



MATHEMATICAL ASSOCIATION OF AMERICA

MAA

SECTION

**LOUISIANA/
MISSISSIPPI**

2024 Section Meeting

New Orleans, LA

February 29–March 2, 2024

The 101st Meeting of the Louisiana / Mississippi Section

Hosted by

Dillard University

The University of New Orleans

Tulane University

Xavier University

Welcome to the 2024 Louisiana/Mississippi Section Meeting!

All sessions for this year's meeting will be on the 4th floor of the Sheraton.
A map of the space is included at the back of this program.

Institutional Partners

Belhaven University

Louisiana Tech

University of Louisiana – Lafayette

University of Louisiana – Monroe

McNeese State University

Millsaps College

Mississippi State University

Northwestern State University of Louisiana

Southeastern Louisiana University

University of Southern Mississippi

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Thursday February 29		
5:30 – 8:00 PM	Registration	Bayside Foyer
6:30 – 9:00 PM	Integration Bee	Bayside A/B/C
Friday March 1		
7:45 AM – 4:30 PM	Registration	Bayside Foyer
9:00 AM – 4:30 PM	Exhibits and Hospitality	Bayside Foyer
8:00 – 10:30 AM	Student Team Competition	Bayside A/B/C
8:30 – 10:30 AM	Workshop: Mathematical Models in Data Science	Oak Alley
11:00 – 11:50 AM	Opening Plenary: Robert Miller	Bayside A/B/C
Lunch Break		
1:00 – 1:50 PM	Plenary (Section Visitor Lecture): Cynthia Wyels	Bayside A/B/C
2:15 – 4:15 PM	Workshop: Mathematical Modeling Comes Alive	Oak Alley
2:15 – 4:45 PM	Student Paper Competition	Bayside A
2:15 – 4:45 PM	Contributed Talks	Bayside C
3:30 – 4:45 PM	Panel: What Do I Do Next? Careers in the Mathematical Sciences	Bayside B
5:00 – 5:50 PM	Plenary (Anderson Lecture): Lisa Fauci	Bayside A/B/C
6:30 – 9:00 PM	Banquet	Landry's Seafood
Saturday March 2		
8:00 – 10:00 AM	Registration	Bayside Foyer
8:00 – 11:00 AM	Exhibits and Hospitality	Bayside Foyer
8:00 – 9:30 AM	Contributed Talks	Oak Alley
8:00 – 9:30 AM	Student Poster Session	Bayside A/B/C
9:30 – 10:15 AM	Teaching Award Presentation (Laura Sheppardson, 2023 Awardee)	Bayside A/B/C
10:15 – 10:30 AM	Leadership Opportunities in the LA/MS Section of the MAA (Judith Covington)	Bayside A/B/C
10:30 – 10:50 AM	Business Meeting	Bayside A/B/C
11:00 – 11:50 AM	Plenary (MAA Editor Lecture): Jason Rosenhouse	Bayside A/B/C
12:00 – 12:30 PM	Student Awards	Bayside A/B/C

2024 Invited Addresses

All invited addresses will be in Bayside A/B/C

Opening Plenary and Student Lecture

Robert Miller, *University of Louisiana Lafayette*

Friday, March 1, 11:00 AM

Biological Action Reaction Models—A Missing Link in the Coastal Sustainability Puzzle?

Intensification of the hydrological cycle has led to an increasing frequency of extreme events—e.g., floods and droughts—both posing a threat to water security. Coastal estuaries are at the confluence between rivers and seas and face compounding hydrological sustainability threats (e.g., sea level rise and watershed urbanization). They also provide abundant water resources which support critical human developments and some of the most productive ecosystems in the world. And while practical engineering workflows quantifying causal effects on the physical regime (e.g., hydrodynamics and estuarine transport)—and ecosystem dynamics to a lesser extent—have been well established, quantitative models of the biological reaction to various actions (e.g., flood control and river diversion effects on fish and phytoplankton populations) are severely lacking in coastal estuaries. This presentation provides an overview of current research activities to support the future development of biological action-reaction (BAR) models integrated directly within mainstream coastal hydrological analysis frameworks. The development of continuously structured population dynamic models integrated with hydrodynamic and water quality models in a realistic setting is emphasized with motivating examples. The setting is the Atchafalaya Basin Continuum (ABC) which represents the largest river swamp wetland in North America. Barriers to the establishment of practical BAR modeling frameworks will be discussed as well as specific population dynamic problems relevant to communities and stakeholders interested in coastal sustainability. The potential for the new modeling frameworks in addressing major unanswered biological questions facing coastal stakeholders will also be discussed, as well as areas requiring further research.

