

ASSOCIATION FOR
WOMEN IN MATHEMATICS

Newsletter

VOLUME 46, NO. 4 • JULY–AUGUST 2016

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.

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PRESIDENT'S REPORT

Presidents. Almost exactly 30 years ago, I was taking Honors Calculus as a first year undergraduate student at the University of Chicago from **Jill Pipher**. Although I wanted to be a physics major, I had never taken calculus before and I felt lost in the class, so I approached Jill with a form to sign, so that I could withdraw. When I explained that I wanted to withdraw “because I didn’t understand all these epsilon and deltas,” she said, “that’s ok, nobody else does either” and she didn’t sign the form 😊. I am eternally grateful for the rewarding mathematical career I have had because Jill refused to sign that form, and I wonder how many other women drop out at some point, when they might have continued with a little bit of encouragement. Jill has been a wonderful inspiration for me and for so many others over the years, as AWM President and the first female Director of one of the NSF math institutes, and now as candidate for President of the AMS!

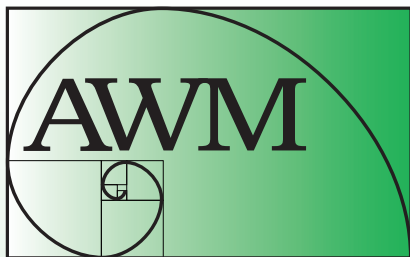
In fact, we can be sure that the next-next President of the AMS will be female, since the other candidate is **Ruth Williams**, former president of the Institute of Mathematical Statistics and active participant in AWM. This will be the third time in 128+ years that the President of the AMS will be female. In addition, the current and former Presidents of SIAM are female: **Pamela Cook** and **Irene Fonseca** (2nd and 3rd female SIAM Presidents in 64 years), and **Deanna Haunsperger**, President-Elect of MAA, will be the 5th female President of MAA in its roughly 100 years. So we are making progress in the leadership of our professional societies, now we need to get our share of positions on top editorial boards!

In reference to my last column, please note that there is **an open call for nominations of speakers** for the next International Congress of Mathematics, **ICM 2018** in Brazil! Nominations for Invited Plenary and Sectional Speakers should be sent to Program Committee Chair **János Kollár** at chair@pc18.mathunion.org by November 1, 2016.

2017 AWM Research Symposium. More good news: AWM’s President-Elect **Ami Radunskaya** and Executive Director **Magnhild Lien** applied for a \$25,000 grant from NSA to support the 2017 AWM Research Symposium and it has been awarded! This award will be used for participant support. Plans for the Symposium at UCLA on April 8–9, 2017 are rolling along and we are delighted to announce four outstanding Plenary Speakers:

- AWM Past President **Ruth Charney**
- AWM Sadosky Prize Winner **Svitlana Mayboroda**
- Blackwell-Tapia Prize Winner **Mariel Vazquez**
- First AWM/SIAM Sonia Kovalevsky Lecturer **Linda Petzold**

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**ASSOCIATION FOR
WOMEN IN MATHEMATICS**

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

The *Newsletter* is published bi-monthly. Articles, letters to the editor, and announcements are welcome.

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

Circulation: 3500. © 2016, AWM

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PRESIDENT'S REPORT *continued from page 1*

The AWM ADVANCE grant includes funds to support special sessions as follow-ups to Research Collaboration Conferences for Women. In addition, we aim to support as many special sessions in other areas as possible. Organizing Committee member **Raegan Higgins** has launched a T-shirt design contest for AWM Student Chapters to design the 2017 AWM Research Symposium T-shirt. See the contest guidelines in the Student Chapter Corner on pages 14–15. Many other fun events and aspects of the Symposium are in the planning stages, so stay tuned...

AWM at SIAM 2016. AWM will have an awesome presence at the SIAM Annual Meeting this July. **Lisa Fauci** will give the Sonia Kovalevsky Lecture on the same day as the AWM Workshop Research Talks. The 2016 AWM Workshop “Dynamical Systems with Applications to Biology and Medicine” was organized by **Laura Ellwein, Trachette Jackson, Ami Radunskaya, and Eva Strawbridge**. The Workshop will include a mentoring lunch, sponsored by Microsoft Research, for all the speakers and poster session presenters. The second day consists of the AWM Workshop Career Panel “Addressing the Challenges Facing Female Scientists and Mathematicians” and the AWM Poster Session. The panel was organized by **Hoa Nguyen, Laura Ellwein, and Maria Emelianenko** and will feature speakers **Lisa Fauci, Rachel Levy, Christine Tobler, and Lynn Apfel**. The poster session was organized by **Fengyan Li and Eva Strawbridge** and poster judging will be coordinated by **Joyati Debnath**. Thanks to all organizers and presenters for contributing to the AWM presence at SIAM this year!

AWM at MathFest 2016. We are delighted that **Izabella Laba**, University of British Columbia, will deliver the Falconer Lecture at MathFest in August this year. Please see the press release on pages 4–5. AWM will also host a panel, “Prioritizing Your Career and Professional Goals,” organized by **Jacqueline Jensen-Vallin, Alissa Crans, Maura Mast, and Candice Price**, featuring panelists **Jenna Carpenter, Annalisa Crannell, Niles Johnson, and Amanda Ruiz**. Please join us for great events at MathFest this year!

There will be a change this year and the **AWM Research Prizes** will be given at the Joint Prize Session at the Joint Math Meetings in January. The Birman Prize will be awarded to **Emmy Murphy**, MIT. Please see the press release on page 6.

AWM Dissertation Prizes. It is very exciting to be launching a new program to honor up to three outstanding PhD dissertations by women in the mathematical sciences each year! Thanks to **Leslie Hogben, Lisa Fauci, Kirsten Eisentraeger, and Linda Allen** for agreeing to serve on the selection committee. Please see the call for nominations on page 9 and nominate outstanding candidates by October 1, 2016.

AWM-MAA Regional Partnerships. In our continuing attempt to host AWM events to create community for women in mathematics locally, we have launched the new AWM-MAA Sectional Liaison Committee. Thanks to **Betty Mayfield, Minerva Cordero-Epperson, Cindy Wyels, and Julie Bergner** for agreeing to serve on this AWM Committee. The committee will look for AWM representatives across the country to help form partnerships and to help set up and run AWM events at MAA Section Meetings. Please contact committee members and volunteer if you would like to help with setting up these partnerships and local events. Examples of events we have in mind include hosting AWM Lunch Tables at MAA Section Meetings and organizing poster sessions for AWM Student Chapters.

This spring we hosted another AWM Lunch Table at the SoCal–Nevada MAA Section Meeting, described in the article on page 11 of this issue.

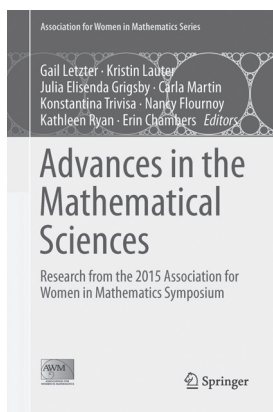
In Cooperation with AWM. A few important meetings have been happening “In Cooperation with AWM” these last few months. The 2016 **EDGE Program**, Enhancing Diversity in Graduate Education, is a four-week summer program designed to prepare women who are entering PhD programs in the mathematical sciences. EDGE 2016 is taking place June 4 – July 2 on the campus of Purdue University. The **Women and Mathematics** conference at the Institute for Advanced Study in Princeton has been running since 1994 and this year was organized in cooperation with AWM. From May 9–20, IAS hosted an intensive 11-day mentoring program for undergraduate and graduate women in mathematics. Re:boot Number Theory 2016 was a 4-day intensive research retreat in March 2016 at Duke University organized in cooperation with AWM. See the write-up on pages 27–28.

Hill Visits. The Policy and Advocacy Committee, under the leadership of Chair **Gail Letzter**, has launched an important new advocacy program for AWM: a schedule of Congressional Hill Visits and an AWM Legislative Priorities document. This program was the brainchild of committee member **Karen Saxe**, who was an **AMS/AAAS Congressional Fellow** in Senator Franken’s office in 2013–2014. With Executive Committee Members **Talitha Washington** and **Talithia Williams**, I visited



Kristin Lauter, Talithia Williams and Talitha Washington in front of Rep. Scott Peters’ office

congressional offices in May to discuss the legislative priorities document and build relationships with lawmakers. For more information or if you would like to participate in one of these visits, please see the article on pages 8–10 of this issue.



AWM Springer series. The AWM Springer Series continues to gather steam as the 5th volume appears: *Advances in the Mathematical Sciences: Research from the 2015 Association for Women in Mathematics Symposium*. This volume contains 25 papers capturing research presented in 8 special sessions and one plenary talk at the 2015 AWM Research Symposium. This volume was put together by Editor-in-chief **Gail Letzter** and serves as a record of the research and activities at the 2015 Symposium. The volume was co-edited by **Erin Chambers, Nancy Flournoy, Eli Grigsby, Carla Martin, Kathleen Ryan, Konstantina Trivisa,** and

myself, and is dedicated to the memory of our friend, colleague and co-editor **Carla Dee Martin**. We currently have 7 more volumes under contract or negotiating contracts in the series, and 8 more volumes in the planning stages, for a total of 20 volumes!

continued on page 4

Membership Dues

Membership runs from Oct. 1 to Sept. 30

Individual: \$65 **Family:** \$30

Contributing: \$150

New member, affiliate and reciprocal members, retired, part-time: \$30

Student, unemployed: \$20

Outreach: \$10

AWM is a 501(c)(3) organization.

Institutional Membership Levels

Category 1: \$325

Category 2: \$325

Category 3: \$200

See www.awm-math.org for details on free ads, free student memberships, and ad discounts.

Executive Sponsorship Levels

\$5000+

\$2500–\$4999

\$1000–\$2499

Print Subscriptions and Back Orders—

Regular and contributing members living in the US may elect to receive a print version of the *Newsletter*. Libraries, women’s studies centers, non-mathematics departments, etc., may purchase a subscription for \$65/year. Back orders are \$10/issue plus shipping/handling (\$5 minimum).

Payment—Payment is by check (drawn on a bank with a US branch), US money order, or international postal order. Visa and MasterCard are also accepted.

Newsletter Ads—AWM will accept ads for the *Newsletter* for positions available, programs in any of the mathematical sciences, professional activities and opportunities of interest to the AWM membership and other appropriate subjects. The Managing Director, in consultation with the President and the Newsletter Editor when necessary, will determine whether a proposed ad is acceptable under these guidelines. *All institutions and programs advertising in the Newsletter must be Affirmative Action/Equal Opportunity designated.* Institutional members receive discounts on ads; see the AWM website for details. For non-members, the rate is \$116 for a basic four-line ad. Additional lines are \$14 each. See the AWM website for *Newsletter* display ad rates.

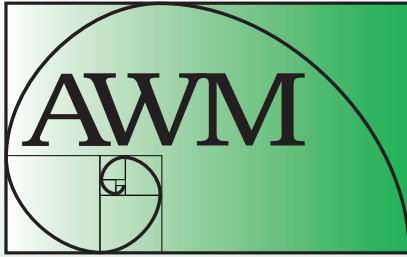
Newsletter Deadlines

Editorial: 24th of January, March, May, July, September, November

Ads: Feb. 1 for March–April, April 1 for May–June, June 1 for July–Aug., Aug. 1 for Sept.–Oct., Oct. 1 for Nov.–Dec., Dec. 1 for Jan.–Feb.

