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 treatment of women and others of marginalized genders and gender identities across the mathematical sciences.

PRESIDENT'S REPORT

New beginnings, transitions, and unknowns play an active role in the advancement of mathematics. I become reminded of this as I peruse the amazing, high-quality research in *La Matematica*, an international peer-reviewed journal of the Association for Women in Mathematics. However, in everyday life, new beginnings, transitions, and unknowns can create uncertainty and apprehensions to proceed in the pursuit of knowledge and growth.

At the AWM, we are governed by the amazing members of the Executive Committee (EC). What you may not know is that in our meetings, we are often presented with challenging scenarios that emanate from committees as well as individuals. Robert's Rules of Order may be abandoned in my logistical implementation of leading the meeting as I become easily sidetracked by the thoughtful responses, and quickly become a student of the EC. Thankfully, others will smile, which brings things back to order, and we press on to identify unknowns and create opportunities that will impact women and girls in mathematics across the world.

The AWM recently supported the celebration of 25 years of EDGE (Enhancing Diversity in Graduate Education). In October of 2023, the celebration highlighted the strength of the EDGE community and how they continue to significantly contribute to diversifying the field of mathematics. Over the years, more than 350 women have participated in the EDGE Summer Program, and at least 90% of those received a graduate degree or are in graduate school. We are thankful for their ongoing commitment to empowering women who transition into graduate-level work and for creating a spirit of confidence that encourages us all to thrive.
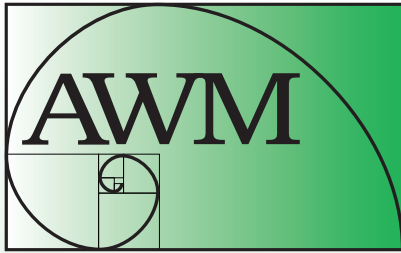
As we look forward, we recognize the need to do more as the numbers of women in the various ranks and jobs that require mathematics still lack equity. While we do have an Institutional, Corporate, and Executive Sponsorship program, we quickly become aware that more is needed to provide broad, robust support to increase engagement in mathematical endeavors. We are arduously working to review ways others can expand the impact of AWM and welcome you to join us as we develop strategies that cultivate effective sponsorships and new beginnings.

Talitha Washington

Talitha Washington
November 30, 2023
Atlanta, GA

Talitha Washington

2024 AWM Dissertation Prizes

In January 2016 the Executive Committee of the Association for Women in Mathematics established the AWM Dissertation Prize, an annual award for up to three outstanding PhD dissertations presented by female mathematical scientists and defended during the 24 months preceding the deliberations for the award. The award is intended to be based entirely on the dissertation itself, not on other work of the individual.

Abigail Hickok and **Parvathi M. Kooloth** will be presented with 2024 AWM Dissertation Prizes at the Awards Celebration on January 3rd at the 2024 JMM in San Francisco, CA.

Abigail Hickok received her PhD in 2023 at UCLA under the supervision of Mason Porter. She is currently an NSF Postdoctoral Fellow at Columbia University.

Hickok's dissertation consists of work from six papers and a book chapter in the area of topological and geometric data analysis. In topological data analysis one uses ideas from algebraic topology to analyze the global structure and "shape" of data not captured by traditional methods in data science, often using persistent homology. In geometric data analysis, one tries to extract the geometry of the data, like curvature, in addition to the topological information. Although her work can be viewed as applied mathematics, she uses many ideas from pure mathematics—

Abigail Hickok

from subjects such as algebraic topology, geometry, and probability. Hickok defines the notion of a persistent-diagram (PD) bundle and develops an algorithm to compute piecewise linear PD bundles. She uses this to study the theory and algorithms for dynamic datasets (evolving over time) and study how its persistent homology (PH) changes over time. In another paper, Hickok considers the analysis of spatial and spatiotemporal anomalies, with detailed case studies on COVID-19 infection cases in Los Angeles and vaccination rates in New York City. One letter writer said: "the method that Abby has developed is the current state-of-the-art approach for using persistent homology to study geospatial and geo-spatiotemporal data."

Response from Hickok

I am very honored and excited to receive the AWM Dissertation Prize. I would like to express my immense gratitude to Mason Porter, my PhD advisor, for nominating me and for supporting me throughout my PhD. I would like to sincerely thank the Association for Women in Math for giving me this award, as well as those who wrote letters of support for me—Andrew Blumberg, Heather Harrington, and Katharine Turner. I wish to acknowledge my exceptional coauthors—Mason, Andrew, Ben Jarman, Michael Johnson, Jiajie Luo, Deanna

Needell—whose collaborations contributed to my dissertation. Last but not least, I want to express my deep appreciation for the unwavering support of my parents, siblings, and partner, whose encouragement has been a constant source of motivation throughout my academic journey.

Parvathi M. Kooloth received her PhD in mathematics in 2022 at the University of Wisconsin-Madison under the direction of Professor Leslie M. Smith. She is currently a postdoctoral research associate at the Pacific Northwest National Laboratory.

Kooloth is interested in geophysical fluid dynamics, climate feedbacks, data science, and dynamical systems. Her groundbreaking thesis is titled "Moist potential vorticity and coherent structures in the atmosphere." In it, she was able to solve a long-standing puzzle in the fluid dynamics of the atmosphere and the ocean. She introduced a moist potential vorticity and dealt with clouds in the atmosphere and with phase changes using a new Hamiltonian/Lagrangian formulation. In a series of elegant theoretical analyses, Kooloth derived fundamental conservation laws for compressible and incompressible moist dynamics with phase changes. She also used idealized numerical simulations to demonstrate and track the existence of the special potential-vorticity-conserving volumes. As one of her letter writers said, "Her dissertation work is without question the most important work in recent years in the mathematics of climate. Her theories will reshape how we think about geophysical flows with phase changes and will drive new approaches to climate modeling."

Response from Kooloth

I am thrilled to receive the AWM dissertation award. I am grateful to the letter writers who supported my nomination and to the AWM selection committee for deeming my work worthy of this honor. I am especially thankful for the support and excellent counsel of my advisor Leslie Smith during my graduate studies. I also wish to thank Sam Stechmann for the many insightful discussions and suggestions that helped shape this work. And I am incredibly lucky to have had the love and support of my family and friends.

Changing of the Guard

The sharp-eyed among you might notice that the editorial address in the sidebar to the right is now for Dandrielle Lewis rather than for me, Anne Leggett. That's because this issue is my last, after all these years as your editor, and last for Sarah Greenwald as Associate Editor (she will be continuing as co-editor of the Media Column). Dandrielle and her associate editor Jenny Fuselier will be producing the next issue (with perhaps some behind-the-scenes transitional help from Anne and Sarah). I send many, many thanks to my Newsletter Team, to graphic designer Cindy Dyer, and to everyone who has contributed since my first issue, September–October 1977. Welcome, Dandrielle and Jenny!

2024 AWM Schafer Prizes

In 1990, the Executive Committee of the AWM established the Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman. The prize is named for Alice T. Schafer (1915–2009), one of the founders of AWM and its second president. AWM will award the 34th Annual Alice T. Schafer Prizes to **Zoë Batterman**, a senior mathematics and statistics major at Pomona College, and **(Arianna) Meenakshi McNamara**, a senior mathematics and physics major at Purdue University. **Mattie Ji**, a senior at Brown University majoring in mathematics-computer science and applied mathematics, has been named as Runner-Up. The prizes will be given at the Awards Celebration on January 3rd at the 2024 JMM in San Francisco.

Zoë Batterman is a mathematics major at Pomona College. She has participated in two summer research experiences. In summer 2022, she participated in the PRiME REU at Pomona College. Her mentor praised her knowledge and ability to ask questions and write up rigorous proofs of her conjectures. In summer 2023, she participated in the SMALL REU at Williams College. She was a key contributor to three research projects, which led to four preprints with two more papers in preparation. Her mentor complimented the quality of her work, which has attracted the attention of experts in the area. In addition to these summer projects, Batterman has sought out research experiences during the academic year and has a paper in preparation with faculty at Pomona College. Batterman has received multiple scholarships and awards and received Honorable Mention for Outstanding Poster at MAA MathFest and won an Award for Outstanding Poster, MAA SoCal-Nevada Section. She has been named a Goldwater Scholar and a Pomona College Scholar.

Zoë Batterman

Batterman's mentors are very enthusiastic about her potential and skills in mathematics. Beyond her ability to produce excellent research, they spoke highly of her presentation skills and aptitude for learning mathematics at a graduate level.

Response from Batterman

It is an honor to be selected for the Alice T. Schafer Mathematics Prize. I am grateful to those who continue to recognize and encourage young women in mathematics through this award.

I would like to thank the Department of Mathematics and Statistics at Pomona College; in particular, I would like to thank Professor Shahriar Shahriari, for exposing me to proof-based mathematics through 1-2-1 Math at Pomona College, a program I participated in the summer before my first year of college. I am also grateful to Professor Konrad Aguilar for taking me under his wing and for giving me my first research project. Under his guidance, I saw the excitement and

creativity of conducting research. I would also like to thank Professor Stephan R. Garcia for supporting me to present my work at conferences.

I am also grateful for the opportunity to conduct research at REUs. I would like to thank my nominator Professor Edray H. Goins for putting the utmost care into fostering a diverse community through the Pomona Research in Mathematics Experience (PRiME). I cannot express my gratitude in words for his phenomenal attention to detail in mentoring, training, and advising me in all aspects of my mathematics career. I thank Professors Renee Bell and Alex Barrios for their warm and generous conversations and mentorship. I am deeply grateful to SMALL which made my research experience fun and rewarding. In particular, I thank Professor Steven J. Miller of Williams College who gave me the freedom to grow as a researcher. The immense dedication he has for giving opportunities to his students impresses me beyond words.

And most importantly, I thank my parents, Drs. Michael Batterman and Veronique Day, for their unwavering love and support.

