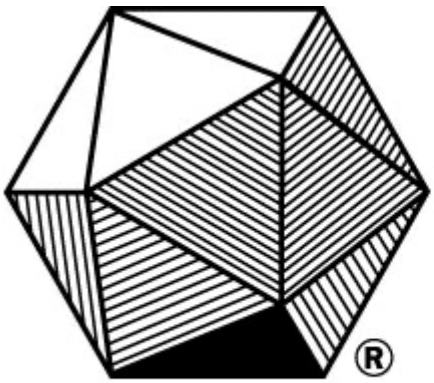

MAA

MATHEMATICAL ASSOCIATION OF AMERICA

86th Annual Meeting
of the
Oklahoma – Arkansas Section

Hosted by
The University of Central Oklahoma
April 3 – 5, 2025

MAA Core Interests:
Education
Research
Professional Development
Public Policy
Public Appreciation

OK-AR Section Website
http://sections.maa.org/okar

Executive Committee
2024 – 2025

Nicholas Jacob (ECU), Past-Chair
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(replacing Christopher Sauer (CU))

Abbreviations for Institutions Represented in this Program Book

CU	Cameron University
ECU	East Central University
HU	Harding University
JBU	John Brown University
NSU	Northeastern State University
OCCC	Oklahoma City Community College
OKBU	Oklahoma Baptist University
OKWU	Oklahoma Wesleyan University
ORU	Oral Roberts University
OSU	Oklahoma State University
OU	University of Oklahoma
SAU	Southern Arkansas University
SC	Swarthmore College
SIU	Southern Illinois University
SWOSU	Southwestern Oklahoma State University
UA	University of Arkansas
UAFS	University of Arkansas – Fort Smith
UALR	University of Arkansas at Little Rock
UCO	University of Central Oklahoma
WCU	West Chester University

2025 Meeting Overview

All times Central Daylight Time

Thursday, April 3

4:00 pm – 8:00 pm	Registration and Check-in, CTL Lobby
4:00 pm	Section NExT, CTL 240
6:00 pm – 8:30 pm	Team Jeopardy Competition, CTL 117 / 118
8:30 pm	Integration Bee, CTL 117 / 118

Friday, April 4

8:00 am – 3:00 pm	Registration and Check-in, EDU 113
9:00 am – 11:30 am	Student Workshop, EDU 308 *Modular Origami and Symmetric Colorings of Regular Polyhedra.* Lisa Mantini, Oklahoma State University
9:00 am – 11:30 am	Faculty Workshop, EDU 311 *Service Learning in Mathematics: Thinking Outside the Tutoring Box*. Lisa Marano, West Chester University, Chair – MAA Council on Sections
11:45 am – 1:00 pm	Department Chairs Lunch, EDU 306 Faculty Sponsors Lunch, EDU 304 Section NExT Lunch, EDU 302
1:00 pm – 3:15 pm	Presented Papers, Sessions 1-6, 15 EDU 304, 308, 311, 312
3:15 pm – 3:40 pm	Break, Forensic Science Building Rotunda
3:45 pm – 4:45 pm	Section Visitor Lecture, Forensic Science Auditorium *Mathematics and Community Engagement.* Lisa Marano, West Chester University, Chair – MAA Council on Sections
4:50 pm – 5:50 pm	Executive Committee Meeting, STEM 227
5:30 pm – 7:30 pm	Student Event (Trivia / Games / Dinner), CTL 117 / 118
6:00 pm – 7:30 pm	Banquet, Nigh University Center, Will Rogers Room (4th Floor)
7:45 pm – 9:00 pm	Plenary Session and Student Awards, Forensic Science Auditorium MAA AWM Lecture, *Projective and Non-Abelian SET.* Catherine Hsu, Swarthmore College

Saturday, April 5

8:00 am – 10:00 am	Registration and Check-in, EDU 113
8:30 am – 9:05 am	Presented Papers, Sessions 7-10 EDU 304, 308, 311, 312
9:15 am – 10:25 am	Section Business Meeting, EDU 102
10:30 am – 11:25 am	Presented Papers, Sessions 11-14 EDU 304, 308, 311 312

Full Meeting Schedule

Thursday Evening, April 3, 2025

4:00 pm – 8:00 pm **Registration and Check-in**, CTL Lobby
4:00 pm **Section NExT**, CTL 240
6:00 pm – 8:30 pm **Team Jeopardy Competition**, CTL 117 / 118
Presiding: Scott McClendon (UCO)
8:30 pm **Integration Bee**, CTL 117 / 118

Friday Morning, April 4, 2025

8:00 am – 3:00 pm **Registration and Check-in**, EDU 113

9:00 am – 11:30 am **Student Workshop**, EDU 308
Modular Origami and Symmetric Colorings of Regular Polyhedra.
Lisa Mantini, Oklahoma State University
Description: Polyhedra are figures in space whose faces are polygons. The Platonic solids are the most regular polyhedra, with faces of congruent regular polygons configured in the same way at each vertex. We'll study their geometry while creating models of some of these polyhedra using modular origami, a technique of folding multiple pieces of paper in the same way to create individual modules which are assembled to create our final model. We'll create models which are colored symmetrically, that is, where the divisions into colored regions is rotationally-invariant, leading to a way to identify the object's group of rotational symmetries with a group of permutations.

