ASSOCIATION FOR WOMEN IN MATHEMATICS

Newsletter

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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.

IN THIS ISSUE

PRESIDENT'S REPORT

Mary Gray, AWM Founder and first AWM President, addressed the banquet of our Research Symposium in April at the University of Maryland. Mary spoke in honor of Lee Lorch and recounted some of the early history of the organization. Mary currently serves as Chair of the AWM Advisory Board, which has met every six months for the last two years and provides sage advice and helpful connections and suggestions. We are fortunate to have Mary's ongoing input on behalf of women in mathematics: recent suggestions include partnering with MAA to help establish a regional presence for AWM to better support women in mathematics and AWM's mission locally. We are actively pursuing this partnership and have high hopes for this and other great ideas from Mary and the Advisory Board!

AWM Research Symposium 2015. The third in a series of biennial AWM Research Symposia took place at the University of Maryland on April 11–12. The Symposium was organized by **Ruth Charney**, **Shelly Harvey**, **Gail Letzter**, **Magnhild Lien**, **Konstantina Trivisa**, **Talitha Washington**, and myself, with many outstanding mathematicians volunteering to organize the fourteen special sessions representing a wide swath of mathematics. The scientific program featured plenary lectures by **Ingrid Daubechies**, **Maria Chudnovsky**, **Jill Pipher**, and **Katrin Wehrheim**. The format was similar to the 40th Anniversary Symposium at Brown and the 2013 Research Symposium at Santa Clara, but there were several new aspects to the Symposium this time: the new AWM Presidential Award was inaugurated, and the first award was presented at the banquet to the founders of the EDGE program: **Sylvia Bozeman** and **Rhonda Hughes**. EDGE (Enhancing Diversity in Graduate Education) is a program with a strong record of supporting graduate students and building community among women from diverse backgrounds. To help celebrate the EDGE program, **Shirley Malcom** (AAAS) delivered an inspiring Keynote address, followed by moving acceptance speeches from Sylvia and Rhonda. The networking reception focused around a jobs panel moderated by **Gail Letzter**, with representatives from industry and government: **Gagan Aggarwal** (Google), **Lily Chen** (National Institute of Standards and Technology), **Michelle Dunn** (National Institutes of Health), **Deborah Lockhart** (National Science Foundation), **Adele Merritt** (National Security Agency), and **Phillip Whitman** (INTECH). At the end of the jobs panel, the **Wolfram Best Poster Prizes** were awarded to **Jessica Fintzen, Ariana Minot**, and **Beth Romano**. For more details and pictures, see the live blog (https://awmsymposium2015.wordpress.com/), the conference webpage, and the article on pages 9–10 of this issue.

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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.

PRESIDENT'S REPORT *continued from page 1*

The Research Symposia, while requiring many hands and significant funding to realize, have proved to be invaluable for building community among female mathematicians, showcasing women's work in mathematics, and attracting attention, support, and sponsorship for the organization and the mission. A proceedings volume for the 2015 Symposium will be published by Springer in the AWM-Springer series, and the next AWM Research Symposium will take place in 2017. Planning and applications for funding will soon be underway!

AWM Workshop at SIAM CSE. The other major AWM activity this spring was the Workshop at the SIAM CSE (Computational Science and Engineering) conference in Salt Lake City in March 2015. AWM usually holds a workshop and other activities at the SIAM Annual Meeting held in July each year. However in 2015 there is no annual meeting due to the International Congress on Industrial and Applied Mathematics (ICIAM) to be held in Beijing, China, August 10–14, 2015. So the AWM workshop took place at SIAM CSE, following the usual format except that the AWM-SIAM Sonia Kovalevsky Lecture will be presented by **Linda Allen** at ICIAM instead. The AWM Workshop was organized by **Yekaterina Epshteyn**, **Fengyan Li**, **Elebeoba (Chi-Chi) May**, **Misun Min**, **Hoa Nguyen**, and **Jingmay Qiu**. Congratuations to the winners of the best poster competition: **Arezou Ghesmati** and **Guanglian Li**! See the article on pages 11–12 for a full report of this year's AWM SIAM Workshop.

AWM at MathFest 100! This year the Mathematical Association of America will celebrate its 100th Anniversary at MathFest in August in Washington, DC. The **AWM-MAA Etta Z. Falconer Lecture** will be delivered by **Erica N. Walker** (Columbia University). Her lecture, entitled " 'A Multiplicity All At Once': Mathematics for Everyone, Everywhere," is scheduled for Friday, August 7, 8:30 a.m. AWM is also organizing a contributed paper session "The Contributions of Women to Mathematics: 100 Years and Counting" and an AWM Student Chapter poster session entitled "Highlights from AWM Student Chapters." We will also have a booth in the exhibit area where we will be selling AWM T-shirts and displaying the first volumes in the AWM-Springer series. I hope to see many of you at MathFest!

Microsoft and Sadosky Prize winners. I am delighted to announce the prize winners: **Lauren Williams** (UC Berkeley) has been selected as the winner of the 2016 AWM-Microsoft Research Prize in Algebra and Number Theory, and **Daniela De Silva** (Columbia University) has been selected as the winner of the 2016 AWM Sadosky Research Prize in Analysis. Both prizes will be awarded at the AWM Reception and Prize Ceremony at the 2016 Joint Math Meetings in Seattle in January. Please see the press releases in this issue for more information.

New Meetings Coordinator. For over 30 years, **Bettye Anne Case** (Florida State University) has served AWM as Meetings Coordinator. She has been a driving force for organizing AWM meetings, workshops and conferences, one of the most vital aspects of the organization. This spring, Bettye Anne announced her intention to pass the baton and to help with the transition to a new Meetings Coordinator. We are delighted to announce that **Kathryn Leonard** (CSU-Channel Islands) has accepted the appointment as Meetings Coordinator offered to her by the Executive Committee. Kathryn has been serving on the Meetings Portfolio for the last few years, co-organized the 2014 AWM-JMM Workshop, and co-edited the first volume

of the AWM-Springer series. We are grateful for Kathryn's continued commitment to organizing AWM meetings, and we hope to be able to adequately celebrate Bettye Anne's many years of service and accomplishments in upcoming issues of the newsletter.

Hill Visits. Several professional societies, including AMS and AAAS, have programs to help scientists learn how to engage with government representatives. Programs such as the AMS and AAAS Congressional Fellowships help to create dialogue between scientists and policy-makers. The AMS Committee on Science Policy meets once per year in Washington and schedules visits to the Hill to meet with members of Congress or their staff to argue on behalf of funding for NSF and basic research. In March, the Society of Women Engineers (SWE) hosted a reception on the Hill featuring several members of Congress. AWM was invited and Executive Committee member **Talitha Washington** attended. At the suggestion of **Karen Saxe**, former AMS Congressional Fellow, we decided to try an initial foray into face-to-face engagement on matters of science policy. On April 13, following the AWM Research Symposium, Talitha Washington and I visited Senate and Congressional offices to make known AWM's existence and mission and to argue for legislation to increase STEM outreach funding. Following on advice from the Advisory Board, we intend to initiate a new program of congressional engagement, involving the Policy and Advocacy Committee, and possibly starting with another set of Hill visits during MathFest in Washington, DC. in August. We welcome input and participation to plan and build engagements at state and local levels!

CBMS Meeting. AWM is a member organization of the Conference Board of the Mathematical Sciences, which comprises 19 societies in mathematics, and meets twice per year in Washington, DC. At the May 1st meeting, I was appointed to the Executive Committee of CBMS, a position I accepted in order to influence the meeting agendas and activities to focus on women and diversity in the profession. The May meeting included a focused discussion on issues of diversity in the mathematical profession. Concrete suggestions emanating from the discussion include running a CBMS forum on diversity. The forum would focus on cooperation between the professional societies on this issue, and concrete outcomes would include a report summarizing issues, making recommendations, and proposing actions to increase diversity and to support diverse populations in the profession.

The May meeting also included presentations on the status of Common Core and the politics of math education at the K–12 level. It was clear from the discussion that there is a need for greater engagement from professional mathematicians at the local level on K–12 math education issues. **Karen Saxe** also presented the Common Vision Program for Undergraduate Mathematics in 2025. AWM Executive Committee member **Tara Holm** serves on the Common Vision Leadership Team, and Karen has written an article in this issue on the Common Vision project (see pages 25–27). My favorite line in Karen's article is the last one, exhorting us to "Do *something*." As professional mathematicians, we impact society in many important ways through our work and knowledge. Training the next generation of scientists, engineers, and mathematicians, and ensuring that diversity is reflected, must be one of the most important.

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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, leggett@member.ams.org. 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.

Likewise, there are many ways to get involved with AWM initiatives to support our mission at both the local and national levels. Thank you all for your continued service to the profession through your work to advance women and girls in mathematics, and let's inspire the next generation of professional women and men to work on behalf of change!

Kristin Lauter
La Jolla, CA
May 27, 2015

Kristin Lauter

AWM Slate Announced!

We are pleased to announce the slate for this fall's AWM election. **Ami Radunskaya** (Pomona College) has been nominated to serve as President-Elect. **Ellen Kirkman** (Wake Forest University) has been nominated to serve as Treasurer. **Minerva Cordero-Epperson** (University of Texas at Arlington), **Laura DeMarco** (Northwestern University), **Reagan Higgins** (Texas Tech University), **Gail Letzter** (National Security Agency), **Fengyan Li** (Rensselaer Polytechnic Institute), **Ivelisse Rubio** (University of Puerto Rico), **Talithia Williams** (Harvey Mudd College), and **Carol Woodward** (Lawrence Livermore National Laboratory) have accepted nominations for Member-at-Large; four will be elected.

