The purpose of the Association for Women in Mathematics is

- to encourage women and girls to study and to have active careers in the mathematical sciences, and
- to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences.

PRESIDENT'S REPORT

Dear AWM Friends,

It is with much excitement and some trepidation that I begin my term as AWM president. First, I am sure you will all join me in thanking Ami Radunskaya for the amazing work she did during her presidency. Among her accomplishments are helping AWM regain its nonprofit status, moving us to a new management company, hiring a new Executive Director, helping us get a spiffy new website and leading the charge to understand and address issues of inclusivity in our organization. Throughout, Ami always had time to engage with many individual AWM members and orchestrate and perform amazing AWM soundtracks.

I have just returned from snowy Baltimore, from a Joint Mathematics Meeting filled with a rich variety of mathematical, social and political events. The AWM week actually started before the Joint Meetings with Hill Day. AWM-sponsored mathematics at the meeting featured an excellent Noether Lecture by Bryna Kra, a terrific poster session by graduate students and a full day of talks on Applied and Computational Topology by the workshop participants. There is more about all of these great events in this newsletter.
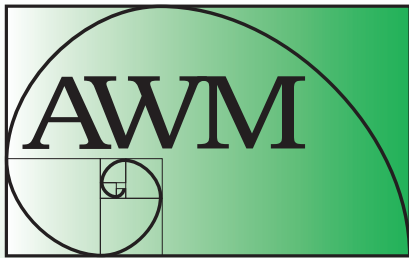
One important AWM event at the Joint Meetings is the only face-to-face Executive Committee meeting that takes place every year. This lengthy meeting gives us a chance to discuss programs and policies at a slightly more leisurely pace than our regular teleconferences. It is fun to meet the people we know only electronically, and many former AWM Presidents also drop by to listen and share their thoughts. It is exciting to be in a room with so many dynamic women all seeking the same goal: how do we continue to make the AWM the organization

IN THIS ISSUE

CALL FOR SUGGESTIONS
Correction!

In December 2019 we will be electing the following officers: President-Elect, Treasurer and four At-Large Members. Suggestions for candidates may be made to Ruth Haas or Ami Radunskaya; they will pass them along to the Nominating Committee. Your input will be appreciated! We apologize for giving an incorrect list of officers to be elected in the preceding issue

that promotes and supports women in mathematics? A pressing issue for the AWM is our decline in membership. The AWM has a rich tradition of volunteerism. It is a fabulous example of a grassroots movement that works because many people give small amounts of money and time to keep us going. While this is an old model of activism, it is also a very current model as seen in the Occupy Movement, the Women's Marches, and GoFundMe sites. How do we reach young allies and have them join us? This is one of the big challenges we face as we approach our 50th anniversary. The essence of who we are, an organization of people that work together to support and promote women of all kinds in mathematical activities of every flavor seems clearly still relevant, so how must we evolve to engage all women in all of mathematics, now?

I look forward to hearing your thoughts and working with our community.

Ruth Haas
January 26, 2019
Mānoa, HI

Ruth Haas

PRESIDENTS' REFLECTIONS

Column Editors: Janet Beery, University of Redlands; Francesca Bernardi, Florida State University; Kayla M. Bicol, University of Houston; Cathy Kessel, consultant

This is the second in a series of "Presidents' Reflections," articles by past presidents of the AWM that are intended to help us take stock of where we are and where we should be going, and to consider what we want the organization to be at its 50th anniversary in 2021.

Alice Schafer was the second president of AWM, and the AWM Schafer prizes (see pp. 13–15) were established in her honor. For more about Schafer, see the January–February 2010 issue of the *AWM Newsletter*, which is dedicated to her memory, and her entries at MacTutor, Wikipedia, and the Agnes Scott College Biographies of Women Mathematicians.

In lieu of a reflection from Schafer, this article describes three actions to which she contributed that shaped the organization during her presidency. These illustrate some of AWM's characteristics: extensive donations of time and energy by volunteers; respect and support (although hardly uniform!) from within the mathematical community; and sponsorship of mathematical activities as well as analysis of the situation of women in mathematics, acting as a mathematics organization as well as an advocacy organization.

Incorporation. During Schafer's term, AWM was incorporated as a non-profit organization and acquired tax-exempt status and the ability to receive tax-deductible donations from individuals or groups, as is typical of a professional society. Mary Gray drew up a constitution and the lawyer who was handling the incorporation used it to write a set of by-laws that were filed with the application for incorporation. Tax-exempt status was a separate effort. As Schafer recalled:

> [Incorporation] was done through a lawyer in Boston, who I had been told would charge very little, so I was amazed when he charged $500, which was really big money for AWM, and so, in the *Newsletter*, I asked for a contribution of a dollar from each member. Some gave and AWM did finally pay the bill. When it came to obtaining tax exemption status from the IRS, the lawyer said he would do it and I said first I would try. He said I could not do it, but I did.[1]

At the time of incorporation, the Executive Committee consisted of a president (Schafer), secretary, treasurer/newsletter editor (who was also the past president, Mary Gray), and clerk. In January 1975, the Executive Committee set up election procedures and a new structure: four regional members, two co-treasurer/newsletter editors, and an employment registrar (Judy Green) who reported on academic employment of women in mathematics.[2]

CBMS membership. In 1974, AWM began the process of applying for membership in the Conference Board of the Mathematical Sciences (CBMS). As it says on its web site, CBMS is:

> an umbrella organization consisting of eighteen professional societies all of which have as one of their primary objectives the increase or diffusion of knowledge in one or more of the mathematical sciences. Its purpose is to promote understanding and cooperation among these national organizations....

At present, CBMS may be best known for cooperative efforts such as its surveys of mathematics departments (conducted since the 1960s) and for reports such as *The Mathematical Education of Teachers*. It may be no coincidence that women are not mentioned in the 1970 survey report: AWM was founded in 1971; by 1975 the report gives percentages of male and female faculty members. At the time of AWM's application, CBMS members were all well-established organizations that were at least twenty years old (some considerably more). After some hiccups,[3] AWM became a member of CBMS in 1976. As the third AWM president, Lenore Blum, observed years later, "An amazing feat for an association that was only four years old!"

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[1] https://awm-math.org/about/history/a-brief-history-of-awm/3/#TOC-alice-schafer, from "A Brief History of the Association for Women in Mathematics: The Presidents' Perspectives," *Notices of the AMS* 38(7), reprinted in *AWM Newsletters* 21(6) and 22(1),

[2] See, e.g., *Newsletter* 6(1).

[3] See *AWM Newsletters* 5(2) and 6(3), and footnote 7 in https://awm-math.org/about/history/a-brief-history-of-awm/3/#TOC-alice-schafer

Mathematics talks. Since its inception in 1971, AWM had organized "consciousness raising" panels and talks at mathematics meetings. In 1974, AWM presented a mathematics talk, as well as a talk on the situation of women in mathematics, for the first time at the Joint Mathematics Meetings.[4] Schafer recalled,

> Lee Lorch, friend of AWM, came to tell me that some of the men were going to attend the AWM meeting, which I was chairing of course, and were going to break it up. He thought I ought to be warned.... I had invited Cathleen Morawetz and Louise Hay to give short talks … and of course, their talks were good. The men, who were for the most part sitting in the last two rows in the audience, never said anything. I never knew who they were and it didn't matter.[5]

[4] See *Newsletter 4*(2). Mary Gray remarked that "Hope Daly, the director of the AMS Meetings Department, was the indispensable key to insuring a visible presence for AWM at the annual mathematics meetings."
[5] https://awm-math.org/about/history/a-brief-history-of-awm/3/#TOC-alice-schafer

AWM at the Baltimore JMM

Thousands gather each year for the Joint Mathematics Meetings, the largest gathering of mathematicians in the country. This year the event was held in Baltimore, January 16–19, 2019. AWM uses this venue to recognize and showcase the work of exceptional women. These honors span the career spectrum—from the Schafer Prize for undergraduate research to the Noether Lecture for a career of distinguished research—as well as the ways in which we can support the mathematical sciences—research, teaching, mentorship, and volunteerism. We are pleased to announce this year's honorees.

AWM-AMS NOETHER LECTURE

The lecture honors Emmy Noether (1882–1935), one of the great mathematicians of her time. She worked and struggled for what she loved and believed in. Her life and work remain a tremendous inspiration. The 2019 Noether Lecture, "Dynamics of systems with low complexity," was delivered by Bryna Kra, Northwestern University. She was introduced by Ami Radunskaya, Pomona College.

Abstract: One way to classify dynamical systems is by their entropy, which roughly speaking gives a measure of the disorder in the system. Deterministic systems have zero entropy, but in spite of this structure, many basic questions about systems with zero entropy remain open. Even when placing strong constraints on the complexity of the system, easily formulated questions remain intractable. I will give an overview of the relations among complexity, algebraic properties, and dynamical characteristics of the system (such as periodicity, minimality, and transitivity), and their relations to combinatorial problems.

Citation for Bryna Kra

Bryna Kra is the Sarah Rebecca Roland Professor of Mathematics at Northwestern University. She has been selected as the 2019 Noether Lecturer for her profound impact on mathematics, both through her work in the fields of dynamical systems and ergodic theory and through her service to the profession.

Kra received her AB from Harvard University and both her MA and PhD degrees in mathematics from Stanford University, under the guidance of Yitzhak Katznelson. Before joining the Northwestern University Faculty in 2004, Kra was an assistant professor at Pennsylvania State University, an NSF-NATO Fellow (University of Marne-la-Vallée), a Raymond and Beverly Sackler Fellow (Institut des Hautes Études Scientifiques) and a Golda Meir Postdoctoral Fellow (Hebrew University of Jerusalem), as well as a postdoc at both the University of Michigan and the Ohio State University.

Kra is best known for her fundamental contributions to ergodic theory. Her 2005 paper joint with Bernard Host titled "Nonconventional ergodic averages and nilmanifolds" (*Annals of Mathematics*) settled a long-standing open problem on the existence of the limit of certain multiple ergodic averages, uncovering the role of nilpotent groups and their homogeneous spaces in analyzing configurations in sets of integers. The work inspired many further developments, including structure theorems in ergodic theory, in topological dynamics, and in combinatorics, convergence results for numerous multiple ergodic averages, and the uncovering of recurrence phenomena that imply the existence of patterns in sufficiently large sets of integers. In further work

Ami Radunskaya and Bryna Kra

joint with Vitaly Bergelson and Host, they introduce the notion of a nilsequence and use it to provide further structural results in dynamics. It has been adapted to the combinatorial setting, playing an important role in studying patterns in smaller subsets of the integers, for example the set of primes. Continuing her work at the intersection of dynamics and combinatorics, Kra's more recent research lies

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CALL FOR PROPOSALS
Research Collaboration Conferences for Women

Supported by a National Science Foundation ADVANCE grant, the AWM is working to establish and support research networks for women in all areas of mathematics research. As part of the grant, the AWM will provide mentorship and support to new networks wishing to organize a research collaboration conference for women (RCCW), including: help finding a conference venue, help developing and submitting a conference proposal, and help soliciting travel funding for participants.

Mathematicians interested in organizing the first conference of a new RCCW are invited to submit a proposal to the AWM describing the conference topic, potential co-organizers and project leaders, and potential participants. Proposals should be no more than one page (PDF files only, please) and should be sent to awm.rccw@gmail.com. Deadlines for submission: **January 1** and **July 1** annually.

More information about the ADVANCE Grant, Research Collaboration Conferences for Women, existing RCCW networks, and related initiatives can be found at http://awmadvance.org/.

in topological and symbolic dynamics, studying systems of low complexity. In joint work with Van Cyr, she has the strongest work to date on Nivat's Conjecture, relating a global property of periodicity of a two dimensional configuration to a locally checkable property on the complexity.

