SUMS 2026 TENTATIVE TIMETABLE

When	What & Where			
9:00-10:00	Registration & Breakfast EnGeo Building, 2nd floor hallway			
10:00 - 10:10	Welcome Dr. Ravi Shankar (JMU, Math/Stat Dept. Head) 2301			
10:10 - 11:00	Opening Talk Dr. G. Eric Moorhouse (UW) 2301			
11:15 - 11:30	Talk Session I			
	I. Tecum 1207	K. Scafe, N. Carter 1208	Q. Jimenez 1209	M. Kelly 1210
11:35 - 11:50	Talk Session II			
	B. McManus 1207	L. Gibson, T. Cohen-Rider 1208	T. Tarter 1209	Z. Baker 1210
11:55 - 12:10	Talk Session III			
		A. Gardner 1208	M. Ahearn-Wood 1209	I. Hammond, R. Patel 1210
12:15 - 12:30	Panel Session I			
		Career/Industry 1208	Graduate School 1209	REU 1210
12:30-1:45	Lunch and Poster Session Hallway			
1:50 - 2:05	Panel Session II			
		Career/Industry 1208	Graduate School 1209	REU 1210
2:10-2:25	Talk Session IV			
		B. Trimmell 1208	J. Noyman 1209	J. Ungerleider 1210
2:30-2:45	Talk Session V			
		N. Harsell 1208	T. Fairfield 1209	A. Dorwin 1210
2:45-3:00	Afternoon Coffee & Tea Hallway			
3:05 - 3:55	Closing Talk Dr. Della Dumbaugh (UR) 2301			
4:05-4:20	Prize session 2301			
4:20	Conference Closing 2301			

9:00 - 10:00 Registration and Breakfast 2nd floor hallway

If you registered online, you should pick up your name tag at the registration table. If you still need to register, please do so at the same table.

Poster presenters should take their posters to room EnGeo 2202 for check in.

Be sure to come to the Prize Session at the end of the day!

10:00 - 10:10 Opening Remarks auditorium 2301

Join Dr. Ravi Shankar, Head of the Mathematics and Statistics Department, as we welcome you to SUMS 2026.

10:10 - 11:00 Opening Address auditorium 2301



Projective Planes

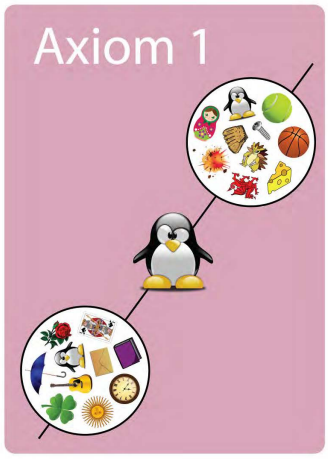
Dr. G. Eric Moorhouse
University of Wyoming

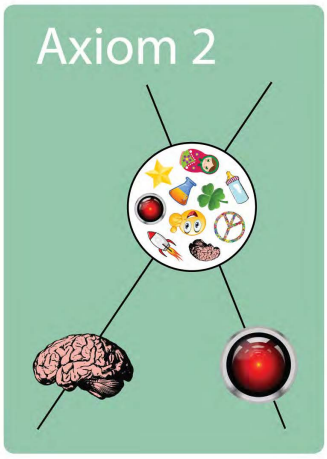
A projective plane is a system of points and lines which obeys the following two axioms:

Axiom 1: Any two points are joined by exactly one line.

Axiom 2: Any two lines meet in exactly one point.

From these two simple axioms there emerges an extremely rich theory with many surprising features and open questions.





1207 **Sharp Perturbation Bounds for Four-Oval Quartics**
Iz Tecum, Columbia University
For $(x^2-1)^2+(y^2-1)^2+ax+by=t$ with t in $(0,1)$, I compute the largest disk in the (a,b)-plane preserving a nonsingular projective curve with four unnested real ovals. I reduce the singularity equations to one-variable minimization, identify the sharp degenerations, and optimize the radius over t.

1208 **Stability of Proximal Average Relaxation for Signal Recovery**
Kevin Scafe, James Madison University
Nathan Carter, James Madison University
We study the sensitivity of image and audio signal recovery under noisy or inconsistent observations and perturbed operators. Using averaged fixed-point relaxation, we derive a bound on reconstruction error that depends linearly on perturbations to operators and data. Our numerical experiments also support the theory.