Nominations by petition signed by 15 members are due to our president by **September 1, 2015**.

Thanks to the Nominating Committee (Jill Pipher, chair, Susanne Brenner, Ingrid Daubechies, Rhonda Hughes, Hee Oh, and Judy Walker) for their efforts in producing this fine slate of candidates

ASSOCIATION FOR WOMEN IN MATHEMATICS

2015–2016 Rates: Institutions

Institutional Dues Schedule

Category 1	$325
Category 2	$325
Category 3	$200

Categories 1 and 3 now include 15 free student memberships.

For further information or to sign up at these levels, see www.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

Adriana Salerno, asalerno@bates.edu

AWM DEADLINES

AWM Workshop at JMM:
August 15, 2015

AWM-MAA Falconer
Lecturer: September 1, 2015

AWM Travel Grants:
October 1, 2015 and February 1, 2016

AWM Alice T. Schafer Prize:
October 1, 2015

AWM-AMS Noether Lecture:
October 15, 2015

AWM-SIAM Sonia Kovalevsky Lecture:
November 1, 2015

AWM Workshop at SIAM 2016:
November 1, 2015

Ruth I. Michler Memorial Prize:
November 1, 2015

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Lauren Williams Wins AWM-Microsoft Research Prize

Lauren Williams

The Association for Women in Mathematics will present the second AWM-Microsoft Research Prize in Algebra and Number Theory to Lauren Williams, Associate Professor of Mathematics, University of California Berkeley, at the Joint Mathematics Meetings in Seattle, WA in January 2016. Established in 2012, the AWM-Microsoft Research Prize recognizes exceptional research in algebra and number theory by a woman early in her career. The award is made possible by a generous contribution from Microsoft Research. The biennial presentation of this prize serves to highlight to the community outstanding contributions by women in the field of algebra and to advance the careers of the prize recipients.

The 2016 AWM-Microsoft Research Prize in Algebra and Number Theory is awarded to Lauren Williams in recognition of her exceptional research in algebraic combinatorics. Williams received her doctorate in 2005 from the Massachusetts Institute of Technology. After appointments at MSRI, Berkeley, and Harvard, she is currently an Associate Professor of Mathematics at the University of California, Berkeley.

Williams is a powerful and broad combinatorialist whose scientific reach extends into representation theory, algebraic geometry and physics. Her early work on the totally nonnegative Grassmannian is a beautiful and fundamental contribution to our understanding of the combinatorics and later (with Rietsch) of the topology of this space, which has important connections to Lusztig's work on canonical bases in representation theory. Williams is also a leader in the exciting new subject of cluster algebras. With Musiker and Schiffler, she proved an important special case of the famous Laurent positivity conjecture that is now a theorem. Their proof is a technical tour de force, which unlike some other approaches, yields a transparent combinatorial rule for the Laurent polynomials in question. Her paper with Ardila and Rincón, in which an old conjecture about realizability of positively oriented matroids is finally established, has been hailed by experts as the "climax of the study of positroids in the past decade." Most recently, her work with Kodama brings her expertise into use in the entirely new directions of soliton solutions of the KP equation and modeling shallow water waves.

Williams has received numerous awards and recognitions. She is a fellow of the American Mathematical Society and a Simons Fellow. Currently her research is supported by the Rose Hills Innovator Award and an NSF CAREER grant.

Beyond her outstanding scientific achievements, Williams has assumed many leadership roles in the mathematical community and is a dedicated PhD and post-doctoral advisor. She gave a series of talks at the 2013 Program for Women and Mathematics at the Institute for Advanced Study and was a plenary speaker at the AWM Research Symposium 2013 at Santa Clara University.

The 2016 Joint Mathematics Meetings will be held January 6–9 in Seattle, WA. For further information on the AWM-Microsoft Research Prize, including the previous winner, please visit www.awm-math.org.

Daniela De Silva Wins AWM-Sadosky Research Prize

Daniela De Silva

The Association for Women in Mathematics will present the second AWM-Sadosky Research Prize in Analysis to Daniela De Silva, Assistant Professor of Mathematics, Barnard College at the Joint Mathematics Meetings in Seattle, WA in January 2016. Established in 2012, the AWM-Sadosky Research Prize recognizes exceptional research in analysis by a woman early in her career. The award is named for Cora Sadosky, a former president of AWM, and is made possible by generous contributions from Cora's husband Daniel J. Goldstein, daughter Cora Sol Goldstein, and friends Judy and Paul S. Green and Concepción Ballester. The biennial presentation of this prize serves to highlight to the community outstanding contributions by women in the field of analysis, to advance the careers of the prize recipients, and to evoke the memory of all that Cora Sadosky exemplified as a mathematician, mentor and friend.

The 2016 AWM-Sadosky Research Prize in Analysis is awarded to Daniela De Silva in recognition of her fundamental contributions to the regularity theory of nonlinear elliptic partial differential equations (PDE) and non-local integro-differential equations. De Silva received her doctorate in 2005 from the Massachusetts Institute of Technology. After appointments at MSRI and Johns Hopkins University, she is currently an Assistant Professor of Mathematics at Barnard College.

De Silva´s research centers on the analysis of free boundary problems, PDE problems solved for both an

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, 2015. She must either be a US citizen or have a school address in the US. The Prize will be awarded at the Joint Prize Session at the Joint Mathematics Meetings in Seattle, WA January 2016.

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, 2015**. If you have questions, phone 703-934-0163, email awm@awm-math.org or visit www.awm-math.org.

unknown function and an (embedded) unknown surface of discontinuity, such as a solid to liquid phase transition or the edge of a drop sitting on a surface. She has done seminal work and obtained outstanding results on one-phase problems and two-phase problems, as well as singular minimizing free boundary problems. Her originality, depth, and enormous technical skills are evident, for example, in her works with Roquejoffre on thin one phase problems, with Savin on a regularity theory for nonlocal free boundary problems, with Ferrari and Salsa on a complete regularity theory for two phase problems in general media, and with Jerison on the construction of a singular minimizing free boundary. In particular, De Silva's solo paper "Free boundary regularity for a problem with right hand" has been highly praised by world leaders as one with tremendous impact that has inspired other distinguished authors to collaborate with her.

De Silva is an outstanding and talented young analyst whose remarkable work has both answered important outstanding questions and opened new research directions. In 2013 De Silva's work with Roquejoffre was recognized by a best paper award in *Annales de l'Institut Henri Poincaré*. Her research is supported by grants from both the National Science Foundation (NSF) and the European Research Council (ERC).

The 2016 Joint Mathematics Meetings will be held January 6–9 in Seattle, WA. For further information on the AWM-Sadosky Research Prize, including the previous winner, please visit www.awm-math.org.

AWM Workshop for Women Graduate Students and Recent PhDs at the 2016 SIAM Annual Meeting

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. Pending funding, an AWM Workshop is scheduled to be held in conjunction with the SIAM Annual Meeting, Boston, MA, July 11-15, 2016.

FORMAT: The workshop will consist of two research minisymposia focused on **Dynamical Systems with Applications to Biology and Medicine**, a poster session and an informational minisymposium directed at starting a career. The poster session will be open to all areas of research. Participants will be selected in advance of the workshop to present their work. Recent PhDs will be selected to join senior women in the Dynamical Systems with Applications to Biology and Medicine minisymposia where they will give 20-minute talks, and graduate students will be selected to present posters. Pending funding, AWM will offer partial support for travel expenses for twenty participants. Departments are urged to help graduate students and recent PhDs obtain supplementary institutional support to attend the workshop presentations and the associated meetings. All mathematicians (female and male) are invited to attend the program.

MENTORS: We also seek volunteers to act as mentors for workshop participants. If you are interested in volunteering, please contact the AWM office.

ELIGIBILITY: To be eligible for selection and funding, a graduate student must have begun work on her thesis problem and a recent PhD must have received her degree within approximately the last five years, whether or not she currently holds a postdoctoral or other academic or non-academic position. All non-US citizens must have a current US address. All selected and funded participants are invited and strongly encouraged to attend the full AWM two-day program.

All applications should include:

- a cover letter
- a title and a brief abstract (75 words or less) of the proposed poster or talk
- a concise description of research (one-two pages)
- a curriculum vitae
- at least one letter of recommendation from a faculty member or research mathematician who knows the applicant's work is required for graduate students and recommended but not required for recent PhDs. In particular, a graduate student should include a letter of recommendation from her thesis advisor.

Applications must be completed electronically by **November 1, 2015**. See http://www.awm-math.org/workshops.html.

Erica N. Walker Named 2015 AWM-MAA Falconer Lecturer

Erica N. Walker

The Association for Women in Mathematics and the Mathematical Association of America are pleased to announce that Erica N. Walker will deliver the Etta Z. Falconer Lecture at MathFest 2015. Dr. Walker is an Associate Professor of Mathematics Education at Teachers College, Columbia University. She earned her BS in Mathematics from the Birmingham-Southern College, MEd in Mathematics Education from Wake Forest University and her EdD in Administration, Planning and Social Policy from Harvard University.

A former public high school mathematics teacher from Atlanta, Walker earned her doctorate in education from Harvard University. Her research focuses on social and cultural factors as well as educational policies and practices that facilitate mathematics engagement, learning, and performance, especially for underserved students. In a letter of support for Walker, her nominator writes: "Her research areas and her demonstrated commitment to improving mathematics education among underrepresented groups and in urban settings indicate interests that overlap with those that undergirded the lifelong work of Dr. Etta Falconer."

Since earning her doctorate, Walker has authored or co-authored more than twenty-five articles and book chapters. Her work has been published in journals such as the *American Education Research Journal*, *Educational Leadership*, and *The Urban Review*. Walker is also the author of two books: *Building Mathematics Learning Communities: Improving Outcomes in Urban High Schools* (published by Teachers College Press in 2012) and *Beyond Banneker: Black Mathematicians and the Paths to Excellence* (published by SUNY Press in 2014).