(Arianna) Meenakshi McNamara is a mathematics and physics major (with honors in both) at Purdue University. She has carried out research in graph theory at Purdue and has participated in REUs in topology and discrete math at Carnegie Mellon University and in mathematical physics at Louisiana State University. McNamara is interested in a variety of mathematical research topics including quantum graphs, operator algebras, and topology. Her research work led to two papers that are already published and several in-prep works. Her work was described as strong and independent by all of her mentors, and she received numerous awards for her scholarship, including a Goldwater Scholarship, an Astronaut Scholarship, and a National Merit Scholarship. She has also presented her research at various national conferences and seminars.

McNamara has also excelled in undergraduate honors courses as well as graduate core and advanced topics courses in mathematics and physics, on topics such as analytic number theory and category theory. Her mentors praised her curiosity and maturity in mathematical research and some mentioned that working with her broadened their own research goals. In addition, McNamara has made significant contributions to the mathematical community, through leadership roles in her AWM and Women in Physics chapters, and through starting a mentoring program as president of the Purdue Math Club.

Meenakshi McNamara

Response from McNamara

I am extremely honored to have been selected as a recipient of this prize, and I would like to thank the AWM for their support and for their work to support all women in mathematics.

The support and encouragement that I have found at Purdue has played a huge role in shaping me into the person I am today, and I would like to thank all of the mentors who have supported me. I am especially grateful to Professor Rolando de Santiago for introducing me to the world of mathematical research and for believing in me and mentoring me as I have grown as a mathematician. He has been the best possible mentor I could have asked for and I would not be where I am today without him. I would also like to thank Professors Caviglia, Fischbach and Jung in the math and physics departments as well as the entire operator algebras group at Purdue for supporting and mentoring me as I have explored different areas of research.

I am also extremely grateful to Professor Florian Frick at Carnegie Mellon University for his invaluable mentorship, encouraging me to achieve my potential, and making the CMU REU into a welcoming and supportive community. This REU showed me how incredible collaborating on math research can be, and I am also thankful to my other mentors and collaborators at CMU who are all brilliant and made the experience so amazing. Additionally, I am deeply thankful to Professor Parampreet Singh at Louisiana State

University for supporting my growth in mathematics through physics, and for further encouraging me to go for my dreams.

Further, I would like to thank Professor Csaba Biro at the University of Louisville and Dr. Scott Bagley for supporting my early sparks of interest in mathematics and encouraging me to double major in math in college.

Finally, I would like to thank my friends and family who have supported and loved me throughout my life, and my partner Cameron who has been there for me through all my ups and downs in college.

Mattie Ji

Mattie Ji is a senior at Brown University majoring in mathematics-computer science and applied mathematics. She has participated in several REUs where she has displayed her natural aptitude for algebraic geometry and topology. Mattie has an extremely wide knowledge base, allowing her to significantly contribute to several different projects, including an investigation into the relationship between the concepts of Euler characteristic transform (ECT) and smooth ECT, fake projective planes, and the study of a class of conic bundle threefolds.

She has a keen interest in coding complex problems and has a fantastic repository set up on GitHub displaying her work. She is consistently described as an outstanding student with the initiative to develop her knowledge and understanding and has an infectious passion for mathematics, with a remarkable record of co-authored papers and conference presentations.

Response from Ji

First of all, it is a great honor to be recognized as the runner-up for the Alice T. Schafer Prize. I would like to thank the Association for Women in Mathematics for promoting underrepresented genders in mathematics.

I am deeply grateful to Professor Nicole Looper, who encouraged me to stay in her modern algebra class and motivated my decision to pursue mathematics. I am also incredibly thankful to Professor Lena Ji, who selected me as her first REU student at the University of Michigan and fostered my interests in algebraic geometry. They are my two biggest role models for women in mathematics.

I am indebted to Professor Lev Borisov, who believed in my potential and ability to do research in fake projective planes at the DIMACS REU while I struggled with personal hardships. I would also like to thank Professor Kun Meng, who introduced me to topological data analysis, gave me immense freedom in research, and made a profound influence on my current research directions.

I would also like to express my gratitude to Professors Richard Schwartz and Thomas Goodwillie, who have both been amazing mentors to me. Schwartz's passion in undergraduate advising is only rivaled by his depth of mathematical knowledge. Goodwillie has helped me to overcome my fear of algebraic topology and supervised my exploration of many mathematical topics.

Outside of academics, I want to thank my friends for their warmest support in my worst and best days, especially to everyone who knows what happened.

Finally, I would like to extend my deepest appreciation to Cassie Ding for making a profound impact on my mathematical journey, encouraging me to come out, and so much more. I would not be anywhere near where I am today without your support. Thank you.

WAM at IAS Receives 2023 AWM Presidential Recognition Award

The AWM Presidential Recognition Award was established in 2014 to recognize those individuals who, or programs that, have significantly increased and/or supported women in mathematics. The first award was presented at the 2015 AWM Symposium and is presented at the banquet at the biennial AWM Research Symposium. The 2023 AWM Presidential Recognition Award was presented to the **Women and Mathematics Program** (WAM) at the Institute for Advanced Study (IAS) at the 2023 AWM Research Symposium at Clark Atlanta University in Atlanta, GA.

Citation. Founded by Karen Uhlenbeck and Chuu-Lian Terng in 1993 as part of the Park City Mathematics Institute, the Women and Mathematics Program was established at the Institute for Advanced Study in 1994. To date, the program has welcomed more than 1,650 participants, resulting in a powerful network of women mathematicians. The Association for Women in Mathematics honors WAM with the AWM Presidential Recognition Award for its 30-year record of celebrating excellent mathematics and for fostering exceptional community citizenship.

WAM is an annual program with the mission to recruit and retain more women in mathematics. WAM aims to counter the initial imbalance in the numbers of men

Chuu-Lian Terng and Karen Uhlenbeck at Glimpses of Mathematics, Now and Then: A Celebration of Karen Uhlenbeck's 80th Birthday at IAS. Photo taken by Mihaela Vajiac

and women entering mathematics training as well as the higher attrition rate of female mathematicians compared to their male counterparts at every critical transition stage in mathematical careers. WAM encourages female mathematicians to form collaborative research relationships and become active in a vertical mentoring network spanning a continuum from undergraduates to emerita professors. This provides

NSF-AWM Travel Grants for Women

Mathematics Travel Grants. The objective of the NSF-AWM Travel Grants is to enable women mathematicians to attend conferences in their fields, which provides them a valuable opportunity to advance their research activities and their visibility in the research community. Having more women attend such meetings also increases the size of the pool from which speakers at subsequent meetings may be drawn and thus addresses the persistent problem of the absence of women speakers at some research conferences. The Mathematics Travel Grants provide full or partial support for travel and subsistence for a meeting or conference in the applicant's field of specialization.

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 $2300 for domestic travel and of $3500 for foreign travel will be funded. For foreign travel, US air carriers must be used (exceptions only per federal grants regulations; prior AWM approval required).

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 awm@awm-math.org or 401-455-4042 for guidance. Applications from members of underrepresented minorities are especially welcome.

Deadlines. There are three award periods per year. Applications are due **February 15**, **May 15**, and **October 1**.

support and reduces the sense of isolation experienced by many women in mathematics. While there are a number of women's programs targeted solely at undergraduates, graduate students, or postdocs, very few programs provide the depth and breadth that come from simultaneously including features tailored for undergraduate students, graduate students, and researchers from a broad spectrum of US institutions, all in one united community of scholars, as WAM does.

The core WAM curriculum includes an intensive multi-day workshop on the IAS campus, which features lectures, seminars, and working sessions on a selected topic. Beyond the core, participants are encouraged to organize evening programs around topics that are of current interest or relevant to their career development. Interested participants also have the opportunity to perform local outreach. WAM alumnae have won numerous accolades, including many AWM prizes and awards. The benefit of this program to the mathematical sciences community, and specifically to the AWM, can be measured by the number of volunteers, leaders, program organizers, and supporters who have been impacted by the WAM program and have, in turn, enriched our community with their contributions.

Response from WAM. We are honored that the AWM selected the Women and Mathematics Program (WAM) at the Institute for Advanced Study (IAS) for the 2023 AWM Presidential Recognition Award. We are very grateful for the support of AWM, the mathematical community, and the IAS, as well as the sponsors, including Lisa Simonyi, the Minerva Research Foundation, the National Science Foundation, and the Princeton University Department of Mathematics. Thank you also to the enormous group of people who have made this program possible over the years: the founders (Chuu-Lian Terng and Karen Uhlenbeck), the committee members and organizers, the lecturers and seminar speakers, the panelists and other volunteers, the IAS faculty and staff, and the participants themselves! We hope that many mathematicians will continue to benefit from the WAM program in the upcoming years. A video response is posted on the AWM YouTube Channel: https://youtu.be/ZMXW6vETLbE?si=4vemPC87MUXHmkqQ

Editors' note: The program has recently changed its name to Women+ and Mathematics (W+AM) to reflect its updated mission. At https://www.ias.edu/math/wam/about/mission we find:

> The IAS School of Mathematics is committed to developing and fostering a successful living and learning environment for our diverse mathematical community, in which all are valued. We recognize that diversity includes a range of gender identities and expressions. W+AM is open to all that support its mission. All, regardless of gender, are welcome to apply, and women are especially encouraged to apply.

NSF-AWM Mentoring Travel Grants for Women

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 is one award period per year. Applications are due **February 15**.

Meet Kathleen McKinstra!

Kathleen McKinstra, JD, joined the AWM in October as Director of Development. Her philanthropic experience encompasses all aspects of fundraising at both private foundations and at public institutions. McKinstra maintains a license to practice law in the states of Minnesota and Wisconsin. Her specialty is elder law and estate planning.

A Message from the AWM Development Office

I am honored to have been selected as the Fund Development Director at the Association for Women in Mathematics (AWM). It is clear that this organization has developed a collaborative, supportive community for all involved. I believe fostering a culture of philanthropy, from our annual appeal to planned giving, will allow AWM to thrive in the years ahead.