1209 **Introduction to McEliese Cryptosystems & Computing**
Quinne Jimenez, Radford University
If ever developed and accessible, quantum computers could threaten cryptographic systems like RSA. This talk introduces the McEliece cryptosystem, a potential quantum-resistant alternative. Using Hamming codes and interactive Maplets, we demonstrate its operation and discuss security and implementation challenges.

1210 **Can Modifying Moisture Reduce Dry Variable Correlations?**
Matt Kelly, Virginia Commonwealth University
This talk examines relationships between moisture and dry atmospheric variables in the midlatitudes through statistical correlation analysis. Comparing these relationships across different moisture variables helps assess which is best suited for use in data assimilation schemes for weather forecasting.

1207 **Predicting Rocket Launch Noise Using the Parker-Sochacki Method**
Brooke McManus, James Madison University
The noise a rocket emits at launch can damage the rocket and its payload, and the flame trench is a key source. This talk covers how we model that noise, past methods and current experiments, and a new method (the Parker-Sochacki Method) for accurately predicting the flow, and therefore the noise, from the trench.

1208 **The Multi-Drone-Assisted Pickup and Delivery Problem**
Lauren Gibson, Arizona State University
Tristan Cohen-Rider, Rose-Hulman Institute of Technology
We consider the n-commodity pickup and delivery problem, where n distinct packages are collected and delivered via trucks and drones. Extending the work of Mulumba et al. to include multiple drones per truck, we formulate a mixed integer linear programming model and a new simulated annealing-based heuristic algorithm.

1209 **Representation Varieties and Fixed Points**
Timothy Tarter, James Madison University
The representation variety of a surface is a topological space whose fixed-point sets under certain transformations correspond to particular Chern–Simons invariants, which are of interest to physicists. In this talk, we will introduce an elucidating example and present certain classification results we have proven.

1210 **Compartmental Airway Model to Assess Mucus Clearance**
Zoe Baker, Virginia Commonwealth University
We have developed a three compartment model to study mucus clearance, consisting of the upper, compliant, and small airways. Upper and small airways have a fixed radius while the compliant airways have a time-dependent radius. To model the effects of cilia on clearance, we have introduced a slip boundary condition.

11:55 - 12:10 Parallel Talks Session III

1208 **Accelerated GJK for Robot Collision Detection**
Aurora Gardner, James Madison University
Optimization in robotics relies on fast, accurate collision queries, and Drake, MIT/TRI's open-source robotics toolbox, uses the GJK algorithm to compute distances between shapes. We integrated GJK++, a recent accelerated version of GJK, into Drake and are evaluating its precision and speed against the current engine.

1209 **Visualizing Socles and Docles of Monomial Ideals**
Micah Ahearn-Wood, Mary Baldwin University
This expository talk will give a brief introduction to monomial ideals, socles of monomial ideals, and docles of monomial ideals. In two and three variables, staircase diagrams are a useful visualization tool for these concepts.

1210 **Analysis of a landscape strong Allee growth model**
Isaac Hammond, University of North Carolina Greensboro
Rishav Patel, University of North Carolina Greensboro
We study bifurcation diagrams of positive steady states in a landscape ecological model with strong-Allee growth and density-dependent emigration. We establish both analytical and computational results. Further, with strong negative density-dependent emigration, we establish at least four solutions in large habitats.

12:15 - 12:30 Panel Session I

1208 **Career Panel**
Will Clewett, Software Engineer
Lydia Pelham, Department of the Navy
Grant Wagner, Department of the Navy
Ask questions and learn about careers involving mathematics and statistics.

1209 **Graduate Panel**
Steve Robinson, Wake Forest University, faculty
Reilly Kartchner, Drexel University, graduate student
Jon Henriques, James Madison University, graduate student
Learn about what life is like as a graduate student in mathematics, statistics, and other fields.

1210 **REU Panel**
Alex Capaldi, James Madison University
Timothy Tarter, James Madison University
Learn all about the process of applying for, and participating in, an REU program.

12:30 - 1:45 Lunch hallway

LUNCH: If you are hungry and have a circle on your badge, please pick up a boxed lunch near the registration table at 12:30. (If you do not have a circle, it means that you registered after our catering order deadline. But you still might get a free lunch. Please wait until 12:45 to check for unclaimed lunches).

12:30 - 1:45 Poster Session hallway

POSTER SESSION: Students will be near their posters during lunch. Please stop by to see their excellent work! Poster judging will start by 12:45.

