ASSOCIATION FOR WOMEN IN MATHEMATICS

Newsletter

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The purpose of the Association for Women in Mathematics is to create a community in which women and girls can thrive in their mathematical endeavors, and to promote equitable opportunity and gender-inclusivity across the mathematical sciences.

IN THIS ISSUE

PRESIDENT'S REPORT

As I reluctantly counted the last days of July, I traveled to Montréal, Québec, Canada, for the SIAM Annual Meeting. Bien que le temps et la cuisine aient été délicieux, mon français ne l'était pas. Cela fait plus de vingt ans que je ne parle plus français régulièrement (While the weather and cuisine were delightful, my French was not. It has been over twenty years since I've spoken French regularly). So, I used this as an opportunity to practice. Over the course of my trip, mon français s'est beaucoup amélioré (my French improved very much).

On the first day of the meeting, I met Barbara Keyfitz, the seventh president of AWM, who remains a strong supporter of women and girls in the mathematical sciences. Following her conversation (I appreciate her sage advice), I had the pleasure of introducing Yongjie Jessica Zhang of Carnegie Mellon University, who gave a beautiful overview of her work on computational geometry and finite element methods at the AWM–SIAM Sonia Kovalevsky Lecture, which was established to highlight significant contributions of women to applied or computational mathematics. In addition to receiving a certificate from us, Dr. Zhang received an award at the SIAM Honors and Award Luncheon. During the luncheon, three AWM members were also recognized. Marsha Berger, New York University & Flatiron Institute, received the John von Neumann Prize, Tamara G. Kolda, MathSci.ai, received the SIAM Prize for Distinguished Service to the Profession, and Mason A. Porter, University of California, Los Angeles, received the George Pólya Prize for Mathematical Exposition. I was happy to celebrate their achievements.

The AWM Workshop "Science of Data and Mathematics," organized by Jamie Haddock and Anne Little, showcased eight talks ranging from tensor decompositions to manifold dimensionality reduction. An unexpected highlight for me was our panel "AWM Women in Data Science Panel: Navigating Success and Challenges." The panelists, all at different career stages, gave thoughtful advice with clarity, humor, and authenticity. While I have tucked away several nuggets, I will share only one. In response to an audience member's question about Imposter Syndrome, one panelist said, "If you feel like an imposter, know you have something unique to offer." She developed this perspective after struggling with Real Analysis and realizing that her peers were not necessarily more proficient than she was in the topic. Still, their foundation and path were different from hers, since she had not started as a math major. The panelist realized she could do things they could not, and her success with the topic would come. What a positive perspective! We ended our events with the poster session, which showcased twelve posters on the innovative research of the next generation of women PhDs. The Association for Women in Mathematics was well represented at this meeting; thank you to all those who made it such a success!

I am anticipating the same success at the Mathematical Association of America MathFest 2025 in Sacramento, CA, next week. We will host two panels and one workshop, and have Olivia Prosper Feldman of the University of Tennessee deliver the AWM–MAA Etta Zuber Falconer Lecture. This lecture honors women who have made distinguished contributions to the mathematical sciences or mathematics education. Although the lecture was

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ASSOCIATION FOR
WOMEN IN MATHEMATICS

AWM was founded in 1971 at the Joint Meetings in Atlantic City.

The *Newsletter* is published bi-monthly. Articles, letters to the editor, and announcements are welcome. Authors sign consent to publish forms. The electronic version is freely available at awm-math.org.

Opinions expressed in *AWM Newsletter* articles are those of the authors and do not necessarily reflect opinions of the editors or policies of the Association for Women in Mathematics.

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PRESIDENT'S REPORT *continued from page 1*

first presented at MathFest in 1996, the name 'Etta Zuber Falconer Lecture' was officially adopted in 2004 to honor Falconer's remarkable vision and achievements in promoting the participation of minorities and women in scientific careers. The AWM events will end on Friday with recognition of our student chapter award winners at the Undergraduate Student Dessert Reception. You can learn more about the exemplary recipients inside this issue.

We are thrilled to announce th at the AWM's flagship journal, *La Matematica*, has been accepted for indexing in Web of Science! Content will be available at the end of 2025, and the journal is expected to receive its first impact factor in 2026. Thank you to **Springer Nature** and to all the journal's editors, reviewers, and authors who have helped us to reach this milestone.

While we celebrate this good news, we must also remain attentive to broader issues affecting our field. A recent *Scientific American* article, "**Math Is Quietly in Crisis over NSF Funding Cuts**," describes the consequences of deep cuts to NSF funding for mathematics research. These cuts are already disrupting research trajectories and reducing opportunities, especially for early-career mathematicians. It serves as a sobering reminder that our advocacy efforts remain crucial.

As summer winds down, I look forward to the year ahead with energy and optimism. There is important work to do, and I am grateful to be doing it alongside this vibrant and committed community.

Ensemble vers une année de réussites (Together toward a year of success),

Raegan Higgins

Raegan Higgins
Montréal, Québec, Canada
July 30, 2025

Raegan Higgins

AWM Newsletter AI Policy

In *Newsletter* articles, columns, essays, and reviews, the author's perspectives are to be expressed in their own words and voice. If any AI tools contributed in a non-trivial way to the content, wording, or images of the article, they are clearly acknowledged by the author in the article.

2025 AWM Research Symposium

Elizabeth Donovan and Darla Kremer

The eighth biennial Association for Women in Mathematics (AWM) Research Symposium took place at the University of Wisconsin–Madison from May 16 to 18, 2025. The AWM is thankful for the UW–Madison Mathematics Department, which graciously hosted symposium attendees from around the world. With a record number of participants, 415, of which 177 were students, this year's symposium showcased a wide range of mathematics, engaged participants in informative panel discussions, and offered many networking and social opportunities.

This year, the Symposium Organizing Committee made a concerted effort to develop and implement engaging mathematical activities for undergraduates, opening with an event titled *Puzzles, Patterns, & Play with AWM and Jane Street*. This informal session, moderated by AWM President **Raegan Higgins** and facilitated by AWM EvenQuads Project Management Team Member, **Sherli Koshy-Chenthittayil**, along with Jane Street representatives, **Michaela Ennis** and **Graham White** (sponsored by Jane Street), was designed for undergraduates but was fun for everyone. Participants were introduced to EvenQuads and other games using the AWM EvenQuads Decks. Jane Street provided number puzzles, logic puzzles, puzzles with and without clear answers, puzzles with and without clearly defined rules (all part of day-to-day life at Jane Street).

The opening plenary lecture, *What is a Good Quantum Encoding?* by **Tai-Danae Bradley** was geared toward undergraduates but engaged all attendees with a lucid explanation of how category theory can help design quantum data encodings that preserve mathematical structure.

The Friday afternoon poster session and ice cream social featured the work of undergraduates and beginning graduate students.

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Tae-Danae Bradley

Participants play games and puzzles

Poster session

Membership Dues
Membership runs from Oct. 1 to Sept. 30
Individual: $70/$100 **Family:** $40
Contributing: $160/$190
New member, affiliate and reciprocal members, retired, part-time: $35
Student: $25 **Unemployed:** $20
Outreach: $10
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$5000+
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Print Subscriptions and Back Orders—Regular and contributing members living in the US may elect to receive a print version of the *Newsletter.* Libraries, women's studies centers, non-mathematics departments, etc., may purchase a subscription for $75/year. Back orders are $20/issue plus shipping/handling ($5 minimum).

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Newsletter Deadlines
Editorial: 17th of January, March, May, July, September, November
Ads: Feb. 1 for March–April, April 1 for May–June, June 1 for July–August, August 1 for September–October, October 1 for November–December, December 1 for January–February

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2025 AWM RESEARCH SYMPOSIUM *continued from page 3*

Organized and sponsored by the Casualty Actuary Society and the Network of Actuarial Women and Allies), the panel discussion *Academia, Industry, or Grad School? A Guide to Making the Right Career Move* highlighted three accomplished women who have taken different paths in their mathematical careers. **Melissa Garrison**, American Family Insurance in Madison, **Sarah Chehade**, Oak Ridge National Laboratory, and **Emille Davie Lawrence**, University of San Francisco, shared their experiences, the factors that influenced their decisions, and the opportunities and challenges they encountered along the way. **Margie Rosenberg**, University of Wisconsin–Madison, moderated.

Margie Rosenberg moderates a panel with panelists (left to right) Melissa Garrison, Sarah Chehade, and Emilie Davie Lawrence.

Other undergraduate-focused events included an estimathon, sponsored by Jane Street and facilitated by **Michaela Ennis** and **Graham White**; a roundtable on *Micro-mentoring: Belonging in Mathematics* hosted by **Keisha Cook**, **Brittany Gelb**, **Lucy Martinez**, **Omayra Ortega**, and **Lena Zide**; and a special session on *Exploring Data Science in the Biomedical Field* organized by **Sherli Koshy-Chenthittayil** and **Monica Morales Hernandez**.

Students participate in the estimathon

The opening reception on Friday evening was sponsored by Jane Street and took place in Tripp Commons, a beautiful room within Memorial Union on the Wisconsin campus, with access to a lakeside patio. Throughout the reception, participants connected with friends and colleagues around mathematics while enjoying a selection of nachos, sliders and, of course, fried cheese curds.

AWM Past President **Talitha Washington** introduced former president AWM **Kathryn Leonard** as the second plenary lecturer on Saturday morning. In her talk, *Skeletal Models for Shape Understanding,* Leonard described the Blum Medial Axis (BMA) mod-

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AWM ONLINE

The *AWM Newsletter* is freely available online.

Online Ads Info: Classified and job link ads may be placed at the AWM website.

Website: https://awm-math.org
Updates: webmaster@awm-math.org

Media Coordinator
Kimberly Ayers, socialmedia@awm-math.org

AWM DEADLINES

Ruth I. Michler Memorial Prize:
Oct. 1, 2025

Student Chapter Innovation Grants:
Oct. 15, 2025

AWM OFFICE

Darla Kremer, Executive Director
darla@awm-math.org

Samantha Faria, Managing Director
samantha@awm-math.org

Association for Women in Mathematics
Attn: Samantha Faria
201 Charles Street
Providence, RI 02904
401-455-4042
awm@awm-math.org

Opening reception

el used to perceive shapes in, for example, image processing, and some methodologies based on the BMA for automatically decomposing a shape into a hierarchy of parts and determining the similarity between those parts.

Program officers from the US National Science Foundation could not attend. To ensure that attendees had up-to-date information on the grant landscape and federal funding priorities and to offer some ways to advocate locally and nationally on issues that concern you, the AWM Policy and Advocacy Committee organized a panel on *Federal Actions and Advocacy Opportunities*, moderated by **Michelle Manes**, with panelists **Deborah Lockhart**, **Michelle Snider**, and **Talitha Washington**.