I would welcome the opportunity to learn why you choose to support AWM, and to listen to your ideas about

Kathleen McKinstra

the transformative role that philanthropic giving can play in advancing equity and creating opportunity for women and girls in the mathematical sciences. Let's chat! kathleen@awm-math.org

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BOOK REVIEW

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

Proving Ground. The Untold Story of the Six Women Who Programmed the World's First Modern Computer, by Kathy Kleiman, Grand Central Publishing, 2022. ISBN 978-1538718285

Reviewer: Marge Bayer

Some years ago I saw a film, *Top Secret Rosies*, about women hired by the military during World War II to do computations for ballistics. My recollection is that the film focused on their work during the war, essentially hand computations with the aid of mechanical calculators. A smaller part of the film dealt with their subsequent work as some of the first programmers of the ENIAC computer. This book tells a much more detailed story of the women's work, with most of it focused on the work with ENIAC and successor computers. It is based on substantial research by Kathy Kleiman, starting when she was an undergraduate computer science major.

The book focuses on six women (the "ENIAC 6"). Kleiman interviewed five of these six. (One died in 1986; the others lived into the 2000s.). The ENIAC 6 were

Betty Snyder Holberton, Jean Jennings Bartik, Kathleen McNulty Mauchly Antonelli, Ruth Lichterman Teitelbaum, Marlyn Wescoff Meltzer, and Frances Bilas Spence. (I have listed them with married names, although none were married when they were hired.) The title "Proving Ground" comes from a term used in the military for land used to experiment with and test weapons and tactics. This describes the ENIAC 6's initial work with the computer.

The six women were originally recruited as undergraduate math majors, mostly from colleges in the Philadelphia area, in 1942. Three of them came from women's colleges. One (Betty Snyder) was a math major at the University of Pennsylvania, where women students were first admitted in 1933 and the math classes were segregated by gender. Betty's first year calculus teacher proclaimed: "You women should be at home raising children!" [p. 36]

The Ballistic Research Laboratory (BRL) of the US Army hired these six women, and a number of others (including one African-American woman, Alyce Hall), to work at the Moore School of Electrical Engineering at the University of Pennsylvania. When they started, in the fall of 1942, the Moore School was a busy place. But after Pearl Harbor, the campus population shrank as (male) students and some faculty went off to war. Initially, the women's job was to compute ballistics trajectories. Of course, these "computers" needed instruction on the particular calculations they would do,

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and their first instructor at BRL was a lot like Betty's first calculus teacher at Penn. Fortunately, he was replaced by a supportive woman instructor.

Using mathematics developed by Oswald Veblen and Gilbert Bliss, the trajectories were calculated for a huge variety of conditions such as wind currents, temperature, speed and weight. A typical calculation took 30 to 40 hours to complete. The calculations significantly increased the accuracy of weapons. This accuracy played a part in the success of the US armed forces, but as the war went on, the hand calculations were not able to keep pace with the demand. The computers sometimes included notes in their ballistics reports, hoping that the soldiers who used them would receive their encouraging words. But apparently the soldiers did not see the original reports or these notes.
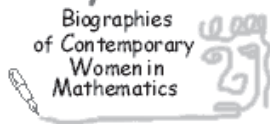
The six women of focus in the book were reassigned from their roles as "computers" to developing the first programs for ENIAC. ENIAC (the Electronic Numerical Integrator and Computer) was designed by a team led by John Mauchly and J. Presper Eckert. It was a giant machine built with vacuum tubes and operated with dials, switches, plugs and cables. Before construction was completed, the women were shown diagrams of the circuitry, etc., but were given no "user's manual." They were to figure out themselves how to operate the machine to carry out the computations. They developed procedures, which they referred to as "direct programming," to input numbers, get the computer to do the right sequence of calculations (at the right time), and output answers, by flipping switches and plugging in cables. According to the book, the women consulted with engineers on the basic operation of the machine but did all this "programming" themselves. They tested the machine and their procedures by doing a long hand calculation, then stopping the machine at intervals to check if the intermediate results matched. Thus, they found the value of the breakpoint in debugging. At one point, identifying an error, but not being able to find out why it happened, they eventually discovered that a vacuum tube had failed.

From today's vantage point it is hard to imagine the strides the ENIAC 6 had to make—figuring out how to get the machine to do loops, and how to implement if… then… statements, for example. While a single calculation by ENIAC was very fast, the awkward direct programming made the calculation of a trajectory slower than needed (though still faster than the hand calculations!). This led the women to develop the rudiments of parallel programming.

The detail in the book demonstrates the enormous contributions of these six women in the development of computer programming. They were not recognized for this at the time. The inventors Mauchly and Eckert apparently had a lot of respect for the women and their contributions. But this was not true of the administrators in charge. Once ENIAC was working, the Army decided to go public and scheduled events for the press and for the scientific community. At the press event, the six women were engaged as hostesses. Male mathematicians delivered the presentation and did not mention the fact that the programming had been done by women. After the presentation, lunch was provided for the attendees and the ENIAC 6 were expected to pour the coffee.
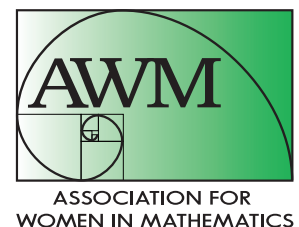
On "Demonstration Day," the event scheduled for the scientific community, the ENIAC 6 were engaged to greet the attendees and direct them to the coatracks. In the demonstration of ENIAC, the women were not mentioned. Demonstration Day ended with a celebratory dinner, to which the women were not invited. Five months later, the Moore School had one more public event: the Moore School Lectures, given by Mauchly and Eckert, on the foundations of modern computing. This time the ENIAC 6 were not invited, and apparently there was not a single woman in attendance. Betty and Jean sat in a room next door to hear the presentations.

When the ballistics work ended, ENIAC was used for a variety of scientific calculations, and the ENIAC 6 continued in their programming roles for a while. Kleiman mentions a few of these projects, including a project on rounding errors with Hans Rademacher. Then ENIAC was relocated from the University of Pennsylvania to the Aberdeen Proving Grounds. One of the 6 (Marlyn Meltzer) left the group at that time, while four moved to Aberdeen and Jean stayed in Philadelphia while working on a specific project on the ENIAC. At that point, they also got long-overdue promotions in title, from "subprofessionals" to "professionals." Moving the giant machine was a major feat, taking months. When all of it was in Aberdeen, Kay and Ruth helped to rebuild it—they used programming to find hardware problems in the reconstruction.

By 1948 most of the women had moved on. Betty was hired by the new Mauchly-Eckert Computer Corporation, which built the UNIVAC. Fran and Kay stayed a bit longer at Aberdeen, but Kay later was also very involved in the Mauchly-Eckert company, after marrying John Mauchly. Ruth worked in computing in Texas. Jean worked with John von Neumann and others to convert ENIAC into a stored-program computer, and later also joined the Mauchly-Eckert company.

Although the ENIAC 6 were largely forgotten for decades, Kleiman pointed us [p. 242] to recognition of Betty (Frances Elizabeth Holberton) by Donald Knuth in his 1973 *The Art of Computer Programming*. (See the history section in the chapter on sorting in Volume 3.) And Kleiman quotes Joel Shurkin, from his 1996 history of computing book, The Engines of the Mind: "the best early programmers in computer history … were women," with particular mention of Betty Holberton. [p. 221] However, Kleiman points to several instances of photographs of the ENIAC (some included in the book), where women and men were pictured, but only the men were identified. In 2019 Ruth was in a picture on the cover of *Time Magazine*, but she was not named.

The author referred to all the people in the story by their first names. I assume this was because she wanted to present the women in a more personal way, and then she did not want to treat the men differently. It was sometimes confusing, however, since two of the main male participants were named John. Also, if one didn't remember who one of the men was, it was hard to find him in the index, where, of course, all were listed by their last names.

In the Epilogue, Kleiman notes some negative responses to her research, dismissing the value of the work of the ENIAC 6 and other women programmers. Kathy Kleiman has given us a well-documented book that proves the importance of these women. She has been recognized with the IEEE William and Joyce Middleton Electrical Engineering History Award. I recommend the book highly.

2025 AWM Prizes and Awards Call for Nominations

Nominations for the following AWM prizes and awards will be accepted between **April 1 and May 15, 2024** on mathprograms.org and will be presented during the Awards Celebration at the Joint Mathematics Meetings in Seattle in 2025.

2025 Class of AWM Fellows

The Association for Women in Mathematics Fellows Program recognizes members of any gender who have demonstrated a sustained commitment to the support and advancement of women in the mathematical sciences, consistent with the AWM mission: "to create a community in which women and girls can thrive in their mathematical endeavors, and to promote equitable opportunity and treatment of women and others of marginalized genders and gender identities across the mathematical sciences." For more information visit https://awm-math.org/awards/awm-fellows/.

2025 Louise Hay Award

The Louise Hay Award for Contributions to Mathematics Education recognizes outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense. The annual presentation of this award is intended to highlight the importance of mathematics education and to evoke the memory of all that Hay exemplified as a teacher, scholar, administrator, and human being. For more information visit https://awm-math.org/awards/hay-award/.

2025 M. Gweneth Humphreys Award

The M. Gweneth Humphreys Award recognizes outstanding mentorship activities. This prize is awarded to a mathematics teacher who has encouraged women undergraduate students to pursue mathematical careers and/or the study of mathematics at the graduate level. M. Gweneth Humphreys (1911–2006) taught mathematics to women for her entire career, first at Mount St. Scholastica College, then for several years at Sophie Newcomb College, and finally for over thirty years at Randolph-Macon Woman's College. This award, funded by contributions from her former students and colleagues at Randolph-Macon, recognizes her commitment to and her profound influence on undergraduate students of mathematics. For more information visit https://awm-math.org/awards/humphreys-award/.

2025 Joan & Joseph Birman Research Prize in Topology and Geometry

The Joan & Joseph Birman Research Prize in Topology and Geometry highlights outstanding research by a woman in topology and geometry. Made possible by a generous contribution from Joan Birman who works in low dimensional topology and her husband Joseph Birman who was a theoretical physicist, this prize has been awarded every other year since 2015. For more information visit https://awm-math.org/awards/awm-birman-research-prize/.