9:00 am – 11:30 am **Faculty Workshop**, EDU 311
Service Learning in Mathematics: Thinking Outside the Tutoring Box.
Lisa Marano, West Chester University, Chair – MAA Council on Sections
Description: Service learning is a powerful tool for engaging students in meaningful, real-world applications of mathematics while fostering civic responsibility. In this workshop, *Service Learning in Mathematics: Thinking Outside the Tutoring Box*, we'll explore innovative approaches to incorporating service-learning projects into mathematics courses beyond traditional tutoring roles. Participants will design projects that connect mathematical concepts to community needs, such as analyzing data for local organizations, optimizing resources for nonprofit operations, or addressing public policy issues through quantitative reasoning.

Through hands-on activities, case studies, and collaborative brainstorming, faculty will learn to integrate service learning into a variety of courses—from introductory algebra to advanced statistics—while aligning with course objectives. This workshop will also address strategies for forming community partnerships, assessing student learning, and ensuring projects have lasting impact. Join us to expand your toolkit and inspire students to see mathematics as a tool for social change!

Friday Lunch, April 4, 2025

11:45 am – 1:00 pm **Department Chairs Lunch**, EDU 306
Faculty Sponsors Lunch, EDU 304
Section NEXT Lunch, EDU 302

Friday Afternoon, April 4, 2025
Presented Papers
1:00 pm – 3:15 pm

Session 1: Undergraduate Presentations – Applied Mathematics and Modeling, 1:00 – 2:35 pm, ***EDU 311***
Presiding: Cherith Tucker (OKBU)

1:00 - 1:15 pm **Agent-Based Modeling of Fibrin Fiber Network Formation**
Key Crosley (UCO)
Mentor: Brittany Bannish
Abstract: Blood clots are held together by a network of fibrin fibers. Our agent-based model aims to render accurate fibrin interactions to better understand how fibrin networks form. We adjust different variables to coincide with different physiological conditions to see which produce results most like experimental output. Early results of our random-motion model suggest that biologically accurate interactions are only possible if the fibers have first reached a critical length.

1:20 - 1:35 pm **Systematic Analysis of Parameter Variations in a Stochastic Fibrin Fiber Degradation Model**
Austin Segrest (UCO)
Mentor: Brittany Bannish
Abstract: Fibrinolysis is the process of breaking down fibrin, the main protein in blood clots, to maintain blood flow and prevent thrombosis. This process is regulated by plasmin, activated from plasminogen by tissue plasminogen activator (tPA). We present a stochastic model using the Gillespie algorithm to simulate fibrin fiber degradation. The model predicts cleavage time and success rate under various conditions. Results are compared to *in vitro* experiments to better understand fibrinolysis mechanisms.

1:40 - 1:55 pm **Generalized Special Relativity (GSR): Extending Special Relativity to Non-Inertial Frames**
Victor Gomes (ORU)
Abstract: GSR extends SR to non-inertial frames, predicting relativistic acceleration effects without gravity or curved spacetime. This pedagogical stepping stone between SR and GR highlights the mathematical challenges of computing nonlinear solutions via implicit and functional equations, revealing SR as the only linear case with analytical solutions.

2:00 - 2:15 pm **Powerlifting Leverage Calculator**
Camden Wilmes (ECU)
Mentor: Nicholas Jacob
Abstract: We created a program using Python that analyzes a picture submitted by the user to give feedback about positioning for powerlifting. The program predicts what lift the user is best suited for based on their leverages. Additionally, we trained a machine learning model on professional powerlifters to give the user a professional equivalent of themselves.

2:20 - 2:35 pm **Subset Selection Methods for Multi-Lead ECG Data**
Kassidy Crockett (UCO)
Mentor: Emily Hendryx Lyons, Tyler Cook
Abstract: Serious heart health complications are often identifiable by anomalous heartbeat morphologies in the ECG. However, identification may be time sensitive in the presence of large streams of data, motivating automated summarization of ECG data. We investigate the performance of different CUR matrix decomposition algorithms to select subsets from several ECG representations. The presented results offer insight regarding methods in summarizing different ECG representations for clinical support.

Session 2: Undergraduate Presentations – Pure and Applied Mathematics, 1:00 – 2:35 pm, *EDU 312*
Presiding: Chizuko Iwaki (UAFS)

1:00 - 1:15 pm **Fixed Points, Periodic Points, and Expansiveness**
Abinadi Lupton (OKWU)
Mentor: Frederick Worth
Abstract: We will look at some results involving fixed points, periodic points and the expansive property for continuous functions on closed intervals.

1:20 - 1:35 pm **Generating Function for Bessel Functions of Integer Order**
Keenan Smith (ECU)
Mentor: Nicholas Jacob
Abstract: Bessel functions arise when studying differential equations of the form $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$, where n is any complex number and is the order of the equation. Of interest to is the generating function for the Bessel functions of integer order. Using a Laurent expansion, we can show that the Bessel functions $J_n(z)$ are the coefficients of the function $f(t) = e^{(z/2)(t+1/t)}$, whenever $|t| > 0$

1:40 - 1:55 pm **Beyblade: Xceptional Transitivity**
Noah Steelman (OKBU)
Mentor: Nathan Drake
Abstract: Observing the existence and properties of transitive cycles within Beyblade battles in the Beyblade X system and analyzing the implications of the findings

2:00 - 2:15 pm **Sixth Subgroups of Permutation Groups**
James Blalack (JBU)
Mentor: Gregory Varner
Abstract: Permutation groups are an entry point for understanding many students learning abstract algebra. Due to Cayley's Theorem, the investigation of permutation groups directly relates to our understanding of groups in general. In this presentation, we will discuss how to use permutations to generate permutation groups. In particular, we will discuss a result involving the Orbit-Stabilizer Theorem in connection to a particular class of subgroups, ones that are one sixth of the entire group.

