobtail squid." *Journal of the Royal Society Interface* **23**(240), 20251136 (2026). doi:10.1098/rsif.2025.1136.

1. **Williams, S.**, Jeanneret, R., Tuval, I., Polin, M. "Confinement-induced accumulation and de-mixing of microscopic active–passive mixtures." *Nature Communications* **13**, 4776 (2022). doi:10.1038/s41467-022-32520-9.

Manuscripts in preparation

- **Williams, S.**, Khatri, S., Polin, M. "Controlling passive particle distributions in mixed systems through active scattering events." Target: *Physical Review Research*.
- **Williams, S.**, Muffett, K. M. "Deep learning measures the timing of strobilation in *Cassiopea* from daily photographs." Target: *Ecology and Evolution*.

Ongoing projects

- **Williams, S.**, Muffett, K. M., Sindi, S. S., Sogin, E. M., Khatri, S., Rutter, E. M. "Modeling and identifiability in size-structured populations of *Exaiptasia diaphana*."
- **Williams, S.**, Ruiz, K. A.[*], Heath-Heckman, E., Rutter, E. M., Khatri, S. "Exploring the impacts of squid breathing dynamics on bacterial symbiont acquisition."

Research Mentoring

- Graduate student collaborations
  - Yibing Wang, Applied Mathematics, UC Merced — Jun 2024 – present
  - Pablo Curiel, Applied Mathematics, UC Merced — Jun 2024 – present
  - Morgan Lavenstein-Bendall, Applied Mathematics, UC Merced — Apr 2023 – present
  - Daravuth Cheam, Quantitative Systems Biology, UC Merced — Apr 2023 – present
    Co-author, *Bull. Math. Biol.* (2026).
  - Antonia Peters, Applied Mathematics, UC Merced — Summer – Fall 2024
- Undergraduate students
  - Kyra Ruiz, Mechanical Engineering (research in Applied Mathematics), UC Merced — 2024 – 2026
    UC LEADS scholar; Student Poster Award, APS DFD 2024; talk, APS DFD 2025; co-author, *J. R. Soc. Interface* (2026); now a graduate student in Aerospace Engineering at UC Davis.
  - Paul Futscher, Department of Physics, University of Warwick — Summer 2019

Presentations

Invited talks

- 2026 Spring AMS Western Sectional Meeting, Boise, ID — Mar 2026
- Seminar, Interdisciplinary Center for Quantitative Modeling in Biology, UC Riverside, CA — Oct 2025

Contributed talks

- CassiopeaBase MATH-BIO 2026, Key Largo, FL — Jun 2026
- NITMB Workshop: Mathematical Modeling, Computational Methods, and Biological Fluid Dynamics, Chicago, IL — Jul 2025
- 77th Annual Meeting of the APS Division of Fluid Dynamics (session: Ecology of Fluid Mechanics II), Salt Lake City, UT — Nov 2024
- SIAM Conference on the Life Sciences (LS24), Portland, OR — Jun 2024
- Active Days EUTOPIA – Challenges in Active Matter, Paris, France — Dec 2022
- 11th Liquid Matter Conference (LMC), Prague, Czechia — Jul 2021

Posters

- NITMB Workshop: Mathematical Modeling, Computational Methods, and Biological Fluid Dynamics, Chicago, IL — Jul 2025
- Mathematics of Data, Dynamics, and Life Sciences, UC Irvine, CA — Jan 2025
- MOB 6.0: 6th Microscale Ocean Biophysics Meeting, Majorca, Spain — May 2022
- 5th International Soft Matter Conference (ISMC), Edinburgh, UK — Jul 2019
- 44th Conference of the Middle European Cooperation in Statistical Physics (MECO44), Munich, Germany — May 2019

- CompSysBio: Advanced Lecture Course on Computational Systems Biology, Aussois, France — Apr 2019

Awards and Funding

- Conference Travel Award, CassiopeaBase MATH-BIO 2026, Florida ($350) — Jun 2026
- Conference Travel Award, Mathematics of Data, Dynamics, and Life Sciences, UC Irvine ($500) — Jan 2025
- Outstanding Service Award, Department of Applied Mathematics, UC Merced ($500) — 2023 – 2024
- COST Short-Term Scientific Mission, COST Action CA17120 *Chemobrionics* (€1,500) — Apr – May 2022
  Hosted at IMEDEA (Mediterranean Institute for Advanced Studies), Majorca, Spain. Project: *Interplay between phototaxis and photosynthesis in a model motility*
- Undergraduate Research Support Scheme (URSS), University of Warwick (£1,500) — Summer 2018
  Project: *Automated multi-scale imaging of swarming microorganisms*
- Undergraduate Research Support Scheme (URSS), University of Warwick (£1,500) — Summer 2016
  Project: *Wavelet Monte Carlo simulations of polymer chains*