In her service to the profession and the community Walker collaborates with teachers, schools, districts, and organizations to promote mathematics excellence and equity for young people. She is widely known as a speaker. Since 2001, the year of her doctoral degree, she has been invited to give more than fifty presentations at conferences, special gatherings and universities all across the country.

Walker's lecture at MathFest is entitled " 'A Multiplicity All At Once': Mathematics for Everyone, Everywhere." What does it mean to learn mathematics? What does it mean to say that some people are "math people"? In her talk, she will draw upon 20 years of research and teaching to describe multiple contexts for mathematics learning and socialization across the lifespan.

MathFest 2015 will be held August 5–8 in Washington, DC. 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 Marie Vitulli, Pat Kenschaft, Karen King, Dawn Lott, Ami Radunskaya, Kate Okikiolu, Rebecca Goldin, Katherine St. John and Trachette Jackson.

Call for Nominations for Norwood Award

Over the weekend of October 24–25, 2015, the Department of Mathematics at Northwestern University will host a conference for undergraduate women who may be interested in pursuing graduate study in the mathematical sciences (pure and applied mathematics, and also mathematical physics, statistics, theoretical computer science ...). There will be research lectures, panel discussions, and numerous opportunities for interaction with faculty and graduate students, both casual and structured (including time set aside for mentorship).

Please share this information with appropriate undergraduate candidates. More information about the conference, along with a link to the application form, is available here: http://www.math.northwestern.edu/about/graduate-research-opportunities-for-women.html. In addition, if you have names of students that you would like us to contact directly, please send them to Bryna Kra (kra@math.northwestern.edu).

AWM Research Symposium 2015

Anna Haensch (AWM Twitter) and Adriana Salerno (AWM Web Editor)

AWM Research Symposium participants

The AWM Research Symposium took place at the University of Maryland, College Park, April 11–12, and by any measure, it would be deemed a success. With more than 300 participants from a wide range of career stages and research areas the schedule was overflowing with exciting activities. Four plenary talks, fourteen special sessions, two poster sessions featuring twenty posters, networking events, panels, and a banquet, all made for a packed weekend.

After a warm welcome from AWM president Kristin Lauter (Microsoft Research) on Saturday morning, things got underway. In the first plenary talk, Ingrid Daubechies (Duke University) spoke to a packed lecture hall about recent attempts by art historians and mathematicians to restore paintings which were crumbled, cracked, stolen and weathered by time. Later in the day, a second plenary address was given by Maria Chudnovsky (Columbia University), who talked about coloring square free perfect graphs.

The poster sessions, which took place in the rotunda of the math building, featured work from graduate students and recent PhDs. The presenters all did a commendable job of succinctly summing up their research in a three-minute pitch, and the posters covered a wide range of topics. The prize for best poster went to Jessica Fintzen (Harvard University), who was awarded a one-year free subscription to Wolfram/Alpha Pro. The runners-up were Ariana Minot (Harvard University) and Beth Romano (Boston College).

Jessica Fintzen (poster winner), Ariana Minot and Beth Romano (poster runners-up)

Throughout the day there were special sessions running in parallel, covering topics from statistics, math at government labs, number theory, image processing, mathematical biology … and the list goes on. Throughout the day there were also several opportunities for networking, an LGBQ tea, a book sale, exhibitors, and the requisite coffee, baked goods, and chatter in the main hall.

Saturday night brought us to the AWM Symposium Banquet. As always, these events are a place to mingle,

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Shirley Malcom and Talitha Washington

network, catch up with old friends (and their babies), and to celebrate all of our "sheros." After dinner was served and gobbled up, we had a wonderful keynote address by Shirley Malcom (American Association for the Advancement of Science), who authored the landmark report *The Double Bind: The Price of Being a Minority Woman in Science*. Other great things happened: awards were given to the top three posters in the Poster Session, and a very well-deserved award was given to Sylvia Bozeman and Rhonda Hughes for creating the EDGE program.

After a wild night at the banquet, we greeted Sunday morning with a plenary talk from Jill Pipher (Brown University), who told us about "Dyadic Analysis: From Fourier to Haar to Wavelets, and Back." Yet another speaker with a long list of accomplishments, Pipher is also a former president of the AWM and the current director of ICERM, making her the first female director of an NSF funded institute. And the last talk of the day (indeed the last talk of the whole conference) was delivered by Katrin Wehrheim (Berkeley), who told us about "String Diagrams in Algebra, Topology, and Analysis" and also shared some thoughts about her career as a woman in math.

Adriana Salerno and Anna Haensch in their new AWM T-shirts

CALL FOR NOMINATIONS

The 2016 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 Brenner and Barbara Keyfitz, Margaret Cheney, and Irene M. Gamba. Linda J.S. Allen will deliver the 2015 lecture at the 8th International Congress on Industrial and Applied Mathematics.

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, 2015** 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 at the SIAM CSE 2015

Magnhild Lien, AWM Executive Director

Due to the International Congress on Industrial and Applied Mathematics being held in Beijing, China in August 2015, SIAM will not hold its annual meeting in July. Hence the yearly AWM Workshop, normally held in the conjunction with the SIAM Annual Meeting, was moved to the SIAM Conference on Computational Science and Engineering (CSE). The SIAM CSE 2015 was held March 14–18 at the Calvin L. Rampton Salt Palace Convention Center in, Salt Lake City, UT. The AWM Workshop for Women Graduate Students and Recent PhDs took place over a period of two days, March 14 and 15, and was organized by **Yekaterina Epshteyn**, University of Utah; **Fengyan Li**, Rensselaer Polytechnic Institute; **Elebeoba (Chi-Chi) May**, University of Houston; **Misun Min**, Argonne National Laboratory; **Hoa Nguyen**, Trinity University and **Jingmay Qiu**, University of Houston. AWM appreciates the efforts made by this dedicated group of women. Thanks to them the workshop was a great success.

The workshop began Saturday morning with the first of a two-part AWM Session on Career Development: **Celebrating Firsts—Lessons from Trailblazers, First Ones, and Only Ones**. The session was chaired by **Chi-Chi May**. In the morning session, the workshop participants, the organizers and general conference attendees were treated to presentations by three inspiring women who all have been a first or only one. The session started with **Theresa Good**, National Science Foundation who spoke about "Breaking Barriers in Academia: The Road to Tenure as a First and an Only." She recounted her experience as the only woman in a department of chemical engineering, where she was referred to as Mrs. Good and the name plate on her office door listed her name only, not her title. She however persevered and received tenure and then promptly moved to an institution that was culturally a much nicer place but with fewer resources. Even through the trials and tribulations of her first academic job she truly enjoyed what she was doing. She ended her presentation with the following: "If it isn't fun, then don't do it." The second speaker **Maria Emelianenko**, George Mason University, championed interdisciplinary research in her presentation "The Road Less Traveled: An Interdisciplinary Mathematician's Journey." Her quest for interdisciplinary research took her from Moscow State University to Penn State (PhD) to Carnegie Mellon University (postdoc) to George Mason. Her advice to anyone who wants to do interdisciplinary research: "Take a detour—learn to speak their language." Maria was the first mathematics postdoc to win the poster competition at a Gordon Research Conference on Physical Metallurgy and the first mathematics faculty member at GMU to receive an NSF CAREER grant. The last presentation in the morning session was by **Cynthia Phillips**, Sandia National Laboratories who spoke passionately about "Trailblazing in the National Laboratories—My Path to Senior Scientist." When, after finishing her PhD in computer science from MIT, Cynthia was thinking about going to one of the national labs her PhD advisor encouragingly said, "Nothing wrong with doing things people care about." She learned from experience that even though much of the work is interdisciplinary and applied one can still publish very theoretical papers.

Chi-Chi May, Cynthia Phillips, Maria Emelianenko, and Theresa Good after the morning session

Roundtable discussion

The afternoon session was split into two parts. For the first hour there was a panel discussion with the three presenters from the morning session. For the latter part, which was closed to the general conference attendees, the workshop participants, organizers, mentors and the three panelists took part in a roundtable discussion. Three groups were formed

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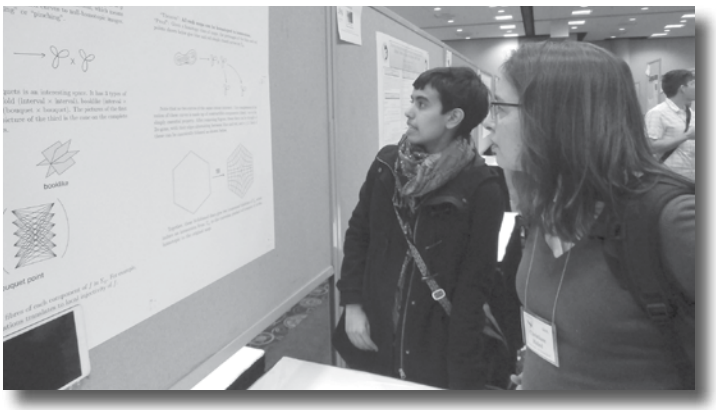
and Theresa Good, Maria Emelianenko and Cynthia Phillips rotated among the groups.

On Sunday, the workshop continued with eight recent PhDs presenting research talks during two minisyposia on **Mathematical Modeling and High-Performance Computing for Multiscale and Multiphysics Problems**. The minisymposia were chaired by **Misun Min**. The presentations were well done and the speakers fielded many questions from the audience. The presenters and the titles of the talks are listed below.