Dr. Robert Miller is an associate professor in the department of civil engineering at the University of Louisiana at Lafayette. Dr. Miller is a coastal hydrologist and mathematician whose research seeks to improve our ability to model how water environments and biological systems respond to hydrological changes. In 2021 Dr. Miller was one of only 8 scholars nationally to be selected as a recipient of the National Academies of Science, Engineering, and Medicine Early-Career Gulf Research Fellowship in Environmental Stewardship. Miller is also a recipient of the Louisiana Engineering Foundation (LEF) Faculty Professionalism Award. In 2022 Dr. Miller was appointed by the President of the United States of America and confirmed by the U.S. Senate to be one of seven members to serve on the Mississippi River Commission (MRC). The MRC provides water resources engineering direction and policy advice on the Mississippi River System to the Administration, Congress, and the U.S. Army Corps of Engineers. Prior to joining the engineering faculty at ULL, Dr. Miller worked for more than a decade in private industry as a senior engineer and project manager for numerous projects ranging from FEMA flood map development, stormwater master plans, and coastal restoration projects. Dr. Miller obtained his PhD in computational and applied mathematics in 2015 from the University of Louisiana at Lafayette and is a registered professional engineer in the state of Louisiana.

Section Visitor

Cindy Wyels, *MAA Secretary, California State University Channel Islands*

Friday, March 1, 1:00 PM

Data Science for and by Pure Mathematicians

Consider the skills and habits of mind developed through studying pure mathematics. These—and some basic statistical techniques—are enough to address some questions of interest given a small data set. With a larger investment of time for individual learning, a healthy dose of humility, and perhaps some collaborators, those whose preparation focused on pure mathematics can produce data-based studies of interest to wide audiences. Join me for a story involving a years-long transition, a cast of dozens, some alluring marine megafauna and much serendipity as I argue for the value of all types of research for and by all types of researchers.

Dr. Cynthia Wyels came to CSU Channel Islands in Fall 2005 after several years at California Lutheran University. At CSUCI, she co-authored three \$6 million HSI-STEM grants, directed the campus' LSAMP program, and served as chair of the Faculty Senate. She's mentored students through undergraduate research projects through the MAA's NREUP grants and NSF grants and has offered minicourses for faculty on conducting research with undergraduates. Dr. Wyels received SACNAS' Distinguished Mentor Award for work mentoring students and faculty from historically underserved groups as well as the MAA's Haimo Award for Distinguished University Teaching of Mathematics. Her mathematical research interests began in combinatorial mathematics and linear algebra. She now applies data analysis tools to study the effectiveness of educational interventions and to collaborate on environmental issues.

Anderson Lecture

Lisa Fauci, *Tulane University*

Friday, March 1, 5:00 PM

The Fascinating World of Flexible Filaments in Fluid

The motion of waving or rotating filaments in a fluid environment is a common element in many biological and engineered systems. Examples at the microscale include bacterial flagella propelling a cell body and engineered helical nanorobots designed to deliver drugs to tumors. Complex fluid environments, such as networks of polymers, can have dramatic effects upon the dynamics of microorganisms as they move through mucus or tissues. In this talk we will present a mathematical and computational framework used to model these viscosity-dominated flows. We will investigate a few intriguing systems: actin-like fibers in straining flows that spontaneously buckle into helices, helical filaments that penetrate and break a polymeric network, and the journey of extremely long and flexible sperm flagella through narrow and tortuous female reproductive tracts.

Lisa Fauci received her PhD from the Courant Institute of Mathematical Sciences at New York University, and directly after that joined the Department of Mathematics at Tulane University in New Orleans. Her research focuses on biological fluid dynamics, with an emphasis on using modeling and simulation to study the basic biophysics of organismal locomotion and reproductive mechanics. Lisa served as president of the Society for Industrial and Applied Mathematics (SIAM) in 2019–2020. In 2023, she was elected to the US National Academy of Sciences.