2025 Mary & Alfie Gray Award for Social Justice

The Mary & Alfie Gray Award for Social Justice recognizes the vigorous and imaginative application of the mathematical sciences to advancing the cause of social justice, defined as promoting a just society by challenging injustice and valuing diversity. The prize, awarded for the first time in 2023, is named for Mary Gray, Founder and Past President of AWM, who has lived her life fighting for social justice and human rights, and Alfred Gray who was devoted to working with mathematicians from around the world, and with students from underrepresented groups within the United States. For more information visit https://awm-math.org/awards/gray-award/.

Facilitating Accessibility in Our Courses

Megan Breit-Goodwin, Anoka Ramsey College

The National Center for Education Statistics (NCES) found that in 2015–2016, the percentage of undergraduate students who reported having a disability was 19.4% (NCES, 2018). However, findings from a national study of students who were enrolled in college in 2016, showed that only 37% of students who responded that they had a disability while attending college informed their college of the disability (NCES, 2022).

Students with disabilities are in our courses and, whether or not their disabilities are disclosed, faculty are responsible for developing and delivering courses that are inclusive and accessible for all students. How to implement accommodations in course-specific ways is a particular challenge for individual instructors in quantitative or lab-based STEM fields. Unfortunately, the intersection of disability-accessibility and accommodation efforts and quantitative STEM disciplines is an underdeveloped area of expertise.

In one recent effort to address this, the American Mathematical Association of Two-Year Colleges,[1] the Two-Year College Chemistry Consortium,[2] and the Organization for Physics at Two-Year Colleges[3] held a three-day workshop in June 2023, titled "Facilitating Accessibility in STEM at Two-Year Colleges" (NSF #2228226).[4] The workshop, hosted by Minneapolis College in Minnesota, brought together faculty from several STEM disciplines. Participants learned about Universal Design for Learning[5] (UDL), disability accommodations, and disability justice. They also gained specific, hands-on, teaching techniques to support students with specific kinds of disabilities (e.g., vision impairment, deaf or hard of hearing, mobility disability, ADHD, and autism spectrum disorder).

The conference began with an opening keynote talk on a UDL Framework by Erin Scanlon, a member of the physics department at the University of Connecticut, Avery Point. Her keynote provided a background on UDL guidelines for providing accessible content and experiences for students with a focus on how students receive information, demonstrate understanding, and engage with STEM content. Scanlon's presentation set the stage for the workshop by providing space and a shared vocabulary for participants to reflect on their roles and actions as educators in supporting diverse learners. It also prepared participants to identify barriers in learning environments and begin to design more inclusive environments.

The workshop also included:

- A presentation on neurodiversity in the classroom and laboratory, and sessions on improving student success in biology, chemistry, and mathematics settings facilitated by Douglas Lynch, Kim Coleman, and Christin Monroe, STEM faculty at Landmark College.[6]
- Presentations on accessibility for deaf and hard of hearing students, and the development of inclusive materials through the use of alternative text, closed captioning, and interactive content led by Britt Mammenga, Closed Captioning Coordinator at Minneapolis College, and Jill Moe, Assistive Technology Specialist at Minneapolis College.
- A presentation and discussion about disability justice and opportunities for change within STEM fields led by Travis Sandland of the IDEAL Center[7] at the Science Museum of Minnesota.
- A workshop on translating visuals in introductory STEM courses into accessible resources for students with low or no vision developed by Katherine Ryker, Geoscience faculty member at the University of South Carolina, and Annie Klyce, Earth and Environmental Sciences Senior Lecturer at Vanderbilt University, presented by Ryker.
- A tour of Minneapolis College's campus, hosted by students with disabilities, focusing on classroom and laboratory environments.

The student-hosted tour was particularly meaningful to me. I learned from a student with a visual disability

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[1] https://amatyc.org
[2] https://2yc3.org
[3] https://optycs.aapt.org/
[4] https://amatyc.org/page/AccessibilityInSTEM
[5] For an overview of UDL for postsecondary settings, please see http://udloncampus.cast.org/page/udl_about

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[6] Landmark College was the first higher education institution in the United States designed to serve neurodiverse learners. See https://www.landmark.edu/
[7] https://new.smm.org/ideal-center

that they were responsible for ensuring their service dog was properly attired for laboratory experiences.[8] Canine protective equipment is expensive and can impose an insurmountable financial burden for students. Another student who utilized a motorized wheelchair shared some of the ways their disability came into conflict with individual course policies that fell outside of their articulated accommodations. For example, transportation options to get to campus in Minnesota are sometimes not feasible for people in wheelchairs because snowbanks on curbs and unplowed sidewalks can make access to public and mobility transit challenging. When this happens, it can result in unexpected hours-long delays and missed classes. Because of missed classes, the student had to learn the course content independently and leverage supports like additional tutoring. The student was reluctant to ask for extensions on due dates because of negative past experiences with such requests and personal feelings around their own agency and experience in such situations.

At times, the workshop felt overwhelming because the need to do better for our students with disabilities is so great. However, I was encouraged and supported by the other participants who were also looking to learn and make changes to their practices. Here are three key takeaways that I learned from the workshop:

1. Good teaching practice calls for us to create more accessible documents, select accessible materials, and utilize UDL practices for course design. The Do-IT Center[9] at the University of Washington provides open access general UDL resources for education and specific resources for STEM. It is fine to start with just one document that you aim to make accessible.
2. The list of accommodations that is officially given through a campus disabilities services center is an opportunity to start a conversation with your students. Ask students what has worked well for them in the previous courses and discuss what the accommodations could look like in your course. Then make a plan to continue the conversation during a follow-up meeting a few weeks into the semester.
3. Partner with students and connect with colleagues in your department, institution, and professional organizations to do this work. Share resources, creative ideas, and most of all, encouragement.

I can vouch for the third point from a recent experience. Several weeks into the Fall 2023 semester, a student let me know that there were aspects of the eText selected for the course that were not accessible for them due to a disability. This led me to have conversations about this problem with my colleagues, my textbook representative, and my college's disabilities services. Together, we learned some new functionalities within the eText that helped my student. When I shared these resources and functionalities with the class, they received positive feedback from other students. With the help of our campus disability services personnel, the math department recognized the need to update some physical copies of textbooks within our tutoring centers, veteran's services center, and the reserves in our library to ensure the newest editions were available for students. The ripple of impacts that emerged from a single conversation with one student has already supported greater access for many students on my campus.

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[8] See Roy (2022) for more about service animal accommodations in science and STEM laboratories.
[9] https://www.washington.edu/doit/

MEDIA COLUMN

In addition to longer reviews for the Media Column, we invite you to watch for and submit short snippets of instances of women in mathematics in the media (WIMM Watch). Please submit to the Media Column Editors: Sarah J. Greenwald, Appalachian State University, appalachianawm@appstate.edu and Alice Silverberg, University of California, Irvine, asilverb@math.uci.edu.

Representation is Important, But Insufficient: Why the Olay #FacetheSTEMGap Campaign Needs to Go Deeper

Nicole M. Joseph, Associate Professor of Mathematics Education, Vanderbilt University

In the last couple of years Olay embarked on a 10-year #FaceTheSTEMGap media campaign which has a goal to double the number of women in STEM and triple the number of women of color in STEM by 2030 (Olay is Facing the STEM Gap, n.d.). The initiative was kicked off with a $1 million commitment and an initial $500,000 donation to Historically Black Colleges and Universities (HBCUs) to support women of color in pursuit of STEM careers. Olay's campaign includes four components: (1) celebrating the next generation of Black women leaders in STEM with a partnership with *Ebony Magazine* that highlighted in the February 2022 print edition, Black women STEM majors at HBCUs who were chosen for the HBCU STEM Queens pageant; (2) memorializing Mary Golda Ross, the first-known Native American female engineer and the first female engineer of Lockheed Martin, with a statue located in a museum in Ross' hometown; (3) providing mentorship through virtual panels for high-school students featuring female role models in STEM fields; and (4) illuminating career paths in STEM by creating a space-themed, limited-edition moisturizer jar inspired by the mission of the initiative (Olay Announces Second $1 Million Commitment, 2022). So, what are the affordances of such a campaign? First, Olay is a major beauty skincare company that can shed light on these issues in a public way, such as through social media. Next, they provide a financial commitment to contribute to national efforts focusing on increasing the number of women of color in STEM. Finally, this campaign has developed important partnerships, specifically with HBCUs that provide opportunities to elevate young Black women

contributing to STEM futures. Overall, the Olay campaign is beautiful, inviting, and "non-threatening" to the power structure. Olay's focus on increasing numbers is surely important, but it is limited in that it does not address deep inequalities and harm that STEM as a "system" has perpetrated against women of color (Joseph, 2021; Martin, 2019). I have written elsewhere that for far too long, Black communities have experienced a lengthy and complicated history of structural barriers; epistemological, symbolic, and intellectual violence; dehumanization; and antiblackness in STEM, and that a critical-historical framing is necessary in order to challenge the ahistoricism implicit in such national efforts as the Olay #FaceTheSTEMGap (Joseph, Frank, & Elliott, 2021). In other words, a different type of strategy (that I will say more about later) is necessary to truly address the gender gaps in STEM.

Olay is a skin care company started in South Africa by a white male South African chemist in the 1950s, during the time of apartheid. In 1991 it was the first mass-market skincare brand to offer antioxidants and UVA/UVB protection (The Olay Story, n.d.). Olay has been on the cutting edge of skincare beauty and science innovation for decades. It is considered one of the largest cosmetic brands in the world. With this type of prominence, I would presume that Olay would go below the surface of the STEM gap to better understand that these issues facing Black women and other women of color are historical, political, economic, and educational, rooted in latent power and oppression. I say that because Olay themselves have firsthand experience with the entrenched complexities of STEM Gap discourse and efforts. For example, in 2020, Olay was criticized by the Black Lives Matter Movement for making a public statement about standing with the Black community against racial injustice yet was selling skin-lightening products in their Asian market (Rajagopalan, 2020). Skin-lightening processes are rooted in colonial history, and South Africa is one of those countries that have participated in focusing on lightening darker skin (Dlova et al., 2014). Within days of Olay posting that statement about racial justice, a Malaysian influencer wearing a white hijab was promoting an Olay product called "White Radiance Light Perfecting Essence." This product, according to Olay, provides "dual whitening action" for "luminous fairness" and "inhibits melanin formation in the deepest layer of skin" (Rajagopalan, 2020). There were several angry comments towards Olay, one quite salient:

> Stop making and selling fairness and skin lightening products across the world. You have done enough damage to us dark skinned Indian women. Just stop. (Rajagopalan, 2020)

These types of comments point to a heavy issue that is far beyond getting more women of color in STEM. These issues are rooted in white supremacy and gendered antiblackness (Joseph, 2021). Powerful decision-makers such as Olay should be bold and unrelenting in contributing to the struggle for gender equity in STEM.