Addresses

Send all queries and all *Newsletter* material except ads and queries/material for columns to Anne Leggett, amcdona@luc.edu. Send all book review queries/material to Marge Bayer, bayer@math.ku.edu. Send all education column queries/material to Jackie Dewar, jdewar@lmu.edu. Send all media column queries/material to Sarah Greenwald, greenwaldsj@appstate.edu and Alice Silverberg, asilverb@math.uci.edu. Send everything else, including ads and address changes, to AWM, fax: 703-359-7562, e-mail: awm@awm-math.org.



ASSOCIATION FOR
WOMEN IN MATHEMATICS

AWM ONLINE

The *AWM Newsletter* is freely available online.

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

Website: <http://www.awm-math.org>

Web Editor

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AWM DEADLINES

AAWM ADVANCE Proposals for
RCCWs: July 1, 2016

AWM Workshop at JMM: August 15, 2016

AWM-MAA Falconer Lecturer:
September 1, 2016

AWM Alice T. Schafer Prize:
October 1, 2016

AWM Dissertation Prize: October 1, 2016

AWM-AMS Noether Lecture:
October 15, 2016

AWM-SIAM Sonia Kovalevsky
Lecture: November 1, 2016

AWM Workshop at SIAM: November 1, 2016

AWM Michler Prize: November 1, 2016

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PRESIDENT'S REPORT *continued from page 3*

CBMS Active Learning Statement. Co-Chairs of the AWM Committee on Education, **Pao-sheng Hsu** and **Jacqueline Dewar**, participated in a working group commissioned by CBMS and co-authored a new Active Learning Statement to be signed by all the Presidents of the CBMS member societies. This statement has been sent to the White House Office of Science and Technology Policy and will be available and widely circulated to describe efforts and advocate for active learning methods in mathematics education. Thanks to Jackie and Pao for their hard work to produce this valuable document!

I am continually impressed by all the great work done by the volunteers who make AWM possible. I feel a strong sense that we are making progress on our mission and seeing some improvements. Keep up the great work! Also I should mention that the Bylaws changes approved by the January Business Meeting were ratified by the membership. Happy Summer.

Kristin Lauter
May 24, 2016
La Jolla, CA



Kristin Lauter

Izabella Laba Named Falconer Lecturer

The Association for Women in Mathematics and the Mathematical Association of America are pleased to announce that Izabella Laba will deliver the Etta Z. Falconer Lecture at MathFest 2016. Dr. Laba is a Professor of Mathematics at the University of British Columbia (UBC).

Laba earned her MSc in mathematics from Wroclaw University, Poland and her PhD in mathematics from the University of Toronto under the supervision of I.M. Sigal. She held positions at the University of California, Los Angeles and Princeton University before joining the faculty at the University of British Columbia as an associate professor in mathematics. While at UBC she has held visiting positions at the University of Missouri, Pennsylvania State University and the Fields Institute, University of Toronto.



Izabella Laba

Laba's main research areas are harmonic analysis, geometric measure theory and additive combinatorics. One of the nominators wrote of Laba: "The total range of her research expertise is impressive: additive combinatorics, geometry of sparse sets, differentiation theory, tilings, incidence

geometry, Kakeya conjecture, and Fourier restriction theory. There are underlying connections between all these problems, and some of these connections were observed first by Izabella.”

Laba has earned the honors of becoming a Fields Institute Fellow in 2009, an inaugural fellow of the American Mathematical Society (AMS), and an invited speaker at the International Congress of Mathematicians in Seoul 2014, and she has won the Coxeter-James and Krieger-Nelson prizes of the Canadian Mathematical Society. She is a prolific researcher whose list of scholarly works includes two books, nearly forty research articles, and seven expository articles.

In her service to the profession Laba has been an active member of various committees of the Canadian Mathematical Society, AMS, MAA (the William Lowell Putman Committee, which she chaired) and AWM (AWM-Sadosky Research Prize Selection Committee). She is currently an editor of three journals.

The following quote from one of the nominating letters summarizes Laba’s contribution to the mathematics community through informal communication and education:

Many follow her informative and entertaining blog *The Accidental Mathematician* (<https://ilaba.wordpress.com/>). She has been a strong advocate for women in

mathematics. Izabella contributed the article “From harmonic analysis to arithmetic combinatorics: A brief survey” to the Proceedings of the 2006 AWM-MSRI workshop Women in Mathematics: The Legacy of Ladyzhenskaya and Oleinik. Izabella is also a talented photographer; some of her photographs helped me visualize the Kakeya set. Her thoughts on mathematics and arts can be found in the AMS book *Art in the Life of Mathematicians* (<http://bookstore.ams.org/mbk-91>).

Laba’s lecture at MathFest is entitled “Harmonic Analysis and Additive Combinatorics on Fractals.”

MathFest 2016 will be held August 3–6 in Columbus OH. The Falconer lectures were established in memory of Etta Z. Falconer (1933–2002). Her many years of service in promoting mathematics at Spelman College and efforts to enhance the movement of minorities and women into scientific careers through many forums in the mathematics and science communities were extraordinary. Falconer lecturers are women who have made distinguished contributions to the mathematical sciences or mathematics education. Previous recipients of this honor include Erica Walker, Marie Vitulli, Pat Kenschaft, Karen King, Dawn Lott, Ami Radunskaya, Kate Okikiolu, Rebecca Goldin and Katherine St. John.

CALL FOR NOMINATIONS

The 2017 Etta Z. Falconer Lecture

The Association for Women in Mathematics and the Mathematical Association of America (MAA) annually present the Etta Z. 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 Z. 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, Bozena Pasik-Duncan, Fern Hunt, Trachette Jackson, Katherine St. John, Rebecca Goldin, Kate Okikiolu, Ami Radunskaya, Dawn Lott, Karen King, Pat Kenschaft, Marie Vitulli and Erica Walker. This year’s lecture will be delivered by Izabella Laba.

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, 2016** and will be held active for two years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

Emmy Murphy Wins Birman Research Prize

The Association for Women in Mathematics will present the second AWM – Joan & Joseph Birman Research Prize in Topology and Geometry to Emmy Murphy, Assistant Professor of Mathematics at the Massachusetts Institute of Technology (MIT), at the Joint Mathematics Meetings in Atlanta, GA in January 2017. Established in 2013, the AWM – Birman Prize recognizes exceptional research in topology/geometry by a woman early in her career. The award is made possible by a generous contribution from Joan and Joseph Birman. The biennial presentation of this prize serves to highlight to the community outstanding contributions by women in the fields of topology and geometry and to advance the careers of the prize recipients.

The 2017 AWM – Joan & Joseph Birman Research Prize in Topology and Geometry is awarded to Emmy Murphy for major breakthroughs in symplectic geometry. She has developed new techniques for the study of symplectic and contact structures on manifolds, uncovering a startling degree of flexibility in a branch of geometry that is ordinarily distinguished by rigidity. As a result, some geometric problems can now be reduced to homotopy theory; for example Murphy's methods have yielded answers to long-standing questions concerning the existence of contact structures on high-dimensional manifolds. She has shown great creativity in the delicate work of inventing powerful new h-principle techniques. She has also masterfully combined these new tools with other tools, such as the method of pseudo-holomorphic curves, to explore the boundary between flexibility and rigidity.

Murphy earned a BS in mathematics from the University of Nevada, Reno and a PhD in mathematics from Stanford University. She started as a C. L. E. Moore instructor at MIT immediately after receiving her PhD and



Emmy Murphy

two years later was hired as an assistant professor at MIT. Murphy has received numerous awards and recognitions including an Académie Royale de Belgique prize for an original contribution to the existence of contact structures and a Sloan Research Fellowship. Currently her research is supported by an NSF Research grant.

Murphy is a highly original thinker, and leading geometers will not be surprised if she goes on to make breakthroughs in very different areas of mathematics.

The 2017 Joint Mathematics Meetings will be held January 4–7 in Atlanta, GA. For further information on the AWM – Joan & Joseph Birman Research Prize, including the previous winner, please visit www.awm-math.org.

Women in Leadership

Women are not new to leadership; think of Cleopatra or Queen Elizabeth. Think of the women who led the civil rights and education reform movements. But women are still outnumbered by men in the most prestigious positions, from Capitol Hill to the board room. The recent AAUW publication *Barriers and Bias: The Status of Women in Leadership* examines the causes of women's underrepresentation in leadership roles in business, politics, and education and suggests what we can do to change the status quo.

At <http://www.aauw.org/research/barriers-and-bias/> it is possible to download both the full report and a one-page summary. The one-pager is a colorful, accessible fact sheet that makes it easy to share some of the key themes of the report and spark discussion in your community.

AWM WORKSHOP AT THE 2017 JOINT MATHEMATICS MEETINGS

Application deadline: August 15, 2016

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 and going forward, the workshop talks will be 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 Atlanta, Georgia, January 4–7, 2017.

FORMAT: The workshop will consist of a Special Session focused on Number Theory organized by Alina Bucur and Ellen Eischen and a Poster Session for graduate students. Selected junior and senior women from the Research Collaboration Conferences for Women (RCCWs) WIN3 and WINE will be invited to give 20-minute talks in the Special Session on Number Theory. 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, and graduate students working in areas related to number theory are especially encouraged to apply. The graduate students will be selected through an application process to present posters at the Workshop Reception & Poster Session. Pending funding, 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 number theory will have the opportunity to connect with the Women in Number Theory (WIN) 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 workshop participants, in particular the graduate students. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **September 15, 2016**.

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 for the poster session 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, 2016**. See <http://www.awm-math.org/workshops.html> for details.

AWM Visits to Capitol Hill

*Karen Saxe, Macalester College and Talitha Washington,
Howard University*

In 2015, the Association for Women in Mathematics embarked on a new venture: visiting members of Congress in order to engage them on issues of importance to women in the mathematical sciences. AWM President Kristin Lauter and Executive Committee member Talitha Washington made the first trip to congressional offices immediately following the AWM Research Symposium in April 2015. A second larger AWM contingent met with members of Congress during the MAA MathFest in August 2015. Inspired by these initial encounters, the AWM Policy and Advocacy Committee (current members: Gail Letzter (chair), Sara Billey, Bryna Kra, Magnhild Lien, Karen Saxe, Julie Sutton and Katrin Wehrheim) took up the charge to launch a program of activism via establishing a regular cycle of Hill visits with members of Congress.

The current Policy and Advocacy Committee has been in place since February 1, 2016, and we have worked over the intervening months to develop a view of top legislative issues for AWM. A document shared with Congressional members outlining these priorities can be found on page 10. In addition to advocating for basic research funding through

the National Science Foundation (NSF), other AWM legislative goals include expanded STEM educational opportunities for girls and students from other underrepresented groups, as well as creating welcoming work environments for women in mathematics and science. In a broad sense, we look for initiatives and legislation to increase the number of women in the mathematical sciences. With these Hill visits, we build relationships with members of Congress who can help champion AWM's causes.

Though the AWM has made Hill visits in the past, we are moving to a more coordinated effort. The most recent visit to the Hill was set to coincide with the AWM President's role in the Conference Board of Mathematical Sciences (CBMS) meetings (which take place biannually, in May and December). Talitha Washington (Howard University and AWM Executive Committee member) and Talithia Williams (Harvey Mudd College, current ACE Fellow at University of Maryland-Baltimore County, and AWM Executive Committee member) joined President Kristin Lauter on these visits. In advance, the Policy and Advocacy Committee suggested Congressional offices for them to visit and helped prep them with talking points and follow-up procedures.