Predicting Diabetes Risk Using Statistical and Machine Learning
Thao Le, James Madison University

Comparing Anderson Acceleration and Krylov Subspace Methods
Liam Curtis, Virginia Tech

A Block-Coordinate Frank-Wolfe Splitting Algorithm
Nicholas Harsell, James Madison University

A Time-Dependent Information Bottleneck Tradeoff Parameter
Jack Zettlemoyer, James Madison University
Keegan Muralles, James Madison University
Jacob Fitzmaurice, James Madison University

Parasite Load and Behavior Duration in Minuca minax
Peier Li, William & Mary

Modeling Third Parties in Virginia's State Legislature
William Schwebach, Yorktown High School

Power series and the N-body Problem
Kolbi Lee, James Madison University

Early Warnings in Ventricular Arrhythmias using MSE
Joeun Park, Carter G. Woodson High School

Analyzing the Coanda Effect via Jet Boundary Digitization
Destiny Jones, James Madison University

1:50 - 2:05 Panel Session II

1208 **Career Panel**
Will Clewett, Software Engineer
Lydia Pelham, Department of the Navy
Grant Wagner, Department of the Navy
Ask questions and learn about careers involving mathematics and statistics.

1209 **Graduate Panel**
Steve Robinson, Wake Forest University, faculty
Reilly Kartchner, Drexel University, graduate student
Jon Henriques, James Madison University, graduate student
Learn about what life is like as a graduate student in mathematics, statistics, and other fields.

1210 **REU Panel**
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Learn all about the process of applying for, and participating in, an REU program.

1208 **Positive Solutions For Resonance Problem**

Bradley Trimmell, Wake Forest University

We consider a discrete system of equations involving the p-Laplacian at its principal eigenvalue:

$$-\Delta_p u_i = \lambda_1 |u_i|^{p-2} u_i + c \sin u_i,\ i = 1, \ldots, n,\ u_0 = u_{n+1} = 0.$$

We will prove that this system has infinitely many solutions with all positive components using variational methods.

1209 **Separating Path Systems of Size at most 7.75n**

Jared Noyman, William & Mary

A family of paths in a graph G strongly separates the edges of G if for every ordered pair of distinct edges (e, f) some path in the family contains e and avoids f; the minimum size of such a family is denoted by $\mathrm{ssp}(G)$. We prove, for every n-vertex graph G, that $\mathrm{ssp}(G) \leq 7.75n$.

1210 **Acoustic Loading on Rockets: Predicted vs. Reality**

Joseph Ungerleider, James Madison University

Predicting acoustic loading on rockets is vital in minimizing damage during liftoff. The NASA SP-8072 is an outdated prediction model developed in 1971. Despite being over 50 years old, it is still the best model available today. This paper will discuss and compare possible improvements upon the NASA SP-8072 model.

2:30 - 2:45 Parallel Talks Session V

1208 **Analytical Fractal Dimension of Perlin Noise**
Nicholas Harsell, James Madison University
By linking octave Perlin noise to fractional Brownian motion (fBm), we analytically derive fractal dimension estimates of Perlin noise from generation parameters. We verify these estimates numerically using a Fourier method, establishing a framework to analyze broader noise functions that lack closed-form solutions.

1209 **Correspondence packing of graphs with bounded MAD**
Thomas Fairfield, William & Mary
A k-fold correspondence packing is a set of k k-correspondence coverings with pairwise distinct colors at each vertex. The correspondence packing number is the least k where every cover admits such a packing. We prove relationships between the Maximum Average Degree and the bounds of the correspondence packing number.

1210 **From Exploration to Estimation: Evaluating Survival Models**
Andrew Dorwin, James Madison University
Survival analysis focuses on modeling time-to-event data. This project demonstrates parametric and nonparametric survival analysis methods using the R survival package and compares their performance through an application to the Primary Biliary Cirrhosis (PBC) dataset.

2:45 - 3:00 Afternoon Coffee and Tea 2nd floor hallway

Please join us for tea and coffee in the EnGeo foyer. This is your last chance to enter the candy contest!

3:05 - 3:55 Closing Address auditorium 2301



Expect the Unexpected: Pioneers who Promoted Women in Math and Science

Dr. Della Dumbaugh
University of Richmond

How did a department store magnate and a playwright advance American mathematics and science—and women in these male dominated fields in particular? This talk will explore the lives of Caroline Bamberger Fuld and Clare Booth Luce as we examine the surprising range of personalities that influenced the development of mathematics and science in America in the twentieth century.

4:05 - 4:20 Prize Session auditorium 2301

Please join us for the prize session in the auditorium. Poster competition winners and the candy contest winner will be announced!

4:20 Conference Closing auditorium 2301

Notes: