

# GABE LUMPKIN

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## Career Statement

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I am currently interested in differential geometry, topology, and dynamics. In particular, I enjoy investigating how deep knowledge of these fields and how they interact can prove useful in applications. In addition, I have a passion for teaching mathematics. I have the firm belief that anyone can learn and even enjoy math. My experience teaching at varying levels to students from diverse intellectual, socioeconomic, and ethnic backgrounds has given me the ability to present mathematics in a way that builds foundational concepts, while keeping the material relevant and engaging.

## Education

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**George Mason University, Fairfax**  
BS Mathematics

August 2017 - May 2023

**George Mason University**  
MS Mathematics

August 2023 - May 2025

## Research

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### **Foliations of Surfaces (MEGL, GMU)**

This project studied the interplay between algebraic structures and the geometric objects they are associated to. In particular, we sought to determine if a foliation of a surface is completely determined by its holonomy data. Specific examples were studied and in some cases, such as the annulus, the answer was determined. Roles included:

- Work with small research group to build understanding of the field of differential geometry
- Survey the state of active research in the theory of foliations
- Develop ways to visualize and describe complex mathematical theory
- Make connections between differential geometry and abstract algebra
- Design and give presentation to audience consisting of undergraduates with no background on the project and experts in the field

### **Resolving Neural Ideals (MEGL, GMU)**

In this project, we studied algebraic objects (neural ideals) constructed from combinatorial data which is related to the firing of neurons. Computations were done using the software Macauley2, designed for research in algebraic geometry and commutative algebra. Roles included:

- Work with small research group to strengthen background in commutative algebra
- Construct novel examples highlighting algebraic structures of interest to neuroscience
- Compute free resolutions using Macauley2
- Identify patterns in computation results
- Record results and relay relevant information to researchers
- Design and give presentation to audience consisting of undergraduates with no background on the project and experts in the field

## Spectroscopy and Solar Flares

In this project we interpreted spectral imaging of the sun using a software called Information Data Language (IDL). We then wrote a series of programs which would assign to each pixel an intensity value, then trace the pixels of highest intensity. My roles included:

- Learn unfamiliar software
- Develop background in astronomy, particularly spectroscopy, and imaging
- Extract meaning from data, including understanding instrument error
- Design a series of programs to quickly and efficiently extract relevant data
- Work closely with researcher and team of undergraduate researchers to solve problems and reach conclusions about data

## Technical Skills & Certifications

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**Proficient Languages/Software:** Matlab, Python, Mathematica, Macauley2

**Certificate of Completion:** Program for Advanced Teaching in Mathematics (PAT Math), GMU

## Teaching Experience

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### Tutor at Enrich and Excel (1-7 Students)

August 2022 - June 2023

- Tutor small groups of high school students in Precalculus, Calculus AB, and Calculus BC
- Design worksheets to aid in student understanding
- Assist in problem solving in active learning environment

### Tutor at PassCS Math Tutoring

January 2023 - June 2023

- Tutor students at the university level in Calculus I-III, Linear Algebra, and Discrete Mathematics
- Prepare exercises catered to individual student needs
- Navigate meeting the needs of non-traditional students

### Graduate Learning Assistant, Graduate Topology (10-20 Students)

Spring 2024 & Spring 2025

- Assist in student understanding of material covered in lecture
- Select relevant exercises to adequately prepare students for topology preliminary exam
- Present exercises in weekly problem solving sessions
- Provide constructive written feedback on graded assignments

### Graduate Teaching Assistant, Calculus 3 (145 students)

Fall 2024

- Manage classrooms of 12-40 students
- Maintain pace with paired course schedule and syllabus
- Meet with students weekly to review and supplement material presented in lecture
- Design lectures and worksheets which capture key concepts and highlight areas where students need practice
- Employ the Active Learning model to encourage student participation and collaboration

## Mentoring & Service Work

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### Graduate Mentor, Mason Experimental Geometry Lab

Spring 2024

- Introduce advanced mathematical topics in geometry and knot theory to undergraduate student research group
- Meet weekly to assess student research progress and provide feedback, direction, and goals for the project

### Graduate Mentor, Mason Experimental Geometry Lab

Fall 2024

- Present introduction to algebraic geometry to undergraduate students
- Meet weekly to assess student research progress and provide feedback, direction, and goals for the project
- Use expertise and research experience in the field to assist in students' progress

### Student Research Talks (StReeTs) Management

August 2023 - Spring 2025

- Find graduate and undergraduate students to present research talks
- Ensure that the seminar maintains a friendly and welcoming environment
- Update website weekly

## Talks & Presentations

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**Spaces of Geometric Structures:** StReeTs (George Mason University), October 27, 2023

**Deformation Spaces of Geometric Structures:** Geometry, Topology, and Algebra Conference (Temple University), May 31, 2024

## References (add info after verifying)

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### Teaching/Professional

Dr. Timothee Bryan

Dr. Benjamin Schweinhart

### Academic

Dr. Anton Lukyanenko

Dr. Carlos Rautenberg