During the May 5th visit to the Hill, Talitha, Talithia and Kristin met with several Senate and House members and discussed everything from Title IX implementation, to equal pay issues, to the new Computer Science For All initiative

CALL FOR NOMINATIONS

Alice T. Schafer Mathematics Prize

The Executive Committee of the Association for Women in Mathematics calls for nominations for the Alice T. Schafer Mathematics Prize to be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical community are invited to submit nominations for the Prize. The nominee may be at any level in her undergraduate career, but must be an undergraduate as of October 1, 2016. She must either be a US citizen or have a school address in the US. The Prize will be awarded at the AWM Reception and Awards Presentation at the 2017 Joint Mathematics Meetings in Atlanta, GA.

The letter of nomination should include, but is not limited to, an evaluation of the nominee on the following criteria: quality of performance in advanced mathematics courses and special programs, demonstration of real interest in mathematics, ability for independent work in mathematics, and performance in mathematical competitions at the local or national level, if any.

With the letter of nomination, please include a copy of transcripts and indicate undergraduate level. Any additional supporting materials (e.g., reports from summer work using math, copies of talks, recommendation letters from professors, colleagues, etc.) should be enclosed with the nomination. All nomination material is to be submitted as ONE PDF file via MathPrograms.Org with a copy of transcripts included at the end of the file. The submission link will be available 45 days prior to the deadline. Nominations must be received by **October 1, 2016**. If you have questions, phone 703-934-0163, email awm@awm-math.org, or visit www.awm-math.org.



Talitha Washington, Kristin Lauter, and Talitha Williams on the Capitol subway

recently unveiled by the White House (<https://www.whitehouse.gov/the-press-office/2016/01/30/fact-sheet-president-obama-announces-computer-science-all-initiative-0>). Title IX “protects people from discrimination based on sex in education programs or activities that receive Federal financial assistance” (http://www2.ed.gov/about/offices/list/ocr/docs/tix_dis.html). Issues of faculty accountability and how to better implement the efforts of Title IX were discussed. For women in the workplace, the issues of paid leave, equal pay, and fair promotion were shared. Computer Science For All seeks to ensure that students in grades K through 12 receive computer science education, as it is now seen as a basic skill. There is concern about the inclusion of and participation of students who

are female, or of color, and/or low income. It is not yet clear how this will be implemented since the curriculum is still to be developed.

Hill visits are particularly valuable during the annual appropriations process, which is when Congress determines what to fund. AWM visits, in collaboration with the Coalition for National Science Funding (CNSF), can push for maximum funding for NSF. AWM coordinates appropriations efforts with other visits which are equally important. In particular, the visits provide great opportunities to introduce members of Congress and their staff to new or complex issues and, at the same time, help members of AWM build personal connections with lawmakers. These Hill visits do not depend on Congressional budget schedules and can be made at any time in the year. Last August, for example, several AWM student chapter members were in DC to attend the MAA MathFest, so we made Hill visits which coordinated with that conference. You can read about the students’ trip to the Hill in the November–December 2015 edition of the *AWM Newsletter*. Congressional members love success stories and love meeting students.

We hope that AWM’s Hill visits become more regular and include more participation by AWM members. In addition to coordinating congressional meetings with the AWM President’s trips to Washington, DC, we aim to galvanize a group of AWM members who live in or frequently travel to the DC area, who will be “on call” for other visits. If you are interested, email Magnhild Lien at mlien@awm-math.org and we will be happy to include you in this important effort.

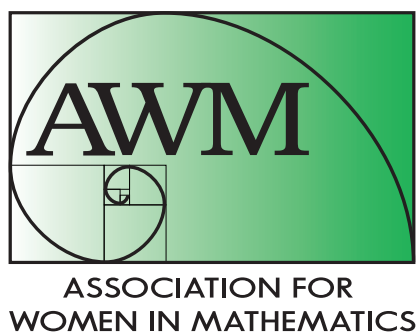
CALL FOR NOMINATIONS

The Association for Women in Mathematics Dissertation Prize

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

To be eligible for the award a graduate student must have defended her dissertation within the last two years (October 1, 2014 to September 30, 2016). She must either be a US citizen or have a school address in the US. The Prizes will be presented at the AWM Reception and Awards Presentation at the Joint Mathematics Meetings in Atlanta, GA, January 2017.

The nomination should include: 1) a one to three page letter of nomination highlighting the exceptional mathematical research presented in the dissertation; 2) a curriculum vitae of the candidate not to exceed three pages; 3) a copy of the dissertation and 4) two letters supporting the nomination. 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 **October 1, 2016**. If you have questions, phone 703-934-0163, email awm@awm-math.org, or visit www.awm-math.org.



Association for Women in Mathematics Legislative Priorities

www.awm-math.org

The problem: Too few women pursue careers in the mathematical sciences. According to the American Mathematical Society's most recent annual survey, women make up only 19% of full-time faculty in doctoral math departments. This number is only 11% if one restricts to tenured faculty at the top 50 research institutions. Although 41% of bachelor's degrees in the mathematical sciences are earned by women, the percentage of women drops dramatically at every subsequent stage: 32% of new PhDs are female, 25% of new postdoctoral positions went to women. The numbers are as alarming in heavily math-oriented industries and in the closely related field of computer science. In 1985, 37% of undergraduate computer science degrees were awarded to women; by 2012, this percentage had dropped to 18%. Recently released statistics from tech giants report that women make up a similar percentage of their technical work force.

In this era of big data and fast-paced technological changes—both of which require mathematical expertise and sophistication—we cannot afford to leave so much of the population behind. The deficit of women in STEM, and in particular women in math, is not just a women's issue. Diverse perspectives are necessary for scientific advances and technical innovations that benefit all.

Please join the Association for Women in Mathematics in supporting initiatives and legislation to increase the number of women in the mathematical sciences.

Expand STEM educational opportunities: Help us ensure access for girls to classes devoted to STEM subjects. For instance, President Obama's new initiative "Computer Science for All" aims to bring high quality computer science education classes to all students in the K–12 grades. Please support programs at both the Department of Education and the National Science Foundation that will help implement this important initiative.

Support research funding: Research funding is essential for creating a vibrant research program. Please support funding the National Science Foundation at the highest possible level. These funds provide basic research grants as well as programs, such as NSF's Advance Grants, that specifically target women.

Work/life balance: Finding an effective work-life balance is a challenge, especially for women. Please support legislation that expands child-care and family leave options.

Modernize self-perpetuating mechanisms that limit public recognition of women's achievements: Many prestigious math and science organizations, including elite groups such as fellows within professional societies, have very few female members. These organizations often have influence over the profession and are a source for scientific advice to both government and industry. New members of such groups are frequently elected by current ones. Additional avenues for selecting members should be explored.

Creating a welcoming environment: All too often, women in mathematics and science are faced with on-the-job harassment. Recent cases have made headlines, but improvements are slow. Please support Representative Jackie Speier's efforts to strengthen federal anti-discrimination laws in order to better address hostile environments.



Attendees of
the Spring So
Cal-Nevada
meeting at
an AWM
Lunch Table

AWM Lunch Table

Ami Radunskaya, AWM President-Elect

The AWM had two tables at the Spring So Cal-Nevada meeting of the MAA, held at Loyola Marymount University on April 2, 2016. The idea of AWM lunch tables is part of a new initiative to strengthen ties between the AWM and the MAA, particularly at the regional level. On this sunny, but not too hot, Saturday, it seemed that the lunch tables were a big success. MAA President Francis Su, local organizer

Herb Medina and MAA sectional VP Chris Towse all stopped by and enthusiastically welcomed us. After introductions, we had conversations in large and small groups. We talked about student chapters (what to do in them, how to start them), the tenure process, putting together resources for undocumented students (for both the students and for people who are running math programs), bridge programs, financed masters programs, and research collaboration workshops. Lunch was informative, lively and fun, and I highly recommend trying the same thing at your next MAA sectional meeting.

Announcements

Introducing “Natural Math”

The new book series *Natural Math* published by Delta Stream Media is being distributed worldwide by the American Mathematical Society. *Natural Math* is a community for families, math circles, and other learning groups interested in creating rich, multi-sensory experiences for children early on. A title that resonates with this issue’s Media Column is *Playing with Math: Stories from Math Circles, Homeschoolers & Passionate Teachers*, edited by Sue VanHattum. Its blurb reads: “Coming together to share their math enthusiasm through puzzles, games, and activities, over thirty authors share their stories to encourage adults and children to play with math too.” See more at: <http://bookstore.ams.org/NMATH>.

Hungary Conference 2017

The 13th International Conference of the Mathematics Education for the Future Project in Catania, Sicily, September 2015, was attended by 130 people from 22 countries. The next conference will be held at Balatonfüred, Balaton Lake, Hungary, September 10–15, 2017. The conference, entitled Mathematics Education for the Next Decade, continues our search for innovation in mathematics, science, computing and statistics education. Our thirteen previous conferences since 1999 have been renowned for their friendly and productive atmosphere and have attracted many movers and shakers from around the world. We now call for papers and workshop summaries for presentation at the conference and publication in the printed conference proceedings. For further details and updates please email Alan Rogerson at alan@cdnalma.poznan.pl.

AWM Does “Euler-gami” at USASEF

Tai Melcher, Katharine Ott, and Katelynn Kochalski

Back in April, the AWM took part in the 2016 USA Science & Engineering Festival (USASEF) two-day Expo. The USASEF is hosted in Washington, DC every other year and is a national celebration of science, technology, engineering, and mathematics. Since its inaugural edition in 2010, USASEF has established itself as the largest such celebration in the United States. The mission of this multicultural, multi-generational, and interdisciplinary festival is to re-invigorate the interest of our nation’s youth in STEM fields. The Festival culminates in a Grand Finale Expo, and every Festival since 2010, AWM has been there to support this mission by leading fun, math-based activities for kids of all ages.

This year’s AWM activity was called “Euler-gami.” Visitors used origami to explore some mathematical invariants, in particular, the Euler characteristic. Volunteers took visitors through a brief worksheet to explain the basics of the Euler characteristic and then had them fold their own “topological soccer ball” in the form of a 6-sided polyhedron called “Toshie’s Jewel.” Visitors looking for more of a challenge tried folding cubes, and even the occasional icosahedron. Organizers came armed with more than 800 pre-folded origami modules and 10,000 sheets of origami paper to help the more than 2500 visitors to the booth fold their own creations of Euler characteristic 2.

The kids really enjoyed the origami! There were times when the ring around the booth was several children deep and volunteers were working with four or five kids at a time guiding them through the folding procedure. The AWM booth was located directly across from one of the large stages which had live shows, and at one point volunteers were actually shouting about topology to be heard over a “They Might Be Giants” performance.

Michelle Snider, one of the volunteers at the booth, was inspired to see kids so drawn to the activity, when there were so many other impressive exhibits to choose from: “The most amazing part to me is how we were there, in a convention

center filled with mini Mars Rovers, a Space Camp ride, and video games about zombies (for tracking disease vectors, of course), and we had kids waiting to come to a table to learn how to fold paper! As a lifelong crafter, I’m excited to see the next generation still engaged with hands-on activities.”