In addition to becoming a recent Fellow of the American Academy of Arts and Sciences, Kra is also an AMS Fellow and was awarded an AMS Centennial Fellowship as well as the AMS Levi L. Conant Prize. She was an invited speaker at the International Congress of Mathematicians (2006) and has given numerous invited lectures, including an AMS-MAA Invited Address (2007), the Arnold Ross Lecture of the AMS (2013), a lecture at the National Museum of Mathematics (2014), the Bartlett Lecture (2015), the Dresden Lectures (2015), and the Coven-Wood Lectures (2017).

Kra is currently on the Board of Trustees of the AMS and has previously served on the AWM Executive Committee, the Council and Executive Committee of the AMS, the Board of Trustees of the Institute for Pure and Applied Mathematics, the Advisory Board for the Young Mathematicians Conference, and the Steering Committee for the Park City Mathematics Institute. She holds several editorial positions, including those with *Ergodic Theory and Dynamical Systems* and *Discrete Analysis*.

AWM FELLOWS

The Executive Committee of the AWM has established the AWM Fellows Program to recognize individuals who have demonstrated a sustained commitment to the support and advancement of women in the mathematical sciences, consistent with the AWM mission: "to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences." The second class of Fellows was chosen by a nomination process. Nominations are due by May 15th for the 2020 class; see www.awm-math.org and page 31.

Second Class of AWM Fellows

Hélène Barcelo, Mathematical Sciences Research Institute
For her extraordinary service to the community of women in mathematics, starting with the Berkeley undergraduate research program for women and continuing in her capacity as deputy director of MSRI, working for women at all stages of their careers.

Lida Kittrell Barrett
For her profound and long-lasting effect in diversifying the committees and leadership of the MAA, during and beyond her term as its second woman president; for her value to the mathematics community as a pioneer and defender of women and underrepresented groups.

Sun-Yung Alice Chang, Princeton University
For shattering the glass ceiling and inspiring women mathematicians to follow her lead; for her leadership of the Princeton mathematics department and her extraordinary record

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) for details on eligibility and do not hesitate to contact Steven Ferrucci at 401-455-4042 for guidance.

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

of groundbreaking research in geometric analysis that has had worldwide impact.

Amy Cohen, Rutgers University
For her remarkable achievements as a teacher, scholar, and administrator; for her service to the profession, as AWM treasurer and beyond; and for her important contributions to mathematics education through her talks, writing, and work with K–12 teachers.

Ingrid Daubechies, Duke University
For her promotion of women in mathematics through her own outstanding mathematical achievements and special efforts on behalf of women, mathematics education, and budding mathematicians in developing countries. She is a mathematician of world class whose work is a masterly example of how pure mathematics can profoundly impact real-world applications.

Chandler Davis, University of Toronto
For inspiring and supporting the activism of so many mathematicians of diverse background and beliefs, leading the way for the Association for Women in Mathematics since its beginning and throughout its history. For equal rights and encouragement in the pursuit of mathematics, he has been a lodestar.

Jacqueline Dewar, Loyola Marymount University
For her work to encourage females to study and be successful in
mathematics; for her commitment to educating pre-service teachers, with particular attention to gender equity; for her outreach to liberal arts students to change attitudes about mathematics and women in mathematics; and for her exemplary teaching and mentoring.*

Edray Herber Goins, Pomona College
For outstanding leadership in the mathematics community; for his efforts and success in making the community more fair and diverse; for inspiring and mentoring many individuals; and for his significant research in number theory.

Judy Green, Marymount University
For her role as a founding member of the Association for Women in Mathematics; for her long-standing service; and for her groundbreaking scholarly contributions in documenting the lives and work of the US women who earned PhDs in mathematics before 1940.

Pao-sheng Hsu, Independent
For her sustained efforts and achievements as a researcher and leader in mathematics education, especially for AWM; for her building of bridges connecting the communities of mathematicians, mathematics educators, and K–12 teachers; and for her work as a teacher and scholar of mathematics.

CALL FOR NOMINATIONS
The Association for Women in Mathematics Student Chapter Awards

In September 2016, the Executive Committee of the Association for Women in Mathematics established the Student Chapter Awards, to be awarded annually at the MAA MathFest. The purpose of these awards is to recognize outstanding achievements in chapter activities among the AWM student chapters.

Awards will be given out in up to four categories: (1) scientific excellence, (2) outreach, (3) professional development, and (4) funding/sustainability. More details about each category can be found on the AWM website www.awm-math.org.

Eligibility: Any chapter may nominate itself for awards in at most two of the four categories.

The nomination should include: 1) A cover letter: The cover letter should summarize the chapter's qualifications for the award category to which it is nominating itself. If the chapter is applying in two categories, it should ensure that both categories are clearly included in one cover letter. 2) An activities report: The activities report, 500–1000 words in length, should give a detailed description of the particular work for which it is seeking an award. If the chapter is applying in two categories, a separate activities report is required for each. Nomination materials should be submitted online at MathPrograms.org. The submission link will be available 45 days prior to the nomination deadline. Nominations must be received by **April 15, 2019**. If you have questions, phone 401-455-4042, email awm@awm-math.org, or visit www.awm-math.org.

Ellen E. Kirkman, Wake Forest University

For her lifelong support of women in mathematics in research in noncommutative algebra and representation theory as well as in teaching; for her successful leadership and advocacy for women in so many professional organizations; and for her mentoring of women at all levels of the profession.

Maria M. Klawe, Harvey Mudd College

For exceptional impact on the advancement of girls and women in the mathematical sciences and in science and engineering more broadly, through her leadership in academia, industry, professional societies, and institutes, her fostering of innovative programs, and her influential research in computer science.

Anne M. Leggett, Loyola University Chicago

For extraordinary contributions in promoting opportunities for women in the mathematical sciences through AWM and as a teacher and scholar; for her amazing and steady work as editor of the AWM Newsletter *since 1977; and for her invaluable leadership and guidance.*

Magnhild Lien, California State University, Northridge

For extraordinary leadership and service devoted to advancing and supporting women in the mathematical sciences, as AWM Executive Director and, for a quarter century, as initiator, director, and fundraiser of programs for women.

Maeve Lewis McCarthy, Murray State University

For her commitment to mentoring students and colleagues; for her inspired service as executive director of AWM; and for her stewardship of the ADVANCE project at Murray State University.

Dusa McDuff, Barnard College, Columbia University

For her deep and vast contributions to research in symplectic geometry, leading by example as one of the most accomplished mathematicians of her generation; for her enthusiastic and sustained support of the IAS Women and Mathematics program; and her cultivation and support of junior mathematicians, including her nine women PhD students.

Irina Mitrea, Temple University

For her vast and impactful contributions toward encouraging and promoting women and girls in mathematics; for directly influencing school-aged girls, undergraduate and graduate students, and her junior women colleagues as an accomplished researcher and role model.

Alice Silverberg, University of California, Irvine

For her outstanding research in number theory and deep commitment to the promotion of fairness and equal opportunity evidenced by her service and outreach efforts. She has given over 300 invited lectures worldwide, and exposed sexism and discrimination in her blog Alice's Adventures in Numberland.

Audrey Terras, University of California, San Diego

For her great support of young women in mathematics throughout her career; for her superb record of research in number theory and her leadership in the profession; and for her role as the principal advisor for nine women PhDs.

Marie A. Vitulli, University of Oregon

For her exceptional efforts to promote women in mathematics through her active participation in AWM, on Facebook, in Wikipedia, and in writing AMS Notices *articles; for her contributions to commutative algebra and algebraic geometry.*

A lineup of Fellows (and a President): Ami Radunskaya, Ulrica Wilson, Marie Vitulli, Irina Mitrea, Dusa McDuff, Maeve McCarthy, Magnhild Lien, Anne Leggett, Ellen Kirkman, Edray Goins, Jacqueline Dewar, Amy Cohen, and Hélène Barcelo

Judy Leavitt Walker, University of Nebraska-Lincoln
For her leadership in promoting girls and women in mathematics and STEM fields, for her mentoring activities; for her service to the profession manifested through conference organization (such as the Nebraska Conference for Undergraduate Women in Mathematics); for mathematical exposition; and for excellence in teaching and research.

Lesley Ward, University of South Australia
For her enduring commitment to supporting women in the mathematical sciences; for her mentoring in research; for her work on inclusivity; and for her leadership of the Women in Mathematics Special Interest Group in Australia.

Ulrica Wilson, Morehouse College
For her many years of supporting the professional development of women in their pursuit of graduate degrees in mathematics, most visibly through mentoring, teaching and program administration within the EDGE Program, and as associate director of diversity and outreach at ICERM.

AWM PRIZES

Louise Hay Award for Contributions to Mathematics Education

In 1990, the Executive Committee of the AWM established the Louise Hay Award for Contributions to Mathematics Education. While Louise Hay was widely recognized for her contributions to mathematical logic and for her strong leadership as head of the Department of Mathematics, Statistics, and Computer Science at the University of Illinois at Chicago, her devotion to students and her lifelong commitment to nurturing the talent of young women and men secure her reputation as a consummate educator. 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.

Citation for Jacqueline Dewar

The AWM presents the 29th Annual Louise Hay Award to Jacqueline Dewar of Loyola Marymount University in Los Angeles (LMU) in recognition of her many achievements as a professor, a leader in outreach, and a contributor to the scholarship of teaching and learning (SoTL). Her peers and students praise her as a teacher, mentor, and scholar.

With a PhD in mathematics, Dewar served LMU for 40 years. She advocated for active learning, initiated a biomathematics program, and developed courses in computer literacy, the history of women in mathematics, and mathematics in civic engagement. Her mentoring continues past graduation: in one notable case she guided a career that moved from classroom teaching into grants management, then to doctoral study and a post-secondary faculty position.

Dewar shares her expertise in mathematics and teaching with students and teachers widely. In 1978 she was a cofounder of the Math Science Interchange in Los Angeles, which still provides an annual career day, "Expanding Your Horizons-LA," for K–12 students and teachers. Thousands of girls and their teachers have attended these events. Dewar still leads workshops and trains other leaders. She was a major contributor to an NSF-funded collaboration among five four-year colleges and five community colleges to enhance preparation of mathematics and science teachers. This project's initiatives persist and have been replicated.

Dewar received the LMU President's Award for distinguished teaching and the MAA's Deborah and Franklin Tepper Haimo Award. One indicator, among many, of scholarly leadership is her selection as co-editor of *Mathematics Education: A Spectrum of Work in Mathematical Sciences Departments*, published by Springer in 2016.

Response from Dewar

I feel very honored to receive the Louise Hay Award for Contributions to Mathematics Education. I never had the good fortune to meet Louise Hay in person, but I definitely recall reading her autobiographical essay—"How I became a mathematician (or how it was in the bad old days)"—when it first appeared in the September–October 1989 issue of *The Association for Women in Mathematics Newsletter*. Her life story and bravery touched and encouraged me then and did so again recently when I re-read her essay.

No one makes a contribution to something as complex as mathematics education all alone. Over my career I have benefitted from the collaboration and support of colleagues in many locations: at my home institution Loyola Marymount University and at nearby institutions, in the Association for Women in Mathematics, the Carnegie Scholars Program, and the Mathematical Association of America, and throughout the larger mathematics community. I want to thank my colleagues and my former students for the many things I learned from them. It has been a privilege to do work in mathematics education in their company.

M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics

The award is named for M. Gweneth Humphreys

(1911–2006). Professor Humphreys graduated with honors in mathematics from the University of British Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her PhD at age 23 from the University of Chicago in 1935. She 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 Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

Citation for Suzanne Weekes

The Association for Women in Mathematics is pleased to present its ninth annual M. Gweneth Humphreys Award to Professor Suzanne Weekes, a prominent applied mathematician at Worcester Polytechnic Institute (WPI) whose specialties include dynamic materials, numerical methods, and computational fluid dynamics. Weekes has served on the WPI faculty since 1998, where she's been a student favorite, supervising a long list of undergraduate (and a few graduate) research projects. This is only a small part of a truly impressive record of outreach and mentorship, including an unusually broad range of commitments outside of her home university. Notably, Weekes is a founding director and has offered a strong shaping hand in the deeply impactful MSRI-UP program, devoted to "cultivating heretofore untapped mathematical talent" with a focus on communities traditionally underrepresented in mathematics.