2:20 - 2:35 pm **Instant Insanity: Surviving Survivor with Instant Insanity**
Emma Lonngren (OSU)
Mentor: Anand Patel
Abstract: Over the course of our research project, we investigated the relationship between Graph Theory and a seemingly unrelated game called Instant Insanity, which is featured on the television show Survivor. This presentation explores the background and correlation to Graph Theory, the quickest solution to the puzzle, and the further mathematical applications of this technique. This project was co-authored by Anna Cooper, Lauren Duhon, Emma Lonngren, and Jack Smith.

Session 3: Mathematics Education and Classroom Notes, 1:00 – 2:15 pm, *EDU 308*
Presiding: Nikola Petrov (OU)

1:00 - 1:15 pm **Do flipped classrooms improve problem-solving?**
Gregory Varner (JBU)
Abstract: Over the last decade, the concept of flipped classroom models in mathematics courses has received a significant attention. The majority of the research has been aimed toward information retention and grade improvement. Much less research has been done at smaller institutions, where the majority of classes are smaller, or on the impact on learning problem-solving skills. I will discuss results related to my use of a flipped classroom at a small university and its impact on problem-solving skills.

1:20 - 1:35 pm **Exploring a Pre-service Secondary Mathematics Teachers' Use of Conceptual and Procedural Knowledge**
Luan Nguyen (OSU)
Mentor: Michael Tallman
Abstract: This study examines how a pre-service secondary mathematics teacher (PSMT) integrates conceptual and procedural knowledge when reasoning about asymptotes of rational functions. Using Shulman's (1986) teacher knowledge framework and Tallman's (2023) distinction between substantive and syntactic structures, it finds the PSMT proficient in procedures but struggling with conceptual understanding. The results highlight the need for stronger conceptual-procedural integration in teacher preparation.

1:40 - 1:55 pm **The Value of OER**
Beth Rawlins (OCCC)
Abstract: Open Educational Resources are important for student success and accessibility. This presentation will outline a course redesign for Precalculus and Trigonometry using the OER textbook OpenStax Precalculus 2e and the OER online homework platform MyOpenMath. The success of this redesign will include student surveys and instructor reflection.

2:00 - 2:15 pm **The dramatic birth of Calculus of Variations**
Nikola Petrov (OU)
Abstract: The early years of Calculus of Variations were fueled by passions between its creators. In this talk we will discuss the famous 1996 challenge posed by Johann Bernoulli to all scientists, and the solutions proposed by some of the greatest mathematicians of the day. The talk does not require any previous knowledge.

Session 4: Algebra and Analysis, 1:00 – 2:35 pm, *EDU 304*
Presiding: Alan Roche (OU)

1:00 - 1:15 pm **A College Algebra Proof of the Fundamental Theorem of Algebra (FTA)**
Franklin Kemp
Abstract: W. K. Clifford's abstract summarizes the only FTA proof accessible to college students. Our manuscript for it shows how it proves quadratic factorization of even polynomials. 1. simple algebraic elimination of a variable, say x, between two polynomial equations leads to Professor Sylvester's Dialytic method 's determinant, 2. determinant properties, 3. quadratic synthetic division, and 4. Intermediate value theorem suffice. Forget geometry, inequalities, square roots, imaginaries, calculus, discriminants, symmetric functions, g.c.d.'s, splitting fields, etc.

1:20 - 1:35 pm **The word problem for Adian inverse semigroups**
Muhammad Inam (SAU)
Abstract: We introduce the notion of a subgraph of Schützenberger graph generated by an R-word. By using these subgraphs, we can decide the word problem for some classes of finitely presented Adian inverse semigroups.

1:40 - 1:55 pm **Linearization Stability in Conformal Gravity**
Siddiqur Rahman (OSU)
Mentor: Sean Curry
Abstract: In a 4-dimensional Lorentzian manifold, a conformal analogue of Einstein's field equations is a system of fourth order non-linear partial differential equations, i.e., the Bach equations. This talk addresses the question: When does the first-order perturbation theory near a given background solution work in conformal gravity theory?

2:00 - 2:15 pm **Asymptotic Stability of Solitary Waves for the BBM Equation: An Overview of El Dika's Proof**
Sajal Halder (OU)
Abstract: In this presentation, I will introduce the Benjamin-Bona-Mahony (BBM) equation and its solitary wave solutions, focusing on their orbital and asymptotic stability. I will then discuss El Dika's proof of asymptotic stability, which is based on a monotonicity property of the equation and a Liouville-type theorem.

2:20 - 2:35 pm **Thirteen ways of looking at the harmonic series**
Alan Roche (OU)
Abstract: I'll show you a range of proofs - thirteen, time permitting - that the harmonic series diverges. Several are simpler and, to my mind, more striking than the proofs found in standard calculus texts.

Session 5: Discrete Mathematics and Graph Theory, 2:20 – 3:15 pm, *EDU 308*
Presiding: Michelle Lastrina (ECU)

2:20 - 2:35 pm **Classifying Pentominoes**
Tom McNamara (SWOSU)
Abstract: A pentomino is a figure created by joining 5 identical squares along their edges. We will discuss what it could mean for two pentominoes to be equivalent. From there we will determine how many distinct pentominoes there are under several different notions of equivalence.