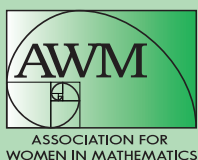
Interacting with the children visiting the booth was clearly a rewarding experience for the AWM volunteers as well. Snider said, “I was impressed at how many young kids just walked up to our table to see what was happening, with a confidence that I did not have at their age. Most of the parents hung back, letting the kids take charge of their own explorations. I also loved seeing so many nerdy kids just owning it, with geeky T-shirts and an enthusiasm for learning which seems now to be the cool thing to do. They don’t know how good they have it! :)”

Mariel Supina, another volunteer at the booth, said, “As someone who had no idea what topology was until college, it was a great experience to be able to share with the kids the joy of discovering new types of math. They seemed pretty excited by it, and I think it helped to dispel in their minds the idea that math is just arithmetic. Plus, the origami activity was fun for both the kids and their parents!”

Katelynn Kochalski, one of the organizers of the booth, said of her experience: “Working at the AWM booth was unique and refreshing. For me, the best part was seeing children of all different ages and backgrounds get excited about learning math. Each one was engaged, eager to understand, and willing to share what they had learned with a sibling or friend. By making an origami polyhedron at the end of the activity, we gave them a tangible reminder of their learning, and the sense of accomplishment they felt after completing it was evident by the looks on their faces.”

So the AWM booth at this year’s USASEF was another success for all participants! We look forward to USASEF 2018!

The organizers of this year’s booth activities were Tai Melcher (University of Virginia), Katharine Ott (Bates College), and Katelynn Kochalski (University of Virginia). On behalf of the AWM we’d like to thank all the volunteers at our booth this year: Alqassem Alshaikh, Caroline Ehler, Nicole Ferree, Molly Ferguson, Johanna Garcia, Marlena Maziarz, Karoline Pershell, Raluca Rosca, Michelle Snider, Mariel Supina, Mac Wade, and Katherine Willard.



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www.awm-math.org



STUDENT CHAPTER CORNER

Coordinator: Kathleen Fowler, kfowler@clarkson.edu

Organizing a Large-Scale Pi-Day Celebration

Kathleen Fowler

At Clarkson University, we have been hosting an annual Pi Day Celebration since 2006. Pi Day is celebrated on March 14 (3.14), or in our case—on the closest Wednesday to that date (approximate Pi Day). It began as an activity for local 7–12 grade students as part of a STEM Outreach grant and now it is open to the public. This event has grown significantly in scope over the last ten years. We usually have roughly 80 college student volunteers running 30–40 activities and over 300 local school-age students in attendance. However, we started *small* (50 attendees and 10 activities) and learned valuable planning lessons along the way. Now, we also partner with nearby colleges who send student volunteers to run additional activities. We work directly with local teachers who arrange for students to be bussed to campus for the event. How you make that connection with schools is critical

and can possibly be facilitated through an office you may have on campus already that works with outreach.

The event itself consists of hands-on activities run by student volunteers. College student volunteers each set themselves up at a table, usually with a colorful tri-fold poster and whatever worksheets and “equipment” they may need. Most activities involve circles, spheres, or π in some way. Alternatively, we have had a set of tables that highlight the different engineering disciplines at Clarkson (for example, one from mechanical engineering, environmental, chemical, etc.).

On the day of the event, each table has a cup on it and upon arrival, the local students are given a bead and a sheet with a list of all the activities. They are told to participate in as many activities as possible within the time frame of the event (usually from 3:30–5:00 PM). At an activity, the college students score the participants from 0 to 3 points based on some criteria they designed for their activity. At the end of the event student attendees vote for their favorite activity by putting a bead in the cup at their favorite one. We have a brief award ceremony at the end where students tally their scores and are awarded something depending on their grade level (so the top 3 scoring 7–8th graders get something and so on) and the activity with the most beads also gets a prize.

CALL FOR NOMINATIONS

The 2018 Noether Lecture

AWM established the Emmy Noether Lectures in 1980 to honor women who have made fundamental and sustained contributions to the mathematical sciences. In April 2013 the lecture was renamed the AWM-AMS Noether Lecture and since 2015 has been jointly sponsored by AWM and AMS. This one-hour expository lecture is presented at the Joint Mathematics Meetings each January. Emmy Noether was one of the great mathematicians of her time, someone who worked and struggled for what she loved and believed in. Her life and work remain a tremendous inspiration.

The mathematicians who have given the Noether lectures in the past are: Jessie MacWilliams, Olga Taussky Todd, Julia Robinson, Cathleen Morawetz, Mary Ellen Rudin, Jane Cronin Scanlon, Yvonne Choquet-Bruhat, Joan Birman, Karen Uhlenbeck, Mary Wheeler, Bhama Srinivasan, Alexandra Bellow, Nancy Kopell, Linda Keen, Lesley Sibner, Olga Ladyzhenskaya, Judith Sally, Olga Oleinik, Linda Rothschild, Dusa McDuff, Krystyna Kuperberg, Margaret Wright, Sun-Yung Alice Chang, Lenore Blum, Jean Taylor, Svetlana Katok, Lai-Sang Young, Ingrid Daubechies, Karen Vogtmann, Audrey Terras, Fan Chung Graham, Carolyn Gordon, Susan Montgomery, Barbara Keyfitz, Raman Parimala, Georgia Benkart, Wen-Ching Winnie Li and Karen E. Smith.

The letter of nomination should include a one-page outline of the nominee’s contribution to mathematics, giving four of her most important papers and other relevant information. 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 **October 15, 2016** and will be held active for three years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

It may seem like Mission Impossible to organize, but with careful planning and teamwork, it can be a rewarding and successful experience. More details are available in the AWM Student Chapter Shared Folders (see below).

Here are some videos about past Pi Day events at Clarkson:

https://www.youtube.com/watch?v=gg_HIX3X8EU

<https://www.youtube.com/watch?v=plm5-tX9lck>

<https://www.youtube.com/watch?v=CeGMudMoy-E>

AWM Student Chapter Shared Resources

The AWM Student Chapter Committee would like to let you know about a new opportunity available to student chapters. We have created a set of folders on Google Drive to share resources and foster collaborations between chapters.

We are inviting student chapters to share ideas and experiences about getting organized, inviting speakers, running activities, giving awards, fund raising, making connections with industry and participating in outreach. We hope you will help make this a valuable resource by disseminating the unique qualities of your student chapter through hand-outs and/or other documents that can serve as a guide for other chapters. Also, feel free to browse the files to look for ideas for your student chapter: Student Chapters Google Drive Folders (<https://drive.google.com/drive/folders/OB7NSE21a-oijZEIQRkNUTkp3NFk>).

If you have any questions, feel free to contact Katie Fowler, Chair of the AWM Student Chapter Committee, at kfowler@clarkson.edu.

Design the Official AWM Research Symposium 2017 T-Shirt!

Do you have a knack for graphic design? Try designing the official AWM Research Symposium 2017 T-shirt.

T-shirt Design Contest Guidelines:

1. Design the shirt. Front only, back only, or front and back. The words "AWM Research Symposium 2017" should be used.
2. Designs should be in one or two colors—we cannot print full-color designs or photographs. Please do not submit copyrighted material without permission.
3. You may want to consider using the AWM logo.

4. Create your design at www.customink.com. Be sure to save your design.
5. Design may change depending on T-shirt color.
6. Designs should come from AWM Student Chapters.
7. The criteria for judging are originality and the likelihood others will buy it and wear it at the symposium and afterwards.
8. The winning chapter will be notified in mid-November.
9. The winning chapter will receive a prize from one of our sponsors and the joy of seeing hundreds of people wearing their original design!

Submissions should be emailed to Raegan Higgins at raegan.higgins@ttu.edu as PDFs. Please cc: Kathleen Fowler, Student Chapter Committee Chair (kfowler@clarkson.edu), and the AWM Office (awm@awm-math.org). Include your chapter name, institution, and contact information. Also, include all the specifications you entered at CustomInk. The deadline is **Friday, October 7, 2016** at 12:00 pm CST.

Ruth I. Michler Prize

The Association for Women in Mathematics invites applications for the eleventh annual Ruth I. Michler Memorial Prize.

A \$47,000 prize will be awarded to a woman, recently promoted to associate professor or the equivalent, for a semester of mathematical research without teaching obligations in the Mathematics Department of Cornell University.

A supplemental housing/subsistence stipend award of \$3,000 will be provided. Office space, library access, and computing facilities will be provided by Cornell.

The application deadline is November 1 for the award to be used during the 2017–18 academic year.



www.awm-math.org/michlerprize.html



Cornell University



MEDIA COLUMN

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

Navajo Math Circles

Judith V. Grabiner, Flora Sanborn Pitzer Professor of Mathematics, Pitzer College, Claremont, CA 91711

Navajo Math Circles: A film by George Csicsery. Zala Films, with support from the Mathematical Sciences Research Institute, the Simons Foundation, Vision Maker Media, and the Corporation for Public Broadcasting. Personal-use home video \$24.95; for colleges and libraries, including performance rights, \$149.00. Available at www.navajomathcirclesfilm.com or from Zala Films, PO Box 22833, Oakland, CA 94609, USA.

Navajo Math Circles beautifully and sensitively portrays the “Math Circles” approach to teaching mathematics to Navajo students in the American Southwest. The film opens with views of the spectacular landscape of Navajo country, and then focuses on a Navajo woman silhouetted there, while Dr. Henry Fowler, a Navajo who teaches mathematics at Diné College, talks about his mother and how she inspired him. Then we see her weaving Navajo geometrical patterns into a blanket, measuring with her hands. These opening scenes embody key themes of the film: that mathematics is much more than computation, that it arises from what people see and touch and value, that its patterns have beauty, and that the relationship between mathematics and Navajo culture is rich and meaningful.

As the film progresses, we see vignettes of *Math Circles*, with students working in groups, excitedly presenting solutions to problems on the board. We see the kinds of open-ended problems characteristic of Math Circle pedagogy. Here, one problem gives rise to extensions and other problems; routine computation gives way to powerful ideas and fruitful techniques; working together leads, in the words of one Navajo girl, to “bonding with each other”; and it becomes clear that there is more than one way to do things. We also see vignettes of reservation life, marked by a sense of place and a pride in Navajo culture and history. All this is conveyed by letting the people involved speak for themselves. The students, their parents, the teachers in the Math Circles, all let us know what these experiences mean to the participants.

Henry Fowler tells us on-screen how he started teaching when he had no textbooks to use. Eventually a meeting between him and Tatiana Shubin, a mathematician at San Jose State who has long been involved in Math Circles, led them to start the program for Navajo students. The film highlights not only Dr. Shubin’s role in the Navajo program, but what brought her to it, including her upbringing in the former Soviet Union, her having lived in Kazakhstan and having worked with the indigenous population there, and her consequent passion for effective pedagogy and her interest in helping students with few resources become interested and successful in mathematical thinking. Near the end of the film, several Navajo students speak about how she inspired them. She has also organized Math Circles for Navajo mathematics teachers.

Besides being a compelling documentary about an unusual topic, the film has the potential to inspire many audiences. Teachers of mathematics can learn much from the scenes of the Math Circles interactive classes. Such Math Circles began in Eastern Europe in the 1930s, but now exist in Europe, Asia, and the Americas. They bring committed teachers together with students looking for new challenges and deeper understanding of mathematics. A main activity is problem solving, not by recipe but by learning to think mathematically. There is a National Association of Math Circles (see <http://www.mathcircles.org/>) which can help readers set up a Circle and make it work in their own communities, just as mathematics teachers in Navajo schools and mathematicians from elsewhere in the US collaborated to organize Math Circles in Navajo country, adapting the approach to benefit from and enhance the Navajo way of life.

The film is also valuable for those interested in learning more about Native Americans and their heritage. The voices of the parents and the students, and the camera’s focus on the people within their homes and landscapes, embed us in their society. We watch students, whom we’ve already met talking about their educational goals and solving problems in geometry, engaged in day-to-day activities like running through the countryside on local paths or herding sheep. A student recites a piece of poetry, “I walk in harmony with the spirit of math.”