Suzanne Weekes and Jacqueline Dewar
Photo credit: Kate Awtrey, Atlanta Convention Photography

Over her tenure at MSRI-UP, over eighty-five women, including more than seventy women from underrepresented groups, have passed through the program, with the majority continuing to graduate programs after college.

Current and former students had a range of moving tributes to offer: "Being randomly assigned to Professor Weekes as my academic adviser was most likely the best thing that could have ever happened to me here at WPI. Through her guidance and encouragement, I have discovered SIAM, traveled to my first mathematics conference, received a research grant, and will be presenting said research on an international scale. Because of her enthusiasm and belief in me, she has helped me achieve things I never thought were imaginable during my undergraduate career."

AWM Will Be *50* in 2021!

Can you believe that the AWM is closing in on its Golden Anniversary?! From its small but powerful beginning in 1971, to the expansive network in the mathematical sciences that it is today, AWM has a lot to celebrate in 2021! As we start the countdown, help us develop and plan the festivities. Watch this space for ways that you can be involved in celebrating the great work we have already accomplished, and join us in looking forward to the amazing future of this timeless (and yet timely!) organization.

AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

One student who writes of her struggles with self-doubt continues, "Although I had support and encouragement from various professors, none quite gave me the confidence and honest feedback like Prof. Weekes."

Another, musing on the importance of role models, notes: "I didn't even know that it mattered that I had no female mentors, until I really knew Suzy."

Finally, one student put it simply and powerfully: "Prof. Weekes was our champion."

For her exceptional track record of support, guidance, unvarnished feedback, and inspiration, the AWM proudly recognizes Suzanne L. Weekes.

Response from Weekes

I am humbled and thrilled to receive the 2019 Humphreys Award from the AWM. Thank you to my colleague, Sarah Olson, who nominated me for the award and to my colleagues and students who wrote in support of my nomination. I am fortunate to have spent the majority of my faculty career at Worcester Polytechnic Institute, a university where undergraduate research projects and undergraduate advising are a central part of its academic plan. Also, through my work in our summer REU program and the Mathematical Sciences Research Institute Undergraduate Program (MSRI-UP), I have been able to work with students beyond my home institution.

It is a joy to do work with our young women and to help make sure that our community is a rich, welcoming, and healthy place for those who dwell with us and for those who are passing through. It is a privilege to help our students work toward their own professional goals, to give them work and life advice (solicited and unsolicited), and to see them go off on their own amazing journeys. Thank you to all of my students who have given me the honor of learning from you, growing with you, and walking part of the way with you.

AWM Service Award

In 2012, AWM established the AWM Service Award to recognize individuals for helping to promote and support women in mathematics through exceptional voluntary service to the Association for Women in Mathematics, a nonprofit organization that depends largely on the work of its volunteer members.

Citation for Michelle Snider

For her concern, care and tireless efforts to bring AWM's message to members through aiding in building the new AWM website. Snider launched herself into learning a new piece of software, problem solving, as well as teaching and working with the rest of the website team, so as to create a communication channel for women to feel connected and to find their place in the mathematics community. Snider's goals for a renovated AWM website were for each page to communicate values, goals, and a vision for this important organization.

Response from Snider

I am so happy to have been able to contribute to making the updated website a reality. I hope that the new website projects a message of action and accessibility, that it both highlights and facilitates the wide range of activities and opportunities within the AWM, and welcomes a new generation into this amazing network. I would like to acknowledge all of the women who got the ball rolling on this initiative—I know that a tremendous amount of work was put in to the project before I even joined the website team. Thanks to each of you who supported me in this effort, and to all the current AWM members who continue the ongoing work of promoting and supporting women in math.

AWM – Joan & Joseph Birman Research Prize in Topology and Geometry

The Executive Committee of the AWM established the AWM – Joan & Joseph Birman Research Prize in Topology and Geometry in 2013. First presented in 2015, the prize is awarded every other year to highlight exceptional research in topology/geometry by a woman early in her

Michelle Snider and Ami Radunskaya

career. The award is made possible by a generous contribution from Joan Birman whose work has been in low dimensional topology and her husband Joseph who was a theoretical physicist whose specialty was applications of group theory to solid state physics.

Citation for Kathryn Mann

The 2019 Joan & Joseph Birman Research Prize in Topology and Geometry is awarded to Kathryn Mann for breakthrough work in the theory of dynamics of group actions on manifolds.

Mann uses a broad array of mathematical tools to obtain results at the juncture of topology, group theory, geometry and dynamics, and she finds new connections between them. She has discovered new phenomena, built general theory, and has solved long-open problems. As an example, in a solo paper she introduced a new method to study the topology of the space of surface group representations in the space of orientation-preserving circle homeomorphisms and to prove a rigidity result about geometric such representations. Building on this paper, jointly with M. Wolff, Mann proved that conversely this rigidity property characterizes the geometric surface group actions on the circle. A leading expert describes this as one of the best results obtained in the area in the last couple of decades

Kathryn Mann

and another mathematician describes Mann as "that once-in-a-generation thinker who opens significant new directions for research."

Kathryn Mann received her PhD in 2014 from the University of Chicago. During 2014–2017 she was a Morrey Visiting Assistant Professor and an NSF postdoctoral fellow at the University of California at Berkeley. She now holds a Manning Assistant Professorship of Mathematics at Brown University.

Response from Mann

I am very honored to be selected for the Birman research prize, and deeply grateful to Joan and Joseph Birman for their support in establishing the award with the AWM. I had the pleasure of meeting Joan last fall, after many years of knowing her work. I realize now how fortunate I was to "grow up" mathematically in a field in which Joan Birman was a household name.

I'd like to take this opportunity to thank the many mentors I have had—first and foremost my advisor Benson Farb, and the surrounding community at the University of Chicago. It was there that I first encountered the kind of questions in geometry and dynamics that continue to fascinate me. Though too many to list here, I am indebted to all those I have looked up to and who serve as a continuing source of inspiration: mentors, collaborators, and mathematical friends. I'm very grateful also to my current colleagues at Brown for giving me such a warm welcome and an immediate show of support.

AWM Dissertation Prizes

In January 2016 the Executive Committee of the AWM 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 2019 prizes were awarded to **Ebru Toprak** for "Global dynamics of Schröedinger and Dirac equations" and **Jiayu Wang** for "Malle's conjecture for the compositum of number fields."

Ebru Toprak obtained her PhD in 2018 from the University of Illinois at Urbana-Champaign under the direction of Burak Erdogan. Her work has been recognized through numerous awards, including the 2017 James D. Hogan Memorial Scholarship and the 2017 Waldemar J., Barbara G. and Juliette Alexandra Trjitznsky Fellowship, both from UIUC. Toprak visited the Mathematical Sciences Research Institute in Berkeley until December

Ebru Toprak and Ami Radunskaya

Jiuya Wang and Ami Radunskaya

2018. After this visit, she joined Rutgers University as a Hill Assistant Professor.

Toprak's research interests are in harmonic analysis and dispersive PDEs. Her dissertation provides new decay estimates for the potentials of the linear Schrödinger operator and of the linear massive Dirac operator in endpoint Lebesgue spaces setting, in dimensions 2 and 3 and under suitable assumptions on the threshold energies. Toprak's work has led to several publications, including the single-authored paper "A weighted estimate for two dimensional Schrödinger, matrix Schrödinger and wave equations with resonance of the first kind at zero energy," *Journal of Spectral Theory 7* (2017), 1235–1284, and the paper "Dispersive estimates for Dirac operators in dimension three with obstructions at threshold energies," with B. Erdogan and W. Green, to appear in the *American Journal of Mathematics*. Her results are deemed "surprising"; her collaborators acknowledge that "[they] have benefited and continue to benefit greatly from working with [her]" and that she has already made "several important contributions on notably difficult problems in PDEs."

Jiuya Wang received her PhD in 2018 under Melanie Matchett Wood at the University of Wisconsin–Madison. She is now a Phillip Griffiths Assistant Research Professor and a Foerster-Bernstein Fellow at Duke University. She has received several honors and awards for her research and teaching contributions.

Wang works in arithmetic statistics, a branch of number theory. In her PhD thesis she proved Malle's conjecture for infinitely many non-abelian Galois groups. Malle had conjectured an asymptotic formula, which was later refined, for the number of degree n extensions K over Q with Galois closure having Galois group G. Malle's conjecture is still a central question in arithmetic statistics. The letter writers describe her work as "beautiful" and "impressive." One writes that her work "is a serious analytic accomplishment and I expect it to be published in a top number theory journal." Another writes "Dr. Wang also has many further ideas to use her unique mastery of these subjects, as developed in her thesis, to study related problems" and that "she has already made significant advances in these directions as well." The letter writers concur that her thesis demonstrates a high level of ingenuity, originality and technical mastery. In addition, they expect many applications to the field of arithmetic statistics from the methods she developed in her dissertation.

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman

In 1990, the Executive Committee of the AWM established the annual 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, who contributed greatly to women in mathematics throughout her career.

Citation for Naomi Sweeting, winner

Naomi Sweeting is a senior mathematics and history major at the University of Chicago. At Chicago, she has excelled

in both difficult coursework as well as independent research projects. Her mentors at Chicago describe her as a "truly exceptional student, with a promising future ahead of her." She has already been the recipient of many awards, including the prestigious Barry Goldwater Scholarship and a First Prize in the International Mathematics Competition.

Last summer, Sweeting participated in an REU at Emory University, where she conducted research with other undergraduates in number theory resulting in three excellent publications. On these projects she quickly emerged amongst her peers as an exceptionally gifted mathematician. One of her mentors describes being dazzled by her "depth, vision and sheer computational skill" and believes that one day she "will emerge as a world leading mathematician."

Response from Sweeting

This award is a wonderful honor for me. I must thank the professors Matthew Emerton, Ken Ono, and Wilhelm Schlag; all of them have shared with me their valuable time and their invaluable insights. I am also particularly grateful to my mentor Mathilde Gerbelli-Gauthier for helping me to approach seemingly unapproachable mathematics; my close collaborator and friend Katharine Woo for her crucial contributions to our joint research; and my first mentor and math team coach, Eliza Kuberska, for her boundless enthusiasm for math and her heartfelt concern for her students. I would also like to thank my parents, who provided the environment for my love of mathematics to flourish, and the NSF, Emory University, and the Asa Griggs Candler Fund, whose support made my research experiences possible. Finally, I would like to thank the AWM for its expression of confidence in me as I begin the next phase of my mathematical life.

Citation for Danielle Wang, runner-up

Danielle Wang is a senior math major at MIT. She has excelled in many demanding classes, written four impressive papers and has a strong record both as a participant in math competitions and helping support the next generation of students. Faculty members who have worked with her are enthusiastic about her potential, stating "I believe she will have an excellent career as a research mathematician and bring added prestige to the (Schafer) prize." Faculty who have taught graduate classes Wang has taken describe her comfort with complicated and abstract ideas and the clarity of her solutions. They describe her as combining "world-class problem-solving skills with determination and effort." Wang

Ami Radunskaya with winner Naomi Sweeting (above) and with runner-up Danielle Wang (below)

has also been very successful on the Putnam exam including winning the Elizabeth William Lowell Putnam Prize for her performance on the Putnam Exam in 2015. She has also been a teaching assistant at the Math Olympiad Summer Program.

Wang has participated in the REUs at Emory University and the University of Minnesota at Duluth. Her mentors in both programs describe her results with great enthusiasm, noting her "work is at the level of an advanced PhD student at a top school." In some of her papers, Wang has resolved conjectures in the literature and identified new conjectures

that are likely to draw attention on their own. In other papers, she has successfully mastered and applied technically demanding new approaches. Reflecting this breath of skills, faculty who have worked with her describe her as having "the tools to become a star mathematician."

Citation for Nitya Mani, honorable mention

Nitya Mani is a senior at Stanford University studying mathematics and computer science. While at Stanford, Mani has been a recipient of the Barry Goldwater scholarship, the Karl Menger prize from the AMS, and various prizes for her performance on the Putnam exam, the Intel International Science and Engineering Fair, and outstanding talks and poster presentations.

Mani participated in an REU at Emory University in the summer of 2016. Her work there resulted in two publications on infinite product expansions of modular forms and shifted convolution L-functions for elliptic curves. Her mentor describes her as an "unusually deep" thinker with "unbounded energy and enthusiasm." Mani has also performed research with mentors in the Bay Area and at Stanford, resulting in several other publications in number theory and combinatorics. She is also engaged in numerous teaching, outreach and leadership activities. One mentor describes her as "on the path to becoming a great researcher and leader in mathematics" and an "extraordinary young mathematician."

Citation for Lisa Yang, honorable mention

Lisa Yang is a junior math major at MIT. Lisa has impressive research experience: she has been an intern at Microsoft Research New England, Google and Reservoir Labs, as well as participating in an REU at the University of

ASSOCIATION FOR WOMEN IN MATHEMATICS

RESEARCH SYMPOSIUM

April 6-7, 2019
Rice University

Join us for the 4th biennial AWM Research Symposium showcasing research from women in the mathematical professions!

∫ **3 general audience plenary talks**
Sue Brenner - Louisiana State University
Kristin Lauter - Microsoft Research
Chelsea Walton - University of Illinois

∫ **Over 30 special sessions presenting research in pure mathematics, applied mathematics, and mathematics education**

∫ **A reception and banquet to celebrate local women making a difference in mathematics**

∫ **A Wikipedia Edit-a-Thon**

∫ **Exhibitors and recruiters from across academia, government and industry**

∫ **A poster session for graduate students and recent PhDs**

∫ **A career panel, featuring women in industry**
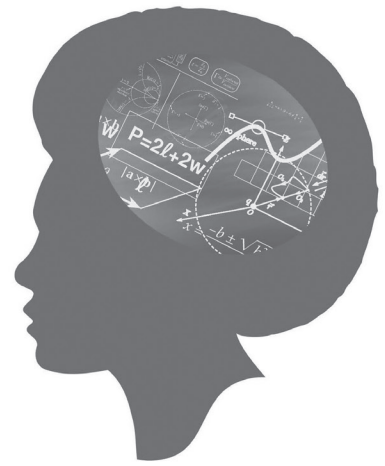
For more information and to register:
www.awm-math.org/

Ami Radunskaya with honorable mentions
Nitya Mani (above) and Lisa Yang (below)

Minnesota. Through these varied research experiences, she has written six papers. She has presented posters about two of these papers at the Joint Math Meetings, where both received Outstanding Poster prizes at the MAA Student Poster Session. Her mentors are impressed with her abilities and potential, describing her as "capable of the kind of research, deep and elegant, that top mathematicians aspire to."

In addition to her abilities and potential, Yang's mentors appreciate her enthusiasm and commitment to math. She has a remarkable ability to learn new math, with her mentors stating, "Lisa's ability to dive into this new complex research area, and the depth of her understanding, her conceptual ideas, and technical ability, is beyond belief!" They are particularly impressed by her engagement and skills integrating her ability and talents with others, noting "working with or talking to Lisa, you can see that she really cares about what she is doing and learning and what the other person is saying. She has that 'spark' to learn and to deeply and completely understand what one is discussing with her or what she is working on."

Response from Yang

I am honored to receive an Alice T. Schafer Prize Honorable Mention. Thank you to the AWM for their encouragement of women in mathematics. I owe much of my fulfillment in research to Yael Kalai whose creativity, energy, and kindness inspires and propels my research. Additionally, I am thankful for my collaborator Omer Paneth, who pushes me to think deeply and never fails to brighten my day, and for the advice and support of my advisor Gigliola Staffilani. I am fortunate to have found homes in the MIT theory group and MIT mathematics department, at Microsoft Research New England, and at the University of Minnesota Twin Cities REU. Last but not least, I am forever grateful for my parents and Carol and Jeff Jessee—without their continual guidance, support, and patience, I would not be where I am today.

Citation for Nina Zubrilina, honorable mention

Nina Zubrilina is a senior mathematics major at Stanford University and is the recipient of a Barry M. Goldwater Scholarship. She has achieved remarkable research success as an undergraduate, having six solo-authored papers written or in preparation. Faculty describe Zubrilina as "in the league of [their] best graduate students," with "a high level of intellectual talent and internal drive," and being "a force for good." In 2016 and 2017, she performed research at the University of Minnesota, Duluth REU, resulting in three papers in analytic number theory and graph theory. She spent last summer at an internship at Microsoft Research New England studying linear programming bounds for the sphere packing problem, where her mentors said "she accomplished things [we] didn't realize were on the horizon." She is currently working on a project on phylogenetic trees whose "upside seems potentially unbounded," according to her mentors.

Nina Zubrillina

Response from Zubrilina

I am very thankful to the AWM for the recognition, as well as for all the wonderful work the AWM does to support women in mathematics. I want to thank my parents and my many extraordinary mentors and teachers, especially Thomas Church, Joe Gallian, Henry Cohn, Kannan Soundararajan and Petr Sergeev.

AWM WORKSHOP

Radmila Sazdanovic, NC State University; Liz Vivas, Ohio State University; and Karoline Pershell, AWM Executive Director

The two-day AWM Workshop started on Friday, January 18, in the evening with a reception and a **Poster Session** for graduate students. The workshop continued on Saturday with an **AMS-AWM Special Session** on Applied and Computational Topology. AWM Workshops are structured to build from previous AWM research programs, reuniting researchers working in a common field to continue to build the collaboration network.

This year's special session was organized by **Radmila Sazdanovic** (North Carolina State University) and **Yusu Wang** (Ohio State University). Some of the talks featured research that began at the Women in Computational Topology (WinCompTop) workshop at the Institute for Mathematics and its Applications (IMA), Minneapolis in 2016 that was sponsored by the AWM ADVANCE grant. The workshop at the JMM provided opportunities for participants in this earlier WinCompTop workshop and other women

mathematicians in these fields to come together, exchange research ideas, and engage in mentoring activities. Speakers and participants were very enthusiastic about the day's events and about being part of this research community. At the mentoring lunch, participants met in small groups for some focused conversations. The workshop was supported by the AWM ADVANCE grant, Career Advancement for Women Through Research Focused Networks.

The workshop title was Applied and Computational Topology, and the topics covered included a number of applications ranging from including RNA branching and the study of neurons to image analysis, road networks and developing statistical tools for topological data analysis of phylogenetic trees. Presentations included visualizations of effectiveness of generalizations of the media axis approach in root reconstructions to amazing animated diagram chasing arguments on spectral sequences. Plenary talks were given by **Christine Heitsch** (Georgia Institute of Technology), **Anthea Monod** (Columbia University), **Sara Kalisnik** (Wesleyan University), **Hee Rhang Yoon** (Georgia Institute of Technology), **Ellen Gasparovic** (Union College), **Bei Wang** (University of Utah), **Nina Otter** (Oxford University), **Carina Curto** (Pennsylvania State University), **Lori Ziegelmeier** (Macalester College), **Rachel Neville** (Arizona State University), **Brittany Fasy** (Montana State University), and **Erin Chambers** (Saint Louis University).

The Friday night Graduate Poster Session was organized by **Matilde Lalin** (University of Montreal), **Radmila Sazdanovic** (NC State University), **Liz Vivas** (Ohio State University) and **Sarah Witherspoon** (Texas A&M University).
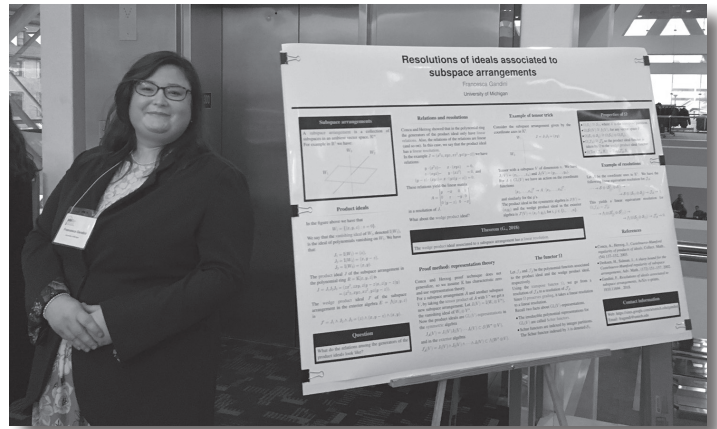
Jeungeun Park explaining her poster

Titles of the plenary talks and of the graduate student posters may be found at awm-math.org.

At the workshop reception on Friday evening twenty graduate students presented their posters. The poster session was well attended, with judges vying with numerous attendees to speak to the presenters! This was an excellent opportunity for the graduate students to showcase their work, practice presentation skills, and to be welcomed into the research community.

The twenty poster presenters were: **Allison Arnold-Roksandich** (Oregon State University), **Rhea Palak Bakshi** (The George Washington University), **Megan Chambers** (North Carolina State University), **Eva Comino** (University of Southern Mississippi), **Keisha Cook** (University of Alabama), **Emelie Curl** (Iowa State University), **Maria Fox** (Boston College), **Francesca Gandini** (University of Michigan), **Hayriye Guckir Cakir** (Michigan State University), **Xiao Hou** (University of Wisconsin – Madison), **Lara Kassab** (Colorado State University), **Lisa Kaylor** (Wesleyan University), **Jenny Kenkel** (University of Utah), **Daewa Kim** (University of Houston), **Seoyoung Kim** (Brown University), **Junyuan Lin** (Tufts University), **Kit Newton** (University of Wisconsin – Madison), **Jeungeun Park** (University of Iowa), **Manami Roy** (University of Oklahoma), and **Amanda Welch** (Virginia Tech).

The AWM Graduate Poster Session is a judged session, offering winning graduate students an opportunity

Prize winner Francesca Gandini at her poster

Prize winner Daewa Kim at her poster

to further anchor themselves in their research fields, with a prize like no other: an invitation to participate in a week-long workshop at one of the research institutes. These prizes are made possible in coordination with the NSF Math Institutes co-chairs of the Mathematical Sciences Institutes Diversity Committee, **Leslie Hogben** and **Ulrica Wilson**. This year's winners were **Francesca Gandini** and **Daewa Kim**.

The graduate student poster portion of the AWM Workshop remains open to all areas of mathematics, but often includes a number of participants from the special session area. This more focused and integrated approach fosters networking among participants in the selected topical theme and allows for further mentoring from women leaders in the field.

Graduate student poster presenters are funded to come to the JMM to be part of a broader AWM Workshop program. Graduate students are paired with mentors from their particular research field before the meeting and are encouraged to get in touch and schedule a time to meet their mentor at the beginning of the conference as well as at the mentoring lunch. Mentors are asked to discuss and advise
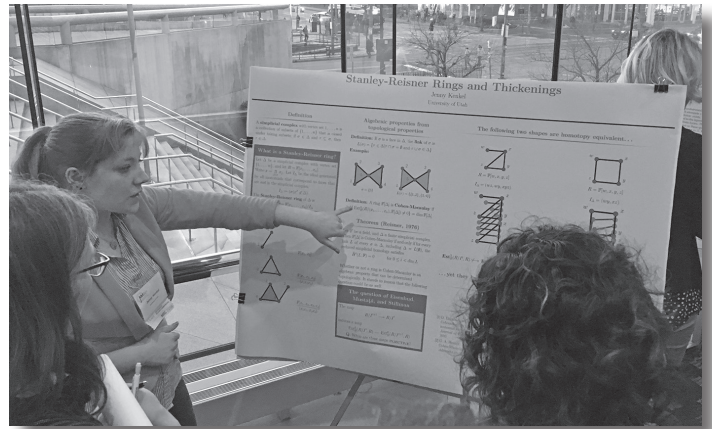
Jenny Kenkel explaining her poster

participants on research-related professional development, provide specific feedback regarding the student's posters, and answer any career-related questions. Attendance at the special sessions is intended to aid graduate students in understanding the greater context for their research while

CALL FOR NOMINATIONS
2020 M. Gweneth Humphreys Award

The Executive Committee of the Association for Women in Mathematics has established a prize in memory of M. Gweneth Humphreys to recognize outstanding mentorship activities. This prize will be awarded annually to a mathematics teacher (female or male) who has encouraged female undergraduate students to pursue mathematical careers and/or the study of mathematics at the graduate level. The recipient will receive a cash prize and honorary plaque and will be featured in an article in the AWM newsletter. The award is open to all regardless of nationality and citizenship. Nominees must be living at the time of their nomination.

The award is named for M. Gweneth Humphreys (1911–2006). Professor Humphreys graduated with honors in mathematics from the University of British Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her PhD at age 23 from the University of Chicago in 1935. She 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 Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

The nomination documents should include: a nomination cover sheet; a letter of nomination explaining why the nominee qualifies for the award; the nominee's vita; a list of female students mentored by the nominee during their undergraduate years, with a brief account of their post-baccalaureate mathematical careers and/or graduate study in the mathematical sciences; and supporting letters from colleagues and/or students. At least one letter from a current or former student of the candidate must be included.

Nomination materials for the Humphreys Award shall be submitted online. See the AWM website at www.awm-math.org for nomination instructions. Nominations must be received by **April 30, 2019** and will be kept active for three years at the request of the nominator. For more information, phone 401-455-4042, email awm@awm-math.org or visit https://awm-math.org/awards/humphreys-award/.

connecting women graduate students to the larger network of research-active women.

A special thanks to **Abbey Bourdon**, **Patricia Cahn**, **Carina Curto**, **Elizabeth Drellich**, **Brittany Fasy**, **Jennifer Kenkel**, **Catherine Kublik**, **Beth Malmskog**, **Anca Radulescu**, **Paola Vera-Licona**, **Bei Wang**, and **Sylvia Wiegand** for serving as mentors to the graduate students and to the junior speakers in the number theory session. These women shared their varied experiences and provided invaluable guidance.

We are grateful to **Emilie Wiesner** (Ithaca College), Poster Judging Coordinator. Wiesner's efforts in recruiting, organizing and preparing the judges, as well as tallying scores and confirming awards, helped this event be a success.

A special thanks to the volunteer judges **Grace Cook**, **Anna Haensch**, **Erin Chambers**, **Evelyn Lunasin**, **Eva Goedhart**, **Heather Smith**, **Kuei-Nuan Lin**, **Hyun-Kyoung Kwon**, **Ariane Masuda**, **Kelly McKinnie**, **Megan Martinez**, **Meghan DeWitt**, **Miranda Teboh Ewungkem**, **Teresa Moore**, **Naomi Tanabe**, **Nina Otter**, **Denise Rangel Tracy**, **Rebecca Segal**, **Sema Güntürkün**, **Satyanand Singh**, **Vani Cheruvu**, and **Wenying Feng**, who gave of their time to review the math, meet the graduate student presenters, and offer pointed and helpful feedback to the students.

A special thank you to ADVANCE Grant Co-PI **Magnhild Lien** and to new AWM Meetings Coordinator **Alina Bucur** (University of California San Diego) who are heavily involved in these grants, so as to be sure that the AWM remains a successful force for women in math.

The 2019 AWM workshop was made possible by funding from the NSF through the ADVANCE grant "Career Advancement for Women Through Research-Focused Networks" (NSF-HRD 1500481) and NSF grant "Graduate Student Participation in National Workshops to

Allison Arnold-Roksandich explaining her poster to AWM President Ami Radunskaya

Encourage Women's Engagement in Mathematics Research" (NSF-DMS 1636610).

In this article, we highlighted several ways to get involved with AWM: Research Collaborative Conference Workshops, including poster sessions, judging, and mentoring. If you are interested in learning more about any of these, please email awm@awm-math.org.

BEYOND THE WORKSHOP

Radmila Sazdanovic, NC State University; Liz Vivas, Ohio State University; and Karoline Pershell, AWM Executive Director

The 2019 Joint Mathematics Meetings featured a number of events organized by AWM, dedicated to inspiring, involving and retaining women in mathematics. AWM hosted a range of events: AWM Hill Visit orientation and meetings with congressional offices in Washington DC;

Graduate Poster Session

Future collaborators??

a discussion, "Understanding the Landscape and Needs in Teacher Collaborations"; the AWM Panel Discussion "Promoting Inclusion in STEM"; the open AWM Business Meeting for members to talk directly to AWM leadership; the AWM Reception and Awards Presentation; the AWM-AMS Noether Lecture; the presentation of awards at the Joint Prize Session; the AWM Workshop Poster Presentations by Women Graduate Students and Reception; and the AWM Workshop "WinCompTop: Applied and Computational Topology."

We were so pleased to again learn of and promote a wide variety of events happening across JMM that championed inclusivity and diversity in mathematics and provided support for women and other underrepresented minorities. These included the AMS Women in Topology session; AMS Advances by Early Career Women in Discrete Mathematics; MAA's The EDGE (Enhancing Diversity in Graduate Education) program: Pure and Applied talks by Women Math Warriors; MAA Session on Inclusive Excellence: Attracting, Involving, and Retaining Women and Underrepresented Groups in Mathematics; panels and presentations such as "Motivating Students in Mathematics: Women Who Count"; NAM's 50th anniversary celebrations; and the Cox-Talbot address "A Seat at the Table: Equity and Social Justice in Mathematics Education," by Talithia Williams. There are likely events we missed! So be sure to send us info for upcoming

Kra taking a question from the audience at the end of her Noether lecture

meetings that should be shared with our membership as we collectively create welcoming environments in mathematics.

Noether Lecture. This year's AWM-AMS Noether Lecturer was **Bryna Kra** (Northwestern University), who spoke on "Dynamics of systems with low complexity," which intended to give "an overview of the relations among complexity, algebraic properties, and dynamical characteristics of the system … and their relations to combinatorial


CALL FOR NOMINATIONS

The 2019 Etta Zuber Falconer Lecture

The Association for Women in Mathematics and the Mathematical Association of America (MAA) annually present the Etta Zuber Falconer Lecture to honor women who have made distinguished contributions to the mathematical sciences or mathematics education. These one-hour expository lectures are presented at the MAA MathFest each summer. While the lectures began with MathFest 1996, the title "Etta Zuber Falconer Lecture" was established in 2004 in memory of Falconer's profound vision and accomplishments in enhancing the movement of minorities and women into scientific careers.

The mathematicians who have given the Falconer lectures in the past are: Karen E. Smith, Suzanne M. Lenhart, Margaret H. Wright, Chuu-Lian Terng, Audrey Terras, Pat Shure, Annie Selden, Katharine P. Layton, Bozenna Pasik-Duncan, Fern Hunt, Trachette Jackson, Katherine St. John, Rebecca Goldin, Kate Okikiolu, Ami Radunskaya, Dawn Lott, Karen King, Pat Kenschaft, Marie Vitulli, Erica Walker, Izabella Laba, Talithia Williams, and Pamela Gorkin.

The letter of nomination should include an outline of the nominee's distinguished contributions to the mathematical sciences or mathematics education and address the nominee's capability of delivering an expository lecture. Nominations are to be submitted as ONE PDF file via MathPrograms.Org. The submission link will be available 45 days prior to the deadline. Nominations must be submitted by **September 1, 2019** and will be held active for two years. If you have questions, phone 401-455-4042 or email awm@awm-math.org or visit https://awm-math.org/awards/falconer-lectures/ to learn more.
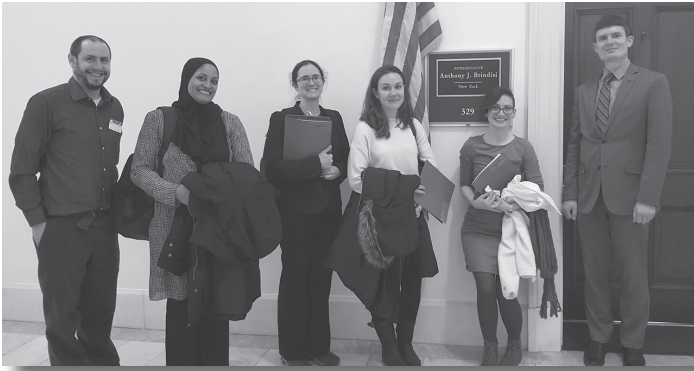
AWM members Moshe Cohen, Khedija Khiyar, Jesse Metcalf-Burton, Cara Peters, and Courtney Gibbons met with staffer Jonathan Lipe (right) from the office of Rep. Brindisi (NY-22) on Hill Day. Photo by Moshe Cohen, Vassar College

problems." This excellent talk was very well received, with over 250 attendees. Bryna ended the talk with a clear and clever summary of the state of the field's major theorems and open problems, an invitation for all to pick up their pencils and work in dynamical systems!

Hill Day. Aligning Hill Day with a "local" JMM was a huge success. AWM's Government Advocacy Committee (GAC) members **Michelle Snider**, **Beth Malmskog**, and **Lindsey-Kay Lauderdale** organized a half day training in Baltimore, transport to and from DC, meetings with Congressional offices and a participant dinner near the Capitol for participants to debrief and celebrate the day's victories. AWM is so appreciative of the volunteers who participate. It is a big deal to spend a full day doing something which may be outside of one's comfort zone, but we heard from everyone that they felt like this was worthwhile! As GAC chair Michelle Snider puts it, "I find that visiting offices in person helps to counteract the constant negative news cycle—I love being reminded that there are a lot of good people who are working to help address these issues."

At the time of this writing, there are four women who have officially announced their intentions to run for president in 2020: Senators Kirsten Gillibrand, Kamala Harris and Elizabeth Warren and Representative Tulsi Gabbard. AWM met with all four of their offices on Hill Day, a nice confluence. Overall, 50 Hill Day participants met with 47 offices in both the Senate and House, across 18 states (both Democrats and Republicans, and one Independent). Thanks to AWM committee member Beth Malmskog who blogged about the event at https://blogs.ams.org/jmm2019/2019/01/16/awm-capitol-hill-visit-at-jmm-2019/.

Hill Day participants in front of the Calder statue, Mountains and Clouds, *in the Hart Senate Office Building
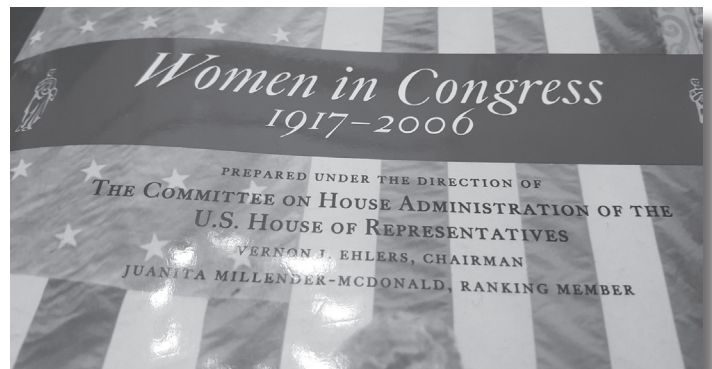Photo by Moshe Cohen, Vassar College*

Photo by Moshe Cohen, Vassar College

AWM Member Business Meeting. At this year's meeting, **Ami Radunskaya** handed over the silver bowl to incoming President **Ruth Haas**. While there were no issues brought up by members, we hope that AWM'ers will contact us throughout the year with their concerns, questions and needs. Please reach out!