The Olay-Ebony STEM partnership is one of the four components of their initiative that specifically aims to address Black women in STEM. I study the experiences of Black women and girls in mathematics and STEM broadly, and what I have learned is that Black women and girls have always been here in STEM, but structural and oppressive barriers get in the way of their true visibility and contributions. For example, the Mag 5 (my term in my new book) earned PhDs in mathematics during the Jim Crow Era and continued to contribute to industry, academe, and their communities (Joseph, 2022). Dr. Euphemia Haynes was the very first Black woman to earn a doctorate in mathematics in the US; it was from Catholic University in 1943. Dr. Evelyn Granville was the second and she finished from Yale University in 1949. In addition to serving as a department chair of mathematics at Fisk University (an HBCU in Nashville, TN), she wrote math curricula and worked as a mathematician for IBM (International Business Machines) focusing on the orbit computations and computer procedures for NASA's Project Mercury. Drs. Marjorie Lee Browne, Gloria Conyers Hewitt, and Vivienne Malone-Mayes finished in 1950, 1963, and 1966 respectively. All of them faced intersectional discrimination that worked against possible aspirations they had for themselves.

Today is honestly not any better. STEM continues to reject many Black girls and women. STEM rejects Black girls and women in part because of the exclusion and the stereotypes that they are not smart enough or intellectual enough to be in STEM spaces—from gifted programming in the K–12 setting, to undergraduate majors, to earning doctorates in STEM disciplines. The pipeline is filled with gatekeepers: high school guidance counselors, standardized tests, and high school algebra (a key STEM gatekeeper course) to name a few. Moreover, beginning with pre-school, Black girls are criminalized and adultified, not receiving clemency like white girls receive (Joseph, 2022). Their full humanities are not welcomed in schools and in mathematics classrooms specifically because they are viewed as too social, talkative, and loud—aspects many teachers see as not a part of a strong mathematics learner (Joseph et al., 2019). In Joseph (2022), I make a case that Black girls want to be social in their mathematics learning; they want to laugh, and to be in a more familial environment as they learn math. Black girls see being competent in mathematics, not by a letter grade, but by their abilities to help others. Yet many mathematics teachers fail to understand Black girlhood and see their full potential as future mathematicians and scientists (Lim, 2008). There are few structural supports and policies to ensure they are engaging to their full potential because we have a STEM system that was created intentionally for only a few to be successful. But out of the ashes, many Black girls and women rise. Black women persist through and sometimes the cost is very high; for example, they may not recognize themselves when they finish STEM degrees or being in STEM as an industry leader, because they have stripped themselves of who they are authentically to fit in or be accepted by an oppressive system—a gendered anti-black and patriarchal space (Joseph, 2022; Battey & Leyva, 2016; McGee & Bentley, 2016). And additional complexities are that while HBCUs such as Spelman have embedded missions to develop leadership in their young Black women, these same Black women also faced challenges as they later earn advanced degrees and enter the workforce because all higher education institutions and organizations have been shaped by whiteness and white supremacy (Borum & Walker, 2011; Squire, Williams, & Tuitt, 2018). Interrogating these systems and relinquishing some power are work that many do not want to do, including Olay.

So where do we go from here? I never like to leave on a low note even though the issues are profound and overwhelming sometimes. I remain hopeful and always provide space to freedom dream of possibilities (Kelley, 2022). Olay focusing on underrepresentation AND the following would position them and other organizations who care about racial justice for women of color in STEM in a radical and new way: (1) partner with and compensate women of color education researchers who bring expertise in these areas to learn about the deeper issues facing women of color in STEM so as to inform future campaigns; (2) create an agenda that comes from the partner work that is focused on structural inequalities in the STEM system—for example, how might a national convening by Olay bringing together a group of national beauty companies to hear from WOC researchers contribute to changing the discourse and actions of cosmetic organizations; (3) finance K–12 public schools that desire to partner with Olay in developing critical STEM courses focused on interesting and innovative curricula, such as the chemistry of beauty products. These courses could be a part of a community effort and be located in informal settings if not in traditional schools.

Overall, the Olay #FaceTheSTEMGap campaign is a great effort. At the same time, a company of such dominance can do much more given their commitments to racial justice. They must be about the work with more than just words. A radical boldness to challenge patriarchy, white supremacy, and gendered antiblackness in STEM is necessary. Women of color deserve our labor in this work, and it must be a solidarity project so as to ensure white saviorism is avoided. Let's do this work together!

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2023 AWM Research Symposium

Elizabeth Donovan, Lakeshia Legette Jones, and Darla Kremer

The seventh biennial Association for Women in Mathematics Research Symposium took place at Clark Atlanta University (CAU) from September 29 through October 2, 2023; the event was hosted by CAU in partnership with the Atlanta University Data Science Initiative. It was a beautiful fall weekend in Atlanta and CAU welcomed:

- 386 registered participants (137 were students!)
- 5 plenary lectures
- 3 panels
- 8 roundtable discussions
- 30 special sessions

- 221 research talks in pure mathematics, applied mathematics, or mathematics education
- 39 early career poster presenters
- A Wikipedia edit-a-thon.

Plenary lectures were presented by **Lillian Pierce** (Duke University), Counting Problems, **Nicole M. Joseph** (Vanderbilt University), Making Black Girls Count in Mathematics Education: A Black Feminist Vision of Transformative Teaching, **Ranthony A.C. Edmonds** (The Ohio State University), Quantifying Fairness, and **Ulrica Wilson** (Morehouse College), A Tour Through Noncommutative Rings.

A public lecture was delivered (and live-streamed) on Monday morning by **Monica Jackson** (American University), Pandemic vs Epidemic: Applications of spatial statistics for disease surveillance. CAU Provost & Senior VP for Academic Affairs, **Charlene D. Gilbert**, introduced Jackson.

If you missed these lectures watch them on the AWM YouTube Channel: 2023 AWM Research Symposium – YouTube. https://www.youtube.com/channel/UCwyJyDCeoUC88KsdrDc_zjg

There were three panel presentations: *Research Collaboration Conferences and Networks for Women*, moderated by **Karamatou Yacoubou Djima**, Wellesley College, in which panelists **Kristine Bauer**, University of Calgary, **Megan Kerr**, Wellesley College, **Hala Nelson**, James Madison University, and **Michelle Manes**, University of Hawai'i at Mānoa, discussed the rewards and challenges of starting and maintaining such an AWM Research Network; NSF Division of Mathematical Sciences Program officers **Stacey Levine**, **Yuliya Gorb**, and **Jodi Mead** offered insights into the NSF proposal and review process in the panel *Women in the Division of Mathematical Sciences at NSF*; and the *Math Research in Government and Government Labs* panel was dedicated to raising awareness of the opportunities for mathematicians throughout government; **Angela Robinson**, National Institute of Standards and Technology, moderated with panelists **Emma Cohen**, Center for Communications Research, **Sarah Chehade**, Oak Ridge National Laboratory, **Danielle Middlebrooks**, National Institute of Standards and Technology, and **Ashlyn W.**, National Security Agency.

In addition to panels and special sessions, this year **Francesca Bernardi**, Worcester Polytechnic Institute, hosted *A Training Edit-a-Thon to Close the "Wikipedia Gender Gap"* and several informal roundtable discussions took place. **Donatella Danielli**, **Kathryn Leonard**, **Michelle Manes**, and **Ami Radunskaya** hosted *Writing Extraordinary Papers and Spectacular Referee Reports*; **Nora Heitzman-Breen**, **Quiyana Murphy**, and **Jennifer Smucker** hosted *Student Led Discussion on the Graduate Student Experience*; *Application of Equations of Mathematical Physics* was led by **Bakhyt Alipova**; another roundtable, *Discussion of Academia, Government, and Industry: Culture, Pathways, and Representation* was hosted by **Christina Edholm**, **Maryann Hohn**, and **Ami Radunskaya**; The roundtable *Math for All Discussion*, organized by **Robyn Brooks**, **Swati Patel**, and **Padi Fuster**, was a follow-up discussion to one of the special sessions and *Constructing an "Elevator Pitch"* was a two-part session organized by **Matt Sammons** and **Brooke Ogrodnik**, allowing for participants to practice before reconvening. A subset of the AWM Policy and Advocacy Committee (**Deborah Lockhart**, **Karoline Pershell**, **Michelle Snider**, and **Bianca Thompson**) rounded out the symposium with a presentation entitled *The Room Where It Happens: A Community Roundtable on AWM's Policy & Advocacy Priorities* about AWM's advocacy work and a discussion of future priorities.
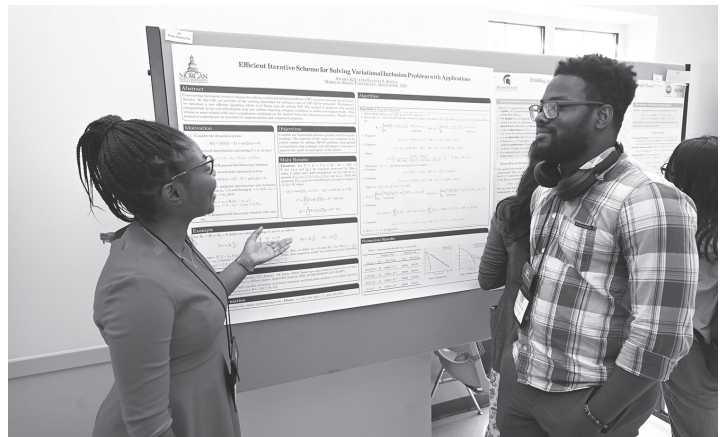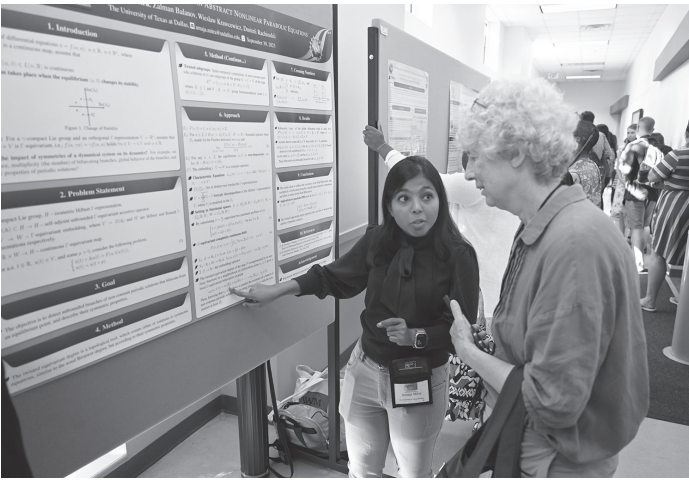
There were two AWM poster sessions during this event in which 39 undergraduates, graduate students and recent PhDs presented their work to a packed hallway of interested participants. The poster session was centrally located near the exhibit hall, the ice cream truck and the cookies.

Representatives from the American Mathematical Society (AMS), the Casualty Actuarial Society (CAS) and Network of Actuarial Women and Allies (NAWA), De Gruyter Academic Publishing, Georgia Institute of Technology, Institute for Defense Analyses and Center for Communications and Computing Research (IDA/CCR), Metron, Inc., National Security Agency (NSA), Society for Industrial and Applied Mathematics (SIAM), Springer Nature, University of Minnesota, and AWM were on hand to interact with symposium participants and to recruit members, authors, employees, and students. Lunchtime yoga was provided by Yoga at Heart.

The Saturday Reception at the Hyatt Regency Atlanta was a great time to connect with old friends and make new connections.

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 and a searchable database of all 276 abstracts are available at https://awm-math.org/meetings/awm-research-symposium by clicking on the appropriate links. If you want to read all 545 abstracts from the 2022 and the 2023 symposium, just reset the search query! The sessions were:

Advances in Partial Differential Equations and Applications, organized by **Maya Chhetri**, UNC Greensboro, **Nsoki Mavinga**, Swarthmore College, and **Irina Mitrea**, Temple University;
Application of Monte Carlo Methods to Real-World Problems, organized by **Francesca Bernardi**, Worcester Polytechnic Institute, and **Andrea Arnold**, Worcester Polytechnic Institute;
Combinatorial and Homological Methods in Commutative Algebra, organized by **Francesca Gandini**, University of Primorska, and **Selvi Kara**, University of Utah;
Computational Inverse Problems and Uncertainty Quantification, organized by **Julianne Chung**, Emory University, **Rosemary Renaut**, Arizona State University, and **Malena Sabate-Landman**, Emory University;
Driving Cultural Change in the Mathematical Sciences: Advice and Reflections from AWM's Moving Towards Action and Aligning Actions at Crossroads Workshop Participants, organized by **Elizabeth Donovan**, Murray State University, and **Emerald Stacy**, Washington College;

Early Career Researchers in Mathematical Biology and Differential Equations, organized by **Rayanne Luke**, George Mason University, **Sarah Strikwerda**, University of Pennsylvania, and **Prajakta Bedekar**, Johns Hopkins University;
Exploring the Intersection of Mathematics and Ecology: Research Applications and Findings, organized by **Lakmali Weerasena**, University of Tennessee at Chattanooga, and **Maeve McCarthy**, Murray State University;
Extremal and Probabilistic Combinatorics, organized by **Jinyoung Park**, Courant Institute, and **Corrine Yap**, Georgia Institute of Technology;
Geometric and Categorical Aspects of Representation Theory and Mathematical Physics, organized by **Mee Seong Im**, United States Naval Academy, and **Xin Jin**, Boston College;
Interdisciplinary Research at the Interface of Math and Life Science, organized by **Asma Azizi**, Kennesaw State University, and **Somayeh Mashayekhi**, Kennesaw State University;

Math for All Special Session, organized by **Robyn Brooks**, Boston College, **Swati Patel**, Oregon State University, and **Padi Fuster**, University of Colorado Boulder;
Meet Researchers Behind the Real-Life Examples of Elementary Statistics: A Guide to Data Analysis Using R, organized by **Nancy L. Griesinger**, Texas Southern University;
Multiscale Modeling for Preclinical and Clinical Oncology, organized by **Maureiq Ojwang'**, Moffitt Cancer Center, and **Chengyue Wu**, Oden Institute, University of Texas at Austin;
Number Theory at Primarily Undergraduate Institutions, organized by **Bella Tobin**, Agnes Scott College, and **Leah Sturman**, Oregon State University;
Post-Quantum Cryptography, organized by **Ryann Cartor**, Clemson University, and **Angela Robinson**, NIST;
Progress in Low-Dimensional Topology, organized by **Akram Alishahi**, University of Georgia, **Jennifer Hom**, Georgia Institute of Technology, **Feride Ceren Köse**, University of Georgia, **Gordana Matic**, University of Georgia, and **Hannah Turner**, Georgia Institute of Technology;

Promoting Children's and Women's Health with Mathematical and Computational Approaches, organized by
Karin Leiderman, UNC Chapel Hill, and **Anna Nelson**, Duke University;
Pure and Applied Talks by Mathematicians Enhancing Diversity in Graduate Education (EDGE), organized by
Quiyana M. Murphy, Virginia Tech, and **Sofía Martínez Alberga**, Purdue University;
Recent Advancements in the Mathematics of Materials Science, organized by **Anna Zemlyanova**, Kansas State
University, and **Silvia Jiménez Bolaños**, Colgate University;
Recent Advances in Curves and Abelian Varieties, organized by **Renee Bell**, Lehman College (CUNY),
Padmavathi Srinivasan, ICERM, and **Isabel Vogt**, Brown University;

Recent Developments in Control, Optimization, and the Analysis of Partial Differential Equations, organized by
Lorena Bociu, North Carolina State University, and **Pelin Guven Geredeli**, Iowa State University;
Rethinking Number Theory, organized by **Deewang Bhamidipati**, University of California, Santa Cruz,
Eva Goedhart, Franklin & Marshall College, and **Amita Malik**, Pennsylvania State University;
Special Session on Discrete Harmonic Analysis, organized by **Christina Giannitsi**, Georgia Institute of
Technology, and **Michael Lacey**, Georgia Institute of Technology;
Tensor Methods for Data Modeling, organized by **Anna Konstorum**, IDA/CCS;
Tropical Geometry, organized by **Josephine Yu**, Georgia Institute of Technology, and **Abeer Al Ahmadieh**,
Georgia Institute of Technology;

Women in Dynamical Systems and Applications, organized by **Christina Athanasouli**, Georgia Institute of Technology, and **Rachel Kuske**, Georgia Institute of Technology;

Women in Groups, Geometry, and Dynamics, organized by **Hannah Hoganson**, University of Maryland, and **Rylee Lyman**, Rutgers University;

Women in Mathematical Biology: Computation and Modeling, organized by **Katharine Gurski**, Howard University, and **Yeona Kang**, Howard University;

Women in Quantum Algorithms and Computing (WQAC), organized by **Sarah Chehade**, Oak Ridge National Laboratory;

Women in Tensor Optimization, organized by **Longxiu Huang**, Michigan State University, and **Jing Qin**, University of Kentucky.

The Symposium Banquet took place on Sunday in the award-winning AUC Robert W. Woodruff Library Exhibition Hall, where we were surrounded by an exhibit from the Joseph Echols and Evelyn Gibson Lowery Collection, Printed and Published Material Series. The banquet was sponsored by the American Mathematical Society and the pre-banquet reception was sponsored by SIAM. AWM President **Talitha Washington** presented the AWM Presidential Recognition Award to Women+ and Mathematics (W+AM) at the Institute for Advanced Study, founded by **Karen Uhlenbeck** and **Chuu-Lian Terng**. A video response from W+AM features Uhlenbeck and W+AM Executive Director, **Wei Ho**. Washington spoke about the AWM and our programs and thanked the local organizers (**Brian Bentley**, **Eboni Dotson**, **Lakeshia Legette Jones**, **Shanise Walker** and, of course, **Talitha Washington**), who worked so hard to make this event a success.

AWM is grateful to **Clark Atlanta University** and **The Atlanta University Center Data Science Initiative** for hosting this symposium; to our sponsors: the **American Mathematical Society**, the **Casualty Actuarial Society** and the **Network of Actuarial Women and Allies**, **Jane Street Capital**, **MDPI**, **Metron**, the **National Science Foundation**, the **Society for Industrial and Applied Mathematics**, **Springer Nature**, and **Valani Global**; and to our Sponsoring Institutional Members: **North Carolina State University** and the **University of Waterloo** for their generous support.

If you missed it—we are already planning the next one…see you in 2025!

Thank you, sponsors!

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Urgent Priorities: Inviting the Membership to Drive AWM's Advocacy Focus

Policy & Advocacy Committee, Michelle Snider, Chair

Mission of the Policy & Advocacy Committee

The P&A Committee seeks to support the whole of AWM membership. Every statement and policy we craft is in line with the AWM's mission statement, and when we consider whether or not to sign on to statements from other organizations or to endorse proposed legislation, we weigh them against our legislative priorities. As of this writing, they are:

• To expand STEM educational opportunities;
• To support research funding;
• To encourage work/life balance;
• To create a welcoming environment;
• To modernize self-perpetuating mechanisms that limit public recognition of our achievements.

