

The Mathematical Association of America New Jersey Section Meeting



MATHEMATICAL ASSOCIATION OF AMERICA

MAA



Virtually (via Zoom)

Sunday, October 24, 2021

8:30 – 9:00	Networking
9:00 – 9:15	Welcome. <i>Paul von Dohlen, Chair of MAA-NJ.</i>
9:15 – 10:05	<u>Narratives of Minority PhD Students</u> Michael Young, Carnegie Mellon University. Presider: Elizabeth Uptegrove, Felician University.
10:05 – 10:20	MAA-NJ Business Meeting
10:20 – 10:30	Break
10:30 – 11:20	<u>Workshop: How to Not Tie a Knot.</u> Allison Henrich, Seattle University. Presider: Jonathan Weisbrod, Rowan College at Burlington County.
	<u>Contributed Papers: Teaching</u>
	<u>Contributed Papers: General</u>
11:20 – 11:35	Break
11:35 – 12:25	<u>Zeroing in on the Implicit Function Theorem</u> Carol Schumacher, Kenyon College. Presider: Linda Ritchie, Centenary University.
12:25 – 12:30	Closing Remarks. <i>Paul von Dohlen, Chair of MAA-NJ.</i>

Abstracts and Biographies of Plenary Speakers

Narratives of Minority PhD Students

Michael Young

Carnegie Mellon University

Abstract: In this talk, we present preliminary data and themes that have come out of a qualitative study in which 100 interviews of PhD candidates that identify as racial/ethnic minorities in the mathematical sciences.

Michael Young is an Associate Professor of Mathematical Sciences at CMU, where he also serves as the inaugural associate dean for diversity, equity and inclusion in the Mellon College of Science. His primary research area is Discrete Mathematics, particularly problems in anti-Ramsey theory and zero forcing. Recently, he has had a focus on equity in the mathematics classroom. Most of this work has been through teacher professional development on creating inclusive mathematics learning spaces. He is responsible for establishing the Center for Minorities in the Mathematical Sciences.



How to Not Tie a Knot

Allison Henrich

Seattle University

Abstract: Have you ever thought about how to NOT tie a knot? Seems simple, right? You hold the ends of a piece of rope in your hands and do nothing. Sure, this is one way to not tie a knot, but can you do it with flair? Can you make it look like you didn't tie a knot by some amazing magic? In this talk, we will learn about various ways to tie knots that magically disappear. We will also explore mathematical ideas from knot theory that demonstrate how the *magical is mathematical!*

Recommended Supplies: [magician's rope](#) (best) or a thick shoelace (ok) or your phone charging cable (worst)

Allison Henrich is a Professor of Mathematics at Seattle University, where she has been teaching since 2009. Her research is primarily in knot theory, recreational math, and the intersection between the two fields. She is passionate about working with students on research and has co-authored a book, *A Mathematician's Practical Guide to Undergraduate Research*, to help others mentor students in research, too. She is currently working with a diverse team of authors to write a guidebook for math majors to help students decide what courses to take, learn what opportunities there are for extracurricular activities, discover what career opportunities there are for students with a math degree, and more!



Zeroing in on the Implicit Function Theorem

Carol Schumacher

Kenyon College

Abstract: In mathematics, it often happens that baroque, highly technical results disguise beautiful underlying principles. This talk traces the path from the elegant contraction mapping principle to the rather inscrutable implicit function theorem---a path that passes through Newton's method for finding roots, linear algebra and linear approximation, and the geometry of multidimensional surfaces.

Carol Schumacher is Professor of Mathematics at Kenyon College and is currently serving her fourth term as department chair. She received her Ph.D. in mathematics from The University of Texas at Austin. Schumacher is the recipient of Kenyon's Trustee Teaching Award and of the Ohio Section MAA's Distinguished Teaching Award. She is the author of *Closer and Closer: Introducing Real Analysis* and *Chapter Zero: Fundamental Notions of*



Abstract Mathematics, 2E. She loves teaching pretty much anything, but especially loves Calculus I and Calculus III, the transitions to proof course, the real analysis sequence. And she has recently gotten into teaching geometry.

Schumacher is active in the Mathematical Association of America. She was co-chair of the 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences and served one term as vice president. She has addressed Project NExT fellows at their summer workshop and has been involved with workshops that help faculty incorporate inquiry into their classrooms.

Abstracts of Contributed Paper Sessions

Session 1: Contributed Papers – Teaching

Organizer and Presider: Kathy Turrisi, Centenary University

10:30 – 10:40: Writing about Math using Lesson Checkups and Discussions

Ashley Tasy, Brookdale Community College

Abstract: In a time where students get their information from memes or short video clips on social media, it is increasingly more important that they can communicate clearly and effectively through writing. In particular, students find it difficult to write about mathematics due to only having a surface understanding of the content. Giving students many opportunities to write about the mathematics they are studying aids in developing these skills. During this presentation, I will demonstrate the various ways I have students write about mathematics in each lesson and how to easily incorporate writing prompts in courses ranging from foundational skills through calculus and beyond.