MAA Editor Lecture

Jason Rosenhouse, *Editor of Mathematics Magazine, James Madison University & U.S. Air Force Academy*

Saturday, March 2, 11:00 AM

The Saga of the Hardest Logic Puzzle Ever

The Hardest Logic Puzzle Ever was first presented by philosopher George Boolos in 1996. We are to imagine three gods: one always tells the truth, one always lies, and one randomly decides whether to tell the truth or to lie. You do not know which is which. The gods will answer any yes/no question put to them, but they will answer in their own language. In this language, the words for yes and no are da and ja, but you do not know which word means what. You are to ask a sequence of three yes/no questions, after which you must determine which god is which. Boolos' solution led to a veritable industry of papers presenting ever more ingenious solutions and considering ever more complex variations. The resulting saga involves, among other things, nested biconditional statements, the nature of randomness, the art of extracting more than two answers from a binary question, the embedded question lemma, and exploding heads. We will explore the high points of the saga while introducing it all with some ruminations on logic as a discipline.

Jason Rosenhouse received his PhD in mathematics from Dartmouth College in 2000, specializing in algebraic graph theory. Since 2003, he has been a professor at James Madison University, Harrisonburg, VA. For the 2023–2024 school year, he is the Distinguished Visiting Professor in mathematics at the United States Air Force Academy, Colorado Springs. He is the author or editor of nine books, on subjects such as recreational mathematics and evolution versus creationism. He is currently the Editor of *Mathematics Magazine*, published by the MAA. When not doing math, he enjoys playing chess, cooking, and reading locked room mysteries.

Workshops

Mathematical Models in Data Science

Friday, March 1, 8:30 AM

Facilitators: Christian Smith, Pradeep Chowriappa, and Vivya Kalidindi; *Louisiana Tech University*

Data science enables the application of mathematical models in newer applications that are rich in data. For instance, Indoor Location Tracking Systems (ILTS) rely on the mathematical model referred to as the path loss model. The path loss model is used to estimate distance between the user and sensor device. These distances will help to track user locations over time. However, the path loss model does not work effectively because data generated from sensors are noisy and non-gaussian in nature. Due to the dynamic characteristics of data, the accuracy, reliability and scalability of ILTS is compromised. This workshop is designed to 1) address the challenges posed by dynamic data in ILTS and 2) engage the participants by using real-time datasets to analyse the performance of path loss model. The goal of this workshop is to empower participants with the knowledge and tools necessary to improve the accuracy of distance estimation models within the context of ILTS.

Mathematical Modeling Comes Alive

Hands-on Participation, Discussion, and Live Demonstration by Experts

Friday, March 1, 2:15–4:15 PM

Facilitators: Ricardo Cortez, *Tulane University*; Cynthia Anhalt, *University of Arizona*

Modeling Experts: Hongfei Chen and Adnan Morshed, *Tulane University*

This workshop is designed to illustrate the mathematical modeling process at different levels of expertise. The purpose is to reveal similarities and differences between the thought process experienced by novice modelers and expert modelers, and to discuss the implications for teaching mathematical modeling in k-16. The workshop will feature opportunities for participants to engage in mathematical modeling, and to observe two professional modelers as they work on a modeling task they have not seen before. The professionals will verbalize their thinking as they develop their models so that the observers can capture an accurate picture of the mathematical modeling process the experts experience. The workshop will conclude with a discussion of the process experienced by modelers of different expertise, implications for teaching modeling, and for preparing future teachers in this area. Everyone is invited. No prior modeling experience is necessary. Modelers with different levels of experience are encouraged to attend.

Panel

What Do I Do Next? Careers in the Mathematical Sciences

Friday, March 1, 3:30–4:45 PM

Moderator: Catherine Putnam, *Delta State University*

Panelists: Raven Alexander, *National Security Agency*

Dr. Julie Jordan, *Vice President for Research and Academic Development, Mississippi State University*

Sarah Lee, *Director, Corporate Actuarial, Southern Farm Bureau Life Insurance Company*

Dr. Robert Miller, *Associate Professor of Civil Engineering, University of Louisiana Lafayette*

Join experts from a wide range of fields as we explore career paths for undergraduate and graduate mathematics majors! Panelists will share their expertise in a series of short presentations before engaging audience members in open Q&A.

