

# Allison Cruikshank

Duke University  
Box 90320  
Durham, NC 27708

E-mail: [allison.cruikshank@duke.edu](mailto:allison.cruikshank@duke.edu)  
Web: [services.math.duke.edu/~ac758](http://services.math.duke.edu/~ac758)

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## Overview

I am a fourth year PhD candidate in Mathematics at Duke University. I study mathematical biology and am interested in the mathematical modeling of human physiological processes to answer and inform questions in medicine. I plan to obtain a career in the biotech/pharmaceutical industry after graduation and am interested in PK/PD and QSP modeling for drug development.

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## Education

- **Duke University** Expected May 2026  
PhD in Mathematics, Advisor: Professor Michael C. Reed
- **University of Nebraska-Lincoln** May 2021  
BS in Mathematics and Biochemistry with Highest Distinction  
Thesis: A Mathematical Model of Pancreatic Cancer Growth and Response to Treatment  
Advisor: Professor Huijing Du

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## Professional Experience

- **Simulations Plus QSP Modeling Intern** Summer 2024  
Supported the development of the BIOLOGXsym platform, a quantitative systems toxicology software focused on complex macromolecule liver safety
- **Johnson & Johnson Clinical Pharmacology and Pharmacometrics Intern** Summer 2023  
Supported the development of co-stimulatory combinations of T cell redirectors for treatment of lymphoma through mechanistic mathematical modeling.

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## Research Experience

- **Sex Differences in Glutathione Metabolism** Present  
Investigating sex differences in the glutathione pathway which is a key component of relieving oxidative stress. Systems of ordinary differential equations are used to model the biological mechanisms.
- **Co-Modulation of Neurotransmitters** Present  
Developing deterministic models for neurotransmitters and their interactions with one another in different areas of the brain.
- **Pancreatic Cancer Growth and Response to Treatment** Fall 2020 - Spring 2021  
Developed a differential equations model of Pancreatic Cancer cell growth and response to different radiotherapy treatments.

- IUPUI Mathematics REU

Summer 2020

Created a steady and near-steady state cancer cell model with Jacob Woodrome under the mentorship of Dr. Jared Barber.

## Publications

### Graduate Work

- [2024] Sergio Mena, **Allison Cruikshank**, Janet Best, H. Frederick Nijhout, Michael C. Reed, Parastoo Hashemi. Modulation of Serotonin Transporter Expression by Escitalopram under Inflammation; Implications for SSRI Effectiveness. *Communications Biology*. <https://doi.org/10.1038/s42003-024-06240-3>.
- [2024] **Allison Cruikshank**, Michael C. Reed, H. Frederick Nijhout. Sex differences in glutathione metabolism and acetaminophen toxicity. *Metabolism and Target Organ Damage*. <https://doi.org/10.20517/mtod.2023.44>.
- [2024] Anna Marie Buchanan, Sergio Mena, Iman Choukari, Aditya Vasa, Jesseca N. Crawford, Jim Fadel, Nick Maxwell, Lawrence Reagan, **Allison Cruikshank**, Janet Best, H. Frederick Nijhout, Michael Reed, Parastoo Hashemi. Serotonin as a Biomarker of Toxin-Induced Parkinsonian. *Molecular Medicine*. <https://doi.org/10.1186/s10020-023-00773-9>.
- [2023] **Allison Cruikshank**, Janet Best, H. Frederick Nijhout, Michael C. Reed. Dynamical Questions in Volume Transmission. *Journal of Biological Dynamics*. <https://doi.org/10.1080/17513758.2023.2269986>.

### Undergraduate Work

- [2023] Madison Albert, **Allison Cruikshank**, Kausik Das, Luoding Zhu, Jared Barber. Image Digitization and Calculation of forces for osteocyte viscoelastic networks.
- [2023] Archer Harrold, **Allison Cruikshank**, Bryan Penas, Rebecca Roston. Introducing High School Biology Students to Biochemistry with a Short, Content-Oriented Intervention. *Biochemistry and Molecular Biology Education*. <https://doi.org/10.1002/bmb.21782>.

## Teaching

- **Duke University**

Fall 2022

*Instructor of Record*

**Math 111L: Laboratory Calculus I**

Prepared and presented lectures three days per week and co-designed exams with the course coordinator (Professor Shira Viel) and a team of graduate instructors.

- **Duke University**

Fall 2021

*Teaching Assistant*

**Math 111L: Laboratory Calculus I**

Led a discussion section with a partner twice a week. Facilitated group work, answered questions, gave mini-lectures, and graded exams.

- **University of Nebraska-Lincoln** Fall 2019 – Spring 2020  
*Learning Assistant*  
**Math 101: College Algebra**  
 Assisted in student learning in the classroom and prepare active review sessions.
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## Outreach and Service

- Association for Women in Mathematics (AWM) Present  
*Chapter Officer, Duke Mathematics Department*  
 Coordinate community-building events, talks, and academic enrichment opportunities.
  - Society for Industrial and Applied Mathematics (SIAM) Present  
*Chapter Officer, Duke Mathematics Department*  
 Organize community-building events, research talks, and career development opportunities.
  - Semester REU Spring 2024  
*Graduate Student Support, Duke Mathematics Department*  
 Assist in a research experience for undergraduates led by Dr. Jacob Madrid in mathematical biology and probability.
  - Triangle Area Graduate Mathematics Conference (TAGMaC) Present  
*Co-organizer, Duke-UNC-NCSU Mathematics Departments*  
 Rotating conference for mathematics graduate students in the NC Triangle area, sponsored by the AMS and SIAM chapters at Duke, UNC Chapel Hill, and NC State. Co-organized the Fall 2021 TAGMaC.
  - Triangle Contest in Mathematical Modeling (TriCoMM) Present  
*Co-organizer, Duke Mathematics Departments*  
 Local mathematical modeling contest for undergraduate students based on the international Mathematical Contest in Modeling (MCM). Helped organize logistical meetings and the contest.
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## Talks and Conferences

- AWM Workshop at SIAM Annual Meeting- Poster Summer 2024
  - SIAM Life Sciences Meeting - Invited Talk Summer 2024
  - Triangle Area Graduate Mathematics Conference (TAGMaC) - Contributed Talk Spring 2024
  - Triangle Computational and Applied Mathematics Symposium - Poster Fall 2023
  - Association for Women in Mathematics Research Symposium - Poster Fall 2023
  - Society of Mathematical Biology Annual Meeting - Talk Summer 2023
  - Dynamical Systems in the Life Sciences - Invited Talk Summer 2023
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## Awards

- NSF RTG Research Assistantship *Duke Applied Math RTG (\$42,000)* Spring 2023, Spring 2024

- AWM Poster Award at SIAM Annual Meeting Summer 2024
  - SIAM Student Chapter Certificate of Recognition 2024
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## **Skills**

- Languages: Matlab (advanced), Python (basic)