A second poster session featuring advanced graduate students and recent PhD recipients took place on Saturday. Both poster sessions and the exhibits were centrally located in the Mathematics Learning Center of Van Vleck Hall. Excellent ice cream from Babcock Dairy was served to visitors as they engaged with poster presenters and exhibitors. Representative from American Mathematical Society (AMS), Casualty Actuary Society (CAS) and Network of Actuarial Women and Allies (NAWA), the NSF Mathematical Sciences Research Institutes, the Society for Industrial and Applied Mathematics (SIAM), Springer Nature, University of Wisconsin, and AWM were on hand to interact with symposium participants and to recruit members, authors, employees, and students.

Opening reception

Graduate student poster session

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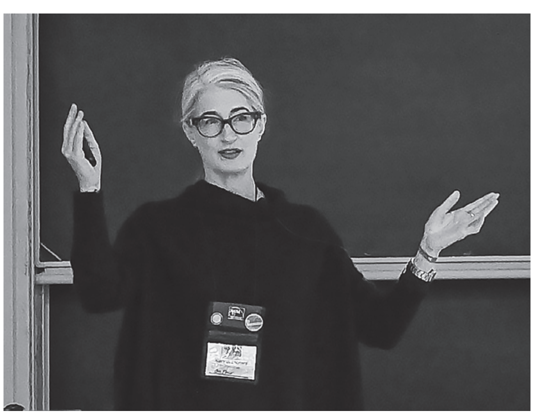

Kathryn Leonard

Michelle Manes moderates a panel with panelists (left to right) Deborah Lockhart, Michelle Snider, and Talitha Washington.

2025 AWM RESEARCH SYMPOSIUM *cont. from page 5*

On Saturday afternoon, **Emille Lawrence** introduced plenary lecturer, **Candice Price**. Price provided attendees with a mathematical toolkit for modeling and studying the biology of DNA-protein interactions in her plenary lecture *Unravelling Biochemistry Mysteries: Knot Theory Applied to Biochemistry*.

The Symposium Banquet took place on Saturday in Varsity Hall, located in Union South. The banquet was sponsored by the AMS, and SIAM sponsored the pre-banquet reception. Representatives from each of these organizations said a few words before AWM President Raegan Higgins presented the AWM Presidential Recognition Awards to ***Black Girl MATHgic*** and ***The Nebraska Conference for Undergraduate Women in Mathematics (NCUWM)***. **Christine Kelly** and **Eloísa Grifo** were on hand to accept the award on behalf of NCUWM, and **Brittany Rhodes**, founder of Black Girl MATHgic, provided a video response. Read more about the awardees on the AWM website: https://awm-math.org/awards/awm-presidential-award/awm-presidential-recognition-award-2025/

Sunday morning, the conference resumed with a fourth plenary lecture, *Seeing Elections, Finding Fairness* by **Moon Duchin**. Duchin was introduced by **Tullia Dymarz**. Moon surveyed new developments in the theory of social choice that use computational methods. Later in the day, Duchin facilitated an informal discussion around political engagement in the current climate.

Several roundtables were organized to encourage interactive discussions around mathematics on a variety of topics including the following:

- *Teaching and Research in the Era of Generative AI*, organized by **Qin Li**, UW–Madison, Wendy Di, Argonne National Laboratory, and **Yunan Yang**, Cornell University

Symposium banquet

Candice Price

Moon Duchin

- *Micro-mentoring: Belonging in Mathematics* hosted by **Keisha Cook**, **Brittany Gelb**, **Lucy Martinez**, **Omayra Ortega**, and **Lena Zide**
- *AWM Research Networks* hosted by AWM Research Networks Coordinator, **Michelle Snider**
- *Math for All Discussion* hosted by **Robyn Brooks**, University of Utah, **Padi Fuster Aguilera**, University of Colorado at Boulder, and **Swati Patel**, Oregon State University
- *Mid-life, Mid-career, and Beyond* hosted by **Mariya Soskova** and **Betsy Stovall**, University of Wisconsin–Madison AWM Research Symposium
- *Reading of Mathopoly, A Play on Academic Dystopia* hosted and performed by **Annette Karrer**, The Ohio State University, **Indira Chatterji**, J. A. Dieudonné Laboratory of the University of Côte d'Azur, **Christian Gorski**, University of Washington, and **Giulio Tiozzo**, University of Toronto

Thirty special sessions were organized by the mathematical sciences community on a broad range of research topics in pure mathematics, applied mathematics, and mathematics education. The complete list of special sessions is available here: AWM Research

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Symposium banquet

Symposium attendees socialize and engage

Participants engage in the symposium

Participants engage in the symposium

AWM President Raegan Higgins addressed attendees at the Symposium banquet

2025 AWM RESEARCH SYMPOSIUM *cont. from page 6*

Symposium (https://awm-math.org/meetings/awm-research-symposium/#a1402b02008ab6b05), and a searchable database of all 330 abstracts is here: Search Research Symposium Abstracts (https://awm-math.org/meetings/awm-research-symposium/search-abstracts/?_sfm_abstract_symposium_year=2025&sort_order=_sfm_abstract_time+asc+datetime). If you want to read all 875 abstracts from the 2022, 2023, and 2025 symposia, just reset the search query!

- *Advances in Applied Algebra and Algebraic Statistics* organized by **Bella Finkel**, University of Wisconsin–Madison;
- *Analysis, Computational Methods and Data Science in Multiphysics Problems* organized by **Wendy Di**, Argonne National Laboratory, **Qin Li**, UW–Madison, **Min Wang**, University of Houston, **Yunan Yang**, Cornell University, and **Lu Zhang**, Rice University
- *Applied Geometric Analysis* organized by **Goong Chen**, Texas A&M University, **Ming Mei**, Champlain College St-Lambert & McGill University, and **Jie Xiao**, Memorial University
- *Category Theory, Algebras, and Representation Theory* organized by **Charlotte Aten**, University of Colorado, Boulder and **Layla Sorkatti**, Southern Illinois University
- *Combinatorics and Graph Theory* organized by **Gabriela Araujo-Pardo**, Math. Institute. National University of Mexico (UNAM) and **Linda Lesniak**, Western Michigan University
- *Control Problems in PDE-Modeled Systems* organized by **Shuxia Tang**, Texas Tech University
- *Curves and Abelian Varieties in Characteristic p* organized by **Deewang Bhamidipati**, University of California, Santa Cruz, **Steven Groen**, Lehigh University, and **Sandra Nair**, Colorado State University
- *Early Career Researchers in Mathematical Biology* organized by **Prajakta Bedekar**, National Institute of Standards and Technology, **Rayanne Luke**, George Mason University, and **Sarah Strikwerda**, University of Wisconsin–Madison
- *Early Career Women in Differential Equations and Applications* organized by **Shalmali Bandyopadhyay**, The University of Tennessee at Martin and **Thialita Nascimento**, Iowa State University

Participants engage in the symposium

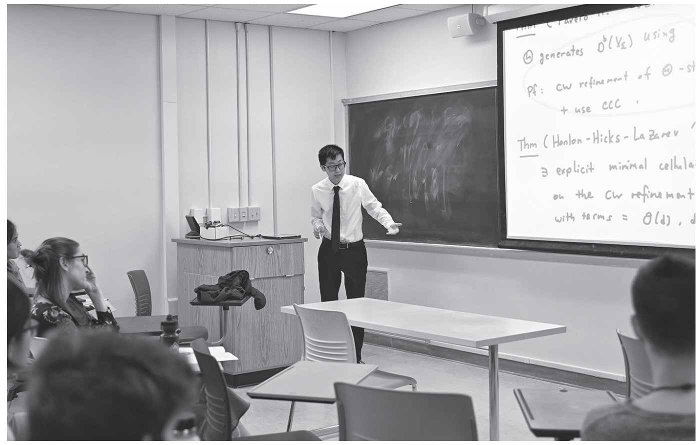
Sheela Devadas

- *EDGE* organized by **Keisha Cook**, Clemson University, **Sofia Rose Martinez Alberga**, Purdue University, and **Quiyana Murphy**, Virginia Tech
- *Geometric and Topological Aspects of Mathematical Physics and Representation Theory* organized by **Mee Seong Im**, Johns Hopkins University, **Xin Jin**, Boston College, and **Xinchun Ma**, University of Chicago
- *Group, Geometry and Dynamics* organized by **Carolyn Abbott**, Brandeis University, **Tullia Dymarz**, University of Wisconsin–Madison, and **Yandi Wu**, Rice University
- *Groups, Representation Theory, and Their Related Structures* organized by **Jennifer Guerrero**, UC Santa Cruz and **Nariel Monteiro**, UC Santa Cruz
- *Homological Methods in Commutative Algebra* organized by **Caitlin Davis**, University of Wisconsin–Madison and **Boyana Martinova**, University of Wisconsin–Madison
- *Innovative Mathematical Solutions: Bridging Data, Models, and Real-World Challenges* organized by **Himali Gammanpila**, Eastern Kentucky University
- *Logic Across Mathematics* organized by **Johanna Franklin**, Hofstra University, **Rehana Patel**, Wesleyan University, and **Lynn Scow**, California State University, San Bernardino
- *Math for All* organized by **Robyn Brooks**, University of Utah, **Padi Fuster Aguilera**, University of Colorado at Boulder, and **Swati Patel**, Oregon State University
- *Mathematics, Modeling, and Art* organized by **Danyun He**, Flatiron Institute, **Jiayin Lu**, University of California, Los Angeles (UCLA), **Christiana Mavroyiakoumou**, New York University (NYU), and **Yue Sun**, University of Wisconsin–Madison

- *Non-commutative Algebras, Tensor Categories, and Diagrams* organized by **Monique Müller**, Federal University of São João del-Rei (Brazil)/Indiana University Bloomington, **Emily Peters**, Loyola University Chicago, **Julia Plavnik**, Indiana University Bloomington, and **Abigail Watkins**, Indiana University Bloomington
- *Nonlinear Constraints: A Catalyst for Creativity in Analysis and its Applications* organized by **Paige Bright**, University of British Columbia, **Marjorie Drake**, Massachusetts Institute of Technology, and **Vinh Nguyen**, Michigan State University
- *Number Theory at Primarily Undergraduate Institutions* organized by **Kelly O'Connor**, Rose-Hulman Institute of Technology, **Leah Sturman**, Southern Connecticut State University, and **Bella Tobin**, Agnes Scott College
- *Recent Advances in Numerical Methods for PDEs* organized by **Duygu Vargun**, Oak Ridge National Laboratory and **Yunhui He**, University of Houston
- *Recent Developments in Control Theory of Infinite Dimensional Systems* organized by **Lorena Bociu**, NC State University and **Irena Lasiecka**, The University of Memphis
- *Rethinking Number Theory* organized by Swati LNU, University of South Carolina, **Deewang Bhamidipati**, UC Santa Cruz, and **Shilpi Mandal**, Emory University