Contributed Talks

Friday, March 1 in Bayside C		
2:15 PM	Christian Ennis	Approximating the Uniform Distribution: Metrics on the Space of Discrete Probability Distributions
2:40 PM	Maggie Lai	Zero-Sum-Free Graph Labellings
3:05 PM	Cyril Ocloo	A Homotopy Analysis Method with Delta Shaped Basis Approximation for Solving a Nonlinear PDE
3:30 PM	Yanli Cui	Elevating STEM: Dual Enrollment Multivariable Calculus in Public High Schools
3:55 PM	Haiyan Tian	The method of approximate fundamental solutions for well-posed or ill-posed PDEs
4:20 PM	James Lambers	A Crash Course on Matrices, Moments and Quadrature
Saturday, March 2 in Oak Alley		
8:00 AM	Alex Rice	The sum-product problem for small sets
8:25 AM	Edgar Reyes	An Iwasawa-like decomposition for the group $O(p, q)$
8:50 AM	Jimmy Kimball	Student Success in Entry-Level Mathematics Courses Amid a Sea of Change

Student Papers

Friday, March 1 in Bayside A	
2:15 – 2:27 PM	Cost-Risk Analysis of the ERCOT Region Using Modern Portfolio Megan Sickinger Faculty Advisor: Dr. Haiyan Tian, <i>The University of Southern Mississippi</i>
2:30 – 2:42 PM	Branching Out: A Further Look at Christmas Trees Shelby Dean Faculty Advisor: Dr. Daniel Watson, <i>Mississippi College</i>
2:45 – 2:57 PM	Random Walks on a Class of Trees Lilly Ates, Zachary Chapman, Sejin Kim, Todd Larkin, Martavin McWilliams, Joseph Wickes, <i>Belhaven University</i>
*4:25 – 4:37 pm	Modeling the Open Probability of Ion Channels on Cell/Organelle Membranes using Deep Neural Networks Abel Gurung and Qingguang Guan, <i>University of Southern Mississippi</i>

Student Papers (cont.)

Friday, March 1 in Bayside A	
3:15 – 3:27 PM	Graph Theory Approach to Arbitrage Luke Boarman Faculty Advisor: Dr. Daniel Watson. Includes joint work with Jorge Areces, <i>Mississippi College</i>
3:40 – 3:52 PM	The integrals in Gradshteyn and Ryzhik Part 33: Sines and cosines of multiple and of linear and more complicated functions of the argument Mackenzie Bookamer, Peter Carroll, Saul Alejandro Chavez Muñoz, Sam DeMarinis, Harry Feldman, Russell George, Sarah Helmbrecht, Walter Herasymiuk, Julian Huddell, Caroline Kovalan, Isabella Kulstad, Maggie Lai, Melanie McAdoo, Henry Miller, Victor H. Moll, Arzaan Singh, Ellie Stevenson, and Maggie Welland
3:55 – 4:07 PM	From Rock, Paper, Scissors to the Petersen Graph: Uncovering the Existence of Strategy on Graph Games Tyler Jackson, <i>Belhaven University</i>
4:10 – 4:22 PM	Using the Hungarian Method for Endowment Distribution David Torrent Faculty Advisor: Dr. Daniel Watson. Includes joint work with Mason Walker, <i>Mississippi College</i>
*3:00 – 3:12 PM	Component-wise Backward Differentiation Formulas for Stiff Systems of Ordinary Differential Equations Anzhelika Vasilyeva Faculty Advisor: James V. Lambers, <i>The University of Southern Mississippi</i>

Late addition!

Redesigning Your Math Curriculum with Coreqs, Planning, and Practice

Friday, March 1, 2:15 pm in Bayside B

Dayna Leaman, Wiley Senior Digital Learning Executive

Grace Bush, Associate Digital Learning Specialist – Knewton Alta

Christy Sue Langley, University of Louisiana Lafayette & Peer Advisor for Knewton Alta

Join us in Jackson!

The 2025 MAA Louisiana/Mississippi Section meeting will be hosted by Belhaven University on February 27 – March 1, 2025. We're looking forward to seeing you there!

Plenary speakers next year are

Section Visitor

Jenna Carpenter, Campbell University and MAA President-Elect

Polya Lecture

Pamela Harris, University of Wisconsin at Milwaukee

Anderson Lecture

James Tanton, MAA Mathematician at Large and co-founder of the Global Math Project

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