Ami Radunskaya, the silver bowl, and Ruth Haas

Three Executive Directors, Present and Past: Karoline Pershell, Magnhild Lien, and Maeve McCarthy [we apologize for failing to corral Jennifer Quinn to join in the photo]

AWM Reception and Awards Presentation. A fine time was had by all at this year's event. The reception was in full swing when Ami Radunskaya welcomed us (and brought the awards presentation to order) with a rap. The awards and prizes have already been described above. Here is the rap:

Reception Welcome

by Gabriel Chandler

Are you ready for this? Are you ready for this?
— it's the joint … meetings
as I do my dutiful greeting
and please feel free to stand if there's a lack of
      suitable seating
the sound of beautiful beating hearts
profound, that's what sets we apart
founded 48 years ago
been around, some might say spherical
and entering our prime and far from being newly formed
you're all a part of this circle like vectors all with unit norm
who've help to push the measure from point mass
      more t'wards uniform
so the woman math warrior is far from the mythical unicorn
but magical's still apt to say as we look at the state of
      math today
seeds planted by Kovalevsky have taken root to grow
      the next tree
with a forest starting to form complete with diverse
      perspection
inclusive in our approaches, welcome to the AWM reception

(Call and response)

A-W-M
Let me hear it now!
A-W-M

The AWM Booth. The AWM Booth again served as a gathering spot to connect (and reconnect!) with the community. The booth was almost always busy with people dropping in to say hello, or supporting AWM by purchasing a T-shirt or a book to be signed!

AWM Executive Committee member and author of *Power in Numbers*, **Talithia Williams**, was interviewing *Hidden Figures* author and lifetime AWM member, **Margot Lee Shetterly** on Saturday. AWM sold both books and want to thank Talithia, Margot and AMS Executive Director and AWM Member, **Catherine Roberts**, for helping with

Michelle Snider, Joseph Frias and Steven Ferrucci at the booth

that fundraiser. In addition to T-shirts, AWM also sold onesies, intended for infants, but also worn well by small dog friends.

Thank you to **Michelle Snider**, **Lily Silverstein**, **Aimee Johnson**, **Jessica De Silva**, **Stefanie Wang**, **Joseph Frias**, **Shanise Walker**, **Vee Galloway**, and **Julian Benali** for your time and care in representing AWM at the exhibitor's booth.

AWM PANEL: PROMOTING INCLUSION IN STEM (PI-STEM)

Yen Duong and Talia Fernós

For the second year in a row, the AWM hosted a Joint Mathematics Meetings panel about "Math-tivism." This year, it was moderated by Talia Fernós and live-blogged by Yen Duong, which is how they have come to write this article together. The title was "Promoting Inclusion in STEM (PI-STEM)." The name PI-STEM was created by Talia's math and chemistry graduate students at UNCG. They invite marginalized people to express common concerns with inclusive language, which they can then use for advocacy and fighting for their common equality. The room was full of anticipation for a fantastic discussion featuring five panelists:

Pamela E. Barnett: Dean of Arts and Sciences at La Salle, University of Philadelphia. Her career and research in higher education have focused on advancing diverse student bodies, faculties, and curricula.

Harrison Bray: Postdoc at University of Michigan, invested in addressing diversity issues in math and especially building community for queer mathematicians.

Piper Harron: Postdoc at University of Hawai'i at Mānoa, founder of the blog "The Liberated Mathematician: power^people," sparker of controversy by speaking truth to power.

Autumn Kent: Associate Professor at University of Wisconsin – Madison. Trans activist, writer, and poet.

The panel began with a slide of five axioms. The first four are from Federico Ardila's article in the *Notices*, "Todos Cuentan: Cultivating Diversity in Combinatorics."

- **Axiom 1.** Mathematical talent is distributed equally among different groups, irrespective of geographic, demographic, and economic boundaries.
- **Axiom 2.** Everyone can have joyful, meaningful, and empowering mathematical experiences.
- **Axiom 3.** Mathematics is a powerful, malleable tool that can be shaped and used differently by various communities to serve their needs.
- **Axiom 4.** Every student deserves to be treated with dignity and respect.
- **Nature vs. Nurture Axiom:** All inequality is a consequence of current and accumulated bias.

These axioms were the foundation for the discussion. Any conversation that questions the validity of these

Moderator Talio Fernós and panelists Autumn Kent, Piper Harron, Pamela Barnett, and Harrison Bray

statements is antithetical to providing concrete solutions for achieving representation in the white cis male dominated world of mathematics. We assert that the following groups are underrepresented in that world:[1] cis and trans women, and gender minorities; racial and ethnic minorities, particularly people with African, Latin, Native American, and Pacific Islander descent; lesbian, gay, bisexual, transgender, and queer people; people coming from economically disadvantaged backgrounds; and people with disabilities.

Here is an excerpt from the resulting conversation.

Q: What can faculty do to retain students from under-represented groups?

The panel made several suggestions such as making student mental health a priority; Autumn mentioned being her departmental Mental Health Liaison to connect students to resources. Representation among faculty is important for retaining students. Ask for graduate students' inputs into what they value, what they feel is lacking, and how they view the departmental climate. The AWM Policy and Advocacy committee is working on a paragraph that faculty can include in their syllabi to address harassment, particularly peer-to-peer sexual harassment.

Q: How can we measure success in representation? Should we aim for percentages? Or absolute numbers?

Piper got an impromptu audience ovation when she said "We're in this messed-up system and we're asking how can we get more people to join this messed-up system with us?"

Channeling Ruth Bader Ginsburg's thoughts about the Supreme Court, the panel agreed that proportional representation isn't good enough. If there were no bias, then overrepresentation would sometimes happen, so some departments would be majority female or even all female.

Q: How do you react if someone says something sexist or racist or homophobic?

Autumn got laughs when she said "people can be trained." Avoiding placing the onus of education on marginalized people—don't rely on a particular woman to explain why a statement is sexist. Pamela added that "you can't put it off on students or grad students or untenured members of the department who are already carrying a lot of the weight." However, people from one marginalized group

can stand up for people from another one, assuming that it does not put them at risk.

Q: How can you get someone acting problematically to be receptive to feedback?

All of the panelists had something to say to this question. Harrison had an interesting perspective with male privilege, as he said "After I transitioned, I found these conversations man-to-man could be a spirited intellectual debate … young men in math really respond to axioms and consequences."

Q: As an early career person, what are things you can do to promote inclusion and still get a job?

You can advertise your beliefs and identity on your website, because you probably don't want to work somewhere that will stigmatize you for those. On the other hand, don't say "yes" to too many committees and volunteer organizations, because it can negatively impact your work. Sometimes academics idealize academic jobs, but there are many other jobs out there. Being a mathematician is like having the superpower to learn anything. We're highly sought after in the job market.

The audience was lively and asked many questions, but there wasn't enough time for all of them. People wondered about bullying and exclusion from cliques. One audience member said she had started a race and gender study group within the faculty in her department, which was attended by several white cis men.

In the end, we heard some concrete suggestions to help ease underrepresentation. But because of the composition of the panel, issues concerning disability and economic background were not really addressed. The panel discussion was an exercise in asking questions, more so than answering them. We hope that the attendees and the people reading this will continue the conversation about how to bring marginalized people together to fight for our common equality.

We thank the panelists for sharing their time with us. We commend them for their honesty and openness, and their bravery for fielding "wild card" questions from the audience.

For a more detailed but still incomplete transcript of the session, visit the Joint Math Meetings blog post, written by Yen at blogs.ams.org/jmm2019/2019/01/16/association-for-women-in-mathematics-panel-discussion-promoting-inclusion-in-stem/#more-63.

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[1] The AMS keeps demographic data on some of these groups. The groups are overrepresented in some or all of the following populations: people/youth experiencing homelessness, incarcerated people, victims of hate crimes.

WOMEN HONORED AT JOINT PRIZE SESSION

The awards given by AWM have been reported on elsewhere. Here we give the citation for the Satter Prize from the Prizes and Awards booklet. Also, we give brief mentions of other female recipients. The full prize booklet is available at http://jointmathematicsmeetings.org/meetings/national/jmm2019/2217_prizes-all.

The Ruth Lyttle Satter Prize in Mathematics

The Satter Prize was established in 1990 using funds donated by Joan S. Birman in memory of her sister, Ruth Lyttle Satter, to honor Satter's commitment to research and to encourage women in science. The prize is awarded every two years to recognize an outstanding contribution to mathematics research by a woman in the previous six years.

Citation for Maryna Viazovska

The 2019 Ruth Lyttle Satter Prize in Mathematics is awarded to **Maryna Viazovska** of École Polytechnique Fédérale de Lausanne for her groundbreaking work in discrete geometry and her spectacular solution to the sphere-packing problem in dimension eight.

In his 1900 list of outstanding mathematical problems, David Hilbert asked, "How can one arrange most densely in space an infinite number of equal solids of a given form, e.g., spheres with given radii …?" Viazovska's work is a major advance in addressing this question. Her 2017 paper in *Annals of Mathematics* shows that the E_8 root lattice is the densest sphere packing in eight dimensions. Shortly after this much heralded breakthrough, Dr. Viazovska, in collaboration with Henry Cohn, Abhinav Kumar, Stephen D. Miller, and Danylo Radchenko, adapted her methods to prove that the optimal sphere-packing density in dimension twenty-four is achieved by the Leech lattice. Prior to these results, the sphere-packing problem had not been solved beyond dimension three.

Maryna Viazovska's work has been described as "simply magical," "very beautiful," and "extremely unexpected." Her solution to the sphere-packing problem in dimension eight, while conceptually simple, has a deep structure based on certain functions that she explicitly constructs in terms of modular forms. It establishes a new, unanticipated connection between modular forms and discrete geometry.

Viazovska's earlier results on spherical designs are fundamental contributions to the topic. Her 2013 *Annals of Mathematics* paper with Andriy Bondarenko and Danylo Radchenko solved a conjecture of J. Korevaar and J.

L. H. Meyers by showing for $N > C_d t^d$, where C_d is a positive constant depending only on d, that spherical t-designs with N points exist in the unit sphere S_d. Spherical designs have been essential tools of practical importance in the statistical design of experiments and in both combinatorics and geometry. Most recently, spherical t-designs have appeared in the guise of quantum t-designs with applications to quantum information theory and quantum computing.

Other Honors

From the AMS: **Ilse Fischer** and her coauthors Roger Behrend and Matjaž received the David P. Robbins Prize for their paper "Diagonally and antidagonally symmetric alternating sign matrices of odd order," published in 2017 in *Advances of Mathematics*. In this work they prove, after more than thirty years, the conjectured formula for the number of odd-order diagonally and antidiagonally symmetric alternating sign matrices, the last remaining of David Robbins' conjectures on alternating matrices.

From AMS-SIAM: **Marsha Berger** was one of two recipients of a 2019 Norbert Wiener Prize in Applied Mathematics, for her fundamental contributions to Adaptive Mesh Refinement and to Cartesian mesh techniques for automating the simulation of compressible flows in complex geometry.

From the JPBM: The 2019 JPBM Communications Award was presented to **Margot Lee Shetterly** for her 2016 book *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race* and subsequent movie *Hidden Figures*. They opened science and mathematics to a new generation of women and people of color by bringing into the light the stories of the African-American women who made significant contributions to aeronautics and astronautics.