As one of its responsibilities, P&A writes statements on behalf of the AWM, as well as signs on to statements and letters from other organizations. Historically, these have included actions ranging from endorsing legislation which would increase access to data science education in the US, to commenting on international political movements. The larger framework of our statements is the context of addressing demographic disparities in mathematical careers across gender and racial lines, and supporting the systemic changes needed to both attract and anchor more diverse populations in these fields. Our endorsements and statements just over the past few years have included support for data science literacy legislation, support for protests in Iran over women's rights, comments on proposed changes to Title IX, condemnation of state laws negatively impacting LGBTQ+ populations, and condemnation of the federal rolling back of protection of access to reproductive healthcare. All of P&A's statements and endorsements can be found on the AWM website at https://awm-math.org/policy-advocacy/endorsements.

The AWM Policy & Advocacy (P&A) Committee is charged with oversight of AWM's activities and policy development in the area of public affairs, including statements on behalf of AWM. This includes responding to queries from the community that relate to policy and advocacy, seeking opportunities to collaborate with other societies on issues involving advocacy, monitoring and updating the AWM website to ensure that it includes appropriate policy statements, and working with the Government Advocacy Committee to prepare and approve AWM initiatives for Capitol Hill Days.

The topics that P&A takes on come from a range of sources, both internal to the AWM such as from the Executive Committee, student chapters, or individual members; and external including from the Coalition for National Science Funding (CNSF), other mathematical organizations, and legislative offices. The committee charge guidelines are fairly broad, and it is up to P&A to decide which topics are in line with the AWM Mission and Legislative Priorities, and to judge their importance to the membership as a whole.

P&A Asked for Membership Priorities

P&A works to connect with the membership to understand where to focus our efforts and has collected data in two ways:

1. P&A circulated a digital survey to the membership in the September 2023 eCommunication.
2. P&A held a roundtable session, *The Room Where It Happens*, at the 2023 Research Symposium.

The results presented in this article are drawn from both data sources.

The results of the survey highlighted the priorities of the membership, clustering into a few major themes:

• recruitment and retention
• reaching out to bring a more diverse population into mathematics; and
• anchoring mathematicians in the profession.

Comments ranged from the broad ("eliminate toxicity in departments") to the very specific ("reduce usage of phrases like 'You've probably seen this before/It easily follows'" which can make people feel like they don't belong).

Of note: AWM members are looking for ways to get involved and access resources. We highlight applicable items throughout this article!
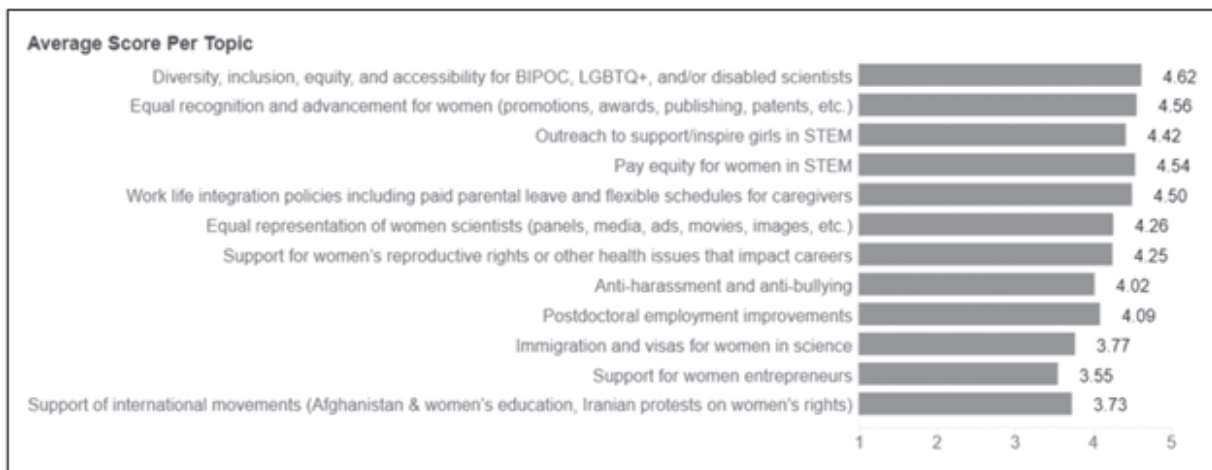
Summary of Findings

Survey respondents were asked '"how important do you think each of the following topics are for AWM to engage with?" on a scale of 1 to 5, with 1 corresponding to "Least Important" and 5 "Most Important." Figure 1 shows all the averaged responses to the question. Respondents were then asked to pick their top 3 priorities. Figure 2 shows the percentage of respondents that picked each topic as one of their top 3, with the highest scoring responses being:

1. Diversity, inclusion, equity, and accessibility for BIPOC, LGBTQ+, and/or disabled scientists (55.4%),
2. Equal recognition and advancement for women (promotions, awards, publishing, patents, etc.) (47%), and
3. Outreach to support/inspire girls in STEM (41%).

We break down the responses into focus areas and then highlight some of AWM's current and future projects in each.

Focus Area 1: Diversity, inclusion, equity, and accessibility for BIPOC, LGBTQ+, and/or disabled scientists; anti-harassment and anti-bullying.

As pointed out by one survey respondent, this is quite a broad category! The AWM's Diversity and Inclusion Statement states: "It is AWM's goal to celebrate, recognize and support a diverse mathematical community of individuals from across the spectrum of age, race, gender, gender identity and expression, national or ethnic origin, religion and religious belief, marital status, parental status, body shape or size, sexual orientation, physical ability, socioeconomic status, employment status and other aspects of diversity." Survey respondents highlighted the need for representation

Figure 1. *Averaged responses to the question, '"how important do you think each of the following topics are for AWM to engage with?" on a scale of 1 to 5, 5 being "Most Important."*
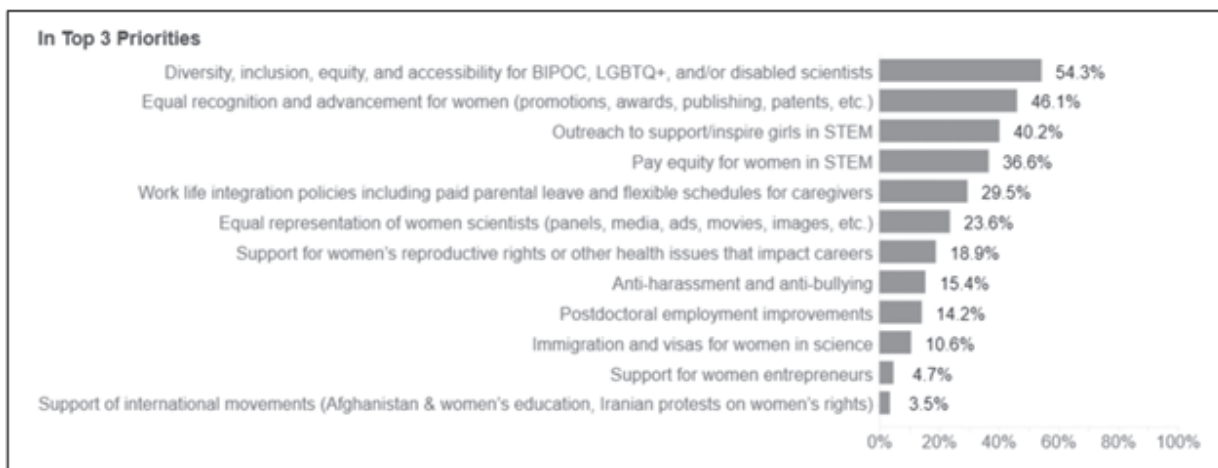
Figure 2. *In decreasing order, the percentage of respondents that included each topic as one of their top 3 priorities.*

across these categories. (https://awm-math.org/policy-advocacy/welcoming-environment/)

AWM Activities in Focus Area 1. Working to support all forms of inclusivity and equity is an ongoing project of self-evaluation within the AWM.

- In 2018, the AWM formed a Diversity Task Force (DTF) to examine how well AWM was supporting its community members with intersectional identities and to report back to the Executive Committee. In addition to beginning to implement high-level changes, each Portfolio within AWM (Management Team, Awards, Membership, Policy and Advocacy, Education and Outreach) was asked to detail steps that they intend to take to address the findings of the DTF. Find out more at https://awm-math.org/about/governance/#0e9640d3b5e359596.

- In 2021, the AWM updated its Mission Statement to be more gender-inclusive (awm-math.org). P&A is working to update the language in previous statements and on the website more generally to include and support people independent of gender expression.

- One survey respondent's suggestion was to have more talks like the Plenary Lecture by Nicole M. Joseph on "Making Black Girls Count in Mathematics Education: A Black Feminist Vision of Transformative Teaching" along with facilitated conversations or breakout groups. This talk, along with other invited lectures, will be available on the AWM's YouTube channel at https://www.youtube.com/@AssociationForWomenInMath/videos.

- On the accessibility front, respondents mentioned that many departments do not have gender-neutral bathrooms or changing stations in bathrooms. P&A is slated to write a statement to send out to all institutional members with a list of actions they can take, both for their departments and for conferences and events. If you have suggestions, email awm@awm-math.org and include "For P&A" in the subject line.

- Survey respondents called for more training on recognizing and mitigating bias, as well as for training on how to actively support underrepresented groups. AWM has supported workshops at the JMM in 2020 (https://awm-math.org/meetings/jmm-2020-workshop/) on Moving Towards Action, and at the Research Symposium in 2022 on Aligning Actions at Crossroads (https://awm-math.org/meetings/aligning-actions-at-crossroads/). The 2023 Symposium saw a community discussion following up on both, Driving Cultural Change in the Mathematical Sciences: Advice and Reflections from AWM's MTA and AAC Workshop Participants (https://awm-math.org/abstract/community-discussion-2/).

Focus Area 2: Equal recognition and advancement.

Survey respondents called out the need for more recognition of achievements and for more women and gender minorities to be in positions of power, as well as the issue of multiple awards going to individuals who have already received recognition for their work instead of using awards to lift up new individuals.