2:40 - 2:55 pm **Integer flows on triangularly connected signed graphs**
Chong Li (SAU)
Abstract: Tutte observed that every nowhere-zero k-flow on a plane graph gives rise to a k-vertex-coloring of its dual, and vice versa. Thus nowhere-zero integer flow and graph coloring can be viewed as dual concepts. Bouchet conjectured in 1983 that every flow-admissible signed graph admits a nowhere-zero 6-flow which is equivalent to the restriction to cubic signed graphs. In this talk, I will discuss our recent results about integer flows on triangularly connected signed graphs.

3:00 - 3:15 pm **Solving Strimko Puzzles Using Graph Coloring**
Michelle Lastrina (ECU)
Abstract: In this talk, we explore explore how to solve Strimko puzzles using the techniques of graph coloring. Strimko puzzles are a variation of a Latin square and were invented by the Grabarchuk family in 2008. They are similar to Sudoku puzzles, but with a different twist. We will introduce these puzzles and some graph theory terminology, then transform a Strimko puzzle into a graph coloring problem to solve.

Session 6: Statistics and Data Science, 2:40 – 3:15 pm, *EDU 304*
Presiding: Roshini Gallage (OU)

2:40 - 2:55 pm **Analysis of Stochastic Differential Equations with Continuously Distributed Delay**
Roshini Gallage (OU), Harry Randolph Hughes (SIU)
Abstract: Stochastic delay differential equations (SDDEs) are systems of differential equations with a time lag in a noisy or random environment. We are researching processes with continuously distributed delay which depend on weighted averages of past states over the entire time lag interval $[t-\tau, t]$. In this talk, we discussed the existence of a unique solution of certain n-dimensional nonlinear SDDEs with continuously distributed delay. Further, we present the Euler Maruyama numerical approximation results of such nonlinear SDDEs.

3:00 - 3:15 pm **Unidimensional Distance Transformation for Efficient, Scalable Unsupervised Outlier Detection**
Jie Zhou (SAU)
Abstract: Outlier detection is essential for data integrity and machine learning performance. We present novel statistical techniques for unsupervised outlier detection, emphasizing efficiency, ease of use, and scalability. Our method uses unidimensional distance transformation to preserve outlier-ness while remaining computationally feasible across dimensions. This design enables robust outlier characterization without the high costs of higher-dimensional methods. Benchmark evaluations show our approach consistently outperforms existing methods in ROC AUC, highlighting its potential as a scalable, effective solution for diverse datasets.

Session 15: Number Theory, 2:40 – 3:15 pm, *EDU 312*
Presiding: Scott McClendon (UCO)

2:40 - 2:55 pm **A Sieve for Twin Primes**
Scott McClendon (UCO)
Abstract: In this talk we develop a sieve to quicky and easily locate all twin primes.

3:00 - 3:15 pm **The Twin Primes Theorem**
Scott McClendon (UCO)
Abstract: In this talk we will use the sieve we developed in our first talk, or its complement, actually, to show that there is an infinitude of twin primes.

Friday Afternoon, April 4, 2025
Break
Forensic Science Building Rotunda
3:15 pm – 3:40 pm

Friday Afternoon, April 4, 2025
MAA Section Visitor Lecture
Forensic Science Auditorium
3:45 – 4:45 pm

Mathematics and Community Engagement

Lisa Marano
West Chester University
Chair, MAA Council on Sections

Presiding: Ron Smith (HU)

Abstract: First-year seminars, learning communities, service-learning courses, undergraduate research projects, and capstone experiences are among a list of high-impact educational practices compiled by George Kuh (2008), which measurably influence students' success in areas such as student engagement and retention. It is recommended that all college students participate in at least two of these HIPs to deepen their approaches to learning, as well as to increase the transference of knowledge (Gonyea, Kinzie, Kuh, & Laird, 2008). In Mathematics, if a student participates in service-learning, it is typically in the form of tutoring, in conjunction with a school or with an after-school program, or modeling work or statistical analysis for non-profits. Today, I will discuss a number of service-learning projects developed for mathematics courses, which do not involve these traditional opportunities. I will also describe my current research project which has potential impact on my community and yours.

About the Speaker: Lisa Marano is a Professor of Mathematics and former Associate Dean and Interim Dean of the College of the Sciences and Mathematics at West Chester University of Pennsylvania. In the Mathematics Department, she was the Founding Director of the Actuarial Science and Mathematical Finance Programs. She was also inaugural co-Director of the university's First-Year Experience program. Lisa serves on the Board of Directors for the Mathematical Association of America, serving as the Chair of the Council on Sections. Her research interests include areas which intersect probability theory, statistics, mathematical finance, and raptors.

Friday Evening, April 4, 2025
Banquet
Nigh University Center, Will Rogers Room (4th Floor)
6:00 pm – 7:30 pm

Friday Evening, April 4, 2025
Plenary Session and Student Awards
Forensic Science Auditorium
7:45 – 9:00 pm

Featuring: MAA AWM Lecture

Projective and Non-Abelian SET

Catherine Hsu
Swarthmore College

Presiding: Ron Smith (HU)

Abstract: Mathematicians love SET. On the surface, this classic game is a contest of pattern recognition, but it also presents an interesting way to visualize the geometry of a torus over a finite field. In this talk, we will discuss some of the mathematics connected to SET and then explore several new versions of the game, including one arising from projective geometry and one arising from non-abelian groups. In particular, we will see how these non-abelian variations on SET can give intuitive visualizations of abstract group structures.

About the Speaker: Catherine Hsu is an Assistant Professor in the Department of Mathematics and Statistics at Swarthmore College. Her mathematical interests began as a penchant for logic puzzles and problem solving and grew into a love of abstract algebra and Galois theory while she was an undergraduate student at Rice University. Her research is now primarily in algebraic number theory, including projects related to modular forms and Apollonian circle packings. She also enjoys thinking about mathematical exposition, pedagogy, and unnecessarily complicated strategies for the card game Hanabi.