From the MAA: **Cathy O'Neil** received the Euler Book Prize for *Weapons of Math Destruction*, Crown 2016. This is a singularly important book, especially at the current historical juncture. It is well-written, engaging, and tackes an important issue, "the dark side of data science," in a thoughtful way. Two of the three Deborah and Franklin Tepper Haimo Awards for Distinguished College Teacher of Mathematics were given to **Suzanne Dorée**, Augsburg University, Minneapolis, MN and **Jennifer Switkes**, Cal State Poly. Dorée was recognized for her exemplary teaching innovation and leadership, not only at Augsburg University, but also nationally through her work with the MAA, the Charles A. Dana Center, and numerous presentations and workshops on campuses throughout the US. Switkes was recognized for bringing her educational core values of excellence, honor, integrity, love and purpose to all students, and specifically to tradionally underserved students.

AWM Workshop at the 2020 Joint Mathematics Meetings

Application deadline for graduate students: **August 15, 2019**

For many years, the Association for Women in Mathematics has held a series of workshops for women graduate students and recent PhDs in conjunction with major mathematics meetings. Beginning in 2016, the workshop talks are supported by the AWM ADVANCE grant. The AWM Workshops serve as follow-up workshops to Research Collaboration Conferences for Women, featuring both junior and senior women speakers from one of the Research Networks supported by the ADVANCE grant. An AWM Workshop is scheduled to be held in conjunction with the Joint Mathematics Meetings in Denver, CO, January 2020.

FORMAT: The workshop will consist of a Special Session focused on several complex variables organized by Liz Vivas and Loredani Lanzani, and a Poster Session for graduate students. Selected junior and senior women from the Research Collaboration Conferences for Women (RCCW) WinSCV, to be held at AIM in April 2019, will be invited to give 20-minute talks in the Special Session on Several Complex Variables. The speakers will be supported by the National Science Foundation AWM ADVANCE grant: Career Advancement for Women Through Research Focused Networks. The Poster Session will be open to all areas of research; graduate students working in areas related to several complex variables are especially encouraged to apply. The graduate students will be selected through an application process to present posters at the Workshop Reception & Poster Session. With funding from NSF, AWM will offer partial support for travel and hotel accommodations for the selected graduate students. The workshop will include a reception, luncheon and a mentoring session where workshop participants will have the opportunity to meet with other women mathematicians at all stages of their careers. In particular, graduate students in several complex variables will have the opportunity to connect with the Women in Several Complex Variables (WinSCV) Research Network.

All mathematicians (female and male) are invited to attend the talks and poster presentations. Departments are urged to help graduate students and junior faculty who are not selected for the workshop to obtain institutional support to attend the presentations.

MENTORS: We also seek volunteers to act as mentors for graduate students as part of the workshop. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **September 15, 2019**.

ELIGIBILITY: To be eligible for selection and funding, a graduate student must have made substantial progress towards her thesis. Women with grants or other sources of support are welcome to apply. All non-US citizens must have a current US address.

All applications should include:

- a title of the proposed poster
- an abstract in the form required for AMS Special Session submissions for the Joint Mathematics Meetings
- a curriculum vitae
- one letter of recommendation from her thesis advisor.

Applications (including abstract submission via the Joint Mathematics Meetings website) must be completed electronically by **August 15, 2019**. See https://awm-math.org/meetings/awm-jmm/ for details.

BOOK REVIEW

Blindspot: Hidden Biases of Good People, by Mahzarin R. Banaji and Anthony G. Greenwald, Delacorte Press, 2013, ISBN 978-0-533-80464-5

Reviewed by Marge Bayer

The subtitle clearly indicates the subject of this book. The book deals with gender discrimination and, in particular, biases about women and science, but the greatest attention is paid to race discrimination. The authors explain that this is because of its great importance to society, but also because this is where there is the most scientific research. In this review I will talk about various biases but will highlight the gender and math/science results.

The basic idea is that we have subconscious biases that affect our actions, even though we would make conscious decisions differently and even though we are not aware of the effect of these biases. These biases are the result of exposure to stereotypical images, essentially from birth. Our blindspots are our failure to recognize these subconscious biases. This has a significant effect on our society. Some feel that the decline in overtly racist acts (until recently) shows that we are in a post-racial society and that individuals are responsible for their own lack of success. But that does not take into consideration the implicit bias described in this book. The resulting in-group favoritism "may be the largest contributing factor to the relative disadvantages experienced by Black Americans and other already disadvantaged groups." [p. 162] This is particularly hard to combat, precisely because we are unaware of our hidden biases and of how they affect our own attitudes and actions.

In 1994 the second author introduced a tool to identify these hidden biases: the Implicit Association Test (IAT). The authors and others set up a website, where various IATs are available for anyone to do online, at https://implicit.harvard.edu/implicit/takeatest.html. They collect anonymous data from this web site—in the book they say that by 2013, 14 million tests were completed online. The IAT is used by many researchers in psychology. In this review, I will assume that the IAT is a valid measure of implicit biases and that these biases affect our decisions and actions. This is not universally accepted.[1]

As an example of the IAT, one on gender and family/career has you go through a series of exercises, which you are supposed to do as quickly as possible. You are given four sets of words, a set of easily identified female names, a set of male names, a set of words for family relationships, and a set of words associated with careers or business. One exercise is to sort female and male names. One exercise is to sort family and career words. The third exercise is to sort into two sets: (1) female names and family words and (2) male names and career words. And the fourth exercise is to sort into two sets: (1) female names and career words and (2) male names and family names. The theory is that if it takes longer to do the fourth exercise than the third exercise, it is because of our implicit (and perhaps unconscious) association of women with family and men with careers. The data show that the great majority of people (including me) do take longer on the fourth exercise than on the third. The good news is that younger survey participants show less bias on this test.

The results on these tests are in contrast to survey research, where people are asked their opinions on, say, gender differences or racial differences. On surveys, people may consciously lie because they are embarrassed about their views; more likely they believe that they are answering truthfully, but are not aware of their unconscious biases. The authors refer to our conscious opinions as "reflective preferences"; what is measured in the IAT are "automatic preferences."

The fact that we have automatic preferences does not imply that we endorse or act on them. But they may have a negative effect on our decisions. This is backed up by the familiar research where employers are sent equivalent fake job applications with male and female names or with names associated with ethnic or racial groups, and similar research with landlords and rental applications. In addition, the book talks about the effects of self-applied stereotypes. "Elders who internalize stereotypes of the elderly are at greater risk of declining health." [p. 93]. And, not surprisingly, automatic gender stereotypes can adversely affect women's career paths, not just because of men's perception of women, but because of the self-directed stereotypes of women themselves.

The word "stereotype" originally meant a printer's metal plate used to produce copies of a page. It was given its current meaning in 1922 by Walter Lippman. The insidious feature of stereotypes is that they are acquired unconsciously and effortlessly. The effect of stereotypes is amplified by the "out-group homogeneity effect," the failure to differentiate within an unfamiliar category. The authors suggest a theory that stereotyping can actually contribute to our perception of people as individuals. If we perceive an individual as belonging to several different categories, each with its

stereotypical properties, then we can see them as an almost unique individual within our experience. This does not prevent us from acting on a particular stereotype of one of those categories.

Here are some of the reported results on women and careers, or women and math. Research using IAT showed that the more strongly a woman associated romantic partners with a Prince Charming image (rather than a "regular guy"), the less likely she was to aspire to status and power herself. [p. 116] Research by the first author with students demonstrated that subjects who said they had no preference for a male or female boss revealed that they were willing to take a job with a lower salary if the boss was male. [p.117] The researchers also found that a "male = math" preference as measured by the IAT was correlated with lower math SAT scores for girls. [p. 119]

Let me return to the issue of the validity of the IAT and the consequences for implicit bias. Not having any training in psychology, I turned to a colleague in my university's psychology department. He says that there is a small group of people (including the authors of the article in the endnote) who object strongly to the IAT, while most researchers in psychology believe that it is an imperfect measure that does predict some behaviors, but could not be used in a court or for employment decisions.

The authors try to be hopeful for the future. "... It is conceivable that in the not-too-distant future the idea that once upon a time such a stereotype [math and gender] existed might seem quaint." [p. 122] However, there is little evidence of effective interventions in general. Blind auditions for orchestras have resulted in a significant increase in the number of women in major orchestras. But in most professions, including university professors, blind recruiting is not feasible. Some fields use blind refereeing for publication decisions, but it is not used much in mathematics; in many cases it would be hard to be truly blind, since the very specialized nature of our research and the dependence on cited works often reveal the authors without including their names.

Research has shown some success from interventions in the short term. One experiment started with a task that involved exposure to images of famous, esteemed Black Americans and images of infamous, repudiated White Americans. Then a race IAT was administered. The result was lower "white = good" associations on the IAT. But no research shows the effect is durable. The IAT itself makes us more aware of our hidden biases, which, we hope, helps us overcome these biases in our actions. Evidence that younger people show less bias association with the IAT is encouraging, and the authors suggest that the greatest hope for change lies with counterstereotypical images in mass media. Our conscious minds are sometimes cynical about these, but frequent images of women or minority role models can influence both reflective and automatic preferences.

The book helps us understand the insidious effects of stereotyping in our society. It gives us a way to respond to people who question the continuing effect of discrimination.

Endnote

1. See Mitchell, Gregory and Philip E. Tetlock, Popularity as a poor proxy for utility: The case of implicit prejudice. pp. 164–195 in Lilienfeld, Scott O. and Irwin D. Waldman, eds., *Psychological Science under Scrutiny: Recent Challenges and Proposed Solutions*. John Wiley & Sons, New York, 2017.

EDUCATION COLUMN

Education Column Editor: Jackie Dewar, Loyola Marymount University, jdewar@lmu.edu

Connecting with Teachers

Suzanne Lenhart, University of Tennessee, Department of Mathematics and NIMBioS, and Greg Wiggins, University of Tennessee, NIMBioS and Department of Entomology and Plant Pathology

The goal of the AWM Teacher Partnership Program (https://awm-math.org/programs/teacher-partnerships) is to encourage collaboration by connecting mathematics teachers from an array of educational institutions, ranging from primary and secondary schools to colleges and universities, with other teachers working in an environment different from their own, as well as with mathematicians working in business, government, and industry. This program is open to anyone interested in contributing to mathematics education.

The AWM Teacher Partnership committee is trying to rejuvenate this Partnership Program, which was started

in August 2006 by Pao-sheng Hsu, Erica Voolich and Suzanne Lenhart. Initially teachers and mathematicians were matched after submitting a request through an online system. Despite generating a few successful partnerships in the Program, in which either the partners became friends or collaborated, there were not sufficient participants in close geographic proximity to one another to make matching feasible. That led to the formation of an online forum started for exchanging ideas in 2011. Currently, a closed Facebook Group is our forum for teachers and mathematicians to exchange ideas related to mathematics education, activities, and outreach. (To join the group, submit a request through the link found on https://awm-math.org/programs/teacher-partnerships.)

The AWM Teacher Partnership Committee and the Education Committee need more input to understand the landscape and the needs in teacher collaborations. As we write this column, the two committees are planning to host a forum at the Joint Mathematics Meetings in Baltimore in January 2019, for the math community to discuss common interests on collaborations and interactions with teachers. The ways to connect to teachers are various, and you may have valuable insights based on your own experience. If you would like to share your pedagogical expertise, favorite examples, or engaging applications, feel free to contact either Suzanne Lenhart at slenhart@utk.edu or the chair of the AWM Teacher Partnership Committee, Christina Eubanks-Turner at Christina.Eubanks-Turner@lmu.edu, with your input.

We'll close this column with a description of some of the ways we have engaged with pre-college mathematics teachers through education and outreach programs of National Institute for Mathematical and Biological Applications (NIMBioS) (http://www.nimbios.org/education/ed_spotlight) that focused on mathematical modeling. Since the Common Core State Standards and the Next Generation of Science Standards arrived on the education landscape about 2012–2013, there has been an increasing emphasis on mathematical modeling as an essential tool in K–12 education. From our experiences in teacher workshops, teachers are frequently looking for novel and interesting applications for use in their classrooms and want to learn more about building models. Thus, we have recently hosted a series of Teacher Workshops that concentrated on mathematical modeling and its applications.