Participants engage in the symposium

Participants engage in the symposium



Participants engage in the symposium

- *Topics in Algebraic Geometry* organized by **Julie Rana**, Lawrence University and **Ursula Whitcher**, Math Reviews
- *Valuations of Sequences* organized by **Jane Long**, Stephen F. Austin State University
- *WIGA: Graph Labeling and Graph Structures* organized by **Katherine Benson**, University of Wisconsin-Stout, **Christine Kelley**, University of Nebraska-Lincoln, and **Alison Marr**, Southwestern University
- *Women and Gender Minorities in Symplectic and Contact Geometry and Topology (WiSCons)* in Madison organized by **Bahar Acu**, Pitzer College and Claremont Graduate University, **Catherine Cannizzo**, University of California, Berkeley, **Sierra Knavel**, Georgia Institute of Technology, and **Morgan Weiler**, University of California, Riverside
- *Women in Quantum Computing (WIQC)* organized by **Sarah Chehade**, Oak Ridge National Laboratory and **Elaine Wong**, Oak Ridge National Laboratory;
- *Women Leading at the Intersection of Mathematics, Statistics, Data Science, and Biology* organized by **Arnaja Mitra**, University of Maryland, and **Nisha Yadav**, Clemson University

AWM is grateful to the **University of Wisconsin–Madison Department of Mathematics** for hosting this symposium; the AWM Organizing Committee; and our sponsors: the **American Mathematical Society**, the **Casualty Actuary Society** and **Network of Actuarial Women and Allies**, the **Data Science Institute at the University of Wisconsin**, **Jane Street Capital**, the **Madison Community Foundation**, **Riverwater Partners**, the **Society for Industrial and Applied Mathematics**, **Springer Nature**; and to our Sponsoring Institutional Member, **North Carolina State University**, for their generous support.

If you missed it—we are already planning the next one… *see you in 2027*!

STUDENT COLUMN

Why You Should Attend Department Seminars as a Student (Even If You Have No Idea What They Are Talking About)

Abigail Rose Drumm, Worcester Polytechnic Institute
ardrumm@wpi.edu

Back in the spring and summer of 2022, after I had tied up all of my undergraduate work and officially accepted an offer to a PhD program, I spent a fair amount of time reading up on the math graduate school experience. No one in my family had gone to graduate school, least of all graduate school for mathematics, so I turned to the wisdom of library books and the internet to gain a sense of what to expect and how to best prepare. One of the pieces of advice that stood out to me, written in an old web page from Ravi Vakil, a professor at Stanford,[1] boiled down to this: Attend seminars early and regularly.

I'm nothing if not a rule-follower, so, come the first semester at my current institution, I tracked the timing of the department seminars and attended those that my schedule allowed. And, to begin, almost all of the seminars in that first semester left me feeling like I knew nothing about anything that anybody was talking about. Nevertheless, looking back three years on, I recognize the soundness of the advice and value that the seminars have had for me so far in my early academic career.

I argue that if you, too, feel like you know nothing about anything that anybody is talking about, it is a good and worthwhile practice as a mathematics student to attend the seminars that your department puts on. In this column, I will present three benefits of attending seminars that directly connect to important areas of academic life.

Benefit #1: Connect to Classwork

It is the bane of many mathematics teachers to justify the existence of their subject matter in middle school, high school, and college classrooms. At some point between learning to count and learning to solve for x, many students begin to question the utility of mathematics in their lives and the careers that they plan to pursue, and the profusion of popular mathematics books and YouTube channels arguing for its applicability attests to the perennial problem of assumed irrelevance.

If you are a student of mathematics—undergraduate, graduate, whatever level—you are likely beyond thinking that the many branches of mathematics are nothing more than decorative boughs in the academic backyard. Even with that prejudice thrown aside, though, it is not always immediately clear how some complicated theorem from analysis, cumbersome computational work in algebra, or mind-bending exercise in geometry is a useful tool in other mathematical work, yours or others.

In the first couple of semesters in my graduate program, many of the seminars I attended went beyond the undergraduate mathematics knowledge that I brought with me. I sometimes followed the five minutes of motivation presented at the start, then found myself lost afterward. One of the earliest seminars was on a topic in graph theory involving nice linear algebra theorems and tedious computations with matrix decompositions, which I had some memory of from undergraduate courses but never delved too far into. That first go-around, despite my efforts, not much of the seminar made sense to me. This wasn't because the speaker was uninteresting (they were, in fact, quite animated in their talk); rather, I lacked the background to connect the dots of their story.

The more seminars I attended and the further I went in my graduate studies, though, the more I started to understand. In a later semester, I saw the same speaker presenting results from the same vein of research as that early seminar talk. At that point, I had a much firmer grounding in the more theoretical aspects of linear algebra—nothing too fancy, but enough for the department's comprehensive exams—and I could follow more of the problem and solution processes. Through regular attendance of the department seminars, I was recognizing my classwork in the research presented at seminars and, moreover, witnessing my own gradual growth in studying mathematics.

Benefit #2: Connect to Broader Mathematics

Among my friends who are not in mathematics or mathematics-adjacent fields, calculus has often been regarded as the pinnacle of mathematical learning, and teaching mathematics as the goal of higher mathematics education. In addition to the classes you take and papers you read as part of a mathematics program, departmental seminars provide opportunities to expand your knowledge of the mathematics landscape.

At the beginning of my graduate program, I did not have abundantly clear ideas for what I wanted to research. I wasn't too attached to any particular topic; my general interest was mathematical biology, which is a beast with many arms. Through the seminars my department put on, I first learned about fluid mechanics and the centrality of mathematics in its development as a field. Prior to that, my knowledge of fluids was limited to what my illustrator/aspiring-animator sister knew: i.e., that water was very expensive to animate and that the river scene from *The Mitchells vs. the Machines* (2021) almost did some of the animation team in. In my first couple of semesters, I attended applied mathematics talks featuring invited speakers whose work involved microfluidic channels, waves,

[1] There is other good advice for new graduate students in this web page, which can be viewed at: https://math.stanford.edu/~vakil/potentialstudents.html.

and numerical methods for fluid flows, as well as student-geared "faculty lunch talks" featuring department faculty whose research lived in the world of fluid mechanics.

Did I understand these talks? Not at first. The important shift was not in my understanding of all of the great computational fluid dynamics, asymptotic analysis, and the like that was shared through the seminar presentations, but rather in my becoming familiar with fluid mechanics as a viable field of interest. I also became acquainted with the names of concepts in mathematics, mechanics, thermodynamics, etc. that researchers in that field used. Through seminars, you can attain a kind of learning by osmosis.

I don't claim that every seminar that you attend will be so enlightening or even enjoyable. No shade to my friends from the statistics side of the department, but I've attended a fair share of statistics seminars that did not thrill me. Nevertheless, exposure to the ideas of statistics in the context of specific research problems has given me a greater appreciation for that discipline, and has also benefited me as a surprising amount of statistics has made itself relevant in the mathematical modeling work that I'm involved in now.

Benefit #3: Connect to the Department

In mathematics, a full-time masters program typically takes between one and two years and a full-time PhD program typically takes between four and six years to complete—basically, a fine fraction of your life. You'll cross paths with many of the same people in classrooms, computer labs, office spaces, and hallways for a while.

I'm a big proponent of taking advantage of the opportunities presented for the denizens of your university's math world to get to know one another or get to know what you all do, and one of the most consistent opportunities are the seminars. As argued above, seminar attendance is beneficial for grounding the mathematics of the classroom in the mathematics of the "real world" and for exposing you to mathematical ideas that you may not have otherwise encountered. A third benefit of attendance is that seminars help you orient yourself in your department.

What do the seminars reflect? Certainly, they can reflect your mathematical blind spots and potential areas of exploration. Beyond that, they also reflect the mathematical passions and current areas of exploration among the faculty of the department and, by extension, the graduate students who work with them. You may already have some sense of the department's specialties; seminars fill in specifics of the different research threads. By learning more about these different research threads, and noting who else attends a given seminar and how they engage with the presentation, you're able to form a clearer picture of the connections between faculty members, other students in the department, and yourself. In turn, faculty members and other students come to know you, if only by plain face recognition.

Lack of knowledge about others can breed lack of belonging. Especially early on in your academic journey, seminars are a relatively easy way to start learning who your colleagues are and what they're about—and, along the way, make some friends!

Conclusion

Students have many demands on their time, and it can be challenging to determine what's really worth engaging with and what can be cut out of the schedule. For me, making a consistent point to attend a range of department seminars has enriched my graduate experience, helping me in these first three years to form connections to my classwork, to broader mathematics, and to my local math community.

If you haven't already, I hope that you consider creating space in your schedule to attend some of your department's seminars this academic year.

NSF-AWM Mentoring Travel Grants for Women *(New deadline added!)*

Mathematics Mentoring Grants. The objective of the NSF-AWM Mathematics Mentoring Travel Grants is to help junior women to develop long-term working and mentoring relationships with senior mathematicians. This relationship should help the junior mathematicians to establish their research programs and eventually receive tenure. Each grant funds travel, accommodations, and other required expenses for an untenured woman mathematician to travel to an institute or a department to do research with a specified individual for one month. The applicant's and mentor's research must be in a field which is supported by the Division of Mathematical Sciences of the National Science Foundation.

Selection Procedure. All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians appointed by the AWM. A maximum of $5000 per award will be funded.

Eligibility and Applications. Please see the website (https://awm-math.org/awards/awm-grants/travel-grants/) for details on eligibility and do not hesitate to contact us at awm@awm-math.org or 401-455-4042 for guidance. Applications from members of underrepresented minorities are especially welcome.

Deadline. There are now two award periods per year. Applications are due **February 15, 2026**.

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ASSOCIATION FOR WOMEN IN MATHEMATICS

ASSOCIATION FOR WOMEN IN MATHEMATICS

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BOOK REVIEW

Book Review Editor: Margaret Bayer, University of Kansas, Lawrence, KS 66045-7523, bayer@ku.edu

Women in Science Now. Stories and Strategies for Achieving Equity
by Lisa M. P. Munoz
Columbia U Press, 2023
ISBN 97802312027

Reviewer: *Marge Bayer, bayer@ku.edu*

Women in Science Now opens by rejecting the leaky pipeline metaphor as an explanation for underrepresentation of women in science. It then presents nine chapters, each chapter title beginning with the word "Fixing." Fixing: Representation, Signals, Mentorship, Recruitment, Environments, Visibility, Work-Life Balance, Reporting, and Science. Each chapter includes a story from a woman scientist relevant to the chapter's theme, accompanied by a drawing of her. This is followed by a description of the problem and recommendations for steps towards fixing the problem.

