

POM SIGMAA

Philosophy of Mathematics Special Interest Group of the MAA

From the Chair: ChatGPT Might Be Trying to Tell Us Something

Jason Douma, chair, POMSIGMAA

One short year ago, many of us were just beginning to learn about ChatGPT and the recent (game-changing?) advances in the technology supporting generative artificial intelligence. Now, as we reflect on the significant developments of 2023, few of us would claim the expanded access to and applications of artificial intelligence are irrelevant in their intellectual or professional lives.

Certainly, easy (even free) access to large language models like ChatGPT has substantial implications for instructional practices. Teachers are quickly reconfiguring student assessment methods; in some cases, faculty have revisited the core learning objectives for their courses to better reflect competencies appropriate to the technology of our time. Artificial intelligence also raises interesting and important questions about the work we do as humans. Is there a meaningful qualitative difference between human and computer-generated work (writing, art, inventions, experiments, theorems) by virtue of the fact that it was done by a human? Is there some sort of intrinsic value in work done by humans simply because it was done by a human and not a machine?



But artificial intelligence also raises particularly intriguing questions for mathematics, as generative AI appears to especially struggle to perform mathematics correctly.

Granted, this could just be a matter of perception or bias. Artificial intelligence may struggle equally with many tasks, including mathematics. When we speak of AI's "struggle to perform mathematics correctly," the difficulty may lie in the "correctly" as much or more than the "mathematics." I am not ruling out this possibility.

But maybe there is indeed something distinctive about the nature of mathematics that makes it a particularly difficult nut for AI to crack. On one level, this would be surprising, since mathematics and programming languages share similar norms of logical reasoning, and since the neural networks in artificial intelligence are designed to capitalize on pattern recognition, presumably an essential characteristic of mathematical reasoning.

Yet on the other hand, especially to those who are familiar with the history and philosophy of mathematics, AI's struggle to achieve a passing grade in this subject may not be surprising after all. David Hilbert's formalist program envisioned mathematics as subject matter that can be reduced to strings of symbols that are manipulated according to computational rules. Under such a scheme, mathematics is separated from meaning. But Hilbert's formalist agenda reached a dead end, at least in its original form, with Kurt Gödel's incompleteness theorems. The idea that all of mathematics can be reduced to "code" is fraught with challenges, if not impossible. This could suggest that our ability to do mathematics relies—at some point—on understanding the meaning of the terms and statements we use, something that would be inaccessible to machine-based processes.

As a teacher of mathematics, I have greeted the arrival of ChatGPT with mixed emotions. The new technology promises some opportunities, along with obvious challenges, for deep and meaningful learning. As someone interested in the philosophy of mathematics, I find myself intrigued by the questions and case studies that arise when generative artificial intelligence attempts to tackle field of mathematics.

I hope all of you found something intriguing to ponder in 2023. And I hope that 2024 brings new insights...and new questions...to invigorate our conversations.

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Philosophy of Math at the Joint Math Meetings

POMSIGMAA Guest lecture: Arezoo Islami, San Francisco State University

The Unreasonable Effectiveness of Mathematics: Dissolving Wigner's Applicability Problem

Friday, January 5, 2024, 5:30 - 6:30 p.m., Moscone Center, Room 303

Abstract: In a 1980 Monthly article, "The Unreasonable Effectiveness of Mathematics", Richard Hamming discussed what he took to be Wigner's problem (from 1960) of "The Unreasonable Effectiveness of Mathematics in the Natural Sciences" and offered some partial explanations. My goal is to show that Hamming's reading misses Wigner's highly original formulation of the problem. Rereading Wigner's work more closely, we are led in new directions in addressing and solving the applicability problem.

POMSIGMAA Contributed Paper Session

Current Directions in the Philosophy of Mathematics

Friday, January 5, 2023, Moscone Center, Room 056

Organizers: Tom Morley and Bonnie Gold

Time	Presenter	Title
8:00 a.m. - 8:25 a.m.	Donald G. Palmer	<u>Bridging the Boundary of Applied and Pure Mathematics: A Philosophical Argument for Expanding Mathematics and Scientific Disciplines via a New Numeric System</u>
8:30 a.m. - 8:55 a.m.	Theodore V. Theodosopoulos	<u>Some remarks on collective sense-making</u>
9:00 a.m. - 9:25 a.m.	Thomas Drucker	<u>Lewis Carroll and Mr. B*tr*nd R*ss*ll: P.E.B. Jourdain on the State of Mathematical Philosophy in 1918</u>
9:30 a.m. - 9:55 a.m.	Jared M. Ifland	<u>Metaontology in Light of the Frege-Hilbert Controversy</u>
10:00 a.m. - 10:25 a.m.	Martin E. Flashman	<u>Do We Need a Separate Philosophy of Geometry?</u>
10:30 a.m. - 10:55 a.m.	Chanwoo Lee	<u>Category Theory as an Explanatory Foundation</u>
11:00 a.m. - 11:25 a.m.	Owen Biesel	<u>Sheaves of Probability</u>
11:30 p.m. - 12:00 p.m.	Discussion among presenters, audience	

ASL Invited Address

Toby Meadows, UC Irvine, A Modest Foundational Argument for the Generic Multiverse

Saturday January 6, 1:00 p.m.-2:00 p.m., Moscone Center 306. The generic multiverse is a system of set theoretic universes that is, roughly speaking, closed under the operations of generic extension and its inverse. The underlying idea can be axiomatized and the resultant theory MV might be thought of as a competitor to ZFC. In this talk, I want to make a modest philosophical argument for the value of MV as a foundation for set theory. I'll start by discussing the way in which ZFC provides a satisfying foundation for almost all of mathematics. I'll then argue ZFC does not provide a similarly satisfying foundation for contemporary set theory. Finally, I'll argue that MV can fulfill this role in a very natural manner.

AMS Special Session on the History of Mathematics, IV

Charlotte Aten, University of Denver, [Bourbaki's mathematical structures and their legacy](#)

Saturday, January 6, 3:30 – 4:00 p.m., Moscone Center 103. I will discuss the attempt by the Bourbaki group to rigorously define the notion of a mathematical structure in a way which would suffice for their textbook series, as well as, ambitiously, all of mathematics. This will include the downfall of the idea as category theory subsumed the relevant notions, and the group's unsuccessful attempt to reconcile their notion of structure with that of category. While this talk was motivated by my thesis work, I will also discuss related concepts such as the theory of combinatorial species, model theory, and the advent of Lawvere's algebraic theories.

Colloquium Lecture I

Terrence Tao, Machine Assisted Proof

Wednesday, January 3, 1:00 p.m.-2:00 p.m. Moscone Center 207. For centuries, mathematicians have relied on computers to perform calculations, to suggest conjectures, and as components of mathematical proofs. In the light of more modern tools such as interactive theorem provers, machine learning algorithms, and generative AI, we are beginning to see machines used in more creative and substantive ways in our work. In this talk we survey some historical and recent developments, and speculate on the future roles of machine assistance in mathematics.

MAA Lecture on Teaching and Learning

Yvonne Lai, University of Nebraska – Lincoln, (Why) To Build Bridges in Mathematics Education

Thursday January 4, 11:00 a.m.-12:00 p.m. Moscone Center 205, It can be easy to silo ourselves with those that think "like us". This is the opposite of what we want to do if we want to be better teachers. In this talk, I will use the case of designing courses for prospective high school mathematics teacher to argue for the value of building bridges in mathematics education. Along the way, I will discuss recent work that examines the cost of uncivil discourse in mathematics education. I will conclude with examples and suggestions for bridge building in mathematics teaching, departmental structuring, and writing policy for the mathematical sciences community.

NAM Claytor-Woodard Address

Shelly M. Jones, Central Connecticut State University, Choosing Hope: Teaching Culturally Relevant Mathematics as a Human Endeavor

Thursday, January 4, 2:15 p.m. - 3:20 p.m. Moscone Center 205, Culturally Relevant Mathematics Pedagogy encompasses a teaching approach that actively involves and empowers students, fostering connections between the subject matter and their personal lives, communities, and the broader world. This presentation offers a vision of how this teaching approach has paved the way for more equitable teaching and learning experiences in K-16 mathematics classrooms. The speaker will emphasize selected instructional strategies from her book, 'Engaging in Culturally Relevant Math Tasks,' illustrating how educators can deliver meaningful mathematical instruction from an asset-based perspective. Participants will have the opportunity to partake in discussions exploring how these strategies relate to their own experiences and to identify how to enhance their current teaching practice.

NAM Cox-Talbot Address

Ranthy A. Clark, Duke University, Quantitative Justice: Intersections of Mathematics and Society

Friday, January 5, 7:45 p.m.-8:45 p.m., Marriott Marquis Golden Gate A. In this talk, we use a historical lens to consider intersections of mathematics and society. We look internally and externally by considering two perspectives-(1) how society impacts equity within the mathematical community, and (2) how the mathematical community impacts equity within society. With respect to the latter, we focus on one particular external effort-an emergent new field of interdisciplinary research called Quantitative Justice. Quantitative Justice comprises the mathematical, computational, and statistical analysis of real-world problems related to social inequity. In this context, mathematical tools are used to quantify notions of 'fairness' in a given domain, generating both new mathematics and impacting society at large. We will give current examples of how math is being

Officers

Chair (through 1/25, after which he becomes Past Chair for 1 year)

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New officers

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used to shift societal systems, and discuss how this research complements historical efforts to improve equity in mathematics by bridging the divide between scholarship and activism.

Other Upcoming Events

POM SIGMAA business meeting

We will have a virtual POM SIGMAA business meeting in late January over Zoom. Details to come later.

CSHPM/SCHPM meeting

The 2024 CSHPM Annual Meeting will be held as part of the Congress of the Humanities and Social Sciences at McGill University on June 15-17, 2024. The deadline for the submission of abstracts is February 10, 2024. You can find the call for papers at <https://www.cshpm.org/meeting/CSHPM2024Call.pdf>.

Introducing your New Officers

POMSIGMAA elected two new people to the board starting January 7, 2024: Thomas Drucker was elected Chair-Elect (he becomes Chair-Elect for one year, then Chair for two years), and Steve Deckelman was elected Program Director, a position that he will hold for two years.

Thomas Drucker is back for his second stint as Chair of POMSIGMAA. His interest in the philosophy of mathematics goes back many decades and has materialized in the form of many talks and articles. He organized an AMS session in philosophy of mathematics in Madison just before COVID struck. His philosophical views are at the border between W.S. Gilbert and Charles Dodgson.



Steve Deckelman is a professor of mathematics at the University of Wisconsin-Stout where he's been since 1997. He wrote a thesis in several complex variables under Patrick Ahern at the University of Wisconsin-Madison in 1994. Some of his hobbies and interests include reading, music(piano), card games, hiking, antique books, and foreign languages.