We tried to broaden the viewpoints of teachers toward modeling by framing common application problems in terms of models. For example, using a piecewise-defined function to represent the amount of federal taxes in terms of annual income can be expressed in terms of building of a model. One could also use algebra to help design postal mail delivery routes [1].

Another example can use sequences to represent simple models in discrete time. Suppose a fish species (say, brim) is growing at 10% each year in a certain lake, and after the growth each year, 50 of those fish are harvested. Given an initial number of fish, one can write an equation for the number of the fish in a year in terms of the number in the previous year as a recursive sequence. This example can be extended to study the limits of fish populations after many years. Making an open problem in this format can be interesting:

> A specific lake is stocked with trout. As time goes on, how will the trout population change?

Then you need to construct a scenario, formulate the corresponding questions to ask, build a model, and communicate your solution. Formulating a problem in this manner encourages critical thinking and familiarizes students with model formulation and application.

Our recent workshop in summer 2018 concentrated on applications and examples accessible to Algebra I and II students, and activities from this workshop can be found on our educational resources webpage at the National Institute for Mathematical and Biological Applications (NIMBioS) (http://www.nimbios.org/education/mathmodeling). For other resources and applications for K–8 teachers from our previous workshops, see http://www.nimbios.org/education/mathcounts.

Other resources for connecting teachers with modeling include the modeling handbooks and sample problems on the MathWorks Math Modeling Challenge pages on the SIAM website (https://m3challenge.siam.org/resources/modeling-handbook).

For ideas about modeling in K–8, see the book by Jennifer Suh and Padmanabhan Seshaiyer [2]. An interesting side note is that Seshaiyer (a mathematics professor at George Mason) was part of a successful Teacher Partnership match with Kris Kappmeyer (a secondary mathematics teacher, Arlington Virginia Public Schools) starting in 2007 and described in [3] and [4]. See also the article in the AMS *Notices* by Cynthia Oropesa Anhalt and Ricardo Cortez [5] about an innovative collaboration between a researcher in secondary mathematics education and an applied mathematician emphasizing modeling with teachers.

Again, we would like to get your input and suggestions on connecting and collaborating with teachers!

References

1. J. A. Czocher and D. L. Moss, Mathematical Modeling: Are Prior Experiences Important? *NCTM Mathematics Teacher*, May 2017, 110 (9), 654–650.
2. J. M. Su and P. Seshaiyer, *Modeling Mathematical Ideas: Developing Strategic Competence in Elementary and Middle School*, Rowman and Littlefield, 2017.
3. P. Seshaiyer, Partnering to make a difference, *AWM Newsletter*, 2008, 38(4), 14–15.
4. P. Seshaiyer and K. Kappmeyer, Transforming Practices in Mathematics Teaching and Learning Through Effective Partnerships, in J. Dewar, P-s. Hsu, and H. Pollatsek (eds.), *Mathematics Education: A Spectrum of Work in Mathematical Sciences Departments*, AWM-Springer Series (v. 7), Springer, 2016, 105–120.
5. C. O. Anhalt and R. Cortez, Mathematics Education as a Mathematician's Research Area: An Invitation for Collaboration, AMS *Notices*, September 2018, 1007–1010.

CALL FOR NOMINATIONS
2020 Class of AWM Fellows

The Association of Women in Mathematics Fellows Program recognizes members who have demonstrated a sustained commitment to the support and advancement of women in the mathematical sciences, consistent with the AWM mission: "to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences."

The following criteria are required for nominees to be considered for Fellowship.
- Nominees must have demonstrated an outstanding, sustained commitment to the support and advancement of girls and women in the mathematical sciences.
- Nominees should be a member of AWM in 2019.

In the majority of cases a nominee should be at least fifteen years into her/his career; graduate study counts as part of the career. Nominations will close **May 15, 2019**, so please participate in this year's selection process by nominating someone who you think deserves this recognition. The primary nominator need not be a current member of AWM but he/she should have been one at some point in the past. Nomination packages consist of:

- a nomination letter from the primary nominator of at most two pages
- two supporting letters of at most two pages each, of which at least one is from another AWM member
- a CV of 3 pages or less
- a suggested citation (for use when the award is announced) of 50 words or less.

Further information will be posted at the AWM Fellows page, where a link to submit nominations will be open April 1. Questions? Phone 401-455-4042, email awm@awm-math.org or visit awm-math.org/awards/awm-fellows/.
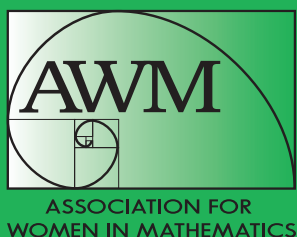
Coordinator: Kavita Ramanan, kavita.ramanan@brown.edu

Building Community Over Lunch

Samantha C. Hill and Anna Macquarie Romanov

Fifteen people at the University of Utah settle around an odd T-shaped mishmash of tables and chairs, filling the unused office space with casual chatter about their weekends, the conferences they recently attended, and their lunches. The graduate students laugh amongst themselves and greet the faculty members who have arrived with some undergraduates in tow, hypothesizing about their upcoming calculus exam. The postdocs weave through the crowded room to claim squeaky chairs and pop the lids off their Tupperware. The atmosphere is familiar, with the hum of anticipation for the conversation about to start, and the solidarity of guilt over not having completed all of the recommended readings for this AWM lunch discussion.

Each month, a member of our AWM student chapter volunteers to lead a casual discussion over lunch about a topic that interests them. To allow participants to gather some thoughts beforehand, recommended articles are shared via our Facebook page. Because of its open-ended nature, these lunches have steered our AWM chapter through conversations contemplating inclusion, meritocracies, gender, race, the climate of the greater mathematics community, and the intersection of these topics. Often the lunches are most productive when the lived experiences of the participants compel everyone to analyze the readings in a more nuanced way from multiple perspectives. Every so often we check in to clarify actionable items, such as what we can do as teachers to reduce stereotype threat in our classrooms, or as mentors to promote seeing math as part of one's identity, or as colleagues and friends to spot and address microaggressions.

The interests and passions of our AWM members at the University of Utah drive not only the topics of AWM lunches, but also our other chapter events. Over the past few years, our events have included a movie night about math circles in the Navajo nation (see http://www.zalafilms.com/navajo/), negotiation workshops, and an on-going department-supported speaker series which brings prominent women mathematicians to Utah for a series of talks on their research and their career experiences. Sometimes the line blurs between the lunches and our other events. For example, a lunch discussion on the importance of role models and community in the formulation of a mathematical identity instigated the creation of a graduate-to-undergraduate mentoring program which has been active since last fall.

Our AWM lunch discussions can be cathartic, and they can be complicated. People have strong opinions and do not always agree. Certainly there is no "answer" at the end of the hour. But being mathematicians, we are accustomed to that. Perhaps the experience of pushing past the boundary of where a problem has one single known answer in math should better prepare us for problems without one single known answer in life. Through these lunches, we hope to gain skills in identifying flaws in math culture and our community, communicating why they are problems, and correcting them however we can. We want to ensure our mathematics department is a welcoming, inclusive, and inspiring place. Through our lunch discussions, we are creating a community where the success of one person uplifts everyone around them.

Reflections on Equity: Response to a Mini-Conference

Priscilla Bremser, Middlebury College, and Viveka Brown, Spelman College, both members of the AWM Education Committee

The American Mathematical Society's Committee on Education held a mini-conference on October 12, 2018 in Washington, DC, titled "Next steps in the evolution of mathematics education: Moving beyond pilots." The day included several discussions of various career paths in mathematics. Elements of this conference challenged educators, researchers, and stakeholders at all levels to examine the mathematical preparations of all students. Presenters discussed three main questions: how to best cultivate necessary changes in our mathematics departments, how to disseminate information about different career paths in mathematics to our students, and how to support those students who are not prepared for mathematics when they enter college.[1]

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[1] Information about the mini-conference, including a Summary Report, can be found at this site: http://www.ams.org/meetings/coeminiconference.

Many speakers discussed the notion of equitability in mathematics. Early in the day, Uri Treisman pointed out that the highest failure rates in college courses are in entry-level mathematics, effectively shutting off a variety of majors and careers to people with weak mathematics backgrounds. He pointed to promising results from the Dana Center Mathematics Pathways Model. During the afternoon session, Christopher Edley Jr. returned to the question of alternate mathematical pathways for different students. We were struck by the need to reassess our current structures for students at risk, and to conduct in-depth analyses of the current programs for such students, track the data from these programs, and then consider alternative methods to improve results.

The "Panel on Next Steps—Equity and Policy" offered participants a chance to synthesize some of the ideas we'd heard. Karen Saxe opened by pointing out that we in higher education work to "advance students, and advance society." The AWM's own, ED Karoline Pershell, spoke of the role of organizations like ours in working for fairness and emphasized the value of shifting from competitive to collaborative working models. In thinking about next steps, we both find ourselves musing on the fact that equity takes many forms. Naturally we want all of our students to thrive in mathematics courses appropriate for them and their aspirations, but it seems to us that this requires a close look at the faculty dynamics within our own departments. How many of our colleagues are from groups underrepresented in mathematics? Do we see a variety of mathematical specialties and backgrounds? Do we work in ways that allow us to take full advantage of the differences in our own pathways to the present?

We appreciated hearing which classes mathematics majors should take to prepare for specific careers, and engaging the idea that mathematics departments might create various tracks for students for certain areas in mathematics, such as statistics and analytics, for careers in government and industry. We also noted those speakers from government and industry who were less interested in hiring people with specific skill sets, instead seeking particular habits of mind, such as logical reasoning and flexible thinking, that they see in mathematics majors of all sorts.

While the themes of equity and preparation for "jobs of the future" came together often during the day, we noticed that the conversation barely touched on careers in K–12 teaching. On one level, this is surprising, as there continues to be a shortage of pre-college teachers, especially in mathematics. In our experience, college professors routinely discuss the foundational mathematics principles that their students lack, suggesting a need for improvements in high school instruction. However, when working with strong mathematics majors, those same professors are often reluctant to encourage them to consider careers in teaching secondary mathematics. Mathematics education at the K–12 level is often viewed as a "fallback" career for mathematics majors. But how can we increase the rigor and conceptual education our students receive in grades K–12 if we are discouraging our most confident mathematics majors from entering the educational arena?

Overall, it was a very full day, offering plenty of food for thought. Moving forward, we need to embrace the plethora of career paths and fields for our mathematics majors. We need to better understand the concerns and situations of struggling students. Then we must adjust our programs accordingly. Once our mathematics majors realize all of the options afforded to them, they can all make educated and informed decisions on their future. That's a form of equity we'd like to see.

Announcement

BBA Call for Submissions

The Lighthouse Almanac is a peer-reviewed journal published by the Benjamin Banneker Association, Inc. This journal, first published in 2017, highlights the research, practices, and composite actions of many individuals and groups.

The focus for its next issue is "Critical Issues in the Mathematics Education of Black Children" and is scheduled to be released in September 2019. BBA invites submissions on any of the following:

- A personal story / original essay;
- An abstract describing your current research or related projects you are developing;
- Commentary on a current event or issue;
- An activity or lesson for PK–16 mathematics teachers or mathematics teacher educators;
- A resource for parents; or
- An instructional tool for mathematics educators and supervisors (e.g. cultural proficiency rubric)

Manuscripts will be reviewed and accepted based on their alignment to the topic as well as the mission and goals of the Benjamin Banneker Association, Inc. The deadline for submitting a proposal is **May 31, 2019**. See http://bbamath.org.

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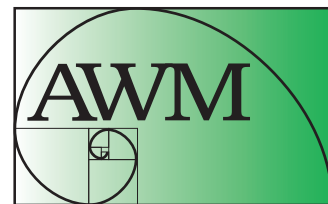
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