Grant Proposal Experience

- Burroughs Wellcome Fund Career Award at the Scientific Interface (CASI) — 2026
  The Biophysics of Symbiosis: Coupling Host Hydrodynamics and Bacterial Motility to Predict Squid–Vibrio Colonization in a Warming Ocean
  Role: applicant and PI; developed the research program, generated the preliminary results, and wrote the proposal.
- NSF Emerging Mathematics in Biology (eMB) — 2026
  Role: Senior Personnel; contributed preliminary results, project aims, writing, and editing. PIs: S. Khatri, E. M. Rutter, E. Heath-Heckman, M. K. Nishiguchi.
- NSF Organismal Response to Climate Change (ORCC) — 2024
  Role: contributor; contributed preliminary results, project aims, writing, and editing. PIs: S. Khatri, E. M. Rutter, E. Heath-Heckman.

Teaching

Course leadership and lecturing

- Lecturer, Introduction to Programming in Python — 2022
  Part of MD1A1: Foundational Laboratory and Computing Skills, School of Life Sciences, University of Warwick. ∼20 students.
- Module Leader, Introduction to Mathematics for Postgraduates — 2021 – 2022
  Midlands Integrative Biosciences Training Partnership (MIBTP), University of Warwick. ∼50 students per year; delivered hybrid.

Guest lecturing

- Guest Lecturer, Modeling in Research, INSITE Cooperative-based Graduate Research Experience (COOGRE; QSB 286), UC Merced — 2024, 2026
- Guest Lecturer, Math 24: Linear Algebra and Differential Equations, UC Merced — 2024

Teaching assistance

- Lab Demonstrator, Introduction to MATLAB (Year 3 computational labs), School of Life Sciences, University of Warwick — 2022
  ∼100 students.
- Problem Class Tutor, Department of Physics, University of Warwick — 2018 – 2022
- Exam Marker, Foundations of Physics; Classical Mechanics and Special Relativity, Department of Physics, University of Warwick — 2019

Service

University of California, Merced

- Organizer, Mathematical Biology Seminar — Summer 2024
- Co-organizer, Applied Mathematics Department Seminar — 2023 – 2024

University of Warwick

- Physics Student–Staff Liaison Committee: Secretary (2021), Chair (2020), Media Manager (2019), Member (2018) — 2018 – 2021
- Chair and Co-organizer, Soft Biological Matter Seminar Series — 2018 – 2020
- Organizer, URSS Summer Seminar Series — 2016
- Academic Coordinator and Seminar Co-organizer, Warwick Physics Society — 2015

Outreach

- Member, INSITE Conservation and Outreach Group, UC Merced — Apr 2023 – present
- Q&A: Scorching Questions: turning up the heat on INSITE faculty, panelist, UC Merced — Mar 2025
- AAUW Science Camp, volunteer, UC Merced — Jan 2025
- CalTeach: The Magic of Marine Microbes, volunteer, UC Merced — Jul 2024

Skills

- **Programming.** *Languages:* Python; MATLAB; C/C++; Julia; R. *Techniques:* high-performance computing and parallelization (UC Merced Pinnacles cluster, SLURM).
- **Mathematical methods.** *Modeling:* method of regularized Stokeslets; (active) Brownian motion; numerical methods; ordinary and delay differential equations; structured-population models (PDEs). *Analysis:* global sensitivity analysis (Sobol/Saltelli); structural and practical identifiability; genetic algorithms; transcriptomic analysis. *Statistics:* general statistical methods; generalized additive models. *Imaging:* ImageJ; image analysis; particle tracking; deep-learning object detection.
- **Experimental skills.** *Laboratory:* bacterial/algal cell culture; microfluidics. *Microscopy:* standard optical techniques; fluorescence microscopy. *Automation:* automated image acquisition; Arduino control; PID temperature control. *Field work:* data collection; marine husbandry; specimen processing.
- **Selected code.** SquidInternalFlows; BiofilmModelAnalysis; ActivePassiveConfinement

References

Available on request.