Zheng Chen, Iowa State University
Recovering Exponential Accuracy in Spectral Methods Involving Piecewise Smooth Functions with Unbounded Derivative Singularities
Ying He, University of California, Davis
Efficient High-Order Algorithms for Solving Drift-Diffusion Systems
Sunnie Joshi, Temple University
Estimating Residual Stresses in Arteries by an Inverse Spectral Technique
Xingjie Li, Brown University
Force-based Blended Atomistic-to-continuum Coupling Method for Crystals: Theory and Computations
Eleni Panagiotou, University of California, Santa Barbara
A Study of the Entanglement in Polymer Melts
Evelyn Ying Wang, University of Oklahoma
A Fast Explicit Operator Splitting Method for a Multi-scale Underground Oil Recovery Model
Ling Xu, Georgia State University
Computational Study of Dynamics and Transport in Vortex-dipole Flows
Yue Yu, Lehigh University
A Stabilized Explicit Scheme for Coupling Fluid-structure Interactions



Chandrika Sadanand explaining her poster

The workshop concluded on Sunday evening with nine graduate students presenting posters during a well-attended joint poster session with the AWM Workshop and the SIAM Conference on Computational Science and Engineering. Several of the AWM poster presenters also took part in the Poster Blitz immediately preceding the poster session. There the presenters were given one minute each to summarize the key elements of their posters while displaying a single slide. For the second year in a row, the AWM poster presenters took part in a poster competition. The AWM presenters and their poster titles are listed below.

Cheng Cheng, University of Central Florida
Sampling and Reconstruction in Finite-dimensional Reproducing Kernel Subspace
Cameron Crowe, Stony Brook University
A Lattice of Poincare Duality Algebras with Acyclic Annihilators and Finite Dimension Associated to a Manifold
Arezou Ghesmati, Texas A&M University
Residual Based A Posteriori Error Estimation in a Fully Automatic Hp–FEM for the Stokes Equations
Cuiyu He, Purdue University
Residual-Based A Posteriori Error Estimate for Interface Problems: Nonconforming Linear Elements
Jiahua Jiang, University of Massachusetts, Dartmouth
Enhancements for Reduced Basis Methods: Reducing Offline Computational Costs
Aradhana Kumari, Graduate Center, City University of New York
Combinatorial Navier-Stokes Equation
Guanglian Li, Texas A&M University
An Adaptive Gmsfem for High-Contrast Flow Problems
Elizabeth Lydon, University of Central Florida
Propagation Failure in Discrete Inhomogeneous Media Using a Caricature of the Cubic
Chandrika Sadanand, Stony Brook University
Nontrivial Structure in Top Homology of a Space

The co-winners of the poster competition were Arezou Ghesmati and Guanglian Li. Each received a certificate of recognition from the Association for Women in Mathematics.

This workshop was made possible by funding from the National Science Foundation. A special thanks to Yingda Cheng, Fengyan Li, Elebeoba May, Minsun Min, Noemi Petra, Cynthia Phillips, Ami Radunskaya and Jingmay Qiu for serving as mentors and/or poster competition judges during the workshop.

Travel Funding for Modern Math Workshop

The nine NSF-funded US-based math institutes will present the annual Modern Math Workshop (MMW) on October 28–29 (Wednesday–Thursday) in the Washington, DC area. The MMW is part of the institutes' Mathematical Sciences Diversity Initiatives and the workshop is a pre-conference activity of the SACNAS National Conference (Society for Advancement of Hispanics/Chicanos and Native Americans in Science, see http://sacnas.org/events/national-conf). The MMW includes two mini-courses for undergraduates and talks related to the research programs at the math institutes that would be of interest to graduate students and early career researchers. The workshop is intended to encourage minority undergraduates to pursue careers in the mathematical sciences and to assist undergrads, graduate students and recent PhDs in building their research networks. The MMW culminates on October 29 with a plenary lecture by Dr. Freeman Hrabowski, President of UMBC (The University of Maryland, Baltimore County). Minority undergraduates, graduate students, and postdocs are encouraged to apply for funding to attend the workshop. For details, please see http://www.msri.org/e/MMW2015. The application deadline for MMW funding is Friday, **July 31, 2015**.

CALL FOR NOMINATIONS

The 2016 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, Bozenna Pasik-Duncan, Fern Hunt, Trachette Jackson, Katherine St. John, Rebecca Goldin, Kate Okikiolu, Ami Radunskaya, Dawn Lott, Karen King, Pat Kenschaft and Marie Vitulli. Erica Walker will deliver this year's lecture.

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, 2015** and will be held active for two years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

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.

Review of "Emmy Noether Circle" Video

https://www.youtube.com/watch?v=3B-3cjAvn1E

Dwight E. Neuenschwander, Southern Nazarene University

This video offers an uplifting three-minute introduction to Emmy Noether and Noether's theorem. It is explicitly designed to encourage young women to see themselves as potential mathematicians or physicists. Emmy Noether is an inspiring role model towards that end.

The video's witty and engaging style draws the viewer in. Images of distinguished female scientists begin appearing one by one in a sweep from left to right as lively music begins—starting with Marie Curie on the left, ending with Lise Meitner on the right. "There have been many women in the history of science" says the heading. The young Emmy Noether stands tall in the center of this distinguished company. The words fade out except for the "EN" in "science," and all the figures fade except Emmy Noether. The EN is joined by other emerging letters to spell out "But Emmy Noether is special." We are off to an engaging start: Emmy Noether is a distinguished member in the pantheon of the world's greatest scientists, with emphasis on the greatest female scientists.

In two minutes and fifty-five seconds one can offer few details of anyone's life and work. This video is like a *curriculum vitae*—it doesn't get you the job, but it aims to win an interview. This video's purpose is to spark the viewer's interest, leaving one wanting to learn more about Emmy Noether and her work. In this reviewer's opinion, this sparkling video achieves that limited but crucial goal.

On the screen we see "The world gave her nothing but obstacles—She gave us one of the most powerful theorems in physics." A tribute by Albert Einstein appears as a paraphrase of his 1935 eulogy of Dr. Noether. Since I have more that three minutes, I can share the original quote, which was published in *The New York Times* on May 4, 1935: "In the judgment of the most competent living mathematicians, Fraeulein Noether was the most significant creative mathematical genius thus far produced since the higher education of women began." [1] In the video, following Einstein's paraphrased comment comes the message, "But few people have heard of Emmy Noether. It's strange, since Noether's theorem connects two huge ideas…."

Emmy Noether and her splendid theorem that connects symmetries to conservation laws are not as widely known among physicists as they should be, even though Noether's theorem applies to essentially all of physics and thus offers a deep unifying principle. I hope this video will be used not only as a tool for recruiting more women into physics and mathematics, but that it also finds a role for introducing Emmy Noether to more physicists in general. Mathematics students who study abstract algebra at the graduate level instantly recognize Noether's name, as in the context of Noetherian rings. Indeed, for Noether herself, her theorem about physics was an application of her abstract algebra studies of invariances under transformation groups. In my observations, for many years the only physicists who recognized Noether's theorem by name knew it in the esoteric contexts of local gauge invariance applied to general relativity or elementary particle physics. Less well recognized has been the fact that Noether's theorem applies across the entire physics curriculum, including topics familiar to undergraduate physicists such as Newtonian mechanics and geometrical optics.

Returning to the video, how does one demonstrate, in under three minutes, to an audience of promising novices, the essence and scope of Noether's theorem? With engaging graphics the video's producers present the theorem's essence through a connection between a bicycle wheel's symmetry and the conservation of angular momentum:

> Take a bicycle wheel /
> It won't fall over while rolling /
> But why? /
> Because the shape of the wheel conserves
> angular momentum /
> and this momentum keeps the wheel upright /
> the wheel is rotationally symmetric /
> meaning it looks exactly the same while spinning

Excellent choice of physical system to discuss: almost everyone has ridden a bicycle, so this introduction to Noether's theorem draws upon our tacit knowledge. I will return to this example in a comment below when I exercise a reviewer's obligation to be a bit pedantic (hopefully not to excess).

The producers answer the question about the theorem's

scope when the bicycle wheel leans over and its elliptical shape blends into the photograph of a spiral galaxy. A comment follows on how Noether's theorem applies "on massive scales, connecting the conservation of energy in the universe to symmetry in time."

Changing gears, the video introduces Emmy Noether as a person: "Noether's story is as remarkable as her discovery." As a Jewish woman with left-wing political views, her difficulties with the contemporary university culture and with the Nazi regime are mentioned, along with a glimpse of her tenacity and strength of character. Emily Noether deserves to be one of your intellectual companions.

Now I will indulge is a couple of minor technical criticisms.

(1) The bicycle wheel example runs the risk of creating a misleading impression. The symmetry of the spinning wheel is contrasted visually to a spinning coffee cup, whose handle spoils the rotational invariance. This part of the video seems to suggest that a spinning coffee cup is incapable of conserving angular momentum. But the criterion for the link between rotational symmetry and angular momentum conservation is not the body's shape. Of course, a three-minute video is not the place to introduce functionals and Lagrangians and transformations. But if one recommends this video (as I do), one should be prepared to point out, when the question comes up, that it's not the body's shape, but conditions more abstract that tie symmetries and conservation laws together through Noether's theorem. I appreciate that in making so short a message to so wide an audience, one must resort to analogies. Given the constraints of the medium, the creators of the video probably took the only real choice open to them. This video is an invitation, not a lecture.