AWM Activities in Focus Area 2. The AWM Awards Committee has been systematically reviewing AWM awards with an eye towards recognizing individuals from institutions which have fewer resources. For example, they ask nominators for the Schafer prize to consider broadening their view of excellence in mathematics (https://awm-math.org/awards/schafer-prize-for-undergraduates/#171422482dc778e26).

There is a broader need for better sharing of opportunities for advancement and also for promoting each other's work to elevate the community. The AWM Research Networks are intended to grow and support communities of researchers in common areas, fostering long-term collaborations. The associated listservs for each network provide invaluable communication pathways for opportunities of interest in specialized subject areas, from conferences to job postings to calls for nominations for awards. The connections made through these networks can last through your career, and one way you can help advance recognition and advancement is to nominate those you have worked with when opportunities arise, being advocates for each other. We encourage AWM members to get involved in existing Research Networks, or if there isn't currently one in your focus area, to start one! Find out more at https://awm-math.org/programs/advance-research-communities/.

AWM continues to support Wikipedia edit-a-thons at many conferences, which focus on reducing the "Wikipedia gender gap" in mathematics by training attendees to edit Wikipedia biographies of mathematicians from marginalized groups. Read about the most recent one held at the 2023 Research Symposium at https://awm-math.org/abstract/wikipedia-event-a-training-edit-a-thon-to-close-the-wikipedia-gender-gap/.

Focus Area 3: Outreach to support/inspire younger people in STEM, and equal representation in media.

The need for outreach was mentioned across many axes of underrepresentation in math and across the ages from K–12 through college. Specifically mentioned were outreach for Black and Hispanic students, support for math education at minority public schools, and at the college level for both recruiting and retention of diverse math majors.

AWM Activities in Focus Area 3. To increase awareness of women's ongoing contributions to mathematics, the AWM and Math for America cosponsor an essay contest in which contestants interview a woman working in or retired from a mathematical career about her life and work, and then they write and submit a short biographical essay based on their interview (500–1000 words). The contest is open to students in Grades 6–8, Grades 9–12, and Undergraduate. You can read winning essays going back to 2001 on the website at https://awm-math.org/awards/student-essay-contest/.

The EvenQuads decks of cards honor notable women mathematicians, "from research to education, pure mathematics to applied mathematics, academia to industry, historical times to the modern day." Featured mathematicians affirmatively consent to inclusion in a deck and are given the opportunity to review their biographies. This project began with a highly successful Kickstarter campaign and has now completed Deck 2 of 4. The cards can be used to play many mathematical games, and there have been several papers written about the game. Find out more, and volunteer to help make future decks a reality at https://awm-math.org/publications/playing-cards/.

Focus Area 4: Career support.

This includes work-life integration policies including paid parental leave and flexible schedules for caregivers, support for women's reproductive rights or other health issues that impact careers, and postdoctoral employment improvements. While the survey question specifically said "postdoctoral employment improvements," respondents pointed out that graduate students also do not receive fair compensation, and they called for unionization efforts.

There is broad concern across the community about insufficient healthcare, at all levels. One participant said when researching job opportunities, she also had to research what healthcare options would be provided. Many respondents expressed the need for better support for parents, both during PhD programs and later in their career paths, in the form of both better leave policies and financial support. Several respondents called out a need for more mental health resources for graduate students, specifically first generation and first year graduate students.

AWM Activities in Focus Area 4. As awareness of the broad range of factors that go into job selection increases, more employers are rethinking the language they use to write job ads and what aspects they highlight. For example, there are recommendations on how job ads can be written that encourage more women and gender expansive folx to apply. P&A can work to create recommendations for math job ads, host this information on the website and share with colleges and universities. These recommendations include being succinct, including flexibility about the position, and including range of salary and benefits. While this would not directly affect the benefits themselves, perhaps highlighting the importance of them is a good first step. If you have suggestions, email awm@awm-math.org and include "For P&A" in the subject line.

Focus Area 5: Career path concerns.

This included pay equity for women in STEM and support for women entrepreneurs. However, the issues raised by the community in the "career paths" category were of a slightly different flavor. There was a call for resources and guidance for job seekers, especially for those seeking to transition between academic, government, and industry jobs. Other respondents highlighted the inequities of underrepresented groups being expected to do more volunteer/planning/outreach tasks at their jobs.

AWM Activities in Focus Area 5. The AWM has a Mentor Network program in which "students who are interested in mathematics or are pursuing careers in mathematics are matched with mentors, both men and women," where "students" encompasses the full range from grade school through recent PhDs. In fact, there are more mentees who have requested mentors than there are mentors to match them with, and mentees are looking for advice in a range of topics. If you haven't already, consider signing up to be a mentor, a mentee, or both! See https://awm-math.org/programs/mentor-network/

AWM continues to support networking across career paths in events at the symposium such as the roundtable "Discussion of Academia, Government, and Industry: Culture, Pathways, and Representation," the panel "Math Research in Government and Government Labs," and the "Roundtable on Constructing an 'Elevator Pitch'."

The AWM just kicked off its first instantiation of the Women on Mathematical Paths Seminar series (https://awm-math.org/programs/student-chapters-info/womathpaths/)

which intends to connect AWM Student Chapter members with working mathematicians. If you are interested in getting involved in this new initiative, please contact ed.admin@awm-math.org.

Focus Area 6: International support.

This area includes immigration and visas for women in science and support of international movements (Afghanistan & women's education, Iranian protests on women's rights). Generally, there was a sense that the AWM should better promote that we are in fact an international organization, and that we should include more international mathematicians on our committees. There was also a call for more opportunities for international mathematicians to travel to the US for research and conferences, and for support to travel within the US when they are here on visas as many funding sources have restrictions based on immigration statuses.

AWM Activities in Focus Area 6. The AWM is always open to new funding sources, in particular those which would allow us to provide more travel grants to international participants. If you have suggestions, or want to volunteer to help the AWM expand its international support, email awm@awm-math.org.

Conclusion

The AWM hopes to continue having open and honest conversations with our diverse membership about the evolving priorities of our community and to use this information to direct future work of our committees on the issues that matter most to the community.

The AWM runs on passionate and enthusiastic volunteers. If something in this article piqued your interest, let us know! Go to our homepage at awm-math.org and check out the "Get Involved" section for links to volunteer for a committee, sign up to be a mentor, or email awm@awm-math.org to get connected with existing initiatives or to suggest new ones.

Re-introducing EvenQuads!

The EvenQuads project commemorates the 50th anniversary of the AWM and includes both an online treasure trove of information about amazing women mathematicians and physical decks of cards, posters, and stickers. For the decks, one side of each card features logos inspired from four mathematical associations (AWM, MAA, NAM, WME) used to play the mathematical EvenQuads games, and the other side features a short biography and hand-drawn portrait of an inspirational woman mathematician. Longer, detailed biographies of each mathematician and individual downloadable posters are available at https://awm-math.org/publications/playing-cards/ (QR code below).

Decks 1 and 2 together honor 128 mathematicians whose stories deserve their place in history. Both sides of the deck can be used to play at least 10 mathematical games.

Deck 2 is now available at the AWM e-store (https://store.awm-math.org/collections/evenquads/ products/evenquads-deck-2-notable-women-in-math-playing-cards). There are also Deck 1 sticker sets and full-size posters showing all 64 women on Deck 1 available for purchase.

This project would not have been possible without the help of hundreds of volunteers, details of which can be found on the site. There are far more than 128 women who merit featuring on cards, so there are two more decks planned to complete a full set of cards to play the original EvenQuads game. The EvenQuads project welcomes more nominations of women for consideration! (Use the form provided on the first webpage, or the QR code at right.)

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Director, Retirement,
Willis Towers Watson

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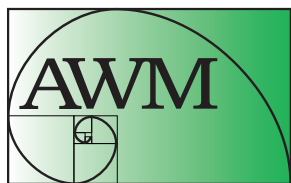Follow us:

AWM Conflict of Interest Policy

A conflict of interest may exist when the interest (financial or other) or concerns of any member of AWM, or the member's immediate family, or any group or organization to which the member has an allegiance or duty, may be seen as competing or conflicting with the interests or concerns of AWM.

When any such potential conflict of interest is relevant to a matter requiring participation by the member in any action by AWM or any of its committees to which the member belongs, the interested party shall call it to the attention of AWM or the committee and such person shall not vote on the matter. Moreover, the person having a conflict shall retire from the room in which the organization or its committee is meeting (or from a conference call) and shall not participate in the final deliberation or decision regarding the matter under consideration.

The foregoing requirements shall not be construed as preventing the member from briefly stating her position in the matter, nor from answering pertinent questions of other members, as her knowledge may be of great assistance.

The minutes of the meeting of the organization or committee shall reflect when the conflict of interest was disclosed and when the interested person did not vote. When there is a doubt as to whether a conflict of interest exists, and/or whether a member should refrain from voting, the matter shall be resolved by a vote of the organization (or its committee), excluding the person concerning whose situation the doubt has arisen.

A copy of this conflict of interest statement passed by the AWM Executive Committee, Vancouver, 8/16/1993, shall be published once a year in the *AWM Newsletter*, and any member serving as an officer or on a committee shall be advised of the policy upon undertaking her duties.

2023–2024 Individual Membership Form
JOIN ONLINE at awm-math.org!

Please fill in this information and return it along with your dues to:

AWM Membership, PO Box 40876, Providence, RI 02940

ASSOCIATION FOR WOMEN IN MATHEMATICS

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http://awm-math.org
awm@awm-math.org

_____
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AWM's membership year is from October 1 to September 30. Please fill in this information and return it along with your dues to: AWM Membership, PO Box 40876, Providence, RI 02940

The AWM Newsletter is published six times a year. If you have questions, contact AWM at **awm@awm-math.org**, 401.455.4042, or visit our website at: **https://awm-math.org.**

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NOTE: All checks must be drawn on U.S. banks and be in U.S. funds.

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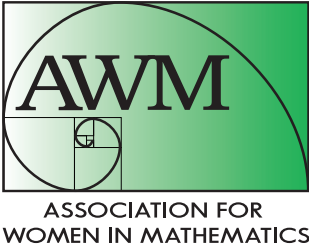
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