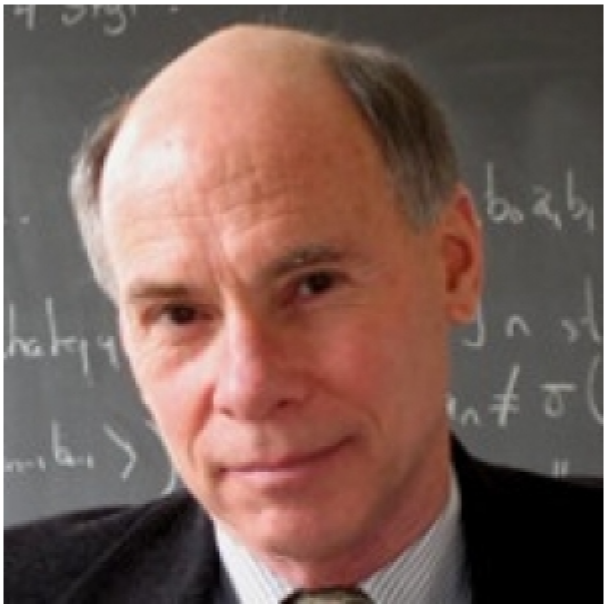
Invited Speakers

Fall 2022 MAA Seaway Section Meeting



Banquet Speaker

Alan Taylor, Union College

The unreasonable ineffectiveness of mathematics (with and without the axiom of choice)

The title is a bit tongue-in-cheek with apologies to Eugene Wigner; nothing we say is in conflict with his wonderful 1960 paper in the Journal of Pure and Applied Mathematics entitled "The unreasonable effectiveness of mathematics in the natural sciences." But although the abstract mathematics we do does, as Wigner suggests, produce many results that yield strange-but-true things about the real world, it also produces some results that seem to be in conflict with the real world that we know. The most famous example is the Banach-Tarski paradox, asserting that a solid ball can be decomposed into five pieces and then reassembled using translations and rotations into two solid balls that are each the same size as the original. We'll mention a couple of others along these lines (predicting the future ...) that rely on the axiom of choice, but we'll also mention a couple that don't (more teams than players; more leagues than teams ...). And we'll mention (with permission) some remarkable unpublished results of Elliot Glazer that reveal paradoxes in the absence of AC and anything contradicting AC.

Biography:

My graduate training was in the field of mathematical logic, and I spent the first fifteen years of my career doing infinitary combinatorics. Most of my work involved ultrafilters on omega, ideals on uncountable cardinals, and partition theory (including a bit of work with finite Ramsey theory). I spent the following fifteen years with a number of questions from the area of “fair division” and with some topics arising from the theory of voting. Here, I was primarily studying simple games. For the past decade I have returned to set theory with somewhat of a focus on coordinated inference as captured by so-called hat problems.

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Invited Lecture

Janet Heine Barnet, Colorado State University Pueblo

The French Connection: Borda, Condorcet, and the Mathematics of Voting Theory

Voting theory has become a standard topic in the undergraduate mathematics curriculum. Its connection to important issues within a democratic society and the accessibility of its methods make a unit on voting theory especially well-suited for students in liberal studies program. The piéce de resistance of such a unit is a somewhat startling theorem known as Arrow's Impossibility Theory which essentially asserts that there is no fair voting system for elections involving three or more candidates. Unpacking what this means by exploring the relationship between different methods for determining election results (called voting methods) and different notions of fairness (called fairness criteria) is the primary objective of the standard undergraduate treatment of voting theory.

The study of specific voting methods and their drawbacks itself dates back well before Arrow's twentieth-century work. This talk considers the contributions of two revolution-era French mathematicians for whom certain key ideas of voting theory are now named: Jean Charles, Chevalier de Borda (1733–1799) and Marie-Jean-Antoine-Nicolas de Caritat, Marquis de Condorcet (1743–1794).

In addition to exploring the technical contents of works written by Borda and Condorcet about elections, I provide an overview of the intriguing biographical and historical contexts in which they developed their ideas. Along the way, I describe a classroom-ready project designed to introduce students to all of the content contained in today's standard textbook treatment of Voting Theory by engaging them directly with Borda's and Condorcet's original writings through a series of project tasks. By drawing on Condorcet's rich discussion of his personal motivations for studying the problems of collective decision-making, the project then goes beyond a standard textbook treatment in terms of its investigation of why Arrow's Impossibility Theorem, and voting more generally, matters in today's society.