> (2) A Jewish woman /
> hounded out of the German academia in the 1930s /
> she was denied faculty positions throughout her
> life despite her brilliance /
> At the height of her persecution by the Nazis /
> She gathered students into her apartment to
> discuss mathematics [the video says "physics"] /
> Her pupils, "Noether's boys," were devoted to her /
> and her teaching was legendary

True enough, and I like how the mention of Dr. Noether holding class in her apartment shows that she was ready to poke a finger in the eye of the establishment. Again, one cannot tell a person's life story in three minutes. Thus a lot is left unsaid (by necessity) in the phrase "throughout her life." Noether being denied faculty positions was not due exclusively

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CALL FOR NOMINATIONS

The 2017 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, Ol'ga 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 and Wen-Ching Winnie Li.

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, 2015** and will be held active for three years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

to the Nazis. While their threat to her was at the level of life or death—causing Noether to emigrate to America—German academia denied her positions, just because she was a woman, long before the Nazis came to power. Should a student inquire about this history, we note that in a May 24, 1918 postcard to David Hilbert, Albert Einstein wrote, "It would not have done the Old Guard at Göttingen any harm, had they picked up a thing or two from her. She certainly knows what she is doing." [1] Seven months later in a letter of December 27 to Felix Klein, who was also at the University of Göttingen, Einstein wrote, "On receiving the new work from Fräulein Noether, I again find it a great injustice that she cannot lecture officially. I would be very much in favor of taking energetic steps in the ministry [to overturn this rule.]" [1] Eventually the university administration relented. Then the Nazis came to power and Noether had to start all over again.

The video closes by acknowledging Emmy Noether's "brilliance, her courage, and her work—which illuminated powerful new principles about our universe," then delivers its invitation: "We know there are other Emmys. Help us find them." In this reviewer's opinion the video offers an effective tool for recruiting "other Emmys." My name is not Emmy (I do have an E name—Edward), but nevertheless I can testify that it was Noether's theorem that drew me into physics. The awareness and appreciation of the stunning

AWM Workshop for Women Graduate Students and Recent PhDs at the 2016 Joint Mathematics Meetings

Application deadline: August 15, 2015

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. Pending funding, an AWM Workshop is scheduled to be held in conjunction with the Joint Mathematics Meetings in Seattle, WA, January 6–9, 2016.

FORMAT: The workshop will consist of a special session focused on **Algebraic Combinatorics**, and a poster session. The poster session will be open to all areas of research. Participants will be selected in advance of the workshop to present their work. Recent PhDs will be selected to join senior women in the special session on Algebraic Combinatorics where they will give 20-minute talks. The graduate students will be selected to present posters at the workshop reception and poster session. Pending funding, AWM will offer partial support for travel and hotel accommodations for the selected participants. The workshop will include a reception and a luncheon. Workshop participants will have the opportunity to meet with other women mathematicians at all stages of their careers.

All mathematicians (female and male) are invited to attend the talks and poster presentations. Departments are urged to help graduate students and recent PhDs 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. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **September 15, 2015**.

ELIGIBILITY: To be eligible for selection and funding, a graduate student must have made substantial progress towards her thesis and a recent PhD must have received her PhD within approximately the last five years, whether or not she currently holds a postdoctoral or other academic position. Women with grants or other sources of support are welcome to apply. All non-US citizens must have a current US address.

All applications should include:

- a title of the proposed poster or talk
- an abstract in the form required for AMS Special Session submissions for the Joint Mathematics Meetings
- a curriculum vitae
- one letter of recommendation from a faculty member or research mathematician who knows the applicant's work—in particular, a graduate student should include a letter of recommendation from her thesis advisor.

Applications (including abstract submission via the Joint Mathematics Meetings website) must be completed electronically by **August 15, 2015**. See https://sites.google.com/site/awmmath/programs/workshops for details.

elegance found in the connection between symmetries and conservation laws—which I first met as an engineering major who landed in an undergraduate physics class called "Theoretical Mechanics"—marks the life-changing moment when physics and I found each other. I switched my major to physics and never looked back. I would love to see more Emmys (and Edwards) come to appreciate Emmy Noether and her elegant theorem, and choose to cast their lot with all of us who do mathematics and physics for the love of the game. This video will help towards that end.

In the opening lineup of distinguished female scientists, there was a conspicuous gap to the viewer's right of Emmy Noether. The message throughout the video seems to invite a young woman to stand in that gap alongside Emmy Noether, to join a company of first-rate intellectual companions who happen to be women. Despite a couple of minor technical caveats (and after three minutes the music begins sounding repetitious, but that may say more about me than about the music), I cheerfully endorse this video as an invitation, made with integrity, to help enlarge the Emmy Noether Circle.

[1] Alice Calaprice, ed., *The Quotable Einstein* (Princeton University Press, Princeton, NJ, 1996), 75.

Note from the Column Editors:

Google celebrated Noether's 133rd birthday on March 23 via a doodle. More information can be found at https://www.google.com/doodles/emmy-noethers-133rd-birthday

BOOK REVIEW

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

Really Big Numbers, Richard Evan Schwartz (American Mathematical Society, paperback 2014, ISBN-13: 978-1470414252).

The Boy Who Loved Math: The Improbable Life of Paul Erdős, Deborah Heiligman (pictures by LeUyen Pham) (Roaring Brook Press, hardcover 2013, ISBN-13: 978-1596433076).

The Short Seller, Elissa Brent Weissman (Atheneum Books for Young Readers, hardcover 2013, ISBN-13: 9781442452558, paperback 2014, ISBN-13: 978-1442452565).

Reviewer: Gizem Karaali, Pomona College, gizem.karaali@pomona.edu

First published in 1995, Jon Scieszka and Lane Smith's *Math Curse* is a classic today; it is packed full of math fun "for ages > 6 and < 99" as the front flap cover suggests. But perhaps both your son and your niece already have read that one and you are looking for a birthday gift that will continue the adventure? A perfect book for a similar range of readers is Richard Evan Schwartz's *Really Big Numbers*, published last year by the American Mathematical Society. If this is the AMS' debut into children's lit, we should demand more! The book is packed with mathematics, starting from the small and easy and moving on to larger and larger numbers, presumably as the reader's mathematical maturity evolves. On most pages there is a lot more a mathematically inclined parent or older sibling can find to wonder about and explore more deeply with the younger reader involved. The drawings are simple but clear, and the voice of the author is friendly, welcoming, and sincere. He begins with "When I was a kid, I liked to think about shapes and numbers. I never stopped thinking about them so I became a mathematician." And then we start climbing the ladder of numbers with him and get to larger and larger numbers. The storyline is simple but effective. This is a book that a child may first start reading when she is five and then come back to on a regular basis and go a few pages deeper each time. A middle schooler can of course read it cover to cover in one sitting, but I'd still suggest a slower, more deliberate read; the first bite is quite good, but the book grows on you; the simmering effect is delicious.

A book possibly aiming for a narrower age range, *The Boy Who Loved Math: The Improbable Life of Paul Erdős*, introduces its readers to Paul Erdős, the quirky twentieth century genius whose many collaborators gave us the infamous *Erdős number* (mine is 2 by the way, and yes, I am bragging!). In a few words to the readers, the author Deborah Heiligman explains how she came "to write a book about a brilliant and important mathematician" even though she thought that "math was for other people, not me"; many (non-mathematician) adults will sympathize. Throughout the book, her careful attention to detail, together with the playful illustrations by LeUyen Pham, makes this a delight to read. For many children, it will be easy to catch little Paul's enthusiasm about numbers. However his undeniable prodigy status may inadvertently convince some of them that perhaps math is not for them; after all, as four-year-olds, they could not tell

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someone they just met how many seconds she had lived as soon as they had heard when she had been born. The book is beautiful, but as someone who is quite wary of the genius myth (even when it is true), I would probably not give this as a gift to a young child who was not also a mathematical prodigy. For those who are older and already deeply into mathematics, however, this is a neat book, and, for them, could easily be a gateway to Paul Hoffman's *The Man Who Loved Only Numbers*, or Bruce Schechter's *My Brain is Open: The Mathematical Journeys of Paul Erdős*.

A third newcomer to the children's math-lit shelves, Elissa Brent Weissman's *The Short Seller*, will also appeal to a certain readership. If you have a preteen, especially a daughter who does not trust herself in mathematics and is slowly gravitating toward speaking disparagingly about math, this book could lead to some interesting and productive conversations. The protagonist of the book, the eleven-year-old Lindy Sachs, is exactly at that stage in her life. She is told that she is good at math, and for all practical purposes, she has been good at math, but she knows deep inside that everyone else is wrong, and that she is not really getting the point of it at all (peer pressure and impostor syndrome mixed in with some serious exposure to plug-and-chug math instruction). Then Lindy gets sick and has to stay home for an extended period. For a reason that may be convincing in some family settings, her dad encourages her to start playing with stocks. Clearly this is at least an upper middle class family, but Lindy is not a spoiled brat, she is just an eleven year old. I have been eleven once, many years ago, and that distance in time does not erase the memory of the sensations of that awkward age. To me, Weissman's Lindy is realistic and reflective, though tackling, besides the natural anxiety coming with that age, the additional one that results from her imprudence. I would not read this with my daughter who is

NSF-AWM Travel Grants for Women

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

Mathematics Education Travel Grants. There are a variety of reasons to encourage interaction between mathematicians and educational researchers. National reports recommend encouraging collaboration between mathematicians and researchers in education and related fields in order to improve the education of teachers and students. Communication between mathematicians and educational researchers is often poor and second-hand accounts of research in education can be misleading. Particularly relevant to the AWM is the fact that high-profile panels of mathematicians and educational researchers rarely include women mathematicians. The Mathematics Education Research Travel Grants provide full or partial support for travel and subsistence for

- mathematicians attending a research conference in mathematics education or related field.
- researchers in mathematics education or related field attending a mathematics conference.

