

Program of Activities
For the 2021 Fall Meeting of the
Mathematical Association of America
Ohio Section



Fall, 2021
The University of Toledo
Toledo, Ohio
October 15 - October 16, 2021

MAA Ohio Section
Fall 2021 Program

Friday, October 15

12:00 – 4:00	Registration	Memorial Field House Lobby
12:00 – 1:00	Committee Meetings (if needed)	
	CONCUR (Curriculum)	FH 2200
	CONSACT (Section Activities)	FH 2210
	CONTEAL (Teacher Education & Licensure)	FH 2220
1:00 – 4:00	Vendor & Book Exhibits	Atrium
1:15 – 1:30	Welcome and Announcements	FH 2100
1:30 – 2:30	Invited Address: “Zoom Silver Linings: How COVID Improved My Teaching” Matt Boelkins	FH 2100
2:30 – 2:50	Break	Atrium
2:50 – 3:50	Invited Address by winner of the Distinguished Teaching Award: “The Wonderful World of Simulations - A Tribute to Stanislaw Ulam” MB Rao	FH 2100
4:00 – 5:35	Contributed Paper Sessions (4 time slots)	FH 2210 FH 2220
5:35 – 6:00	Social Time	Phoenicia Cuisine
6:00 – 7:00	Banquet	Phoenicia Cuisine
7:00 – 8:00	Invited Address: “Geometry of the Earth and Universe” Sarah Greenwald	FH 2100

Saturday, October 16

8:00 – 10:00	Registration	Memorial Field House Lobby
8:00 – 10:00	Book Vendors and Exhibits	Atrium
8:00 – 9:25	Coffee and Pastries	Atrium
8:50 – 9:25	Committee On Local Arrangements and Executive Committee Meeting (if needed)	FH 2230
9:25 – 9:35	Welcome and Announcements	FH 2100
9:35 – 10:35	Invited Address: “How and Why the Association for Women in Mathematics was Founded and is Still Needed Today” Sarah Greenwald	FH 2100
10:35 – 10:50	Break	Atrium
10:50 – 11:50	Invited Address: “Swim, Pump, Fly: Modeling Propulsion in Fluid-Structure Interaction Systems” Alexander Hoover	FH 2100
11:50 – 12:00	Break	Atrium
12:00 – 1:00	CONSACT Invited Address: “Title: Mathematical Modeling Tasks for Calculus” Jim Fowler	FH 2100
1:00 – 1:10	Closing Remarks	FH 2100

Abstracts of Invited Addresses

Friday

Speaker: Matt Boelkins, Grand Valley State University

Title: Zoom Silver Linings: How COVID Improved My Teaching

Abstract: Prior to the global pandemic, I had a long-held teaching aspiration: never teach an online class. But after more than two full semesters of teaching some or all of my students in an online setting, I found that many aspects of my teaching practice were improved through changes necessitated by the modality. In this talk, we'll reflect together on what we learned teaching amidst COVID and consider Zoom-needed practices that we might/will/should carry into our in-person instruction.

Speaker: MB Rao, University of Cincinnati

Title: The Wonderful World of Simulations - A Tribute to Stanislaw Ulam

Abstract: Conducting simulations to solve many statistical and mathematical problems has become part and parcel of statistical education. The core ideas and development are attributed to Stanislaw Ulam and John von Neumann. In this presentation, ideas and development are traced historically culminating modern usage of Monte Carlo simulations in Bayesian Analysis, Bootstrap methods, and Genetics.

Speaker: Sarah Greenwald, Appalachian State University

Title: Geometry of the Earth and Universe

Abstract: The quest to understand the precise geometry and shape of our universe began thousands of years ago, when mathematicians and astronomers used mathematical models to try and explain their observations. We'll explore historical and current theories related to the geometry of the earth and universe.

Saturday

Speaker: Sarah Greenwald, Appalachian State University

Title: How and Why the Association for Women in Mathematics Was Founded and Is Still Needed Today

Abstract: Founded 50 years ago, during a surge of feminist and civil rights activities, AWM is the oldest organization in the world devoted to women in mathematics. We'll look back at how and why AWM was formed and learn about why it's still vital in today's culture and the active role that it continues to play in the lives and work of girls and women.

Speaker: Alexander Hoover, The University of Akron

Title: Swim, Pump, Fly: Modeling Propulsion in Fluid-Structure Interaction Systems

Abstract: For many organisms, swimming and flying emerges from the transfer of momentum from an animal's body to the local fluid environment. The complex kinematics that drive these processes emerge from the coupling between the active and passive material properties of a flexible body and the fluid environment in which they move. In this talk, we will discuss the role computational methods can play in examining a number of fluid-structure interaction systems. Importantly, we will focus on how the scientific process in this interdisciplinary field is aided by different pedagogical backgrounds.

Speaker: Jim Fowler, Ohio State University

Title: Mathematical Modeling Tasks for Calculus

The calculus curriculum presents many opportunities to engage students with mathematical modeling. In this interactive workshop, we will see some examples of modeling in the small (tasks presented to students via short worksheets) and in the large (tasks structured as semester-long projects), and discuss the extent to which these activities do or do not fit into the modeling cycle.

