

EDUCATION

Ohio State University (OSU)

B.S. in Applied Mathematics, Minor in Philosophy (Summa Cum Laude; College Honors)

Aug 2022–Dec 2024

Cum GPA 3.934/4.0

RESEARCH EXPERIENCE

Analyzing self-coherence in oscillations emitted from the ear

Sep 2024–Present

Supervisors: Prof. Christopher Bergevin; Prof. Natasha Mhatre

Bergevin Lab, York University

Development of a signal processing method to quantify self-coherence in oscillatory emissions from the ear

- Lead author on [bioRxiv preprint](#) (now preparing for *PNAS*); will be presenting at Assoc. for Research in Otolaryngology 2026 MidWinter Meeting
- Developed Python package [phaseco](#) for our self-coherence method; integrated analyses into a [unified codebase](#)
- Engineered dynamic windowing techniques to address an issue related to time–frequency uncertainty

Fields Undergraduate Summer Research Program

Jun 2024–Aug 2024

Supervisors: Prof. Christopher Bergevin; Prof. Natasha Mhatre

The Fields Institute

Mathematical modeling of oscillatory emissions from lizard ears during funded research program

- Explored locally coupled oscillator models of these emissions, especially how amplitude-dependent frequency (nonisochronicity) affects synchronization
- Examined how Volterra-series methods can be extended to handle stochastic forcing of nonlinear oscillators
- Expanded existing models to incorporate coupling between lizard ears

Topological data analysis (TDA) of serotonin time-series data

Aug 2023–May 2024

Supervisor: Prof. Janet Best

OSU

TDA approach to find differences in serotonin time-series data from depressed vs control mice

- Modified method based on sublevel set filtrations to design algorithm for time-series “process” extraction
- Identified trend suggesting the measurement itself may have disproportionately affected depressed mice

Optimizing an efficient eigenvector phase retrieval algorithm

Jan 2023–May 2023

Cycle Undergraduate Research with Daniel Packer (PhD Candidate)

OSU

Designed and implemented methods for efficiently recovering eigenvectors from the absolute value of their entries

PREPRINTS

Peacock, S. N. S., Vencovsky, V., Whiley, R. E., Mhatre, N., & Bergevin, C. (2025). Spontaneous oto coherence of the active ear. <https://doi.org/10.1101/2025.11.14.687084> (preparing for submission to *PNAS*)

SELECTED PROJECTS

[phaseco](#)

A Python package providing tools for phase autocohereence analysis with dynamic windowing methods

[Peak-picking otoacoustic emissions with machine learning](#)

A neural network model to identify features in power spectra of oscillations emitted from the ear

- Designed network by integrating approaches in similar domains; generated synthetic data for supervised learning

[Quantifying uncertainty in college basketball](#)

Devised Elo-style ranking to derive a bootstrapped C.I. for the minimum “uncertainty” in a game

- 1st Place at OSU’s Mathematical Competition in Modeling, November 15th–17th 2024

PRESENTATIONS

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|--|-----------------|
| Assoc. for Research in Otolaryngology MidWinter Meeting | Feb 2026 |
| <i>Otocoherence: Interspecies analysis of phase self-consistency in spontaneous otoacoustic emission</i> | |
| OSU Honors Project Symposium | Dec 2024 |
| <i>Topological data analysis of depressed mouse serotonin concentrations</i> | |
| Fields Undergraduate Summer Research Program Final Presentations | Aug 2024 |
| <i>Modeling and analyzing spontaneous emissions from lizard ears</i> | |

HONORS AND AWARDS

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|--|------------------|
| Conference travel award for the 2026 Assoc. for Research in Otolaryngology MidWinter Meeting | 2025 |
| 1st Place at OSU's Mathematical Competition in Modeling | 2024 |
| OSU Dean's List (all semesters) | 2022-2024 |
| National Merit Scholar Finalist | 2018 |

SKILLS AND COURSEWORK

OSU Coursework

Mathematics: Real analysis I & II, linear algebra, ODEs, PDEs, probability, dynamical systems

Applied Mathematics: Quantitative neuroscience, statistics, machine learning, infectious disease dynamics

Physics: Classical mechanics, electricity and magnetism, relativistic mechanics, quantum mechanics

Audited Coursework & Self-Study

Complex analysis, digital signal processing, functional analysis, applied algebraic topology, circuit theory

Computational Skills

Spectral analysis, machine learning, topological data analysis

Languages: Python (advanced); MATLAB, Java (intermediate)

TEACHING / MENTORING

Private tutoring in mathematics **Aug 2025–Present**

One-on-one tutoring, primarily in real analysis and proof writing with OSU undergraduates

Mentoring during Fields Undergraduate Summer Research Program **Jun 2025–Aug 2025**

Mentored Prof. Bergevin's group of undergraduates in later iteration of research program

- Proposed accessible entry points based on each student's interests into our research analyzing, modeling, and simulating stochastic oscillations emitted from ears
- Led regular student meetings for troubleshooting and sharing progress

Private music lessons **Jun 2018–Present**

One-on-one lessons in music theory, guitar, bass, and drums

OTHER EXPERIENCE

Cyclops Studio and Effects: *Effect Pedal Technician, Studio Engineer* **Jul 2019–Present**

Repaired, designed, and built electronic musical effect units; engineered and mixed recordings

Rat Motel: *Band Manager, Songwriter, Performer* **Jun 2016–Present**

Managed tours, merchandise, and financial records, developing project management and organizational skills