Prior to joining Swarthmore in the fall of 2020, Hsu was a Heilbronn Research Fellow at the University of Bristol as well as an AAUW American Dissertation Fellow and a Doctoral Research Fellow at the University of Oregon. As a junior researcher, she has greatly enjoyed traveling and speaking at conferences around the world and is looking forward to meeting new mathematicians as part of the MAA-AWM Lecturer program.

Saturday Morning, April 5, 2025

8:00 – 10:00 am **Registration and Check-in**, EDU 113

Saturday Morning, April 5, 2025
Presented Papers
8:30 – 9:05 am

Session 7: Mathematics Education and Classroom Notes, 8:30 – 9:05 am, *EDU 311*
Presiding: Emily Hendryx Lyons (UCO)

8:30 - 8:45 am **Creativity Tasks in Calculus**
Emily Hendryx Lyons (UCO)
Abstract: Assignments requiring creativity beyond procedural calculations can encourage students to explore concepts through a different lens. Examples of creativity tasks for introductory calculus students are presented along with a discussion of our experiences with task development, implementation, and assessment. We also identify areas of improvement and reflect on the perceived impact of creativity tasks on our students and the evolution of our teaching.

8:50 - 9:05 am **Flourishing in a Liberal Arts Math Class**
Cherith Tucker (OKBU)
Abstract: Reflections on incorporating Francis Su's book, Mathematics for Human Flourishing, in a general education mathematics course at a Christian liberal arts university in the fall of 2024. In this talk, we will explore course design, which included written journals, classroom discussions, varied assessment strategies, and a special visit from Francis Su, as well as student outcomes and feedback.

Session 8: Baseball and Mathematics, 8:30 – 9:05 am, *EDU 312*
Presiding: Fred Worth (OKWU)

8:30 - 8:45 am **Baseball and Mathematics: Undeserved Awards**
Fred Worth (OKWU)
Abstract: Baseball has many awards given to players. Sometimes there is no mathematical justification for who wins a particular award. We will look at MVP, Cy Young, and Gold Glove Award winners that should illicit the response "what were the voters thinking."

8:50 - 9:05 am **Baseball and Mathematics: Hall of Fame Mistakes**
Fred Worth (OKWU)
Abstract: Being enshrined in the Baseball Hall of Fame is baseball's greatest honor. This presentation will look at people who got into the Hall of Fame but should not have and people who should be in but, thus far, are not.

Session 9: Statistics and Technology, 8:30 – 9:05 am, *EDU 308*
Presiding: Chizuko Iwaki (UAFS)

8:30 - 8:45 am **Finding the Average Direction of Moving Rocks Using Simple Statistics and Trigonometry**
Chizuko Iwaki, David Mayo (UAFS)
Abstract: The motion of moving rocks can be described using vector data representing their rate and direction of movement. In this study, I present a straightforward statistical and trigonometric approach to determine the average angle of rock movement. By analyzing given angles, I demonstrate how to compute the mean direction using circular statistics and introduce hypothesis tests to validate the results.

8:50 - 9:05 am **Teaching with Orange: Data Science for College and University Educators**
James Roddy, Samantha Robinson (UA)
Abstract: This hands-on workshop introduces Orange, a powerful and user-friendly data analysis and visualization tool that is perfect for your classroom! Participants will learn to use Orange's intuitive drag-and-drop interface to enhance student engagement and develop data literacy skills without the need for extensive coding knowledge. Using real datasets, educators will explore how Orange can be used to analyze datasets, create predictive models, and visualize results in engaging ways. This workshop is suitable for educators at all levels, and no prior experience with data analysis software is required. Participants are encouraged to bring their own laptops in order to follow along with the demonstrations and exercises.

Session 10: Applied Mathematics and Modeling, 8:30 – 9:05 am, *EDU 304*
Presiding: James Burton (UA)

8:30 - 8:45 am **High-fidelity, front-tracking based simulations of the Raleigh Taylor instability with adaptive mesh refinement**
James Burton (UA)
Mentor: Tulin Kaman
Abstract: Front-tracking is an adaptive numerical method that tracks fluid interfaces as a hypersurface moving through a grid, preventing unwanted mixing. Adaptive mesh refinement (AMR) reduces computational costs by refining only near the interface. A new application combines the front-tracking and AMR libraries FronTier and AMReX. Scaling and high-fidelity simulations of the Rayleigh-Taylor instability are explored.

8:50 - 9:05 am **Numerical scheme for time dependent incompressible Fluid-Structure-Interaction PDE**
Ahmed Zytoon (OSU)
Abstract: Fluid-Structure Interaction (FSI) problems arise in various engineering and scientific applications, including aerodynamics, biomechanics, and industrial fluid flows. The mathematical formulation of FSI involves coupling incompressible fluid dynamics, governed by the Stokes equations, with the elastic or rigid-body motion of a structure. This talk proposes numerical schemes for solving time-dependent incompressible FSI problems.

Saturday Morning, April 5, 2025
Section Business Meeting
9:15 – 10:25 am
EDU 102

Presiding: Ron Smith (HU)

Saturday Morning, April 5, 2025
Presented Papers
10:30 – 11:25 am

Session 11: Topology, 10:30 – 11:25 am, *EDU 311*
Presiding: Matthew Lynam (ECU)

10:30 - 10:45 am **Identifying Recurrence in Dynamical Systems through Efficient Computation of Homology.**
Travis Casey (OU)
Abstract: Solutions on the attractor of nonlinear dynamical systems are often well-described by a set of near-recurrent motions and transitions between them. We present a method due to Bauer et al. of automatically decomposing time series data into elementary near-recurrent motions using ideas from algebraic topology and persistent homology. For high-dimensional attractor embeddings, we also present our novel discrete Morse-theoretic algorithm for computation of homology on sparse cubical complexes.