Selection Procedure. All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians and mathematics education researchers appointed by the AWM. A maximum of $1500 for domestic travel and of $2000 for foreign travel will be funded. For foreign travel, US air carriers must be used (exceptions only per federal grants regulations; prior AWM approval required).

Eligibility and Applications. These travel funds are provided by the Division of Mathematical Sciences (DMS) of the National Science Foundation. The conference or the applicant's research must be in an area supported by DMS. Applicants must be women holding a doctorate (or equivalent) and with a work address in the USA (or home address, in the case of unemployed applicants). Please see the website (http://www.awm-math.org/travelgrants.html) for further details and do not hesitate to contact Jennifer Lewis at 703-934-0163, ext. 213 for guidance.

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

still interested in math; Lindy's initial distaste for mathematics is pretty well explored and I'd not want to pass this on to anyone. But for the young child who is already drifting away, this might send a more constructive message, that math is so much more than school math.

The genre of math lit for children is not huge, but it is growing. My kid loves the early reader books by my friend and colleague Julie Glass (*A Dollar for Penny* (1998), *The Fly On the Ceiling* (2000)). I found Izolda Fotiyeva's *Math with Mom* (2003) too late for my daughter but will definitely read it with my son. For a neat twist on the traditional alphabet book, I recommend *The Technical Alphabet* (2014) by the engineer sisters Lavanya and Melissa Jawaharlal. More recently a colleague introduced me to Laura Overdeck's *Bedtime Math* series; these will soon join the growing math library in our house. Whether your goal is to raise mathematicians or simply adults who enjoy and appreciate mathematics, you have many books on your side.

EDUCATION COLUMN

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

Preparing Teachers to Teach Statistics

Anna E. Bargagliotti, Loyola Marymount University

Statistical literacy is becoming an essential competency, not only for researchers conducting statistical analyses but also for informed citizens making everyday decisions based on data. It has long been advocated that statistics be included in the school curriculum. For example, the recommendations found in *The Reorganization of Mathematics in Secondary Education*, a 1923 report by the Mathematical Association of America National Committee on Mathematical Requirements, stated that statistics should be included in the junior high school curriculum and that a course in elementary statistics ought to be included in the high school curriculum. Many years later, first in 1989 and then again in 2000, the National Council for Teachers of Mathematics (NCTM) included statistics and probability as a strand in their standards (*Curriculum and Evaluation Standards for School Mathematics*, 1989; *Principles and Standards for School Mathematics*, 2000).

In 2007, the *Guidelines for Assessment and Instruction in Statistics Education: A PreK–12 Curriculum Framework* (GAISE) (http://www.amstat.org/education/gaise/) (Franklin et al., 2007) provided fairly detailed guidelines about how to achieve a statistically literate graduating high school student at the end of the student's PreK–12 education. And finally, more recently, the Common Core State Standards for Mathematics (CCSSM) (http://www.corestandards.org/) and other state standards have placed heavy emphasis on statistics and probability, particularly in grades 6–12. Because of the emphasis on statistics in K–12, the American Statistical Association (ASA) commissioned the writing of *The Statistical Education of Teachers* (SET) report (I am one of six co-authors). In particular, the SET report aims to further unpack the recommendations for statistics put forth in *The Mathematical Education of Teachers II* (MET II) report (Conference Board of Mathematical Sciences, 2012). MET II gives recommendations regarding the mathematics that PreK–12 teachers should know and how they should come to know it. A goal of SET is to articulate how teachers should be prepared to meet the current needs of students in statistics education.

The SET report (available free at the ASA website http://www.amstat.org/education/SET/SET.pdf) is organized in nine chapters and two appendices:

Chapter 1: Background and Motivation for SET
Chapter 2: Recommendations
Chapter 3: Mathematical Practices through a Statistical Lens
Chapters 4-6: Grade Level Content
Chapter 7: Assessment
Chapter 8: Overview of Research
Chapter 9: A Brief History of Statistics in Schools
Appendix 1: Examples that address particular difficulties that may occur while teaching statistics to teachers
Appendix 2: Example activity handouts that could be used to teach teachers

SET contends that, to prepare teachers to teach statistics effectively, it is important that (1) teachers be exposed to how statistical concepts are interconnected across the grade bands, and (2) teachers understand how the statistical process progresses *within* each grade band. The SET report also outlines statistical coursework for teachers in each of the three K–12 levels. Here are the recommendations, given by grade band.

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Elementary School

Prospective elementary school teachers should be provided with coursework on fundamental ideas of elementary statistics, their early childhood precursors, and middle school successors. The coursework could take one of these three formats:

- a special section of an introductory statistics course geared specifically to the content and instructional strategies noted in the report,
- an entire course in statistical content for elementary school teachers, or
- more time and attention given to instruction devoted to statistics in an existing course on mathematics for elementary teachers.

Middle School

Prospective middle school grades teachers of statistics should complete two courses:

- a first course in statistics that develops teachers' statistical content knowledge in an experiential, active learning environment that focuses on the problem-solving process and makes clear connections between statistical reasoning and notions of probability and includes both randomization and classical procedures for comparing two parameters based on both independent and dependent samples (small and large), the basic principles of the design and analysis of sample surveys and experiments, inferences in the simple linear regression model, and tests of independence/homogeneity for categorical data; and
- a second course that focuses on strengthening teachers' conceptual understandings of the big ideas from Essential Understandings and the statistical content of the middle school curriculum. This course is also intended to develop teachers' pedagogical content knowledge by providing strategies for teaching statistical concepts, integrating appropriate technology into their instruction, making connections across the curriculum, and assessing statistical understanding in middle school students.

High School

Prospective high school teachers of mathematics should complete three courses:

- an introductory course that emphasizes a modern data-analytic approach to statistical thinking, a simulation-based introduction to inference using appropriate technologies, and an introduction to formal inference (confidence intervals and tests of significance);
- a second course in statistical methods that builds on the first course and includes both randomization and classical procedures for comparing two parameters based on both independent and dependent samples (small and large), the basic principles of the design and analysis of sample surveys and experiments, inference in the simple linear regression model, and tests of independence/homogeneity for categorical data; and
- a statistical modeling course based on multiple regression techniques, including both categorical and numerical explanatory variables, exponential and power models (through data transformations), models for analyzing designed experiments and logistic regression models.

Each of these courses should include the use of statistical software and provide multiple experiences for analyzing real data and communicating statistical results. These courses should focus on conceptual learning of statistics rather than emphasizing computation.

While working with future teachers on statistics, instructors must recognize the importance of processes and proficiencies that complement content knowledge. The CCSSM provide eight Standards for Mathematical Practice that describe what mathematically proficient students are able to do. The SET document advocates that the statistical education of teachers should be informed by these practice standards as seen through a statistical lens. The third chapter of SET interprets and describes the eight practice standards in terms of the practices and proficiencies necessary to acquire and apply statistics.

The report discusses many important dimensions surrounding teacher preparation, e.g., what is known from the research, assessment, and historical context. A main goal of the report was to try to inform both pre-service and in-service teacher training in a manner that was consistent with statistics as a discipline, statistics education research, and guidelines about best practices and goals in statistics education in K–12. The hope is that this document will influence those responsible for teacher statistical preparation—ultimately mathematicians, mathematics educators, statisticians, statistics educators, professional development developers, and district administrators—by providing clear direction about what should be done with regard to the statistical preparation of teachers.

As one of the co-authors of the report, I am optimistic that if the recommendations are followed, they will prepare

teachers to implement successfully the statistics standards present in the CCSSM and in other state standards in their classrooms. Perhaps more importantly, teachers will be better prepared to enlighten their students about the beautiful, sometimes messy, very applicable, and empowering discipline of statistics. For those of us at the university level, this might mean that we will have to rethink the introductory statistics course at the college level as well as the entire statistics sequence offered to the undergraduate student population. In the not too distant future, college level statistics may look much more like an exploration of big data coupled with a deep study of statistics and some probability theory.

In addition to being available online, the SET report is expected to be available in print by the end of 2015. The printing of the document is sponsored by the Joint ASA-NCTM committee.

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Psychology Needs More "Mathematical Intensity"

Cathy Kessel, cbkessel@earthlink.net

In the February 2015 issue, Sarah Greenwald asked for thoughts on the latest spate of publicity connected with Wendy Williams and Stephen Ceci's op-ed in *The New York Times*, entitled "Academic Science isn't Sexist."[1] Since then, they have received an additional gush of media attention in connection with the claim "National hiring experiments reveal 2:1 faculty preference for women on STEM tenure track," which appeared in their CNN op-ed.[2] Here are some remarks on their work, psychologists' use of statistics, and Ceci and Williams's use of statistics.

Ceci and Williams are psychologists who specialize in human development. Their interest in women in STEM seems to have begun in the 2000s. Their first publication on the subject, in 2007, was an edited volume called *Why Aren't More Women in Science?* The second was a long article in *Psychological Bulletin* in 2009 summarizing what they considered relevant findings from various fields. Some fields got more attention than others.[3] In the following year, they published a book based on this article called *The Mathematics of Sex* (reviewed in the May 2010 *AWM Newsletter* by Judy Roitman). Since then, they have published several articles that recycle their main claims and pieces of evidence intended to support those claims, augmented by citations of more recent studies. (Ceci is the first author for most of this work, so I will refer to it collectively as "Ceci and Williams.") Last year's *New York Times* op-ed occurred in conjunction with publicity for their article in *Psychological Science in the Public Interest* (which I'll refer to as "Ceci et al."). This year's publicity occurred with the appearance of their article in the *Proceedings of the National Academy of Sciences* (PNAS) (which I'll refer to as "Williams and Ceci"). Before I discuss this

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[1] http://www.nytimes.com/2014/11/02/opinion/sunday/academic-science-isnt-sexist.html

[2] Note articles in *Science, Nature, Chronicle of Higher Education, Inside Higher Education*.