Those working with students or adult populations of Native Americans or other ethnic or religious communities should also find the film interesting and inspiring. It lets viewers see how one can succeed at mathematics—real mathematics—without losing one’s own cultural heritage. As one of the Navajo students says in the film, “You don’t have to go ‘somewhere’ to be important. You are important where you are.”

If you buy the video, you also get five very short films as bonus material: “Running in the early morning” featuring a young Navajo woman; Henry Fowler’s personal obstacle-

filled story of going away to college and his mother's valedictory charge to him upon his entering Northern Arizona University; "Exile and return" about a Navajo student going to boarding school; "Language" about Diné and English and mathematics; and a nice biographical tribute to Tatiana Shubin, tracing her ideas and commitment from a school in Siberia founded by the famous Russian mathematician A. N. Kolmogorov to promoting the Navajo students' excitement as they discover mathematics.

Of special interest to AWM members is something that is never mentioned explicitly but nonetheless is obvious to viewers of the film: equal representation with respect to gender. Male and female students, fathers and mothers, male and female teachers, both Navajo and from outside universities, have equal roles in the classroom, in the wider Navajo society, and in speaking to us on camera. A Navajo teacher relates teaching shapes to young children. First they would draw a square, then draw a half circle on top of it. And then they spontaneously said, "My grandmother's hogan." The teacher then showed the way the logs, where two walls meet, come together by lacing his fingers together, and added that the nine visible fingers also symbolize the nine months of pregnancy, thus linking geometry, numbers, and mothers and grandmothers. Finally, as AWM members we should be

especially proud of the role played by Tatiana Shubin in *Math Circles* in general and in the Navajo Math Circle in particular. She deserves attention and praise; some colleague should nominate her for some appropriate honor in the AWM or for the MAA's Dolciani Award.

Currently I am teaching a course called "Mathematics in Many Cultures," and when the film came to me for review, I asked for, and received, permission from the film-maker to show it to my students and a couple of colleagues. One colleague, who teaches at an Indian school in California, told me that he is going to buy the film to show his students. And my own students' comments make clear how valuable this film would be for courses in the history of mathematics. For instance, one student wrote, "I liked how much the focus was on the students, hearing their stories and how they learn. What a stark contrast there is between the open-ended questions in the math circles/camp and the regimented system of public education. Integration of culture is key, and I loved learning about the cultural context and the traditions and sayings that related most to the students. Thank you for this film."

Navajo Math Circles is suitable and instructive for a wide variety of potential audiences. It deserves to be seen and appreciated by our members, students, and colleagues.

CALL FOR NOMINATIONS

The 2017 Kovalevsky Lecture

AWM and SIAM established the annual Sonia Kovalevsky Lecture to highlight significant contributions of women to applied or computational mathematics. This lecture is given annually at the SIAM Annual Meeting. Sonia Kovalevsky, whose too-brief life spanned the second half of the nineteenth century, did path-breaking work in the then-emerging field of partial differential equations. She struggled against barriers to higher education for women, both in Russia and in Western Europe. In her lifetime, she won the Prix Bordin for her solution of a problem in mechanics, and her name is memorialized in the Cauchy-Kovalevsky theorem, which establishes existence in the analytic category for general nonlinear partial differential equations and develops the fundamental concept of characteristic surfaces.

The mathematicians who have given the prize lecture in the past are: Linda R. Petzold, Joyce R. McLaughlin, Ingrid Daubechies, Irene Fonseca, Lai-Sang Young, Dianne P. O'Leary, Andrea Bertozzi, Suzanne Lenhart, Susanne C. Brenner, Barbara Keyfitz, Margaret Cheney, Irene M. Gamba and Linda J.S. Allen. Lisa Fauci will deliver the 2016 lecture at the SIAM Annual Meeting in Boston, MA in July 2016.

The lectureship may be awarded to anyone in the scientific or engineering community whose work highlights the achievements of women in applied or computational mathematics. The nomination must be accompanied by a written justification and a citation of about 100 words that may be read when introducing the speaker. 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 received by **November 1, 2016** and will be kept active for two years.

The awardee will be chosen by a selection committee consisting of two members of AWM and two members of SIAM. Please consult the award web pages www.siam.org/prizes/sponsored/kovalevsky.php and www.awm-math.org/kovalevskylectures.html for more details.

AWM WORKSHOP AT THE 2017 SIAM ANNUAL MEETING

Application deadline for graduate students: November 1, 2016

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 and going forward, the workshop talks will be 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 2017 SIAM Annual Meeting in Pittsburgh, Pennsylvania, July 10–14, 2017.

FORMAT: The workshop will consist of two research minisymposia focused on Numerical Analysis and Scientific Computing organized by Susanne Brenner, Fengyan Li and Beatrice Riviere, a Poster Session and an informational minisymposium directed at starting a career. Selected junior and senior women from the Research Collaboration Conference for Women (RCCW) WhAM!2 will be invited to give 20-minute talks in the two research minisymposia on Numerical Analysis and Scientific Computing. 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, and graduate students working in numerical analysis and scientific computing are especially encouraged to apply. The graduate students will be selected through an application process to present posters at the Workshop Poster Session run in conjunction with the SIAM Poster Session. Pending funding, AWM will offer partial support for travel and hotel accommodations for the selected graduate students. The workshop will include a luncheon and 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 numerical analysis and scientific computing will have the opportunity to connect with the Women in Numerical Analysis and Scientific Computing (WINASc) Research Network.

All mathematicians (female and male) are invited to attend the talks, career panel 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 workshop participants, in particular the graduate students. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **February 1, 2017**.

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 for the poster session should include:

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

Applications must be completed electronically by **November 1, 2016**. See <http://www.awm-math.org/workshops.html> for details.

BOOK REVIEW

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

Eileen Pollack, *The Only Woman in the Room: Why Science is Still a Boys' Club*. Boston: Beacon Press, 2015. ISBN 978-0-8070-4657-9. Hardcover, \$25.95.

Reviewer: Margaret A.M. Murray, margaret-a-murray@uiowa.edu

In the fall of 2013, Eileen Pollack published a provocative essay in *The New York Times Magazine* entitled, “Why Are There Still So Few Women in Science?” ([1]) Pollack, a 1983 graduate of the Iowa Writers’ Workshop, is best-known as a novelist and professor of creative writing at the University of Michigan ([2]). But in her essay she reveals that she was also among the first undergraduate women to major in physics at Yale, where she earned a BS in 1978. Despite her excellent academic performance, Pollack writes, the primary reason she abandoned her dream of becoming a theoretical physicist was lack of explicit encouragement from her male mentors in math and physics at Yale. And—returning to Yale more than 30 years later—she finds that, although in some ways things are better there for women in science, in many ways little has changed.

Pollack’s piece generated well over a thousand comments on the New York Times website and was widely discussed on radio and online ([3]), helping to generate considerable buzz for the book she was then writing on women in science. *The Only Woman in the Room*, released this past fall, is that long-awaited book. Having read and written a great deal about women in STEM—and having studied math at Yale and writing at Iowa—I’ve been eager to read it myself.

In the Preface, Pollack writes that this “is my long-postponed attempt to understand how and why I worked so hard to earn a bachelor of science degree in physics, only to become a writer” (p. xi). It is also, she says, an attempt to explain to her son “why his strong and self-possessed mother didn’t achieve her dream to become a physicist.” And finally, it’s an “answer to Lawrence Summers,” who famously speculated, in 2005, on the reasons for “the paucity of tenured female faculty” in STEM. Pollack wondered, in particular, how Summers “could understand why so few women end up as tenured physicists [without having] experienced what I had experienced in attempting to become one” (p. xii).

As both a response to Lawrence Summers and a description of the reasons why some women leave STEM,

Pollack’s book shares common themes with the work of Gioia De Cari. In her one-woman show, *Truth Values*, De Cari describes the personal and professional experiences that led her to leave MIT’s math department with a master’s degree rather than a PhD, and to pursue an alternative career in theater ([4]). But despite these common themes, Pollack’s reflections seem more thoroughly saturated with remorse, regret, and anger than do De Cari’s.

As befits Pollack’s rhetorical purposes, her book is something of a hybrid: two parts memoir, one part assessment of the current situation for women in science. For me, it’s the memoir that compels my attention most. In Part I, “Leaving Liberty,” Pollack traces the origins of her interest, both in science and in writing, to her early education in Liberty, a small town in the New York Adirondacks. She was the youngest of three children in an Orthodox Jewish household; her grandparents owned a “Borscht Belt” hotel, her father was a dentist, and her mother a housewife who deferred her own college education until Pollack’s high school years. In this retelling, her entire family—mother, father, older brother and sister—slip in and out like shadowy figures. But, in a telling comment that Pollack doesn’t pursue further, she says that, until her mother’s return to school, “[m]y father had always been the parent whose absence haunted me” (p. 24).

From her earliest school days, Pollack was a headstrong, relentlessly curious child, whom her teachers characterized as bright but “obnoxious” and unfeminine. These last two characteristics, in particular, were frequently used against her—in particular, to deny her the chance to skip a grade. In response to these indignities, Pollack writes,

I shunned the company of other girls and hung around with the roughest boys, who were even more obnoxious than I was. I still did well on tests—what was I supposed to do, pretend I didn’t know how to add (or multiply)? But I refused to act the part of the well-mannered little lady the grownups wanted me to play. (p. 7)

Indeed, her friendships with boys brought her distinct advantages. Through her friend Jeff, she gained access to an Erector Set, a toy that “[o]nly boys were allowed to own” (p. 8). And, when her brother received “a chemistry set for his bar mitzvah,” Pollack says, “I surreptitiously claimed that gift as mine” (p. 9). Until her early teens she managed to work out a *modus vivendi*, a rough-and-tumble life including boys, “boys’ toys,” science fiction, *Star Trek*, and the futuristic pavilions of the 1964 New York World’s Fair.

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But—as they often do—junior high and high school upset this delicate balance.

Although her two friends and academic peers, Eric and Jeff, were skipped a grade in science and math without her, Pollack persevered, winning the respect (and sometimes accolades) of her high school science teachers, all of them men. But their support could not compare to that of her school debate coach and English teacher, Barry Talkington, with whom she developed a deeply romantic—though apparently Platonic—attachment. “Not only did Barry judge me to be verbally dexterous enough to join the debate team,” Pollack writes, but “the qualities that made most other adults dislike me—my sense of humor, my hunger to be the best at everything, my curiosity about the world—caused Barry to like me more” (p. 33). In the end, Pollack excelled in all her academic subjects, both literary and scientific, became class valedictorian, and headed off to study physics at Yale.

Part II, “Surviving Yale,” chronicles her undergrad years, and it’s here that I find her account most excruciating and painful. When Pollack arrived in fall 1974, Yale College had been coed for just five years and an undergraduate woman was still something of an oddity there. Her rural, public school background, her origins in the Orthodox Jewish culture, her outspokenness, her lack of sophistication, her sexual inexperience: all of these characteristics made her feel odder still. But, while she craved a sense of connection with other women, she still naturally gravitated toward men. After all, Pollack writes, “If a person’s self-worth derives from being the only woman in a field, how much affection can she feel toward another woman who might challenge that claim to fame?” (p. 46).