Brief Biographies of Invited Speakers

Matt Boelkins, Grand Valley State University



Matt Boelkins is Professor of Mathematics at Grand Valley State University in Allendale, MI, where he has been a member of the faculty for almost 25 years. A passionate teacher and proponent of active learning, Professor Boelkins has been recognized with several teaching-related honors, including the Michigan Association of State Universities' 2016 Distinguished Professor of the Year. Throughout his career, he has worked to promote the scholarship of teaching and learning mathematics through scholarly papers, conference

presentations, and the journal *PRIMUS* (Problems, Resources, and Issues in Mathematics Undergraduate Studies), which he serves as Editor-in-Chief. Professor Boelkins has co-authored several research papers with undergraduate students and is the author or co-author of four textbooks, including *Active Prelude to Calculus*, *Active Calculus Single Variable*, and *Active Calculus Multivariable*. As Director of New Student Advising & Registration at GVSU, he leads a large team of staff, faculty, and undergraduate student assistants that welcomes Grand Valley's incoming class of more than 4000 students annually. He is an active member of the MAA and a former first vice president of the Association.

MB Rao, University of Cincinnati



MB Rao got his Ph.D. from the Indian Statistical Institute, Calcutta with thesis work on Measure Theory and Topology. His first job, right after graduation, was at the University of Sheffield, England as an Assistant Professor. He visited University of Pittsburgh for two years and then worked as an associate professor at the North Dakota State University. He joined University of Cincinnati in 2004 as a tenured professor in the Department of Environmental Health in the College of Medicine.

As per research, he considers himself as a jack of all trades. He has publications ranging from applied statistics to infinite dimensional probability, from matrix algebra to dynamical systems, and from Discrete Probability to Mathematical Puzzles. He has published over 350 papers, authored three books, guided over 40 Ph.D. students, and 50 Master's students.

He is an elected fellow of the Institute of Mathematical Statistics, American Statistical Association, International Statistical Institute, and American Association for the Advancement of Science.

Currently, he is expending lots of energy on Data Science and conducting workshops on it around the globe. One is planned in Ethiopia in the Fall and another in Hyderabad next Spring. He is also working on a project with a cardiologist how to eavesdrop on the communications between the brain and heart.

Sarah Greenwald, Appalachian State University



Sarah J. Greenwald, an MAA Polya Lecturer, is a professor in the Department of Mathematical Sciences and a faculty affiliate of Gender, Women's and Sexuality Studies in the Department of Interdisciplinary Studies at Appalachian State University. Greenwald earned a PhD in Riemannian geometry from the University of Pennsylvania and a BS in

mathematics from Union College.

Investigating connections between mathematics and society, Greenwald has won awards for teaching, scholarship and service. These include an MAA Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member, an AWM Service Award, and College of Arts and Sciences Outstanding Teacher of the Year. As an AWM Fellow, Greenwald was cited for “creative and effective efforts to spark interest in mathematics among young people, especially girls... extensive contributions to advancing women in mathematics through writing, lectures and working with professional societies... and mentorship of students.” Recent work includes *Fifty Years of Women in Mathematics: Reminiscences, History, and Visions for the Future of AWM*, an AWM-Springer book edited by Janet L. Beery, Greenwald, and Cathy Kessel, which is anticipated in early 2022.

Alexander Hoover, The University of Akron



Alexander Hoover (he/him) is an assistant professor of mathematics at the University of Akron, where he has been since Fall 2018. Prior to Akron, he completed his PhD at the University of North Carolina - Chapel Hill and was a postdoctoral fellow at Tulane University. He is a Project NExT fellow (Silver '19) and a board member of Spectra, the Association for LGBTQ+ Mathematicians. His research is at the intersection of applied math, fluids, and biology, and is happiest when out at sea looking at marine organisms

for inspiration for the next math model.

Jim Fowler, Ohio State University



Jim Fowler is an Associate Professor at Ohio State in the Department of Mathematics. His research interests broadly include geometry and topology and math education issues. Prior to working at The Ohio State University, he received an undergraduate degree from Harvard University and received a Ph.D. from the University of Chicago.

Contributed Paper Sessions

*denotes undergraduate student

Friday, October 15

4:00—5:35

Time	Session A Session Chair: Anup Lamichhane Room: FH 2210
4:00 – 5:20	<i>Icosahedral Rotations with Five Colors</i> Abstract 1 Preston Nichols Shawnee State University
4:25 – 4:45	<i>The Tale of a Swarm of Lines in the Life of a Simple Linear Regression Model</i> Abstract 2 Tianyuan Guan Kent State University – Kent
4:50 – 5:10	<i>Elementary Foundations Spectral Synthesis and an Open Question</i> Abstract 3 J. Gord Wade Bowling Green State University – Main
5:15 – 5:35	<i>Bounding the roots of polynomials</i> Abstract 4 Anda Stan Ohio State University – Marion