10:50 - 11:05 am **The Cannon-Thurston map for relatively hyperbolic free-by-cyclic groups**
Kailey Perry (UA)
Abstract: In the 80s, Cannon and Thurston proved that if a closed, hyperbolic 3-manifold fibers over the circle, then the inclusion of the universal cover of the surface fiber into the universal cover of the 3 manifold extends continuously to the boundary and is surjective. Analogous theorems have been proven since, and the extension of the inclusion to the boundary is called the Cannon-Thurston map. I will discuss the existence of the Cannon-Thurston map for relatively hyperbolic free-by-cyclic groups.

11:10 - 11:25 am **Nil Geometry**
Tomoya Tatsuno (OU)
Abstract: In modern geometry, we study spaces that are not flat. Among them, Nil is one of the special 8 fundamental spaces that build spaces of dimension 3 (like LEGO blocks). In this talk, we explore how the world looks like if you live in Nil, describing how "light rays" behave. For example, a weird thing happens in Nil, such as a "spiral light ray."

Session 12: Research in Mathematics and Statistics Education, 10:30 – 11:25 am, *EDU 312*
Presiding: Lucas Foster (NSU)

10:30 - 10:45 am **Productive Struggle, Persistence, and Perseverance Phase 3: Putting Theory into Practice**
Lucas Foster (NSU)
Abstract: In phase three of this study, having presented and published their research in Productive Struggle, Persistence, and Perseverance, investigators put theory into practice by implementing the strategies described by the MIP CoRD project. The research team hosted a regional workshop dedicated to revising mathematics learning activities using the lens of the Mathematical Inquiry Project. Faculty in the Northeast region of Oklahoma attended the workshop in May 2024 and worked together to revise and rework their own mathematics activities to reflect the MIP pillars.

10:50 - 11:05 am **Studying Feedback in Undergraduate Mathematics**
Deborah Moore-Russo (OU), Brian Rickard (UA)
Abstract: We report on findings about a minimal, yet potentially powerful, intervention of giving positive feedback to students. Our research found that giving positive feedback is less normative in math (vs. English) courses as reported by both instructors and students. However, students who received positive (vs. objective) feedback on introductory-level college calculus exams reported greater belonging and self-efficacy in math, which predicted increased interest in STEM and higher course grades.

11:10 - 11:25 am **The Unknown Variable: Student AI Usage Patterns in Quantitative Coursework**
Samantha Robinson, James Roddy (UA)
Abstract: This study examines university students' use of AI tools in mathematics, statistics, and data science courses through a national survey. It analyzes adoption patterns, benefits, and challenges of AI in academic settings. Results reveal which tools students use most frequently and for what purposes. While AI offers advantages in accessibility and personalized learning, it raises concerns about academic integrity and conceptual understanding, highlighting the need for educators to develop responsible AI integration strategies.

Session 13: Mathematics Education and Classroom Notes, 10:30 – 11:25 am, *EDU 308*
Presiding: Rachel Lehman (UAFS)

10:30 - 10:45 am **Student-Negotiated Grading on Problem Sets and Reflection Writings**
Chris Oehrlein (OCCC)
Abstract: One aspect of the Ungrading movement in college mathematics is having students self-assess their work on homework problems, projects, etc. The presenter will share rubrics for grading homework problem sets and written reflection activities, and how students are involved in the assessment of their submissions for those assignments.

10:50 - 11:05 am **Keep It Simple - Implementing Alternative Grading for the First Time**
Beth Rawlins (OCCC)
Abstract: Alternative grading is a great way to encourage growth mindset. Offering students the chance for re-assessment is a balancing act due to practical constraints. This presentation will cover the experience of setting up and implementing standards based grading for the first time in a STEM Calculus 1 course.

11:10 - 11:25 am **Teaching Mathematics in a Culturally Responsive Way**
Rachel Lehman (UAFS)
Abstract: Mathematics is often seen as a subject that doesn't necessarily need to be culturally relevant, but we all know that to be effective educators, we must establish a connection with our students. This involves being empathetic toward their home lives and upbringing. How have we been culturally responsive—or not—in the classroom? What are some ways we can improve, and what are the implications for the future? In this talk, I will explore ideas presented in Ukpokodu's paper, Teaching Mathematics in a Culturally Responsive Way, and conclude with current research projects expanding on Ukpokodu's work.

Session 14: Statistics and Probability, 10:30 – 11:05 am, *EDU 304*
Presiding: Andrew Wells (ECU)

10:30 - 10:45 am **Differential Drivers of Psychological Constructs in the US: A Spatial Analysis**
Frank Agyei-Owusu (UA)
Mentor: Samantha Robinson
Abstract: Background: Psychological constructs like Anxiety, Depression, Fatalism, Luck, Divine Control, Internality and Helplessness are critical in the United States (US), with spatial variations often overlooked.

Methods: Using a national survey (N=2000) and Geographically Weighted Regression (GWR), we analyzed how Age, Gender, Race, Ethnicity, Education, and Urbanicity influence these constructs.

Results: We found distinct regional patterns. For example, education and urbanicity impact Anxiety in the West and Central US. Similar regional patterns were found for other constructs.