So Pollack came to Yale with an investment in being “the only woman in the room”—an investment that, at times, led her to rebuff overtures of female friendship. Largely isolated from commiseration with her few female classmates, Pollack befriended her male competitors while largely hiding her insecurities from them. As for her pent-up need for male approval, she projected this on her male mentors, developing crushes on each one: physicists Michael Zeller, Peter Parker, and Peter Nemethy—and the mathematician who supervised her senior thesis, Roger Howe.

To their credit, Pollack’s mentors maintained relationships with her that were warm, professional, and supportive. Zeller, for example, refused to sign her drop slip after a poor performance on an early undergraduate test, instead

sharing advice from his Stanford swim coach. Stop “looking around to see how the other guys are doing,” said Zeller. “Keep your eyes on your own lane, swim your fastest, and you’ll win” (p. 57). Parker, her undergraduate adviser, recommended Pollack for an undergraduate research conference sponsored by Nobelist John Archibald Wheeler (p. 133). And Nemethy talked with her, crucially, about honoring her diverse passions—in a way I wish my own mentors had done when I was in school. While supportive of her interest in physics as a career, Nemethy was also the one to insist that she “sign up for a class in creative writing” (p. 98).

Looking back, it’s not clear how much Pollack appreciated Nemethy’s advice. But she took it, and it led her to a curious kind of balance—a bridging of the gap between C. P. Snow’s “two cultures” that I’ve long found elusive myself. While completing advanced coursework in physics, Pollack also studied writing with, most notably, John Hersey, the Pulitzer-prizewinning novelist and author of *Hiroshima*. In Hersey’s classes, Pollack felt—because “half the students were women”—she could be confident that his praise for her writing was sincere (p. 133). Whether his praise was more consistent than that of her other mentors hardly matters: it was Hersey’s praise that really got through.

By contrast, Roger Howe—a man not well-known for giving effusive praise—seems to be the focus of Pollack’s greatest frustration ([5]). In Part III, “Return to New Haven,” he’s the one she singles out for his failure to encourage her. And, indeed, Howe comes across in these pages as nearly oblivious, even now, to the situation for women. When she asks him, for example, why Yale went so long without a woman on the tenure-track in math, he replies: “I guess I just haven’t seen that many women whose work I’m excited about” (p. 159). But once prodded—finally, 30-plus years after the fact—he characterizes Pollack’s senior thesis as “exceptional” (p. 160).

The final chapters of Pollack’s book are devoted, in part, to revisiting old mentors, with a mix of sorrow and gratitude, at both Liberty High School and Yale. She also spends time with Meg Urry, the first female chair of the Physics Department, and female STEM students at Yale. Clearly, Pollack is heartened by the increasing presence of women in Yale science, but dismayed by the stubborn persistence of sexism. Reviewing the basic literature on women in science, and reflecting on pop culture’s persistent tropes about gender and intellect—her analysis of *The Big Bang Theory* is particularly astute—Pollack comes away dismayed by women’s lack of progress.

In the end, for Pollack, it all comes down to encouragement. If only women could be seen and praised!

“Maybe men,” she writes, “would be as insatiable for praise as women if their parents and teachers starved them for compliments about anything except their looks [and] their deportment” (p. 239). Clearly, Pollack herself wanted the praise of men—so much so that I can’t help wondering about that hauntingly absent father. Even so, I think she’s on to something. In the end, it was mentors like Talkington, Nemethy, and Hersey, who saw Pollack most fully and did their best to guide her. All of us deserve that kind of acknowledgment, no matter what field(s) we pursue.

Notes

1. Eileen Pollack, “Why Are There Still So Few Women in Science?” *The New York Times Magazine*, 6 October 2013; posted online 3 October 2013 at http://www.nytimes.com/2013/10/06/magazine/why-are-there-still-so-few-women-in-science.html?_r=0.
2. See Eileen Pollack’s faculty profile at the University of Michigan, <http://www.lsa.umich.edu/english/people/profile.asp?ID=275>.
3. See, for example, Peter Woit, “Why Are There Still So Few Women in Science,” *Not Even Wrong* blog, 3 October 2013, <http://www.math.columbia.edu/~woit/wordpress/?p=6317>; Arun Rath, “Why Women Might Be

Giving Up on Math and Science,” *All Things Considered*, National Public Radio, 6 October 2013, <http://www.npr.org/templates/story/story.php?storyId=229879527>; Jennifer Welsh, “These Are the 7 Things Keeping Women Out of Science Careers,” *Business Insider*, 16 October 2013, <http://www.businessinsider.com/7-things-keeping-women-out-of-science-2013-10>.

4. See Gioia De Cari, “About *Truth Values*,” *Unexpected Theatre* website, 2015, <http://unexpectedtheatre.org/index.htm>; and Julie Rehmeyer, “The Mathematical Dramatist: Interview with Gioia De Cari,” *Notices of the AMS* 57 (June/July 2010), 6: 740–743, <http://www.ams.org/notices/201006/rtx100600740p.pdf>.
5. After the publication of Pollack’s piece in *The New York Times Magazine*, three of his former students published a defense of Roger Howe in the Letters section of the *AMS Notices*. See Ju-Lee Kim, Andrea Nahmod, and Sijue Wu, “Roger Howe in Perspective,” *Notices of the AMS* 61 (May 2014), 5: 455, <http://www.ams.org/notices/201405/rnoti-p455.pdf>. For a longer version, see http://web.mit.edu/juleekim/www/Roger_Howe.pdf. In the interest of full disclosure: while I declined the authors’ request that I sign on, I did offer assistance in the drafting of the letter, the longer version of which characterizes Howe as “a man who gives compliments sparingly.”

EDUCATION COLUMN

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Learning Trajectories for Teacher Learning*

Anna E. Bargagliotti, Loyola Marymount University

Numerous professional development efforts, both large and small scale, are constantly being designed and implemented to improve teacher understanding of mathematics. Research indicates that a focus on content knowledge, opportunities for active learning, and coherence with other learning activities can be key characteristics of effective professional development (Doerr, Goldsmith, & Lewis, 2010; Garet et al., 2001; Gersten et al., 2014; Heck et al. 2008).

* This work is supported by National Science Foundation Grant no. 1119016.

However, this agreement on general factors does not point the way to a particular professional development strategy. Small-scale studies can offer insights on potentially effective “critical elements” of professional development experiences (Borko et al., 2008). The purpose of this article is to consider the idea of using learning trajectories for teachers, a concept typically applied to K–12 student learning, as a potentially effective critical element of professional development.

The term “hypothetical learning trajectory” was introduced by Martin Simon (1995) as a way to describe “the learning goal, the learning activities, and the thinking and learning in which students engage” (pp. 133) when learning a mathematics concept. Since then, learning trajectories (LTs) in K–12 mathematics education have often been cited as useful ways to model student learning. While the term “learning trajectory” is widely used in the literature, several definitions and interpretations of LTs exist (see special issue of *Mathematical Thinking and Learning*, 2004 for different descriptions and conceptualizations of LTs). LTs describe learners’ thinking and encompass instructional pathways designed to progress students through specific mathematical

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content; however, the manner in which an LT is constructed, the grain size of an LT, the roles for instruction within an LT, the age brackets targeted by an LT, and the scope for which an LT is used differs in the literature (Daro, Mosher, & Corcoran, 2011). For example, Confrey and Maloney (2010) describe LTs for a number of topics as “researcher-conjectured, empirically-supported description[s] of the ordered network of constructs a student encounters through instruction (i.e. activities, tasks, tools, forms, of interaction and methods of evaluation), in order to move from informal ideas, through successive refinements of representation, articulation, and reflection, towards increasingly complex concepts over time” (Confrey, 2008; Confrey et al., 2008, 2009). Clements and Sarama (2004) describe learning trajectories in the early childhood grade-band for narrow sequences of topics. Their learning trajectories have a specific content goal, an instructional sequence, and a set of activities to guide students.

One thing that all developed learning trajectories have in common is that they are used as models for *student* learning. The development of LTs as a model for *teacher* learning has not been explored in the literature. Because in teacher preparation programs and professional development, teachers are learners themselves, it is natural to extend the ideas developed about LTs for student learning to teacher learning. While this extension seems obvious, I found this extension was not straightforward in practice.

Project-SET

The Statistics Education for Teachers project (Project-SET), an NSF-funded project aimed at increasing teacher statistical knowledge, planned to develop two learning trajectories for teachers, one for the topic of sampling variability and one for the topic of regression. Over the course of three years, the Project-SET team tested and refined the initial learning trajectories through three professional development implementations (Bargagliotti et al., 2014; Bargagliotti & Anderson, 2016). The Project-SET learning trajectories were defined as curricular maps for sampling variability and regression for teachers to experience. The LTs were built to have a “loop” structure where a loop represented a learning benchmark and incorporated the four components of the statistical process outlined in the *Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report*—formulate questions, collect data, analyze data, and interpret results. The sampling variability LT consisted of six loops and the regression LT consisted of five. As a result, a teacher moving through the trajectory had to “loop through” the investigative

process multiple times—six times for sampling variability and five times for regression—while achieving learning benchmarks. For example, for sampling variability, teachers would proceed through loop 1 content, then loop 2 content, then loop 3 content, and so on. Each loop was guided by a question that conveyed the main ideas of the loop. Using the LTs, a professional development plan was created and subsequently administered to three cohorts of teachers.

Learning Trajectories for Teachers

While administering our first professional development plan (PD) based on LTs, the project team noticed that we needed to consider how teachers differed from students as learners. One of our key realizations was the fact that, unlike students, teachers can reflect deeply about their progression through a learning trajectory. Because teachers are adults, they clearly have a maturity level much greater than their students. After the first PD, we realized that because of this cognitive maturity level of teachers, teachers should be given the opportunity to know about, reflect on, and alter the LTs according to their understanding.

Our approach to introducing the LTs to the participating teachers changed over the course of the three PDs. During the first PD, we introduced and presented the LTs to the participating teachers at the completion of the entire professional development program. At that time, we believed that after the extensive time teachers had spent working on benchmarks set within the LT, the teachers would connect how everything covered in the LT fit together. Before this presentation of the LTs, the teachers were not aware of the existence of the LTs. However, this after-the-fact introduction to the LT was not effective. Teacher participants remained unable to see the how the sequencing of the benchmarks fit together and thus were not able to connect the big ideas related to sampling variability and regression and unable to complete their final projects adequately. For example, two teacher participants of the first professional development commented on their final project:

Teacher A: “I believe the sample mean of 26.92 is within two standard deviations about the population mean.” Do I need to go back and add something about 95% sure? ... I tried when I was answering the question to use what we had [talked about in the course]....

Teacher B: We didn’t really talk about the confidence intervals. I think #7 was leading there when it was like “how certain can you be....”

While these teachers recognized their boundaries, they were unable to fully connect the ideas even though they had worked for several weeks on the benchmarks outlined in the LT that led them to formal inference.

During the second and third PD implementations, we changed our approach and discussed the idea of the LTs during the first meeting. In addition, we provided the teachers with each LT immediately after completion of the work of that LT instead of waiting until the final meeting of the professional development. In this way, teachers were aware of an existing LT structure of benchmarks that they were meeting while progressing through the professional development. Even though they were given the LTs at their completion, their awareness of the existence of the LTs helped create connections for the teachers. For example, we asked teachers to reflect on each LT and to audio record their answers to the following questions: (1) What are the big take-away ideas of what you have done so far? Are there any open questions that you want answered immediately? (2) Do you feel like you progressed through the trajectory in the manner outlined or do you feel you acquired the knowledge following a different pathway?

The results were impressive.