One of the first things I noted was which sciences were represented. Out of the nine women featured, and two others who were identified in some detail, five are social psychologists, one is a graduate student in genetics and bioethics, one is a documentary film maker (with an undergraduate degree in biology), and four are scientists in the areas of geosciences, paleontology, zoology, and neuroscience. There's no one from the T, E, or M of STEM, although the text frequently refers to STEM.

Throughout the book, attention is paid to intersectionality. There are many examples where the experience of Black or other racial or ethnic groups differs from that of white women. Here's a reference to a telling statistic: the "I Am a Scientist" webpage says that between 1973 and 2012, 66 Black American women and 22,172 white American men earned a PhD in Physics.[1]

Chapter 1 "Fixing Representation" describes the results of many years of the Draw-a-Scientist study (and includes a drawing by Lisa Munoz's daughter when she was in fourth grade). An international study found that countries varied widely in the representation of women in science, and this was correlated with stereotypical associations of gender and science. (The author of the study shared her surprise that the Netherlands was a country with low representation of women in science [p. 25]). Examples are given of increasing representation of women in science in media ranging from children's magazines and television to films for both children and adults, but there are no suggestions of what we can do to encourage and increase this.

In Chapter 2 "Fixing Signals," we see that it is not just how often women in science are represented, but how both men and women are portrayed. (This recalls the Bearded Lady Project, described in the March–April 2025 *Newsletter*.) In one study, undergraduate students were given a survey about their interest in computer science. Some students filled out the survey in a room filled with *Star Trek* posters, electronics, and video game boxes; some students filled out the survey in a room decorated with nature posters, general interest magazines, and art. Women who filled out the survey in the latter room showed significantly more interest in majoring in computer science. In general it has been found that masculine signals have made women feel less welcome in computer science, engineering, and physics; compared with biology, chemistry, and mathematics.

Chapter 3 is "Fixing Mentorship." The advantage of having the mentor and mentee of the same race and gender is recognized. A 2020 article in *Nature Communications* suggested that females may benefit more from male mentors, but the article was retracted [p. 67]. A main recommendation is that a graduate student or postdoc should have more than one mentor. I believe this happens often in mathematics, but may be more difficult in laboratory sciences, where a student is essentially "hired" by a senior faculty member/principal investigator.

In Chapter 4 "Fixing Recruitment," the authors write about another type of study AWM readers have probably heard about: sending to evaluators CVs that are identical in content but with different gendered names attached. Here there was an interesting twist: the authors of the study (Moss-Racusin, et al.) in the *Proceedings of the National Academy of Sciences* then studied the reactions to the study. From 423 written comments where it was possible to identify the gender of the commenter, men were more likely than women to post negative comments. They followed up with a study asking participants to read the abstract of the original paper and rate its quality in terms of competence and trustworthiness. Men rated it as significantly poorer science than women [p. 91]. Publicizing systemic discrimination against women in science may have the unintended consequence of discouraging women's participation. Thus the focus should be on highlighting women's success and demonstrating the equality of talent and performance of women and men. The chapter ends with the list of recommendations of the Study on the Status of Women Faculty in Science at MIT. (See the May–June 2023 review of the book on that process by Kate Zernike.)

Chapter 5 "Fixing Environments" has more to say on recommendations. The standard online bias trainings can have little effect, partly because the individual going through the module has no interaction with colleagues. With that in mind, an interesting program was developed in the US Department of Veterans Affairs. Called CREW: Civility, Respect, and Engagement at Work, it includes group meetings focusing on interpersonal interactions. I would be surprised if this program is allowed to continue. Another response some institutions have made to problems of "incivil" behavior (aka microaggressions) is to develop bystander/ally training. Unfortunately, when a man exhibits discriminatory behavior toward female colleagues, the objections of females may

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[1] https://www.iamascientist.info/vision-strategy

have little effect. However, male colleagues may have more success calling out the perpetrator. The same goes for other groups, including racial minority, LGBTQ+, and international students and colleagues.

Chapter 6 "Fixing Visibility" mentions the concepts of the "Matthew effect" and the "Matilda effect." The Matthew effect is the accumulated advantage accrued from success. The Matilda effect occurs when the work of women is credited to their male collaborators. Here's the irony: the Matthew effect was popularized by sociologist Robert Merton in a 1968 paper in *Science*. In a 1973 reprint of the article, Merton acknowledged that the paper should have listed as coauthor a woman, Harriet Zuckerman, whose research on Nobel laureates and collaboration significantly informed the published research [p. 146]. (The Matilda effect was named later by Margaret Rossiter.) One recommendation is that journals develop guidelines on authorship and ask for detail on individual contributions. This may be less of an issue in mathematics, where the standard is to list authors in alphabetical order, rather than by some perception of relative contributions.

Chapter 7 "Fixing Work-Life Balance" is a major challenge. A 2019 study of full-time professionals in STEM found that nearly one-half of new mothers left full-time employment, compared with one-fourth of new fathers [p. 179]. While parental leave is important for new parents, childcare benefits have a greater effect in maintaining research productivity, particularly for women. There is a suggestion that the online meetings in 2020, when many parents were home with children, helped increase awareness of the challenges of work-life balance. It is hoped that such measures as providing childcare at conferences, funding for dependent care travel, and hybrid options can increase participation of women in research meetings. Something I have not been aware of is a reported culture of heavy drinking at conferences and associated gender harassment. Apparently some scientific societies have responded to this problem with codes of conduct and limits on alcohol at official events.

Chapter 8 "Fixing Reporting" deals with a complex problem. Reporting harassment brings many risks: not being believed, being believed but blamed, losing research midstream, making enemies in the department. Even when official channels are used, the perpetrator is deemed guilty, and some punishment is imposed, the perpetrator can sometimes avoid any long-term consequences. If a harasser applies for jobs elsewhere, perceived or actual legal restrictions may prevent recruiters from learning of the harassment. A 2018 "pass the harasser" study of 300 cases of faculty-student sexual harassment found that 53% involved professors who had previously been accused of sexual harassment [p. 212]. The University of Wisconsin now requires its campuses to share information about sexual harassment with potential employers asking for references. Several universities ask faculty hires to sign waivers allowing them to request information about misconduct in previous jobs. [p. 213]. NSF now requires institutions to report to them if PIs have been found guilty of sexual harassment or sexual assault.

For the last chapter, "Fixing Science," the author interviewed Maï Yasué, a zoologist who left her faculty position to take a position in a DEI office. She provides a good perspective about engaging people in their departments, creating affinity spaces for minority students and faculty, and developing informal as well as formal leaders. Note that this book was published before the current administration's war on DEI. This means that some recommendations will be harder to carry out.

While the chapter titles indicate a focus on solutions, there is little detail on actual implementation. I hope it provides enough insight to help individuals, departments, and universities to develop good programs to address the problems of inequality. And as a final, minor note: unfortunately, the book needed more careful editing, even for basic typographical errors (Columbia University Press, where were you?).

AWM Student Chapter Awards

The Association for Women in Mathematics is proud to announce the 2025 AWM Student Chapter Award winners. We thank all who participated in this year's competition for the attention to their proposals and congratulate them on the strength of the activities they are pursuing to create productive environments for women in mathematics. The chapter winners were recognized at the Student Dessert Reception on Friday, August 8th at MAA MathFest 2025 in Sacramento, California.

University of Utah

Community Outreach

The AWM Student Chapter at the University of Utah is recognized for their exceptional commitment to community outreach through a wide range of events and collaborative activities. The chapter involved a local high school math club to give an accessible, research-inspired talk series that sparked curiosity and excitement. They participated in the University's Campus Engagement Program, where they introduced K–12 students to mathematics through hands-on origami activities. At the Salt Lake County STEM Fest, members volunteered as guides, engaging with hundreds of students and families to highlight the beauty of mathematics. The chapter is also recognized for organizing a thoughtful panel on parenting in academia, which provided a supportive and honest space for faculty, postdocs, and graduate students to share their experiences and build community.

Western University

Fundraising/Sustainability

The Western University AWM Chapter demonstrated innovative and sustainable fundraising within a small mathematics community. Recognizing limited departmental resources, the chapter secured additional bursaries from the Science Students' Council by aligning funding proposals with sustainability and accessibility values. By incorporating ecofriendly practices—such as reusable materials to reduce waste—and budgeting for sustainable event costs, they enhanced both the scale and impact of their initiatives. These funds supported vital student resources, including study packages and menstrual equity care kits in collaboration with campus partners. This strategic, values-driven approach to fundraising demonstrates the chapter's commitment to financial sustainability, equity, and inclusive support, significantly advancing the well-being and success of their community.

University of Florida

Professional Development

The AWM Student Chapter at the University of Florida is recognized for exceptional professional development through their newly established mentorship program. Connecting 60 members across academic levels, the program paired undergraduates with graduate mentors, providing guidance on coursework, research, and professional skills. Developed entirely by the officer team, the program fostered community and engagement, highlighted by popular events like the "Mentea" and "Mentournament." The chapter's efforts showcase the power of mentorship in supporting student growth and building a strong mathematical community.

University of Oregon

Scientific Excellence

The University of Oregon AWM Student Chapter is recognized for its outstanding commitment to scientific excellence through a speaker series featuring distinguished women mathematicians. By hosting world-renowned mathematicians such as Ingrid Daubechies and Stephanie Van Willigenburg, the chapter creates exceptional opportunities for scholarly engagement and mentorship. Their sustained efforts to increase the visibility of women in mathematics by managing a library of books, by fostering scientific curiosity among K–12 students, and by building a supportive professional network exemplify the highest ideals of the AWM mission. Through their creative, inclusive, and impactful programming, the chapter has cultivated a vibrant mathematical community at UO and beyond.

The Executive Committee of the Association for Women in Mathematics established the Student Chapter Awards to be awarded annually each summer at MAA MathFest. The purpose of these awards is to recognize outstanding achievements in chapter activities among the AWM Student Chapters. Awards are given annually in four categories: community outreach, funding and sustainability, professional development, and scientific excellence.

MEDIA COLUMN

Television Review: *Prime Target*, an original series on Apple TV+

Mary Lynn Reed, PhD, mlrsma@rit.edu

Reviewed and written by Mary Lynn Reed, PhD, currently, professor at Rochester Institute of Technology and formerly, Chief of Mathematics Research at the National Security Agency.