Time	<p style="text-align: center;">Session B Session Chair: Chris Swanson FH 2220</p>
4:00 – 5:20	<p style="text-align: center;"><i>Odd-Period Cycles of the Logistic Map</i> Abstract 5 David Calvis Baldwin Wallace University</p>
4:25 – 4:45	<p style="text-align: center;"><i>Active Learning Through GeoGebra Applets in Linear Algebra and Geometry</i> Abstract 6 Bradford R Findell Ohio State University - Columbus</p>
4:50 – 5:10	<p style="text-align: center;"><i>A functional equation with discontinuous solutions</i> Abstract 7 Aurel Stan Ohio State University - Marion</p>
5:15 – 5:35	<p style="text-align: center;"><i>Being an experimentalist: classroom explorations in Experimental Math</i> Abstract 8 Mihai Caragiu Ohio Northern University</p>

Abstracts of Contributed Papers

Friday 4:00 – 5:35

Icosahedral Rotations with Five Colors

Preston Nichols

Shawnee State University

Abstract 1: A digital animation (in progress) showing several continuously linked examples of the following: The rotation group of the icosahedron is isomorphic to A_5 (the alternating group of degree 5), which has five distinct, mutually conjugate subgroups isomorphic to A_4 . This implies that any 3-dimensional figure with icosahedral rotation symmetries can be (perhaps partially) colored with five colors so that each single color is an A_4 -orbit, and the icosahedral rotations permute the five colors.

The Tale of a Swarm of Lines in the Life of a Simple Linear Regression Model

Tianyuan Guan

Kent State University – Kent

Abstract 2: The simple linear regression model is ubiquitous in any introductory class. The model involves two numeric variables X and Y and technically described as $Y | X \sim \text{Normal}(\beta_0 + \beta_1 X, \sigma_2)$. This is a causal model and conditional. There are three parameters in the model. We need data $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$ to estimate the parameters of the model. The method of least squares gives us explicit formulas for the estimates. On the other hand, take any two points from the data. There is a unique line passing through the points. We will have a swarm of $nC2$ lines. The purpose of the presentation is to examine how these lines compare with the queen bee line, which is the least squares line.

Elementary Foundations Spectral Synthesis and an Open Question

J. Gord Wade

Bowling Green State University – Main

Abstract 3: Any invariant subspace of a diagonalizable operator T acting in a finite dimensional space H is spanned by the eigenvalues it contains. Also, any invariant subspace is spanned by the set of powers of T acting a single vector x in the subspace. However, these conditions are not always true if the H is infinite dimension, but they are equivalent. We examine interesting connections, accessible to undergraduates, arising in these considerations, and an open question.

Bounding the roots of polynomials

Anda Stan

Ohio State University – Marion

Abstract 4: We present bounds for the roots of polynomials with complex coefficients. These bounds lead to some numbers that generalize the golden ratio. Moreover, these numbers grow to infinity similarly to the inverse of the function $n \ln(n)$ where n is the degree of the polynomial whose roots we are bounding.

Odd-Period Cycles of the Logistic Map

David Calvis

Baldwin Wallace University

Abstract 5: Pick a number x between 0 and 1 and multiply it by a fixed constant r times $(1 - x)$. Take the result and repeat. You have just iterated the logistic map, one of the icons of the world of nonlinear dynamics. Among this map's many striking features are its cycles -- iterations that lead back to the starting point. The number of iterations is called the period of the cycle. This talk uses nothing more than calculus to identify the threshold value of r for the logistic map to exhibit cycles of odd period.

Active Learning Through GeoGebra Applets in Linear Algebra and Geometry

Bradford R Findell
Ohio State University - Columbus

Abstract 6: GeoGebra classroom allows students to work simultaneously on the same "lesson," providing the instructor simultaneous views of all the students' screens. Instructors can then share individual students' sketches and interact with them during whole-class discussions. This session will share some particularly fruitful lessons from an undergraduate Linear Algebra course, along with other lessons designed for undergraduate Geometry courses for teachers.

A functional equation with discontinuous solutions

Aurel Stan
Ohio State University - Marion

Abstract 7: If g is a strictly decreasing function, then there is no continuous function f that composed with itself equals g . Taking $g(x) = -x$, a function f , that composed with itself equals g , can be constructed algebraically using a base of the set of real numbers, viewed as a vector field over the field of rational numbers. However, such functions have bad analytic properties. We present a function f which has a countable number of discontinuities and composed with itself equals to g .

Being an experimentalist: classroom explorations in Experimental Math

Mihai Caragiu
Ohio Northern University

Abstract 8: We will discuss our recent experiences with topics that are usually found attractive by students with a dual interest in both math and computing. We will deal with a version of "Euler 47" involving quintuples of consecutive integers that have exactly five prime factors each, where we employed a specimen of partly "convergent randomized search" and partly "brute force" (pointing out a moment where we got lucky)...

Save this Date!

2022 Spring Ohio Section MAA Meeting
Xavier University
March 25 – March 26