Teachers had 15 minutes to think and audio record themselves reflecting on their learning and progression through the LT. Here is a representative excerpt on sampling variability from a teacher in the second iteration of PD:

Teacher C: I feel that I progressed through the trajectory in the manner outlined. I followed right along and I really liked how it built up the theories, so that when we actually got to where we were going, it was clear why we did it. So in other words, using samples to estimate population parameters and the whole flow from population parameter down to sampling statistics and then the inference going back up to population parameter. It was very clear and I liked how we built it. Then we actually moved away from taking a bunch of samples, because we already understood what the sampling distribution looked like and then we were able just to use one sample. With the confidence intervals, we moved completely away from that after calculating our confidence interval, without knowing what we were doing, with just estimating a range. Then moving to formal confidence intervals and from there actually just using the software. So once we had calculated by hand and understand what we were doing, we then moved to the software.

This example offers insights on how actively engaging with the LT and knowing that they were progressing through

an LT allowed teachers to see the big picture. One teacher commented: “At first, I didn’t really see where we were going, but now that we went through the whole trajectory, I feel like it is a whole circle and that made sense to me.”

As with the first implementation of the PD, final projects were given to the teachers in implementations two and three after their having seen and reflected on the LT. All teachers in the second and third iterations of the professional development completed the culminating projects successfully, both for sampling variability and regression.

Overall, when made aware of the LTs, teachers questioned the sequencing of concepts, engaged with the idea of a trajectory by referring to it, and upon viewing the actual LT, they were able to reflect on their progression through the trajectory. The impact on teacher understanding was notable.

Reflection

Teacher learning trajectories to help guide their professional development can offer an appealing extension of the literature surrounding learning trajectories for students. In undertaking developing teacher LTs, one can recognize that teachers are mature learners and thus can reflect deeply on their understanding about a topic. Through my work with Project-SET, I have come to believe that developing teacher LTs is worthwhile because they model teacher learning within a bigger contextual picture that, in turn, fosters deeper teacher knowledge. Constructing learning trajectories and using the trajectories to structure the professional development can provide a coherent big picture that teachers often need and seek.

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MATHEMATICS, LIVE!

A Conversation with Tamara Kolda

Interviewer: Katharine Ott, Bates College

Tamara (Tammy) G. Kolda is Distinguished Member of Technical Staff at Sandia National Laboratory in Livermore, CA. In this interview Tammy discusses what it is like to be a mathematician working at a national lab and her educational background. She also suggests two books to help women better understand unconscious biases in the workplace.

KO: What are the duties of your current job?

TK: My basic duty is research in computational science, mathematics, and data analysis.

KO: How long have you worked at Sandia National Labs?

TK: Since 1999.

KO: Has your job stayed the same there (perhaps with a change of title or two), or have you had different responsibilities during your time at Sandia National Lab?

TK: My job has stayed the same in that it has been focused largely on research. My title has changed. I've been technical staff the whole time, but I started off as a Senior Member of Technical Staff, then Principal, and now Distinguished. Several of my cohorts at Sandia have transitioned into line or project management.

KO: Do you have any insight into how working at a national lab is different than working in academia?

TK: At a national lab, the work is typically much more applied than what you would find in academia. Moreover, you can have a very successful career without ever publishing

a single paper and instead focusing on delivering results, such as software packages, development of new materials, or other products. Alternatively, you can have a very successful pseudo-academic research career, as I have done. In either case, lab researchers are supported by so-called “soft money,” which means that every hour of work is billed to some specific research project. Another difference is that we have no teaching duties, although we do host summer interns. One last major difference is that even though a huge variety of work happens at the labs, we are united by a common set of goals and this seems to foster more unity than I typically see in academic departments.

KO: When you were working on your PhD did you have in mind that you would go this direction with your career, or did you think that you would work in academia?

TK: I always thought that I would work in academia. However, I was offered a postdoctoral fellowship at Oak Ridge National Lab in Tennessee and found that I really enjoyed being at a lab. I’ve never completely closed the door on academia, but I’ve stayed at the labs because the work is extremely enjoyable. I’m also not sure what academic department I would fit in—I am in between computer science and math, with strong connections to both.

KO: Do you see any benefits to working in a national lab over an academic career?

TK: Yes. You work much closer to applications, and so have a good sense of the fundamental research that’s needed. And we employ a huge group of computational mathematicians, statisticians, and computer scientists—more than would be typically employed at even the largest university. For instance, Sandia has over 100 SIAM members—that’s a lot of applied mathematicians in one institution. I have a lot of collaborators right here in my own group.

KO: That was actually my next question, about collaborative work. Do you collaborate just with mathematicians, or do you work with other types of scientists and engineers?

TK: I collaborate with all types of scientists and engineers. There’s sort of a continuum here between applied math, computer science, engineering, and statistics. It’s always a fun game for me to guess what field someone’s degree is, and I’m usually wrong.

KO: Where would you place yourself on that spectrum?

TK: My undergrad was in pure math, and my PhD is in applied math, though my advisor was in computer science. So, I guess I’m somewhere between applied math and computer science. I’m also trying to become more of a statistician these days.

KO: Let’s talk about your mathematical work.

How would you describe your research to a mathematical audience, but not a specialized audience?

TK: My background is in numerical linear algebra, numerical optimization, and scientific computing. Nowadays, I apply that expertise in the context of data mining and network science.

KO: What do you find most exciting or interesting about your research?

TK: I think what I find most exciting is the intersection of different disciplines. I am learning a lot more about statistics and statistical reasoning these days, thanks to the assistance of several new statisticians who have joined my group. I enjoy seeing how different perspectives come together and lead to new and interesting research questions. My contributions tend to be on the algorithm and computation side, but I’m always happy to kick in a proof when the chance presents itself.

KO: I was checking out your website and I noticed that you have received several best paper prizes at conference. What is your approach to writing?

TK: I focus on quality rather than quantity, and I strive to always make a strong contribution (and sometimes fail!). I am careful in the details of my writing, including getting all details in the bibliography. Writing is an iterative process, probably too many iterations! I draft and rewrite, and rewrite, and I really try to focus on the big picture in addition to the mathematical details. One of the best paper prizes was for a paper that was previously rejected. But we took the feedback to heart, rewrote the paper, and then not only got it accepted but won the best paper prize. So you learn from these reviews and these rejections. I now say that rejection is the first step to a paper prize!

KO: I want to talk now about your background and education. When do you remember first becoming interested in mathematics?

TK: I liked to do math for fun even in elementary school.

KO: Was there any person or experience in elementary school that sparked that interest?

TK: I did a math camp in 5th grade that I really enjoyed—I especially remember creating a fake budget and paying fake bills with fake checks. I did computer camps in middle school as well as a camp at NASA Goddard [Goddard Space Flight Center] in Maryland where we got to program a big mainframe. It was actually a sleep-away camp where we stayed at the University of Maryland for two weeks. They clearly did gender balancing [at the camp], because there were as many girls as there were boys. This was not true in my computer camps—I remember that there were only three

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girls one summer. We had to have partners. The other two girls partnered with each other. So, I actually was partnered with the only black boy! He was even more in the minority than me.

KO: Where did you attend school as an undergraduate?

TK: At the University of Maryland, Baltimore County. I majored in math.

KO: Where did you attend graduate school?

TK: University of Maryland, College Park. My PhD was in applied math.

KO: Has your research area changed significantly since graduate school?

TK: It has evolved quite a bit. In graduate school I worked in linear algebra and optimization. Part of my thesis was focused on developing new methods for numerical optimization, and I worked in that area for another decade. The other part of my thesis was looking at data mining using linear algebra techniques, and that is more closely aligned with my current work. I also have added network science and high-performance computing to my list of areas.

KO: Have mentors played an important role in your career at any of its stages?

TK: Absolutely. Mentors have been huge in my career at just about every step, and I've had more than my fair share of great ones. I cannot say how important they have been.

KO: What about peer groups—whether it be all women or mixed—have these groups played a role in your career?

TK: Of course. For example, I have two female friends who graduated from the same school and at the same time as me and who are now professors in math departments. We have shared our travails throughout the past two decades. They have been an essential aspect of moving along in my career. Past a certain age, you don't really have mentors anymore, at least not in the sense of an experienced veteran giving advice to a younger colleague. Instead, you have peer mentors—some older and some younger—with different experiences and so different perspectives that can be valuable.

KO: I noticed that you are on Twitter and I checked out your feed and you have a lot of great stuff out there. Do you view your Twitter feed as part of your professional persona?

TK: Yes. It's a way to promote the field, activities of professional societies, and especially women in math and science.

KO: Why do you use Twitter?

TK: My main motivation for getting on Twitter was to understand how it works. As a researcher doing social network analysis, I needed to understand how the Twitter

network functioned. So now I can talk somewhat confidently about “mentions” and “hashtags.” I also do a lot of service for SIAM, and they are interested in social media, so I've used Twitter to help promote SIAM activities.

KO: Are there any other mathematicians or computational scientists that you follow on Twitter and would recommend to readers?

TK: I follow Nick Higham [@nhigham], who is SIAM President-Elect, and his brother Des Higham [@DesHigham]. They are fun. I also follow Manil Suri (mathematician, fiction author, NYT columnist) [@ManilSuri], Math Babe [@mathbabedotorg], and TeX tips [@TeXtip].

KO: You just mentioned your service with SIAM, and I noticed that you have also had some responsibilities with AWM as well. Why do you think working for professional organizations in mathematics is important?

TK: It develops leadership skills and is a way to give back to the community.

KO: Have these organizations made a big impact on your career?

TK: Absolutely. The AWM was very impactful when I was in graduate school. They had the AWM workshops and reading the newsletter was influential. SIAM has been my “home” in my career. It's the main venue for my publications, and I tend to go to a lot of SIAM conferences.

KO: Those are all of my questions. Is there anything else that you would like to share with AWM readers?

TK: I think a lot of folks are working really hard to make strong technical contributions, with the assumption that those technical contributions will be evaluated objectively. In reality, it's a much more complicated system. Women, in particular, are at a disadvantage in the system due to unconscious (and conscious) biases. Women especially need to be aware of potential pitfalls. It's especially important for women to create a strong support network of mentors and advocates and to ask for their help, especially at critical career junctures.

KO: Do you have any advice for where women can get some information to become more aware of these issues?

TK: I can recommend a couple of resources. One is, nothing will replace having good mentors. A reason that female mentors are in such demand is that they have more experience directly dealing with these biases.... I think men are doing a good job of getting better educated, but it's not replacement for first-hand experience.

There's a really good book that just came out, it's called *What Works for Women at Work* [Joan Williams, NYU Press, 2014]. I can't recommend that one enough. It has a lot of evidence from the sociology literature complemented

by narratives of women's encounters with unconscious bias. The theme of the book is that it gives you tools to "hack" the system to lessen the impacts of these biases.

There's another book that I also list on my website, *Influence: The Power of Persuasion* [Robert Cialdini, Harper Business, 2006], which is just a more general book about all of our unconscious biases. That one is really good for understanding the general picture of how the brain makes decisions without our consciousness always being involved.

KO: It sounds like these would be interesting books for women at any career stage to read.

TK: Absolutely. I like *What Works for Women at Work* because it says that there is not one way to be successful. I've certainly noticed that women have different techniques that make their careers work for them. Some women may wear heels and skirts, and others dress in pants. Either way is fine. Some women may talk like a sailor as their way of dealing with it. I used to tell women, "Don't interview in a skirt, wear slacks." I don't say that anymore.

KO: These are great suggestions to end on. Thank you for your time.

Re:boot Number Theory 2016

Lillian Pierce, Duke University

Have you ever had this experience: a grant deadline is shimmering in the middle distance, and while one part of your brain is genuinely gearing up to write a proposal, another part of your brain is remarkably productive in thinking up all kinds of reasons you don't really need to write one this year, after all?

One of those impulses is going to win out, and we want it to be the one that produces a proposal. In March, 27 female faculty in number theory gathered at Duke University for re:boot Number Theory 2016, a four-day intensive research retreat, with a key focus on grant writing. This workshop was designed to prompt early career women to strategize short- and long-term research aims and to frame these research aims in a successful grant proposal. The re:boot workshop model was an experiment, and we think it was a success. We hope this model will be taken up and developed further by other research communities in mathematics. After all, the re:boot motto is: "enthusiasm is contagious!"

Re:boot Number Theory 2016 featured group discussions, examination of previous successful grants (which were "donated" for use at re:boot), and short blocks of individual writing time. One PI wrote: "Seeing other proposals was extremely useful. I have had trouble getting my colleagues to share their documents ... seeing the many ways in which a proposal can be successful was invaluable." Another commented, "In the past, I have seen a couple [example grants] from mentors, but the wider range was very nice ... seeing/discussing the variety of ways successful applicants attacked certain sections of the grant proposals was great."

The individual writing time was intended to help PIs start on a number of text "bricks" which could later be expanded into a full first draft; as one PI wrote, "I sometimes get overwhelmed ... it was so helpful to focus on the task at hand and then go do it (at least a draft) right away. I didn't get all of the 'pieces' done, but I got a lot of them drafted." Other PIs wrote: "This made the process feel a little more manageable and made me feel much less isolated"; "I understand now that I should never assume that whatever I'm doing is easy or trivial. I understand more the importance of communicating my math in a way that educated non-experts can understand and appreciate."

Re:boot also featured four guest lecturers: Loredana Lanzani, Professor at Syracuse University and a recent NSF panel director; Charles Toll, director of the NSA Mathematical Sciences Program; AWM's own president Kristin Lauter (who joined the meeting via Skype); and Pirita Paaajanen, who discussed her transition from a PhD in group theory to her current research at The Genome Analysis Center (UK). PIs commented about the guest lecturers: "This was fantastic, as we could essentially ask anything we wanted, and they were very generous with their time and advice"; "[The] in depth understanding of the review and panel process was very helpful.... I didn't know any of that beforehand and getting that information directly from the speakers was great."

While re:boot brought together PIs who were at a range of career stages, another attractive idea is to assemble a group of PIs who are all working on precisely the same type of proposal. As one PI commented, "It would be nice to attend an event like re:boot as a postdoc, during the beginning years of the tenure track, and immediately after getting tenure (so, at least 3 times). Different grants are available at different stages, and it would be nice to have some

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encouragement every few years.” But a model that mixes people at different career stages, like the 2016 version of re:boot, can also strengthen the community’s mentoring network. As other PIs wrote: “A refresher every 2–3 years would be good, because then one has gained more experience and can reflect on that”; “I enjoyed the experience of being with mathematicians where it felt like everyone was equal and allowed to talk to everybody.”

At the end of re:boot, the participants committed in total to submitting 50 grants to foundations such as the NSF, NSA-MSP, Simons Foundation, and AWM during the 2016–2017 grant cycle. One PI said of re:boot, “I am less intimidated by the process and more willing to dive into another NSF proposal because of it.” Another PI wrote, “I had doubts about the likelihood of being funded and was worried about wasting a lot of time.... However, I am completely converted now. I now think that the act of writing proposals

is extremely beneficial in two main ways. First, it helps the writer to directly improve her research by spending time understanding the context in which it lies. Second, it helps the mathematical community and women and under-represented groups particularly to have more applications. So now I believe strongly that writing a research proposal is helpful to both me and my community.”

And one thoughtful PI left the following feedback: “the enthusiasm is contagious!” We would be delighted to see more re:boot workshops springing up around the country!

Re:boot Number Theory 2016 was organized by Alina Bucur (UCSD), Heekyoung Hahn (Duke), Pirta Paajanen (TGAC-UK), Lillian Pierce (Duke), and Caroline Turnage-Butterbaugh (Duke) and funded by the NSF, the NSA-Mathematical Sciences Program, Microsoft Research, the Number Theory Foundation, Duke University Natural Sciences Division, and Women in the Quantitative Sciences at Duke University.

Roberts and Grundmann Appointed to AMS Office

AMS, June 2016

Catherine A. Roberts Named AMS Executive Director

The American Mathematical Society Board of Trustees is delighted to announce the appointment of Dr. Catherine A. Roberts, professor of mathematics at the College of the Holy Cross, as the new Executive Director of the AMS, following the retirement this summer of our current Executive Director, Dr. Don McClure, who is retiring after more than seven years of outstanding service in this position.

“Catherine has a sustained record of high-level professional service throughout her career, including participation on AMS policy committees during the last ten years,” McClure observed. “Her experience is very broad and is excellent preparation for her new leadership role. I am pleased that she was selected by the Board as the Society’s next Executive Director.”

“I look forward to working with Roberts,” said AMS President Robert Bryant. “She has had a distinguished career in mathematics, both in research and in service, and



Catherine A. Roberts

continues a tradition of excellence in the AMS Executive Director position.”

Roberts, who received her PhD in applied mathematics in 1992 from Northwestern University, brings to her new position as Executive Director a wealth of administrative experience, including her six-year service as chair of the

Department of Mathematics and Computer Science at the College of the Holy Cross and extensive experience as a journal editor. Before taking a position at Holy Cross, Roberts was a member of the faculty at the University of Rhode Island and at Northern Arizona University.

She has served on a number of AMS committees, including the Committee on Education, the Committee on Professional Ethics, and the Committee on Meetings and Conferences. Her involvement with the mathematical community has been wide-ranging in other ways as well, for she has also served in various capacities in organizations such as the Association for Women in Mathematics and the Mathematical Association of America.

Her research in applied mathematics has been in nonlinear Volterra integral equations and natural resource modeling. Roberts currently serves as editor-in-chief of *Natural Resource Modeling* and has long had a leadership role in organizing conferences and workshops in this area. She is a dedicated and enthusiastic teacher, being involved in education at all levels, including stints as associate editor of the *American Mathematical Monthly* and as a workshop instructor for the MAA's Project NExT.

Roberts says, "The AMS has been a partner throughout my career as a mathematician. I value how the AMS provides professional support through its publishing and conference endeavors, as well as its advocacy work promoting the importance of mathematics. I look forward to contributing to the important work the society does on behalf of mathematical research, scholarship and education."

She will begin her initial five-year term of appointment on August 1, 2016, and the Board and Council look forward to working with her to further the mission of the AMS to provide the very best in service and leadership to the professional mathematics community.

Helen Grundman Named AMS Director of Education and Diversity

Helen Grundman, professor of mathematics at Bryn Mawr College, has been named Director of Education and Diversity, a newly established department in the Division of Meetings and Professional Services of the American Mathematical Society (AMS). Grundman will provide leadership for the Society's current and future programs supporting education and promoting diversity, particularly at the graduate level.

The focus of the new department is on graduate education in the mathematical sciences, the preparation and encouragement of students entering graduate programs, the



Helen Grundman

mentoring of students for success in graduate school, and the promotion of diversity and inclusiveness at the graduate level. The new department's efforts will build upon AMS programs that serve graduate students, such as student chapters, Mathematics Research Communities, and travel grants, while working to make AMS programs and activities more inclusive of all underrepresented groups.

Within the AMS, Grundman will work closely with the Committee on Education as well as staff who administer AMS programs concerned with education and/or diversity. Beyond the AMS, she hopes to develop strong connections both with mathematics departments and with other organizations that promote diversity in mathematics, such as the Association for Women in Mathematics (AWM), the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and the National Association of Mathematicians (NAM).

Grundman, a number theorist, received her PhD from UC Berkeley in 1989. She held a prestigious Moore Instructorship at MIT for two years before joining the Bryn Mawr faculty in 1991. Since that time, she has held the positions of Postdoctoral Research Fellow at the Mathematical Sciences Research Institute, Science Fellow at the Bunting Institute of Radcliffe College, and Program Director in the Division of Mathematical Sciences at the National Science Foundation. From 2002 to 2005, she

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served as Chair of the Bryn Mawr College Department of Mathematics.

Grundman has been involved in a range of programs aimed at increasing diversity of mathematicians in the U.S. She conceived of and designed the Mathematics Pre-PhD Program at UC Berkeley to improve the success rate of less-prepared women and minority students, which enabled them to successfully complete doctorate degrees; she has taught courses for and coordinated the Mid-Atlantic Mentoring Cluster of the nationally recognized Enhancing Diversity in Graduate Education (EDGE) Program; and she has been a speaker, mentor, and poster judge at the national SACNAS Conference. For many years, she served as the Mathematics Graduate Director and Pre-Advancement Advisor at Bryn Mawr College. She has also served on the Board of the Fibonacci Association and on a variety of committees of the AMS, AWM, and Council on Undergraduate Research.

She says, “I’m very excited to be joining the exceptional staff of the AMS and to be taking leadership of this new, critically important department.”

AWM extends its hearty congratulations to both Roberts and Grundmann!

On the Web

“The Secret History of the Women Who Got Us Beyond the Moon” by Simon Worrall is an interesting interview of Nathalia Holt, who wrote *Rise of the Rocket Girls: The Women who Propelled Us, from Missiles to the Moon to Mars*. It tells the story of women working at JPL, and will later be reviewed in our Book Review column. See: <http://news.nationalgeographic.com/2016/05/160508-rocket-girls-women-moon-mars-nathalia-holt-space-ngbooktalk/>.

The Other Half, a new podcast from ACMEScience.com, is an exploration of the the other half of a bunch of things. First, Anna [Hensch] and Annie {Rorem} want to take you on a tour of the other half of math—the fun half you might be missing when you learn math in school, the half that helps you makes sense of your own life. And on the flip side of that equation, they want to explore the other half of life—the half of day-to-day social scenarios that can be better understood by thinking like a mathematician. Lastly, Anna and Annie—as women of science—represent the other half of people. More than half of the humans on earth are female, but that parity isn’t reflected in the world of math and science. See <http://theotherhalf.acmescience.com/>.

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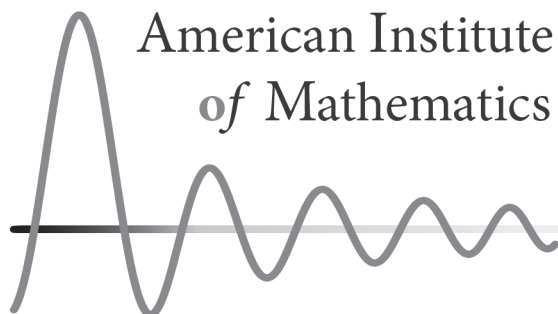


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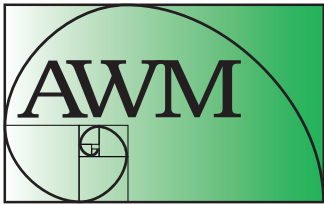
AIM also invites proposals for the SQuaREs program: Structured Quartet Research Ensembles. More long-term in nature, this program brings together groups of four to six researchers for a week of focused work on a specific research problem in consecutive years.

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Printed in the U.S.A.

ASSOCIATION FOR WOMEN IN MATHEMATICS

Volume 46, Number 4, July–August 2016

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