Conclusion: Spatial variability is crucial for targeted interventions in psychological constructs.

10:50 - 11:05 am **Refining TDA Approach to NBA Players**
Andrew Wells (ECU)
Abstract: Recently, we have applied some topological data analysis techniques to NBA player box score data. Although we have been able to create simplices that show some interesting information, it is not always clear what conclusions are appropriate to draw. This presentation will summarize a few different additional elements to hopefully improve our understanding of how to use this technique.

Schedule of Presented Papers by Time of Presentation

Explanation of Column Headings:

- *Name*: Last name of first presenter
- *Title*: Title of presentation
- *Room*: Room Number
- *Session*: Session Number. Abstracts of presentations are given in the program arranged by session. Sessions of undergraduate presenters are identified by *UG*.

Friday Afternoon, April 4

1:00 – 1:15 pm

Presenter(s)	*Title*	Room	Session
Crosley	*Agent-Based Modeling of Fibrin Fiber Network Formation*	EDU 311	UG1
Lupton	*Fixed Points, Periodic Points, and Expansiveness*	EDU 312	UG2
Varner	*Do flipped classrooms improve problem-solving?*	EDU 308	3
Kemp	*A College Algebra Proof of the Fundamental Theorem of Algebra (FTA)*	EDU 304	4

1:20 – 1:35 pm

Name	*Title*	Room	Session
Segrest	*Systematic Analysis of Parameter Variations in a Stochastic Fibrin Fiber Degradation Model*	EDU 311	UG1
Smith	*Generating Function for Bessel Functions of Integer Order*	EDU 312	UG2
Nguyen	*Exploring a Pre-service Secondary Mathematics Teachers' Use of Conceptual and Procedural Knowledge*	EDU 308	3
Inam	*The word problem for Adian inverse semigroups*	EDU 304	4

1:40 – 1:55 pm

Name	*Title*	Room	Session
Gomes	*Generalized Special Relativity (GSR): Extending Special Relativity to Non-Inertial Frames*	EDU 311	UG1
Steelman	*Beyblade: Xceptional Transitivity*	EDU 312	UG2
Rawlins	*The Value of OER*	EDU 308	3
Rahman	*Linearization Stability in Conformal Gravity*	EDU 304	4

2:00 – 2:15 pm

Name	*Title*	Room	Session
Wilmes	*Powerlifting Leverage Calculator*	EDU 311	UG1
Blalack	*Sixth Subgroups of Permutation Groups*	EDU 312	UG2
Petrov	*The dramatic birth of Calculus of Variations*	EDU 308	3
Halder	*Asymptotic Stability of Solitary Waves for the BBM Equation: An Overview of El Dika's Proof*	EDU 304	4

Friday Afternoon, April 4, continued

2:20 – 2:35 pm

Name	*Title*	Room	Session
Crockett	*Subset Selection Methods for Multi-Lead ECG Data*	EDU 311	UG1
Lonngren	*Instant Insanity: Surviving Survivor with Instant Insanity*	EDU 312	UG2
McNamara	*Classifying Pentominoes*	EDU 308	5
Roche	*Thirteen ways of looking at the harmonic series*	EDU 304	4

2:40 – 2:55 pm

Name	*Title*	Room	Session
Li	*Integer flows on triangularly connected signed graphs*	EDU 308	5
Gallage	*Analysis of Stochastic Differential Equations with Continuously Distributed Delay*	EDU 304	6
McClendon	*A Sieve for Twin Primes*	EDU 312	15

3:00 – 3:15 pm

Name	*Title*	Room	Session
Lastrina	*Solving Strimko Puzzles Using Graph Coloring*	EDU 308	5
Zhou	*Unidimensional Distance Transformation for Efficient, Scalable Unsupervised Outlier Detection*	EDU 304	6
McClendon	*The Twin Primes Theorem*	EDU 312	15

Saturday Morning, April 5

8:30 – 8:45 am

Name	*Title*	Room	Session
Hendryx Lyons	*Creativity Tasks in Calculus*	EDU 311	7
Worth	*Baseball and Mathematics: Undeserved Awards*	EDU 312	8
Iwaki	*Finding the Average Direction of Moving Rocks Using Simple Statistics and Trigonometry*	EDU 308	9
Burton	*High-fidelity, front-tracking based simulations of the Raleigh Taylor instability with adaptive mesh refinement*	EDU 304	10

8:50 – 9:05 am

Name	*Title*	Room	Session
Tucker	*Flourishing in a Liberal Arts Math Class*	EDU 311	7
Worth	*Baseball and Mathematics: Hall of Fame Mistakes*	EDU 312	8
Roddy	*Teaching with Orange: Data Science for College and University Educators*	EDU 308	9
Zytoon	*Numerical scheme for time dependent incompressible Fluid-Structure-Interaction PDE*	EDU 304	10

Saturday Morning, April 5, continued

10:30 – 10:45 am

Name	*Title*	Room	Session
Casey	*Identifying Recurrence in Dynamical Systems through Efficient Computation of Homology.*	EDU 311	11
Foster	*Productive Struggle, Persistence, and Perseverance Phase 3: Putting Theory into Practice*	EDU 312	12
Oehrlein	*Student-Negotiated Grading on Problem Sets and Reflection Writings*	EDU 308	13
Agyei-Owusu	*Differential Drivers of Psychological Constructs in the US: A Spatial Analysis*	EDU 304	14

10:50 – 11:05 am

Name	*Title*	Room	Session
Perry	*The Cannon-Thurston map for relatively hyperbolic free-by-cyclic groups*	EDU 311	11
Moore-Russo	*Studying Feedback in Undergraduate Mathematics*	EDU 312	12
Rawlins	*Keep It Simple - Implementing Alternative Grading for the First Time*	EDU 308	13
Wells	*Refining TDA Approach to NBA Players*	EDU 304	14

11:10 – 11:25 am

Name	*Title*	Room	Session
Tatsuno	*Nil Geometry*	EDU 311	11
Robinson	*The Unknown Variable: Student AI Usage Patterns in Quantitative Coursework*	EDU 312	12
Lehman	*Teaching Mathematics in a Culturally Responsive Way*	EDU 308	13

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Room refers to the building and room number.
UG indicates a session of presentations by undergraduates.