10:42 – 10:52: Making Connections from Prerequisites to Core Student Learning

Objectives

Sheila Tabanli, Rutgers University - New Brunswick

Abstract: A common problem faced by instructors in higher education is that students lack important prior knowledge and skills needed when they enter the more advanced courses in their curriculum 1. First year undergraduate students not having a one and a half years of face-to-face learning added extra challenges to this already existing problem. Prior knowledge has long been considered the most important factor influencing learning and student achievement 2. The challenge of effective teaching, as measured by student learning, is to find connections that foster motivation, knowledge building, thinking and integration of old and new information 3. In this presentation, the author shares how she revamped the prerequisites sections of the curriculum by emphasizing the connections between the Precalculus and Algebra content to the core Calculus curriculum. The purpose of the restructuring in the lesson planning and the delivery of instruction is to address the general student misinterpretations of the curriculum such as mastery in Calculus is independent of the mastery in the prerequisites skills and concepts. By having an earlier exposure to how the prerequisite skills will be needed in future Calculus course

content, students are offered an early alert, guided with the proper tools to succeed, and equipped with an informed decision making of taking a prerequisites course prior to enrolling to the Calculus I course.

10:54 – 11:04: Remote versus Face-to-Face Teaching

Mahmoud Affouf, Kean University

Abstract: In this paper, I will present a comparison between remote and face-to-face Calculus teaching, including the student performance assessment, the nature of available textbook exercises, and the need to design different types of questions based on critical thinking.

11:06 – 11:16: An Image Processing Tour of College Mathematics

Eugene Galperin, East Stroudsburg University of PA

Abstract: We discuss the use of basic and advance image processing methods to provide meaningful context for reviewing key topics of the college mathematics curriculum, to help students gain confidence in using concepts and techniques of applied mathematics, to increase student awareness of recent developments in mathematical sciences, and to help students prepare for graduate studies.

Session 2: Contributed Papers – General

Organizer: Kathy Turrisi, Centenary University

Presider: Dawn Nelson, Saint Peter's University

10:30 – 10:40: Prime geodesics on compact hyperbolic 3-manifolds

Lindsay Dever, Bryn Mawr College

Abstract: The study of hyperbolic 3-manifolds draws deep connections between number theory, geometry, and topology. An important geometric invariant of a hyperbolic 3-manifold is the set of its closed geodesics, which are parametrized by their length and holonomy. It turns out that for geodesics of increasing lengths, holonomy is equidistributed throughout the circle; it is equally likely to land in any interval of a given size. In this talk, I'll introduce compact hyperbolic 3-manifolds and present new results on the distribution of holonomy, including equidistribution in shrinking intervals.

10:42 – 10:52: Linear Regression to Deep Learning

George Avirappattu, Kean University

Abstract: The speaker will take the audience through a journey from linear regression to advanced artificial neural networks (ANN), highlighting the common thread of mathematical foundations. Machine learning, powered by ANN's, thrust artificial intelligence (AI) into prominence again today. We will discuss the pros and cons between linear regression and ANN's. The medium of the presentation will be a Jupyter Notebook for Python programming shared with the audience.

10:54 – 11:04: A Trio of 3x3 Magic Squares Possessing Palatable Properties

Jay Schiffman, Rowan University

Abstract: There are a number of appealing magic squares including Rudolph Ordrejka's (1928-2001) consisting of the nine prime entries 17, 89, 71, 113, 59, 5, 47, 29 and 101:

17	89	71
113	59	5
47	29	101

A second magic square also containing eight prime entries and the integer 1 was selected from an activity in an elementary textbook designed for elementary teachers and consists of the following entries:

7	61	43
73	37	1
31	13	67

A third prime magic square discovered by Harry Nelson whose entries are as follows:

1480028159	1480028153	1480028201
1480028213	1480028171	1480028129
1480028141	1480028189	1480028183

We explore a number of interesting properties possessed by these magic squares and determine the smallest constant required to add to each of the entries to obtain a new magic square consisting of from zero to nine primes respectively, if possible. The problem takes on three flavors which will be discussed in the sense that each of the entries will be congruent to either 0, 1 or 2 modulo 3 when constants are added to each entry in the original magic square.

11:06 – 11:16: Proving Theorems in Spherical Geometry using the Quaternions

Marshall Whittlesey, California State University San Marcos

Abstract: It is well known that the complex numbers can be used to do transformation geometry in the plane. In particular, rotation by angle Θ about the origin is accomplished via multiplication by the complex number $e^{i\Theta} = \cos \Theta + i \sin \Theta$. It is less well known that the quaternion algebra (consisting of expressions of the form $a+bi+cj+dk$ with $i^2=j^2=k^2=-1$) can be used to do similar transformations in three dimensional space. In this talk we show how to use quaternions to prove an interesting classical theorem in spherical geometry: the existence of the so-called *pentagramma mirificum* discovered by John Napier. These methods are featured in the speaker's new book with CRC Press, *Spherical Geometry and its Applications*, which the author hopes will be attractive for use in topics courses in geometry.

MAA/AMS Book Sales

Visit the AMS Bookstore at <https://bookstore.ams.org/books-on-sale> during our Fall Sectional Sale and enjoy 35% off a selection of AMS/MAA Press titles.

Future MAA Meetings

MAA-NJ. Spring 2022 - TBA

GSUMC. Spring 2022 - TBA

MathFest. The MAA will hold its annual MathFest in Philadelphia, PA, August 3-6, 2022.

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Check us out!

Email: maanj.socialmedia@gmail.com
Facebook: <https://www.facebook.com/maanewjersey>
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Acknowledgments

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