Prime Target is an 8-episode original serial drama that debuted on Apple TV+ in January 2025. Leo Woodall stars as Edward "Ed" Brooks, a postgraduate algebraic number theorist at Cambridge and Quintessa Swindell stars as Taylah Sanders, the NSA agent who breaks the anonymity of her surveillance detail to befriend and ultimately, protect Ed from a variety of forces trying to harness his knowledge of prime numbers.

Prime Target was likely meant to be a continuing series but as of June 2025, it has not yet been renewed for a second season. The opening few episodes of the show demonstrated great potential. The action opens in modern-day Baghdad and quickly draws connections between the mathematics underpinning the security of our digital world and the Islamic Golden Age, where algebra was born more than a thousand years ago. For algebraists in particular, it's marvelous to see a prime-time TV drama that introduces al-Khwarizmi (even if some of the mathematical attributions are muddied).

Prime Target promised to be a mathematical thriller with a compelling historical connection and relevance to current affairs. But for a mathematician, and particularly an ex-NSA mathematician, the show did not live up to its full potential.

One of the more encouraging aspects of the show was its representations of gender and queer sexuality. While the lead character is a man, his mathematical breakthroughs require results proven by a female mathematician thirty years prior. And while Ed doesn't identify with any specific sexuality, his love interest in the show is another man. It was also nice to see the tough, NSA agent with mad hacking skills played by a strong woman of color.

The show explores some interesting themes, such as who is ultimately accountable for scientific or technological advances that cause societal harm? Ed's initial position will ring true to many mathematicians, that the pursuit of knowledge can be pure. At a dinner party, Ed describes his work with the tantalizing questions: "What if the rules were different? What if numbers didn't behave the way we assume?"

For mathematicians, watching this show can be both intriguing and infuriating. Ed is obsessed with prime numbers and believes they are the "DNA of the universe." That sounds cool and it's nice to see mathematics be so critical to the plot of a TV drama, but if you know some actual details about number theory and cryptography, the math in this show is over-simplified to the level of comedy. Meaning, you may laugh when the writers of the show didn't intend the audience to laugh.

Another theme that is woven throughout the eight episodes is trust and betrayal. But unfortunately, too many of the show's plot twists hinge on one of the many naive characters trusting someone they shouldn't have. If you've ever watched a thriller before, you will likely suspect who the "bad guys" are long before the main characters do.

A few episodes into the season, the character of Jane Torres (played by Martha Plimpton) is introduced. In this fictional world, Jane runs the NSA operations in Europe and has a personal connection to Taylah as well. Those of us with real NSA experience know that Hollywood is notorious for using the cryptographic agency in exaggerated and often villainous ways. *Prime Target* is no exception to that rule but there were a few twists that made the NSA in this fictional world more nuanced than most portrayals.

Plot issues and mathematical simplifications aside, my favorite part of the show were the references to real mathematical history, from the Islamic Golden Age contributions to Sophie Germain to the 1970s invention of public key cryptography.

Of course, there are a few nuisances in the characterization of Ed, the obsessive mathematician. The most laughable images were his tiny notebooks and old-school thick pencils. Certainly, real mathematicians still use paper and pen or pencil, I just couldn't believe the ridiculously small notebook he was trying to write in!

One of the organizations that plays a critical role in the story is a mathematical research institute housed in what looks like a royal castle just outside of Cambridge. The workspaces were a surprising blend of Old English charm and modern cubicle—with the twist that the cubicle walls were made of glass, for the mathematicians to write their formulas. Because of course, no math story is complete without formulas written on glass!

If you can set aside these nuisances and your professional need for mathematical clarity, *Prime Target* does a decent job illuminating the "vibe" of pursuing deep mathematical results. There is also a nice portrayal of the affection Ed has for his mathematical mentor, Professor Osborne (played by the wonderful actor, Joseph Mydell) as he suffers from Alzheimer's.

Overall, even with some cringe-worthy moments, I think *Prime Target* is worth viewing, particularly for audiences who are interested in the ethical questions of science and technology and who aren't going to focus too intensely on whether the math described, or its practical implications for cryptography, make any sense at all.

STUDENT CHAPTER COLUMN

Leadership Award Celebrates Dr. Ayla Gafni's Commitment to Transformative Mentorship

Gauree Wathodkar, gkwathod@go.olemiss.edu

The faculty advisor of the AWM student chapter at the University of Mississippi, **Dr. Ayla Gafni**, won the Leadership & Engagement Award for the Student Organization Advisor of the Year for her contribution to the AWM chapter. This award is presented by the Center for Inclusion and Cross-Cultural Engagement and the Gertrude C. Ford Ole Miss Student Union at the University of Mississippi each year to one faculty/staff advisor who has provided continuous support for their respective student organizations.

Dr. Gafni is an Associate Professor of Mathematics at the University of Mississippi (UM) and her research interests are Analytic Number Theory and Harmonic Analysis. The officers of the chapter were delighted to celebrate this recognition, as Dr. Gafni has made a profound and lasting impact on each of their individual journeys. Her trust in the officers empowered them to grow into strong leaders, and under her guidance, the chapter won the Award for Community and Outreach from AWM in its inaugural year and the New Student Organization of the Year award in 2024 at UM. The founder of the chapter, Gauree Wathodkar, said "We are all celebrating that Dr. Gafni has won this award. From the very beginning of our chapter, she has been a constant source of support, encouragement, and trust. When I first proposed the idea of starting this organization, she believed in my vision and joined as our faculty advisor with a positive and enthusiastic spirit. Her dedication to our chapter is evident—she attends nearly every event we organize, always recognizing and appreciating the hard work of our officers. The remarkable growth of our organization is a testament to her mentorship, and her encouragement has transformed many of our officers from shy, reserved individuals into confident and resourceful leaders. Dr. Gafni is a perfect role model for women researchers in mathematics. As a leader herself, she brings a wealth of experience in organizing events and helping students develop professionally, yet she never imposes her authority. Instead, she inspires by sharing her own journey, openly discussing the challenges she faced during graduate school, which in turn motivates students to persevere."

The president of the Mississippi chapter, Annette Shinn, said "Dr. Gafni has been a great help with our chapter. When we invited speakers to campus, she made sure we went through all the necessary steps and showed us how to get funding and arrange other logistics. With her mentoring and support, our chapter has successfully hosted twenty-three events in just two years, and whenever we encountered challenges, Dr. Gafni was instrumental in helping us find optimal solutions. One such example is the improvement we made to Sonia Kovalevsky Day, our flagship outreach event for high school students. In our first year, while the event was successful, there were moments of awkward silences during the gaps between workshops. Dr. Gafni suggested incorporating puzzles, riddles, and games to keep attendees engaged during transitions. Building on this idea, we introduced a dedicated puzzle room, which turned out to be a tremendous success this year. This simple yet effective addition greatly enriched the event, sparking lively discussions and interactions that maintained enthusiasm and engagement throughout the day."

Dr. Ayla Gafni

Additionally, in Fall 2024, the chapter launched a Directed Reading Program (DRP) to provide early research opportunities to university students. Dr. Gafni played a crucial role in shaping the program's structure tailored to the university's needs, ensuring its feasibility for both graduate and undergraduate students. She now serves on the DRP committee, providing guidance to graduate student mentors, particularly in designing projects and drafting proposals.

Dr. Gafni is a leader who uplifts others, always valuing students' perspectives while offering insightful suggestions. Her grace and empathy create a welcoming environment where everyone feels respected and heard. Congratulations to her for such a well-deserved recognition!

Column Editor's Note—*In addition to the article by regular column contributor Yvonne Lai (and her colleagues), the Education Column has a second article by Cathy Kessel on the Archimedes Standards, a recently announced set of mathematics standards for pre-K through grade 12. An additional article on other aspects and issues related to the Archimedes Standards is planned for a future issue.*

EDUCATION COLUMN (Article #1)

What We Knew Then About Teaching, and What We Can't Find Out Now

Yvonne Lai, Milton E. Mohr Professor, University of Nebraska–Lincoln
Amy Bennett, Research Assistant Professor, University of Nebraska–Lincoln
Rachel Funk, Postdoctoral Researcher, University of Nebraska–Lincoln

What we knew then about teaching

Take a look at these instructional characteristics. If you had to plot them on a timeline, when do you think they were first studied as levers for improving instruction?

- wait time
- student time on task
- lesson planning
- students engaged in mathematical problem solving
- student presentations to each other

Now consider these ways to assess instruction. When do you think they were first used as a measure of quality of instruction?

- standardized tests
- mathematical attitude
- DFW rates (received grade of D or F, or withdrew from the course)

In the US, researchers have been looking for easily scalable resources and policies to improve K–12 education for more than 150 years (Cohen et al., 2002). Until the late 1960s, the prevailing theory was that the more material resources, the better the outcomes; greater student learning should result from greater expenditure, lower teacher-to-student ratios, or more years of teacher education. But then, reports came out in the late 1960s and early 1970s that these kinds of resources made little if any difference (e.g., Jencks et al., 1972). Educational researchers began to hypothesize that classrooms were not input/output machines of entered material resources and exited student learning. Instead, describing what teachers did in the classroom could explain differences in student performance more accurately than material resources could. Moreover, effective teaching practices could be identified by observing teachers at work.

How we teach and what we teach, as we now know, matters for student learning. In the 1980s and 1990s, consensus began to emerge that students benefited from teaching practices such as lesson planning, presenting goals to students, and maintaining student accountability for work (Brophy & Good, 1986; Doyle, 1988). Moreover, students' tasks could range from rote work to more complex or nonroutine tasks, and teaching could promote or take away from students' opportunities to develop problem solving skills (Doyle, 1988; Stein et al., 1996; Schoenfeld, 1989). By the 2000s, mathematics and mathematics education communities agreed that, ideally, the work students do in a mathematics class should bear some resemblance to the work of professional mathematicians. Students should have the opportunity to reason, problem solve, conjecture, look for patterns, construct proofs, and apply mathematics (e.g., Burkhardt & Pollak, 2006; Cuoco et al., 1996), and teaching should cultivate an environment where these practices could happen in a developmentally appropriate way (e.g., Ball & Bass, 2003; Yackel & Cobb, 1996).

Assessments of teachers' mathematical knowledge for teaching were developed based on this vision of education. As items were drafted, assessment writers considered issues such as the potential for a student's method to generalize and whether a task could support student learning (Baumert et al., 2010; Hill et al., 2004). Teachers' performance on assessments of mathematical knowledge for teaching, at elementary through high school levels, were shown to predict student outcomes and were associated with desirable teaching practices (Baumert et al., 2010; Hill et al., 2005; Rockoff et al., 2011).

In the undergraduate STEM setting, the "active learning'" movement was gaining traction in the 1990s (National Science Foundation, 1996). This movement shared a vision with the ideals of K–12 mathematics education researchers: that mathematics classrooms are a place to approximate professional mathematical practice. Mathematicians do collaborative research on blackboards, talking and writing as they think through problems; and so should students.

Through programs such as Project NeXT and the Academy of Inquiry Based Learning, faculty in mathematics departments across the country began to restructure their teaching to include group work and student presentations, and introduce more opportunities for students to talk about mathematics, even in large classes (Braun et al., 2015; Conference Board of the Mathematical Sciences, 2016). Some universities and departments began to reconfigure physical classroom spaces to promote collaboration, including large tables, movable chairs, and boards on all walls (e.g., Bennett, 2022; Smith et al., 2021, LaRose, 2018). The philosophy of teaching practices that elicited and promoted student thinking aloud during class time was embraced from first year undergraduate courses to proof-based mathematics major courses to courses for prospective K–12 teachers (Ernst et al., 2017). Across elementary through undergraduate education, we as a community were attending to the linkages between teaching practices and mathematical practices.

What we started to discover

Researchers across undergraduate education in mathematics, sciences, and engineering started to document the outcomes of active learning, reporting positive outcomes in terms of student performance (Freeman et al., 2014) and affect (Laursen et al., 2014). Mathematics departments and education researchers began to use a combination of DFW rates, grades in subsequent courses, persistence in STEM majors, and student affect to examine the impact of adopting active learning instruction (Ellis et al., 2016; Kogan & Laursen, 2014; Oliver et al., 2024).

Concurrently, we discovered that adopting active learning practices was not always easy, with worries about covering needed content, managing students, and taking too much time to prepare for class (Henderson et al., 2018; Michael, 2007). Researchers started to document the importance of changing mathematics teaching practices in community with others, and the need for departmental policy and culture to address these barriers and support shifts in teaching (e.g., impact of individual and institutional factors, Apkarian et al., 2021; departmental action teams, Reinholz, 2019; course design and departmental change, Smith et al., 2021).

Who benefits?

Buoyed by positive empirical results, educators started to investigate the hypothesis that a focus on active learning practices not only could improve student performance overall, but also help decrease equity gaps in education. Did the theory that "a rising tide lifts all boats" hold, with this interpretation?

No.

Researchers began to find that even when instruction appeared to follow so-called best practices, they were not always equitable. Instead, they appeared to differentially benefit students in ways that exacerbated inequities. At the precollege level, Melhuish et al. (2022) examined yearlong professional development for elementary grades teachers that supported teachers' mathematical knowledge growth and students' mathematical reasoning, conceptual understanding, and participation. At the end of three years of implementation, they found a widening gap between the mathematics performance of white affluent students and students who were low-income, Black, or Latine.

At the undergraduate level, Reinholz et al. (2022) and Johnson et al. (2020) analyzed data from the same set of inquiry-based undergraduate classes (in differential equations, abstract algebra, and linear algebra) in comparison to lecture based classes. In their analyses, women appeared to benefit less on average in inquiry-based classes than in lecture-based classes, based on performance on content knowledge assessments. In Reinholz et al.'s analysis, "even though women in the inquiry-oriented classes did no worse than women in non-inquiry classes, the significant improvement for men in inquiry-oriented classes resulted in an overall gender inequity. Across the sample of 20 classrooms analyzed, only five had a gendered performance difference with women outperforming men; men outperformed women in the other 15 classes" (pp. 212-213).[1] Johnson et al. analyzed whether gender differences could be attributed to instructor, institutional difference, or background; they found that their analysis "verified that the interaction between gender and [being in an inquiry based class] was robust and remained a significant factor (p = .014) even when nesting students within instructors, accounting for institutional differences in terms of SAT, and controlling for the global gender effect favoring men (p = .086)" (p. 513).

In addition to analyzing content test scores, Reinholz et al. (2022) also analyzed the instruction itself, for participation patterns. They defined a *participation rate* by a specific gender group in a class as

$$\frac{\textit{total spoken contributions by [gender] students}}{\textit{number of [gender] students}}.$$

Using this metric, they found that a gendered difference in content performance was predicted more by women's participation rate than men's participation rate, or instructor gender. They also found that in classes where more students built on each others' contributions, and where instructors encouraged the participation of different students to develop the same idea, women's participation rate was higher than in classes featuring longer exchanges between the instructor and a single student (for instance, where one student's idea is refined by the teacher through questions by that teacher directed to that student).

What we can't find out now

The insights into instructional impacts described above were possible through metrics that depend upon disaggregated demographic data in combination with instructional patterns. Reinholz et al.'s work suggests that inequity may be related with how participation is elicited by instructors and expectations set by the class. Moreover, as Melhuish et al. observed, research metrics used in the 2000s and 2010s to quantify instructional quality examine mathematical potential of tasks, and whether and how many students participate in rich tasks, but not whether there is a gap in participation based on demographic. It is newer metrics that combine mathematical practice, teaching practice, and individual and classroom demographics that allow us to see the critical role of teaching in cultivating equity—or inequity.

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[1] We provide a note here about the treatment of gender in this study: "The original data corpus did not include a class roster or seating map of the students, and because assessment data were anonymized, we could not connect reported demographics from the assessments to the students in the videos. Therefore, for this article, we operationalized gender in the classroom video data through gender performance (M. L. Rasmussen, 2009). That is, students' gender was inferred using visual and audio cues (e.g., voice, clothing, presentation, names, or pronouns used) by three members of the team (all women: two White, one Black). Although three students in the inquiry-oriented sample identified as nonbinary and four students declined to answer the question about gender, we did not encounter gender-neutral pronouns in any of the videos. We had no other way to infer whether students were nonbinary, so we cannot determine whether participation from any of the seven nonbinary students was captured on video and the students were misgendered by our coders, or whether their participation was simply not captured. Hence, our claims are limited to binary interpretations of gender performance. Overall, when we could not identify the gender of a particular speaker, their contribution was not coded." (Reinholz et al., 2022, p. 209)

EDUCATION COLUMN *continued from page 19*

Participation rates and elicitation patterns are a start. What if we were also able to sharpen our understanding of teaching moves that impacted students' affect–as Apkarian et al. (2024) begin to do–and also performance? What if we could continue to identify potentially equitable teaching moves through close study of classrooms where minoritized students succeed, as Wilson et al. (2019) have done? What if we could examine how departmental culture and policy impact the uptake of these kinds of teaching moves? The studies of Melhuish et al., Johnson et al., Reinholz et al., and Wilson et al. are only about so many programs and sites, with some data collected pre-pandemic; if we were able to replicate these studies, what would we find? What other instructional and departmental patterns are there that we haven't seen?

Scholars have lost funding to pursue these avenues, and some have been dissuaded or prevented from applying for new funding. As an instance of how this has impacted us personally, in 2023–2024, we read literature on equitable teaching practices in support of grants we were funded through. One of these grants has now been terminated, and the other grant stopped work in this direction.

And still, we must measure inequity and its relationships to mathematics teaching and learning to address equity in the classroom. The last few years have shown a promising foundation for novel ways to see and understand the nature of equity gaps. Now, the momentum of this work has been truncated. We stand to lose a generation of scholars who have opportunities to learn from and contribute to this line of work.

Returning to the levers and measures listed at the beginning of this essay, consider Figures 1 and 2 containing Google ngrams[2] for these sets of terms/phrases, respectively. Note that a Google ngram can only suggest usage; it searches for text without contextual meaning. We scanned the references dating to the peaks in Figures 1 and 2 to see which peaks were about education and which were not. (For instance, in Figure 2, DFW rate has a peak in the 1980s and 2000s, but only the latter peak is relevant; the 1980s peak refers to dFw, a rate of evaporation used in chemical instrumentation.)

Some of these ideas hark back nearly a century, and others begin coming into usage 20 to 30 years ago. Perhaps it is no surprise that leaning only on ideas first used decades or more ago could not fully address the problems that have only drawn more attention more recently.

As a field, we began to establish that we could make progress by studying the measures used previously in disaggregated ways, and we could continue to innovate in both characteristics of classrooms and outcome measures. Inquiry into these issues might well improve access to mathematics. But we cannot know until there is support for studying these issues.

Acknowledgements. *We do not, and cannot, acknowledge any federal funding for the writing of this essay.*

Figure 1: ngram of educational levers from https://books.google.com/ngrams

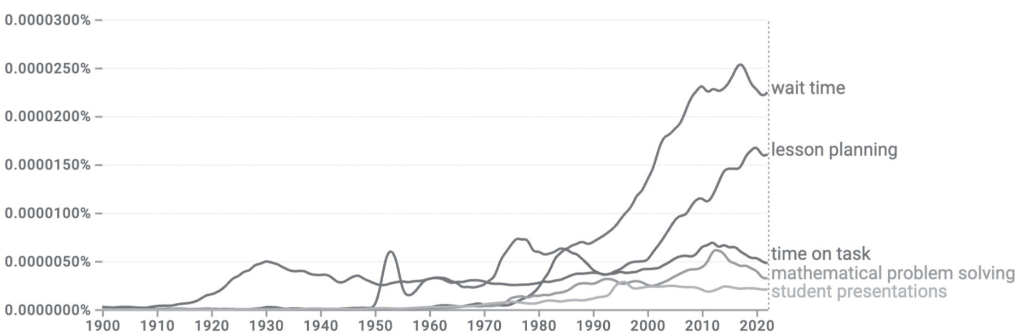
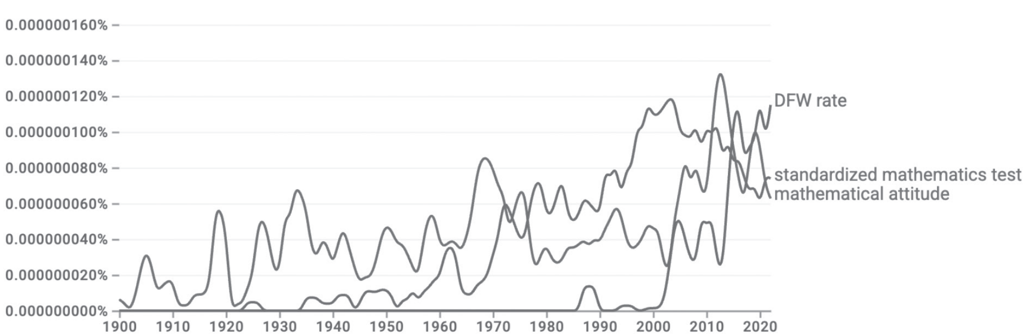


Figure 2: ngram of measures of educational quality from https://books.google.com/ngrams



[2] A Google ngram is a graphical representation of the frequency of particular words and phrases (n-grams) in a collection of books digitized by Google.

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EDUCATION COLUMN (Article #2)

Will the Archimedes Standards Replace Common Core? Should They?

Cathy Kessel, cbkessel@earthlink.net

On June 1 of this year, *The Archimedes Standards: Model PreK–12 State Mathematics Standards* was released by the National Association of Scholars (NAS) and Freedom in Education (FIE).[1] The NAS upholds "the standards of a liberal arts education that fosters intellectual freedom, searches for the truth, and promotes virtuous citizenship" and "seeks to reform higher education."[2] It is a nonprofit 501(c)(3) organization. FIE is "committed to restoring parental rights, high-quality education, and civic virtue to our public schools by enhancing and improving content transparency, curriculum quality learning options, and equipping parents to act."[3] It is a nonprofit 501(c)(3), 501(h) organization. The 501(h) designation indicates the organization can engage in lobbying efforts subject to specific expenditure limits and still maintain its nonprofit status.

Accompanying documents[1,4] describe ways citizens can encourage state and local policymakers to take action in favor of the Archimedes Standards (AS). They provide text for legislation that would create a state mathematics taskforce to develop state standards, text for changes in teacher licensure, and the suggestion that state policymakers encourage school districts to adopt the AS. A press release depicts the Archimedes Standards (AS) as a response to a decline in national performance, which, in turn, is a "direct consequence" of "standards that are vague in content, fragmented in structure, and often rooted in experimental pedagogies rather than educational substance." The activist toolkits are more explicit: "The Archimedes Standards removes the lower standards imposed by the Common Core State Standards for Mathematics (CCSSM), which provide a vague outline of content knowledge, it lack rigor, and were rushed into public use without sufficient testing and evaluation." Variants of this oddly-worded statement appear five times in the toolkits—without any evidence that the statement is true, or citation of any source that might provide it. Another variant, with a single citation, appears in the AS and a recent opinion piece.[5]

[1] https://www.nas.org/reports/the-archimedes-standards. PreK stands for prekindergarten.

[2] https://www.nas.org/about-us

[3] https://freedomined.org/about

[4] https://freedomined.org/archimedes-math-standards/

[5] https://www.realcleareducation.com/articles/2025/06/09/the_alarming_decay_of_mathematical_competency_in_america_1115455.html

This article is intended to provide some information (historical and otherwise) about previous standards and the US education system, and to point out a few interesting features of the above documents. (A longer, more detailed, and technical analysis that examines sources cited in the AS is available on my blog: https://mathedck.wordpress.com.)

Some standards history

I've worked on several standards documents as a writer or editor, among them the Common Core State Standards for Mathematics (CCSSM)[6] and the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics* (PSSM aka "the NCTM standards").[7] Like other standards documents, the format and style of the *Archimedes Standards* reflects its creators' ideas about its readers and the US education system. Table 1 is meant to give a sense of how the three standards documents were created, who created them, their intended audience, and other aspects of their development. It should not be considered comprehensive.

Curriculum. Studies prior to 2010 documented a "splintered vision" in US mathematics education and a "mile-wide, inch-deep" curriculum in grades 1–8. High-achieving countries such as the Czech Republic, Hong Kong, Japan, and Singapore focused on a few topics per grade in elementary school. A given topic was introduced and taught (possibly over several grades), then did not occur in later grades. In contrast, the US lacked focus. Consistent with local control and what the *Archimedes Standards Activist Toolkit* calls "teacher freedom," a given topic might occur at any elementary grade. This was reflected in state standards—the same topic could occur at different grades in different states.[8]

In some ways, this was not a new finding. In the 1980s, the US was one of 20 countries that participated in the Second International Mathematics Study (SIMS). The SIMS findings for the US are discussed in a booklet called *The Underachieving Curriculum*. Compared with countries such as Japan and France, the US had a "low intensity" curriculum that gave a little time to a lot of topics, "characterized by a great deal of repetition and review." Similarly, a study of topics in three US mathematics programs found that most new material occurred in kindergarten, first grade—and ninth grade.[10]

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[6] https://www.thecorestandards.org/Math/

[7] The executive summary is available at https://www.nctm.org/PSSM/.

[8] Figure 4, Schmidt et al., 2005, Curriculum coherence: An examination of US mathematics and science content standards from an international perspective, *Journal of Curriculum Studies*, 37(5), 525–559.

[9] pp. 94–95, McKnight, 1987, *The Underachieving Curriculum: Assessing US School Mathematics from an International Perspective. A National Report on the Second International Mathematics Study*, https://files.eric.ed.gov/fulltext/ED297930.pdf

Table 1: Comparison of various aspects of the three standards documents

Acronym, year of release	**PSSM 2000**	**CCSSM 2010**	**AS 2025**
Sponsoring organization—all 501(c)(3); FIE is also 501(h)	National Council of Teachers of Mathematics (NCTM)	National Governors Association (NGA), Council of Chief State School Officers (CCSSO)	National Association of Scholars (NAS) Freedom in Education (FIE)
Audience mentioned in text	Mathematics teachers; teacher-leaders, developers of instructional materials and frameworks; . . . and policymakers (PSSM, p. ix).	Unspecified, however, the text says: "It is time for states to work together" and mentions "our children" (CCSSM, p. 5).	Teachers, students, parents (AS, p. 30).
Committee members	Mathematics education researchers, teachers, mathematicians (PSSM, p. vii).	Mathematicians, mathematics education researchers, teachers, members of state departments of education, 2 statisticians, 1 person from College Board, 1 from ACT, 2 from Achieve[a]	Members from a variety of fields, many in the classical education movement: 2 mathematics instructors, 1 professor of mathematics, 2 physicists, 1 MD, 1 engineer, 1 elementary education major . . . (AS, p. 6).
Principal writers	Three of the four grade-band groups were chaired by mathematics education researchers (PSSM, p. vii).	Mathematician, mathematical physicist, high school math teacher[a]	Assistant professor of education, Hillsdale College (AS, p. 6)
Writing period	3 years (main work in summer)	9 months[a]	Author: 6–7 months Committee: 3 months[b]
Comment periods	February 1997— CBMS October 1998—public (PSSM, p. xv)	September 2009—public January 2010—CBMS March 2010—public[a, c]	Apparently, no public comment. "Every word has had 15 pairs of eyes on it and probably about a 15- to 20-minute discussion."[d]
Grade levels	PreK–2, 3–5, 6–8, 9–12	Each grade: K–12	Each grade: PreK–12
Influential documents	Previous NCTM standards for curriculum, teaching, assessment (PSSM, p. ix). *How People Learn* (NRC)	PSSM process standards, *Adding It Up* (NRC) (CCSSM, p. 6).	Singapore textbooks Florida standards (AS, p. 20).
Precursor documents	White papers (early versions of *Research Companion* articles)	Research summaries and briefs (early version of *Progressions*[e])	unknown

[a] https://mathematicalmusings.org/2014/08/08/learning-about-the-standards-writing-process-from-nga-news-releases-take-2/.
[b] Minute 8 on https://www.nas.org/blogs/media/video-the-archimedes-standards.
[c] Kessel, 2010, AWM and the Common Core State Standards, *AWM Newsletter*, 40(5), 29–31.
[d] Minutes 12, 15, and 22 on https://www.nas.org/blogs/media/video-the-archimedes-standards.
[e] https://mathematicalmusings.org/2023/05/24/version-of-progressions-with-revised-appendix/.

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The Underachieving Curriculum notes that repetition and review might be considered spiraling as described by Jerome Bruner in his book *The Process of Education*.[11] *The Archimedes Standards* agrees, asserting:

> Repeated instruction in successive grades at increasing levels of complexity—called "spiraling"—greatly increases student learning. [Here a footnote cites *The Process of Education* which does not cite any empirical evidence about student learning.] . . . In the Archimedes Standards, the learning goals associated with a given concept are often stretched across multiple grades.

What's the difference between teaching a topic over several grades and repeating it in several grades? Here is a very experienced Chinese teacher's description of how students' conceptions of place value evolve between grades 1 and 4.

> Students cannot get a thorough understanding of place value in one day, but step-by-step. At first, when they begin to numerate and recognize two-digit, and then multidigit numbers [in grade 1], they get a preliminary idea of what is meant by a place in math, the names of the places, and limited aspects of the relation between places, like 1 ten equals 10 ones, etc. The most significant idea they learn at this stage is that digits at different places have different meanings, or stand for different values. We start to ask them the question, "What does this digit stand for?" They learn that a 2 at the ones place stands for 2 ones, a 2 at the tens place stands for 2 tens, and a 2 at the hundreds place stands for 2 hundreds, etc.
>
> Then when they learn regular addition and subtraction [within 100 in grade 1, within 10,000 in grade 2], place value becomes more meaningful for them, for they have to line up the digits with the same place value. After that, when learning addition with composing and subtraction with decomposing, students learn the aspect of composing and decomposing a unit of higher value. The composition and decomposition of a unit are also important aspects of the concept of place value.
>
> Now, in multiplication [with two-digit multiplier in grade 3, with three-digit multiplier in grade 4] they encounter new aspects of the concept. They used to deal with several tens. Now they are dealing with several tens of tens, let's say 20 or 35 tens, or, even several hundreds of tens, like in this problem, 492 tens. They used to deal with several hundreds. Now they are dealing with several tens of hundreds, or, even several hundreds of hundreds, like 738 hundreds. To understand this aspect, they should know how to deal with place value in a systematic way.[12]

This description is drawn from Liping Ma's book *Knowing and Teaching Elementary Mathematics*. (Incidentally, this book was edited by me, published the year before PSSM, and appears on a list of books[13] recommended by the AS author's home institution Hillsdale College.[14]) In contrast to the deepening of concepts illustrated above, the AS repeats identically worded standards in different grades with no additional guidance.

Accountability. Despite—or perhaps because of—local control, the US has a long-standing tradition of using standardized tests to monitor educational outcomes.[15] Thus, it is not surprising that state standards, a fairly recent addition to our education system, act as test specifications. Because high-quality standardized tests were expensive to produce, states with different standards often used multiple choice tests rather than commissioning a test with other formats such as the constructed response format used in the National Assessment of Educational Progress (NAEP) or the more authentic questions of the Programme for Student Assessment (PISA). Common state standards, however, allowed the costs of test production to be shared by several states, making test specification an important feature of the CCSSM. Unlike the PSSM writers, some members of the CCSSM committees were employees of testing companies.

William McCallum, the lead writer for the CCSSM, described how the style of the CCSSM document was constrained by its test specification role.

> Unlike the NCTM standards, state standards have direct policy and legal consequences, and are used as a basis for writing assessments. They are flat lists of

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[10] Flanders, 1987, How much of the content in mathematics textbooks is new?, *The Arithmetic Teacher*, 35(1), 18–23; Flanders, 1994, Textbooks, teachers, and the SIMS test, *Journal for Research in Mathematics Education*, 25(3), 260–278.

[11] Bruner, 1977, *The Process of Education*, Harvard University Press.

[12] pp. 44–45; grade placement from Figure 2, Ma, 2013, A critique of the structure of US elementary mathematics, *Notices of the American Mathematical Society*, http://dx.doi.org/10.1090/noti1054.

[13] https://k12athome.hillsdale.edu/recommended-curriculum.

[14] For a description of Hillsdale, see Green, 2023, https://www.newyorker.com/magazine/2023/04/10/the-christian-liberal-arts-school-at-the-heart-of-the-culture-wars.

[15] US Congress, Office of Technology Assessment, 1992, *Testing in American schools: Asking the right questions*, https://govinfo.library.unt.edu/ota/Ota_1/DATA/1992/9236.PDF.

> performance objectives of even grain size, designed to be delivered into the hands of assessment writers without the need for too much discussion or interpretation.
>
> It was against this background that the *Common Core State Standards* were written. On the one hand they were commissioned by the states and had to be the type of document states were used to: detailed bulleted lists describing what we want students to know and be able to do. On the other hand, they were being asked to do something new, to break out of the system that produced the mile-wide, inch-deep curriculum.[16]

The Archimedes Standards documents display little evidence that the AS are to be used to produce a standardized test like those produced by the CCSSM assessment consortia. There is no evidence that any AS committee members have worked in test development. The most extensive discussion of testing occurs in *A Better Standard*, which states that the AS facilitate "reliable assessment, whether by national companies such as the Educational Testing Service (ETS), state-level testing, or tests by school districts and individual teachers." Reliability has a technical meaning for test developers, e.g., "The reliability of test scores is the extent to which they are consistent across different occasions of testing, different editions of the test, or different raters scoring the test taker's responses."[17] Why the AS (or any collection of standards) facilitate "reliable assessment," what that means, and why it should be true are not discussed.

This suggests that "accountability" is no longer synonymous with testing—at least for the AS creators. Instead, "Parents can use the lucid Archimedes Standards to hold schools and teachers accountable" (AS, p. 22). How this might work is not spelled out, but this transcript excerpt from the launch video for the NAS–FIE Franklin (science) standards gives some clues.

> Assessment of schools can be both helpful for finding out if they're performing well, and it can be a tool for straightjacketed conformity and indeed for politicization. . . . So that is one reason to be a little leery of national assessments in science, even perhaps state ones. The more local it is, the more accountable the assessors are. The plug for the Franklin standards is that it's entirely to be a tool for parents and grandparents to be able to go to a school and say "So how much of this are you using to teach our kids?" . . . point by point, "Did you cover this? Did you cover this? Did you cover this?"[18]

This new form of accountability seems to have some bugs. Suppose this were the first-grade Archimedes standard: "Identify the place value of each digit for whole numbers to 100." The Chinese teacher mentioned in the previous section might answer no because not all of the hundred numbers had been analyzed. A teacher who had students fill out a worksheet with all hundred numbers and the instructions "For each number, identify the place value of each digit" might confidently answer yes. No and yes, respectively, would be the correct answers for those who subscribe to the belief that each standard corresponds to a lesson[19] but might conflict with findings about the superior performance of Chinese students.[20]

Supporting teachers. Like the NCTM standards, the Common Core standards began with research summaries.

> The Common Core State Standards in mathematics began with progressions: narrative documents describing the progression of a topic across a number of grade levels, informed both by educational research and the structure of mathematics. These documents were then sliced into grade level standards. From that point on the work focused on refining and revising the grade level standards.[21]

Like NCTM's *Research Companion to Principles and Standards for School Mathematics*, the first edition of *Progressions for the Common Core State Standards* made its appearance several years after the standards release. It was only after the CCSSM were released that the standards writers could start to work on updating early drafts to produce the *Progressions*.

States adopting the CCSSM didn't always provide adequate and timely support for teachers.[22] Some countries allow time for teachers to learn about new standards and for new textbooks to be

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[16] McCallum, 2015, The US Common Core State Standards in Mathematics, in *Selected Regular Lectures from the 12th International Congress on Mathematical Education* (pp. 547-560), https://link.springer.com/book/10.1007/978-3-319-17181-6?noAccess=true#page=544.

[17] Livingston, 2018, https://www.ets.org/Media/Research/pdf/RM-18-01.pdf.

[18] See 1:10 on https://www.youtube.com/live/uC3eh8u5c08.

[19] "Each of these items is a lesson," minute 51 on https://www.nas.org/blogs/media/video-the-archimedes-standards.

[20] *Math Power: How To Help Your Child Love Math, Even If You Don't* (revised edition, Pearson, 2006) by long-time AWM member the late Patricia Kenschaft gives different, and in my opinion, more productive, suggestions to family members about interactions with teachers.

[21] Preface, *Progressions for the CCSSM*, https://mathematicalmusings.org/.

[22] Kessel, 2013, Common Core–related events, *AWM Newsletter*, 42(6), 17–21.

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produced before implementation,[23] but this is not generally the case in the United States. However, teachers were able to ask questions of standards writers on *Tools for the Common Core*, a blog run by Bill McCallum.[24] *Illustrative Mathematics* illustrated the standards with tasks[25] and EngageNY,[26] a program for 12 grades was produced a mere two years after the standards were released, followed by the 2013 edition of *Math Expressions* which is deeply consistent with the standards.[27] The *Mathematical Education of Teachers* (MET), published a year after PSSM, was updated as MET II. In addition to publishing the MET reports, the Conference Board of the Mathematical Sciences (CBMS), an umbrella group for 20 professional societies (including AWM), convened two meetings before and after the release of the Common Core State Standards. The importance of teacher support was noted in the first meeting:

> Most students are unlikely to achieve the Common Core Standards for College and Career Readiness unless serious attention and sustained commitment is given to teacher education and support.[28]

[23] Note South Korea's timeline for implementing its 2011 mathematics curriculum, pp. 17–18, Ferraras et al., 2015, *Mathematics curriculum, teacher professionalism, and supporting policies in Korea and the United States: Summary of a workshop*, http://www.nap.edu/catalog/21753.
[24] https://mathematicalmusings.org/. Note the forums for discussion of individual standards.
[25] https://illustrativemathematics.org/.
[26] Now Eureka Math, https://greatminds.org/math/eurekamath.
[27] The author is standards writer Karen Fuson, https://www.hmhco.com/research/math-expressions-research-evidence-base.
[28] CBMS white paper, 2010, 8 January, p. 11.

The goal of the second meeting was to "work toward a major scaling up of content-based professional development opportunities." Moreover:

> Our goal is not only in scaling up professional development opportunities, but in getting these opportunities into our systems so they are a part of the on-going responsibilities of departments and other organizations and thus can be factored into the planning of school districts.[29]

All this activity seems to have been invisible to the AS writers, who describe the CCSSM as doing more harm than good, divisive, and putting a wall between teachers and parents.[30] They seem to believe that the CCSSM writers thought bulleted lists sufficed to communicate the standards to teachers—and parents and students!

Acknowledgement. *Thanks to Jackie Dewar and Karen Fuson for comments on previous versions of this article.*

[29] This appeared in the announcement for the October 2010 CBMS forum, https://cbmsweb.org/cbms-national-forums/.
[30] Minutes 9 and 31 on https://www.nas.org/blogs/media/video-the-archimedes-standards.

AWM Workshop at the 2026 SIAM Annual Meeting

Call for Poster Session Participants

Application deadline for graduate students: **November 15, 2025**

For many years, the Association for Women in Mathematics has held a series of workshops in conjunction with major mathematics meetings. The AWM Workshops serve as follow-up workshops to Research Collaboration Conferences for Women (RCCW), featuring speakers from one of the AWM Research Networks. An AWM Workshop is scheduled to be held in conjunction with the 2026 SIAM Annual Meeting happening in Cleveland, OH, July 6–10, 2026.

The AWM Workshop at SIAM will consist of two research minisymposia focused on **Numerical Analysis and Scientific Computing** organized by Fengyan Li and Jing-Mei Qiu, a **poster session**, a **panel** and a **mentoring luncheon**. The research minisymposia will feature selected junior and senior mathematicians from the Research Network Women in the Numerical Analysis and Scientific Computing (WiNASC). This workshop follows the RCCW that took place in 2024 at ICERM.

POSTER SESSION: The poster session is open to ***all areas of research***; graduate students working in areas related to numerical analysis and scientific computing are especially encouraged to apply. Poster presenters will be selected through an application process to present at the workshop reception and poster session. Subject to funding availability, AWM will provide partial travel support to selected graduate students for their participation in the AWM Workshop. The Mathematical Sciences Institutes will also sponsor all poster presenters to attend a week-long workshop of the presenter's choice (restrictions apply) at one of the participating Mathematical Sciences Institutes (subject to availability). The workshop will include a mentoring luncheon where workshop participants will have the opportunity to meet with other women and non-binary mathematicians at all stages of their careers.

ELIGIBILITY: To be eligible for selection and funding, a graduate student must have made substantial progress towards their thesis. Mathematicians with other sources of support are also welcome to apply.

All applications should be submitted on mathprograms.org and include:

- a title of the proposed poster
- an abstract (75 words or less) of the proposed poster
- a curriculum vitae
- a letter of recommendation.

Applications must be completed on www.mathprograms.org by **November 15, 2025**.

MENTORS: We seek volunteers to act as mentors for graduate students as part of the workshop. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **May 15, 2026**.

Mathematicians of all genders are invited to attend the talks and poster presentations. Departments are urged to help graduate students and junior faculty who are not selected for the workshop obtain institutional support to attend the presentations.

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ASSOCIATION FOR WOMEN IN MATHEMATICS

The AWM membership year is from October 1 to September 30. Please fill in the information requested below and return it along with your dues to: AWM Membership, PO Box 40876, Providence, RI 02940.

Questions? Please contact AWM at awm@awm-math.org or (401) 455-4042, or visit our website at https://awm-math.org.

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AWM institutional membership benefits include:

- All AWM Institutional members are recognized on the AWM website;
- All AWM Institutional members are entitled to 15 student nominee memberships and 1 faculty nominee membership;
- All AWM Institutional members (except stand-alone Student Chapters) receive a 15% discount on advertising;
- All AWM Institutional members receive a subscription to the *AWM Newsletter* and their student nominees have access to the electronic versions. Stand-alone Student Chapters receive electronic-only access unless a newsletter subscription is purchased.

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