

EDUCATION**Ohio State University (OSU)**

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

AU22–AU24

Cum GPA 3.934/4.0

PREPRINTS

Peacock, S. N. S., Vencovsky, V., Whiley, R. E., Mhatre, N., & Bergevin, C. (2025). Spontaneous otocoherence of the active ear. <https://doi.org/10.1101/2025.11.14.687084>

Contributions:

- Developed a mathematical framework to quantify self-coherence of spontaneous otoacoustic emissions (SOAEs), oscillatory signals emitted by the ear
- Engineered a dynamic time–frequency windowing technique
- Created the Python package [*phaseco*](#) to integrate all analyses into a single [*codebase*](#)

RESEARCH**Fields Undergraduate Summer Research Program (Participant)***Professor Christopher Bergevin and Professor Natasha Mhatre***June 2024–August 2024**

The Fields Institute

Funded research program mathematically analyzing and modeling SOAEs

- Developed codebase implementing ordinary differential equation (ODE) models of SOAEs
- Extended existing ODE model to incorporate interaural coupling between lizard ears

Fields Undergraduate Summer Research Program (Mentor)*Professor Christopher Bergevin***June 2025–August 2025**

The Fields Institute

Mentored Prof. Bergevin's group during the 2025 program

- Proposed accessible entry points into our research in SOAEs tailored to each student's strengths and interests
- Led regular student meetings focused on troubleshooting, sharing progress, and developing early-stage ideas

Topological Data Analysis (TDA) of Depressed Mouse Serotonin Concentrations*Professor Janet Best***August 2023–May 2024**

OSU

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

- Designed novel algorithm for time-series “process” extraction by modifying sublevel set filtration method (TDA)
- Discovered CMS mice lost homeostasis after ~30 min, indicating interaction with measurement electrode

Eigenvector Phase Retrieval Problem (CYCLE Research Program)

Optimized efficiency of an eigenvector phase retrieval algorithm

January 2023–May 2023

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SELECTED PROJECTS[phaseco](#)

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

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

A neural network model to identify “peaks” in SOAE power spectra

- Designed neural network architecture by adapting and improving models from related applications
- Generated synthetic (labeled) SOAE data for supervised learning

[Quantifying uncertainty in college basketball](#)1st Place at OSU's Mathematical Competition in Modeling, November 15th–17th 2024

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

HONORS AND AWARDS

Conference Travel Award for the 2026 Assoc. for Research in Otolaryngology MidWinter Meeting	2025
1st Place at OSU Mathematical Competition in Modeling	2024
Ohio State Dean's List (All Semesters)	2022-2024
National Merit Scholar Finalist	2018

PRESENTATIONS

Assoc. for Research in Otolaryngology MidWinter Meeting (Accepted)	February 2026
<i>Otocoherence: Interspecies analysis of phase self-consistency in spontaneous otoacoustic emission</i>	
Ohio State Honors Project Symposium	December 2024
<i>Topological data analysis of depressed mouse serotonin concentrations</i>	
Fields Undergraduate Summer Research Program Final Presentations	August 2024
<i>Modeling and signal processing of spontaneous emissions from lizard ears</i>	

SKILLS AND COURSEWORK

Computational Skills

Digital signal processing, machine learning, spectral analysis, algorithm design

Languages: Python, MATLAB, and Java (completed projects); experience with Julia, Mathematica, JS, C++

OSU Coursework

Applied Mathematics: Computational Neuroscience, Machine Learning, Statistics, Infectious Disease Dynamics

Mathematics: Dynamical Systems, Linear Algebra, ODEs, PDEs, Probability, Real Analysis I & II, Complex Analysis

Physics: Classical Mechanics I & II, Electricity and Magnetism, Relativistic Mechanics, Quantum Mechanics

Self Study

Signal processing, topological data analysis, linear systems theory, discrete mathematics, circuit theory

OTHER EXPERIENCE

Cyclops Studio and Effects: Effect Pedal Technician, Studio Engineer, Instructor	July 2019–August 2022
Repaired, designed, and built electronic musical effect units; engineered recordings; taught private lessons in music theory	

Rat Motel: Band Manager, Songwriter, Performer	June 2016–August 2022
Managed tours, merchandise, and financial records, developing project management and organizational skills	