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Blalack (JBU)	UG2	Fri	2:00 - 2:15 pm	EDU 312
Burton (UA)	10	Sat	8:30 - 8:45 am	EDU 304
Casey (OU)	11	Sat	10:30 - 10:45 am	EDU 311
Crockett (UCO)	UG1	Fri	2:20 - 2:35 pm	EDU 311
Crosley (UCO)	UG1	Fri	1:00 - 1:15 pm	EDU 311
Foster (NSU)	12	Sat	10:30 - 10:45 am	EDU 312
Gallage (OU)	6	Fri	2:40 - 2:55 pm	EDU 304
Gomes (ORU)	UG1	Fri	1:40 - 1:55 pm	EDU 311
Halder (OU)	4	Fri	2:00 - 2:15 pm	EDU 304
Hendryx Lyons (UCO)	7	Sat	8:30 - 8:45 am	EDU 311
Hsu (SC)	MAA AWM	Fri	7:45 - 9:00 pm	Forensic Sci Auditorium
Hughes (SIU)	6	Fri	2:40 - 2:55 pm	EDU 304
Inam (SAU)	4	Fri	1:20 - 1:35 pm	EDU 304
Iwaki (UAFS)	9	Sat	8:30 - 8:45 am	EDU 308
Kemp	4	Fri	1:00 - 1:15 pm	EDU 304
Lastrina (ECU)	5	Fri	3:00 - 3:15 pm	EDU 308
Lehman (UAFS)	13	Sat	11:10 - 11:25 am	EDU 308
Li (SAU)	5	Fri	2:40 - 2:55 pm	EDU 308
Lonngren (OSU)	UG2	Fri	2:20 - 2:35 pm	EDU 312
Lupton (OKWU)	UG2	Fri	1:00 - 1:15 pm	EDU 312
Mantini (OSU)	Student Workshop	Fri	9:00 - 11:30 am	EDU 308
Marano (WCU)	Section Visitor	Fri	3:45 - 4:45 pm	Forensic Sci Auditorium
Marano (WCU)	Faculty Workshop	Fri	9:00 - 11:30 am	EDU 311
Mayo (UAFS)	9	Sat	8:30 - 8:45 am	EDU 308
McClendon (UCO)	15	Fri	2:40 - 2:55 pm	EDU 312
McClendon (UCO)	15	Fri	3:00 - 3:15 pm	EDU 312
McNamara (SWOSU)	5	Fri	2:20 - 2:35 pm	EDU 308
Moore-Russo (OU)	12	Sat	10:50 - 11:05 am	EDU 312
Nguyen (OSU)	3	Fri	1:20 - 1:35 pm	EDU 308
Oehrlein (OCCC)	13	Sat	10:30 - 10:45 am	EDU 308
Perry (UA)	11	Sat	10:50 - 11:05 am	EDU 311
Petrov (OU)	3	Fri	2:00 - 2:15 pm	EDU 308
Rahman (OSU)	4	Fri	1:40 - 1:55 pm	EDU 304
Rawlins (OCCC)	3	Fri	1:40 - 1:55 pm	EDU 308
Rawlins (OCCC)	13	Sat	10:50 - 11:05 am	EDU 308
Rickard (UA)	12	Sat	10:50 - 11:05 am	EDU 312
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Roddy (UA)	12	Sat	11:10 - 11:25 am	EDU 312

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Room refers to the building and room number.
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Name (Institution)	*Session*	*Day*	*Time*	*Room*
Segrest (UCO)	UG1	Fri	1:20 - 1:35 pm	EDU 311
Smith (ECU)	UG2	Fri	1:20 - 1:35 pm	EDU 312
Steelman (OKBU)	UG2	Fri	1:40 - 1:55 pm	EDU 312
Tatsuno (OU)	11	Sat	11:10 - 11:25 am	EDU 311
Tucker (OKBU)	7	Sat	8:50 - 9:05 am	EDU 311
Varner (JBU)	3	Fri	1:00 - 1:15 pm	EDU 308
Wells (ECU)	14	Sat	10:50 - 11:05 am	EDU 304
Wilmes (ECU)	UG1	Fri	2:00 - 2:15 pm	EDU 311
Worth (OKWU)	8	Sat	8:30 - 8:45 am	EDU 312
Worth (OKWU)	8	Sat	8:50 - 9:05 am	EDU 312
Zhou (SAU)	6	Fri	3:00 - 3:15 pm	EDU 304
Zytoon (OSU)	10	Sat	8:50 - 9:05 am	EDU 304

Thank you for coming, and thank you to our hosts,
The University of Central Oklahoma!

Future Section Meeting Hosts

April 9 – 11, 2026
University of Arkansas at Little Rock
Little Rock, Arkansas

2027
Oklahoma Wesleyan University
Bartlesville, Oklahoma

2028
Southern Arkansas University
Magnolia, Arkansas