Biography:
Janet Heine Barnett holds a PhD in set theory from the University of Colorado Boulder and is Professor Emerita of Mathematics at the Colorado State University Pueblo (CSU Pueblo) where she taught from 1990–2018. Her scholarly interests have long included the history of mathematics and its use in promoting mathematical understanding and as a vehicle for promoting teacher reflection on pedagogical issues. Most recently, she has served as an editor of Convergence, MAA's online journal for the history of mathematics and its use in teaching, and as a lead PI for the NSF-funded project TRansforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS). Her distinctions include the MAA Haimo award for excellence in undergraduate teaching and the CSU Pueblo Presidential Award for service to education. Janet shares her passions for mathematics and history (as well as dance and travel) with her husband, George W. Heine, whom she met while serving as a Peace Corps volunteer in the Central African Republic (1982–84).

Randolph Lecture

Xiao Xiao, Utica University

Do Teachers Need Real Analysis?

In 1965, MAA's Committee on the Undergraduate Program in Mathematics made a recommendation in the General Curriculum in Mathematics for Colleges report that real analysis should be part of any general undergraduate mathematics curriculum. A few years later in 1971, the same committee recommended that real analysis should be part of the minimum requirement for preparing high school mathematics teachers. Since then, real analysis has been taught extensively in many universities and colleges that have an undergraduate mathematics program. Based on a 2015 survey conducted by the Conference Board of Mathematical Sciences, approximately 66% of all mathematics programs and 54% of the secondary mathematics teacher training program require at least one semester of real analysis.

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A traditional real analysis course often contains a broad range of topics that tends to focus on preparing students for graduate school. Essential though they are, it creates a disconnect for future high school teachers because only very few topics are directly relevant to what these students will be teaching in the future. In this talk, we report on a recently completed textbook on real analysis written in an inquiry-based style with secondary school mathematics teachers in mind. We choose course content to give students a working knowledge of that part of real analysis that directly underlies the materials on numbers and functions that is taught in high school. The book is a joint work with David M. Clark.

Biography: Xiao Xiao received Ph.D. in mathematics from State University of New York at Binghamton in 2011. After completing his Ph.D., he has been teaching at Utica University and he is currently professor of mathematics. His scholarship interests include arithmetic geometry, and more specifically on classification of F-crystals. More recently, he is also interested in studying arithmetic derivatives and their natural extensions. His teaching interest include the use inquiry-based learning and preparation of secondary mathematics teachers. Between 2016 and 2020, he has co-facilitated annual inquiry-based learning workshops at Academy of Inquiry-Based Learning. He is the recipient of the Clarence Stephens Award for Teaching Excellence by the Mathematical Association of America Seaway Section in 2020. He is a Silver ’12 Project NExT fellow.

Invited Lecture

Pamela E. Harris, University of Wisconsin, Milwaukee

Kostant's partition function and magic multiplex juggling sequences

Kostant’s partition function is a vector partition function that counts the number of ways one can express a weight of a Lie algebra g as a nonnegative integral linear combination of the positive roots of g. Multiplex juggling sequences are generalizations of juggling sequences that specify an initial and terminal configuration of balls and allow for multiple balls at any particular discrete height. Magic multiplex juggling sequences generalize further to include magic balls, which cancel with standard balls when they meet at the same height. In this talk, we present a combinatorial equivalence between positive roots of a Lie algebra and throws during a juggling sequence. This provides a juggling framework to calculate Kostant's partition functions, and a partition function framework to compute the number of juggling sequences. This is joint work with Carolina Benedetti, Christopher R. H. Hanusa, Alejandro Morales, and Anthony Simpson.

Biography:
Dr. Pamela E. Harris is a Mexican-American mathematician and serves as Associate Professor in the Department of Mathematics and Statistics at Williams College and as Associate Professor of Mathematics at the University of Wisconsin Milwaukee. She received her B.S. from Marquette University, and M.S. and Ph.D. in mathematics from the University of Wisconsin-Milwaukee. Dr. Pamela E. Harris's research is in algebraic combinatorics and she is the author of over 50 peer-reviewed research articles in internationally recognized journals. An award winning mathematical educator, Dr. Harris was the 2020 recipient of the MAA Northeast Section Award for Distinguished College or University Teaching, the 2019 MAA Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member, and the 2019 Council on Undergraduate Research Mathematics and Computer Sciences Division Early Career Faculty Mentor Award. She has supervised the research of over 120 undergraduate students, a majority of whom identify as members of groups historically excluded in higher education, has served as a research faculty mentor for undergraduate research programs at the Mathematical Sciences Research Institute and the Institute for Computational and Experimental Research in Mathematics, and she is a trained Entering Mentoring Workshop Facilitator. She is the President and co-founder of Lathisms: Latinxs and Hispanics in the Mathematical Sciences, cohosts the podcast Mathematically Uncensored and is a coauthor of the books Asked And Answered: Dialogues On Advocating For Students of Color in Mathematics, Practices and Policies: Advocating for Students of Color in Mathematics, and Read and Rectify: Advocacy Stories from Student of Color in Mathematics.