[3] Sociology, for example, got short shrift. See Smith-Doerr's review of the resulting book, http://gas.sagepub.com/content/26/3/530.full.pdf+html. In my opinion, sociology is useful in explaining the distribution of women in science. See my *Mathematical Intelligencer* article, *http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/s00283-013-9441-1*

year's claim, here's some background on their work and on recent discussions of statistics in psychology.

In Ceci and Williams's scheme of things, science and engineering fields are split into two groups. One is "mathematically intensive" fields, e.g., mathematical sciences, physical sciences, engineering, economics. The other (non–mathematically-intensive) group includes fields such as biology and psychology. I don't think this is a good classification to use when analyzing the situation of women in science and engineering. For one thing, it's led to Ceci et al.'s statement "the more math, the fewer women," which sounds very peculiar (to put it politely) if you know the relevant statistics: engineering and computer science have smaller percentages of women than mathematics. Surely mathematics is more "mathematically intensive" than engineering and computer science?

In order to justify their classification, Ceci et al. plot mean quantitative GRE scores by testtaker's intended field of graduate study against percentage of female PhDs in that field. But they seem to have done some manipulations to get the desired result. In the *GRE Score Guide*, mean scores for the *three* categories of computer and information sciences, engineering, and mathematical sciences are, respectively, 157, 159, and 162. In Ceci et al.'s plot, mean scores for the *two* categories of mathematics/computer science and engineering are both 160.[4] (I can see that a weighted average for mathematics and computer science *might* be 160, but how does engineering go from 159 to 160?)

Together with such unexplained transformations, Ceci and Williams's classification of psychology as not "mathematically intensive" suggests that knowledge of mathematics is not considered important for psychology. But the mathematical sciences include statistics[5] and concern about use—or misuse—of statistics seems to be growing in psychology (and other fields). However, the concern in psychology seems not to include use of descriptive statistics (e.g., the mean GRE scores that I mentioned), but focuses on just one aspect of statistics: hypothesis testing.

"Textbooks and curricula in psychology almost never teach the statistical toolbox, which contains tools such as descriptive statistics, Tukey's exploratory methods, Bayesian statistics, Neyman-Pearson decision theory and Wald's sequential analysis," remarked Gerd Gigerenzer (a psychologist) in 2004.[6]

Among other things, Gigerenzer describes the "null ritual" which "became institutionalized as statistics per se" in psychology during the 1950s:

> (1) set up a statistical null hypothesis, but do not specify your own hypothesis nor any alternative hypothesis, (2) use the 5% significance level for rejecting the null and accepting your hypothesis, and (3) always perform this procedure.

The current "replication crisis" in psychology seems to center around the "null ritual." Much of the recent discussion that I have seen involves scientific sins such as p value fishing[7] (aka p-hacking), that is, "trying multiple things until you get the desired result" as part of hypothesis testing.[8] Neuroskeptic (the pseudonym of a UK neuroscientist) describes how this sin is punished in "The Nine Circles of Scientific Hell":

> Those who tried every statistical test in the book until they got a p value less than .05 find themselves here, in an enormous lake of murky water. Sinners sit on boats and must fish for their food. Fortunately, they have a huge selection of different fishing rods and nets (brand names include Bayes, Student, Spearman, and many more). Unfortunately, only one in 20 fish are edible, so the sinners in this circle are constantly hungry.

Psychology journals have responded in somewhat less drastic ways,[9] though one has banned hypothesis testing.[10] (The American Statistical Association is preparing a statement about this ban.)

Psychologists have also noted problems with sampling. In many studies, the subjects consist of undergraduate psychology students says "The Neglected 95%," an article in

[4] More anomalies are noted in my blog post: https://mathedck.wordpress.com/2014/11/07/who-is-the-most-mathematically-intensive-of-them-all-2/

[5] At least that's what *I* think. Another anomaly of Ceci et al. is that numbers of AP testtakers are reported by gender for "mathematics and science subjects": calculus, chemistry, computer science, physics, environmental science, biology. This excludes statistics where girls outnumber boys as testtakers, http://nsf.gov/statistics/seind14/content/chapter-1/at01-10.pdf

[6] http://library.mpib-berlin.mpg.de/ft/gg/GG_Mindless_2004.pdf

[7] http://pps.sagepub.com/content/7/6/643.full.pdf+html

[8] Uri Simonsohn as quoted in *Nature*, http://www.nature.com/news/scientific-method-statistical-errors-1.14700

[9] See, e.g., www.psychologicalscience.org/index.php/publications/observer/2015/april-15/whats-new-at-psychological-science-2.html

[10] http://www.tandfonline.com/doi/abs/10.1080/01973533.2015.1012991

American Psychologist.[11] (This is the official journal of the American Psychological Association, which, according to its web site, is the world's largest association of psychologists.) A later article in *Behavioral and Brain Sciences* notes a more general phenomenon:

> Behavioral scientists routinely publish broad claims about human psychology and behavior in the world's top journals based on samples drawn entirely from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies. Researchers—often implicitly—assume that either there is little variation across human populations, or that these "standard subjects" are as representative of the species as any other population.[12]

This article, which was published in 2010, has gotten a huge number of citations, but I have not noticed that it's been much discussed as a part of the "replication crisis" or often connected to more general concerns such as sample or selection bias.

Psychologists have not given attention to misuse of mathematics—but perhaps they should. In 2013, there was what might be called an unclad emperor moment when an article was published in *American Psychologist* called "The Complex Dynamics of Wishful Thinking: The Critical Positivity Ratio."[13] (It had its inception when the first author was a graduate student in psychology. As an academic "child," he suspected that the positivity ratio emperor had no mathematical clothes. The second author was the physicist Alan Sokal, known for the Sokal hoax, an article full of mathematics and physics mistakes that was submitted—and accepted—at a journal of postmodern cultural studies.) "Complex Dynamics" takes two psychologists to task about their use of Lorenz equations in order to obtain exact values of "critical positivity ratios." The positivity ratio article (published in *American Psychologist* in 2005) was "partially withdrawn" in 2013.[14]

To me, these examples suggest that inadequate care with mathematics and statistics is a deeply entrenched tendency in some sectors of psychology, which is reflected in Ceci and Williams's past and present work, including Ceci et al.'s long article published in 2014.[15] Although the latter has two economist co-authors, its composition suggests that the psychologists and economists were responsible for different sections.

This article does have new information and revises previous claims about women's representation in STEM, agreeing with me (though not explicitly!) that "engineering has shown the most remarkable growth" and that post-PhD attrition in academe depends on field.[16] However, it repeats earlier arguments of Ceci and Williams that attempt to establish lack of bias in hiring or funding applications and publications. It claims to rule out the hypothesis that selection bias may play a role in the National Research Council finding it cites for hiring at Research I Institutions in 2002–03 and 2003–04. However, it misinterprets this hypothesis and omits details of the statistics. (See my blog post for further discussion.[17])

Based on similar reasoning,[18] Williams and Ceci assert in their 2015 PNAS article that the "winnowing of women in the STEM … tenure-track pipeline is a result of women PhDs being far less likely than men to apply for tenure-track jobs." This may be true for STEM overall, but it does not appear to the case for "mathematically intensive" fields collectively.[19]

Nor is it the case for mathematics. The statistics in the table below show that women are applying for—and getting—tenure-track jobs in mathematics, mainly at BA- and MA-granting institutions. Thus, numbers of female recent PhDs interested in tenure-track positions somewhere are not

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[11] http://jeffreyarnett.com/articles/neglected95arnettap2008.pdf

[12] http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=7825833

[13] http://www.physics.nyu.edu/sokal/BrownSokalFriedmanAPonline-first.pdf

[14] http://retractionwatch.com/2013/09/19/fredrickson-losada-positivity-ratio-paper-partially-withdrawn/

[15] See e.g., my article in the November 2010 *AWM Newsletter*, my article in *Journal of Humanistic Mathematics*, http://scholarship.claremont.edu/jhm/vol1/iss2/, and blog posts.

[16] Compare with Kessel & Nelson, Statistical trends in women's participation in science: Commentary on Valla and Ceci (2011). *Perspectives on Psychological Science*, http://pps.sagepub.com/content/6/2.toc.

[17] https://mathedck.wordpress.com/2015/04/14/save-the-phenomena/

[18] Although Williams and Ceci discuss additional hiring statistics they repeat the reasoning that I have criticized earlier. This is discussed further on my blog.

[19] Ceci et al. tell us that "women comprised only 25% to 44% of tenure-track assistant professors" in geoscience, engineering, economics, mathematics/computer science, and the physical sciences. Given that women earn fewer than 50% of the PhDs in these fields, this comes as no surprise. But does it tell us they are not applying for tenure-track jobs? Ceci et al.'s Figures 1b and 5 indicate similar percentages of women among PhDs and assistant professors in these fields in 2010. It may be that Williams and Ceci mean "women are not applying for tenure-track jobs at top institutions" rather than "women are not applying for tenure-track jobs" (despite the fact that they cite Ceci et al.'s Figure 5 to support their assertion).

