EMMA O'NEIL

emmao@pdx.edu ⋄ (425)-495-1667 ⋄ https://web.pdx.edu/~emmao

EDUCATION

Portland State University *September 2023–June 2027 (Projected)*
B.S. in Mathematics Cumulative GPA: 3.58 Mathematics & Physics GPA: 3.90
Selected Coursework:
Graduate Courses: **Graduate GPA: 3.96**

- [In Progress] MTH643 - Modern Algebra III (Homological Algebra II) (*Abstract Algebra, Dummit, Foote*)
- [In Progress] MTH610 - Quantum Stochastics *(Quantum Stochastics, Chang)*
- [In Progress] PH632 - Electromagnetic Fields and Interactions II (*Classical Mechanics and Electrodynamics, Leinaas*)
- MTH668 - Stochastic Processes and Probability Theory II (*Probability and Measure, Billingsley*)
- MTH641 - Modern Algebra I (Commutative Algebra)
- MTH605 - Topics in Advanced Number Theory (*Numbers From All Angles, Veerman*)
- MTH638 - Geometric Topology II (*Local Unitary Representations of the Braid Group and Their Applications to Quantum Computing, Delaney, Rowell, Wang*)

Undergraduate Courses:

- MTH461 - Graph Theory I
- MTH405 - Number Theory II
- MTH443 - Introduction to Abstract Algebra III
- MTH312 - Introduction to Math Analysis II
- PH311 - Modern Physics

Self-studied topics

- Real Analysis - Metric Spaces, Measure and Integration, Banach and Hilbert spaces. (*Real Variables, Torchinsky*)
- Diagrammatic Algebras (*The Temperley-Lieb Categories and Skein Modules, Chen*)

RESEARCH INTERESTS

Diagrammatic Algebra, Mathematical Physics, Quantum Computation

PUBLICATIONS

- Visualizing the state space and transformations of higher order quantum logics via toric geometry. *Steven Bleiler, Shanyan Chen, Emma L. O'Neil, J. Eliot Reich, Julia Rezvani, Elijah Whitham-Powell, Ali Al-Bayaty, Jerzy Jegier, Sonia Yang, Marek Perkowski* (revised and resubmitted
- Origami Flip Graph of the $2 \times n$ Miura-ori. *Lumi Christensen, Thomas C. Hull, Emma O'Neil, Valentina Pappano, Kacey Yang* (submitted, in revision).

TALKS GIVEN

- Enumerating Valid Mountain-Valley Assignments on the Miura-ori. **2025 Joint Mathematics Meetings**
- Diameter of the $2 \times n$ Miura-ori Origami Flip Graph. **2025 Joint Mathematics Meetings**
- Ergodic Theory of Complete Interval Map Expansions. **2026 Joint Mathematics Meetings**
- Complete Interval Maps are Mixing. **2026 PNW MAA Spring Sectional**
- Complete Interval Maps are Mixing. *(upcoming)* **2026 PiMUC**

RESEARCH EXPERIENCE

Quantum Information Science Research Group **Portland, OR**
Advisors: Steven Bleiler, Marek Perkowski *January 2026–Present*

- Researching the use of toric varieties for visualization of state spaces of quantum systems for the purpose of quantum gate design, and Cayley graphs of groups generated by certain sets of ternary and higher-radix gates.

Undergraduate Research **Portland, OR**
Advisor: J.J.P. Veerman *June 2025–April 2026*

- Ergodic theory of complete interval maps generalizing the Gauss map. Showed mixing of a class of expanding maps utilizing elementary methods and the transfer operator, without the classical functional analysis machinery.

MathILy-EST REU **Bryn Mawr, PA**
Advisor: Thomas C. Hull *June 2024–August 2024*

- Researched the geometry of origami with combinatorial and computational methods, especially on methods of enumeration of valid states and reconfiguration graphs.

SKILLS AND OTHER INTERESTS

- Software: *Mathematica*, LaTeX
- Interests: Origami, Procedural Terrain Generation