Percentages of tenure-eligible doctoral faculty and new PhDs who are female

	Tenure-eligible faculty	New PhDs produced
Large private PhD-granting departments	10%	25%
Large public PhD-granting departments	25%	22%
All large PhD-granting departments	20%	23%
All PhD-granting departments	24%	28%
MA-granting departments	38%	
BA-granting departments	37%	

Source: AMS 2013 Survey: Dept. Profile, Tables DF.1, F.1, FF.1; New Doct., Tables E.1, F.1, F.2

lacking. (Note that women now get around 28% of PhDs in mathematics, which rises to 31% if applied mathematics, statistics, and biostatistics are included; also, there are more tenure-track positions at BA- and MA-granting institutions combined than at PhD-granting institutions.[20]) This suggests that women are either getting rejected at more prestigious departments or not applying as frequently to them, perhaps due to "chilly climate." (The National Research Council hiring statistics mentioned above support the latter, but do not rule out the former: Women were more likely to apply when a woman was on the search committee.[21])

Statistics collected by the American Mathematical Society suggest part of the explanation. Hiring at US mathematics departments is stratified by a "rule of similars": Departments with doctoral programs of a given size (large, medium, or small) tend to hire graduates from programs of the same size.[22] Larger (and more prestigious) programs graduate smaller percentages of women. For example, in 2013 women were 25% and 22% of PhDs produced by mathematics departments with large PhD programs at, respectively, private and public universities. However, they were 10% and 25% of tenure-eligible faculty members at these departments.[23]

It takes a village to raise a child, and it takes an academic village to produce refereed articles. So, the failings in psychology described above are not solely the responsibility of the authors. As in the case of "positivity ratios," it may take an outsider to produce statements about unclad emperors. A recent book called *The Witch-Hunt Narrative: Politics, Psychology, and the Sexual Abuse of Children* by a professor of political science and public policy has done just that. Among other things, it compares original interview transcripts and excerpts quoted in a book by Ceci and Maggie Bruck (another psychologist), noting how meanings were changed by omissions and rearrangements to "show" that experienced interviewers had suggested to young children that they were abused.[24] Experiments confirmed that it was possible to instill false memories in children in this way. Combining experimental results and observational "data" (the rearranged transcript excerpts), the well-publicized real world result was that children's testimony was suspect.

It's hard not to wonder if Williams and Ceci's current work follows the same pattern of selected and rearranged observational data, experimental studies that fit the scenario described by the "data," and well-publicized findings. Are

[20] Figure D.2, http://www.ams.org/profession/data/annual-survey/2013Survey-DepartmentalProfile-Report.pdf

[21] *Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty*, National Research Council, 2010, http://www.nap.edu/catalog/12062.html, p. 8.

[22] Flahive & Vitulli, An update: are women getting all the jobs?, *Notices of the AMS*, http://www.ams.org/notices/201008/rtx100800984p.pdf

[23] Supplemental Tables F.1, FF.1: 9 out of 90 at large private; 44 out of 179 at large public.

[24] See, e.g., pp. 255–261, which can be read online via Google Books. Because the subject is child abuse, it is not pleasant reading.

the statistical slips and misinterpretations that I have noted in their earlier work omissions and rearrangements to fit a preconceived notion, or only carelessness and ignorance? In either case, the articles might have benefited from more "mathematical intensity" on the part of referees and editors. Certainly, much attention was paid to statistics in the experimental studies (five statisticians were consulted) but that attention did not seem to include interpretation of observational data.

This is not to deny that Williams and Ceci's results may obtain when the experimental conditions are met, i.e., when a hiring committee describes the applicant in glowing terms such as "powerhouse" or "highly creative." Unfortunately, Williams and Ceci's message is "National hiring experiments reveal 2:1 faculty preference for women on STEM tenure track." That's not the same as "2:1 faculty preference for women when choosing among applicants who are unequivocally high in performance ability."[25] More "mathematical intensity" in the form of attention to precision would have resulted in a claim that accurately reflected the findings.

Acknowledgements. Thanks to Jackie Dewar and Sarah Greenwald for comments on earlier versions of this article, and to Marie Vitulli for discussion of the AMS surveys.

[25] "Unequivocally high in performance ability" comes from the abstract of Heilman et al., 1988, one of the references cited by Ceci et al. Consistent with Heilman et al.'s findings for "applicants" for a job "extremely male in sextype," Ceci et al. found that the female "applicant" was, in Heilman et al.'s term "overvalued."

Collective Action: Why the Future is Brighter for Undergraduate Teaching in the Mathematical Sciences

Karen Saxe, Macalester College and Principal Investigator, "A Common Vision for the Undergraduate Mathematics Program in 2025" [NSF DUE-1446000]

A remarkable event took place in May 2015 at the Alexandria, Virginia headquarters of the American Statistical Association. Leaders from five professional associations whose missions include teaching in the mathematical sciences came together to guide future progress to incrementally improve education in our fields. It is the first time that all five—the American Mathematical Association of Two-Year Colleges (AMATYC), the American Mathematical Society (AMS), the American Statistical Association (ASA), the Mathematical Association of America (MAA), and the Society of Industrial and Applied Mathematics (SIAM)—are working together. Our focus is the collection of credit-bearing mathematics courses a student might take in the first two years of college. We examine the undergraduate program using a wide-angle lens, inclusive of modeling, statistics, and computational mathematics as well as applications in the broader mathematically based sciences.

Why now?

Each year approximately 50 percent of students fail to pass college algebra with a grade of C or better.[1] Failure rates under traditional lecturing are 55 percent higher than the rates observed under active learning.[2] Undergraduate education in the mathematical sciences is in crisis in the United States. This crisis will affect all mathematical scientists at post-secondary institutions, regardless of each individual's level of interest in education.

The crisis in mathematical sciences education is well documented in high-profile reports such as the U.S. government's

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[1] Mathematical Association of America (2012). *Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra*. Retrieved from Mathematical Association of America website: www.maa.org/sites/default/files/pdf/CUPM/crafty/introreport.pdf.

[2] Freeman, S., S. Eddy, M. McDonough, M. Smith, N. Okoroafor, H. Jordt, and M.P. Wenderoth, *Active learning increases student performance in science, engineering, and mathematics*. Proceedings of the National Academy of Sciences. Vol. 111. No. 23. June 10, 2014.

PCAST report on STEM education (https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf) and the National Academies' report on *The Mathematical Sciences in 2025* (http://www.nap.edu/openbook.php?record_id= 15269). In response (or in some cases, in anticipation of) these reports, various mathematical science associations have on their own or in collaboration released reports such as:

1. Committee on the Undergraduate Program in Mathematics Curriculum Guide[3]
   http://www.maa.org/sites/default/files/pdf/CUPM/pdf/CUPMguide_print.pdf
2. Modeling Across the Curriculum
   http://www.siam.org/reports/modeling_12.pdf
3. Undergraduate Degree Programs in Applied Mathematics
   http://www.siam.org/reports/undergraduate_14.pdf
4. Partner Discipline Recommendations for Introductory College Mathematics
   http://www.maa.org/sites/default/files/pdf/CUPM/crafty/introreport.pdf
5. Beyond Crossroads
   http://beyondcrossroads.matyc.org/doc/PDFs/BCAll.pdf
6. Guidelines for Undergraduate Programs in Statistical Science
   http://www.amstat.org/education/curriculumguidelines.cfm
7. Guidelines for Assessment and Instruction in Statistics Education
   http://www.amstat.org/education/gaise/

There have been, and continue to be, many successful initiatives aimed at addressing the challenges identified. However, we believe it is time for *collective* action. We can no longer say, "I don't teach those classes," or "I don't teach those students," because students are now more mobile than ever, transitioning between multiple postsecondary institutions. For example, the National Student Clearinghouse Research Center's *Two-Year Contributions to Four-Year Degrees* report (http://nscnews.org/increasing-student-mobility-reshaping-pathway-to-a-college-degree) found that forty-six percent of all students who completed a degree at a four-year institution in 2013–14 had been enrolled at a two-year institution at some point in the previous ten years. Research on "collective impact" suggests that, in achieving significant and lasting change in any area, a coordinated effort supported by major players from all existing sectors is more effective than an array of new initiatives and organizations.[4]

To maintain a viable workforce for our country, to continue the expansion of scientific knowledge, and to remain relevant, we must update our curricula, make current our pedagogical methods, connect more strongly to other disciplines, and perhaps even evolve the culture of our own discipline. Many in our own community predict that if we do not achieve large-scale improvement in undergraduate education on our own, then markets, governments, or other structures will force change upon all of us. We believe it is better to have agency in making the necessary changes.

Ben Braun's recent blog post (http://blogs.ams.org/matheducation/2014/11/10/the-time-has-come-highlights-of-the-2014-ams-committee-on-education-meeting/#more-484), which gives an account of the October 2014 AMS Committee on Education (CoE; http://www.ams.org/about-us/governance/committees/coe-home), states that "the most prominent theme of the meeting was the critical role of collaboration and cooperation at many levels: among department members, at the institutional level among departments and administrative units, among professional societies with common missions, and at the national level to 'scale up' successful models for effective teaching." It is very good news indeed that important stakeholders are involved. A group of prominent mathematicians has come together to form Transforming Post-Secondary Education (TPSE Math; http://www.tpsemath.org/) and they have recently published their first report. The umbrella organization for professional associations in the mathematical sciences, the Conference Board of the Mathematical Sciences (CBMS; http://www.cbmsweb.org/) held its forum on the first two years of college math, which is discussed by Diana White in her November 2014 blog post (http://blogs.ams.org/matheducation/2014/11/01/the-first-two-years-of-college-mathematics-reflections-and-highlights-from-the-cbms-national-math-panel-forum/). Common Vision brings together the five professional associations whose missions include teaching in the mathematical sciences; it is our view that bringing association leadership together to work on undergraduate education is critical for lasting change.

Collective action to improve teaching and education in the mathematical sciences appears to be gaining traction.

[3] See Martha Siegel's blog post. http://blogs.ams.org/matheducation/2015/03/20/creating-the-2015-cupm-curriculum-guide/

[4] Kania, J. and M. Kramer (2011). *Collective Impact*, Stanford Social Innovation Review, Winter 2011.

Who was at the workshop?

The Common Vision 2025 project encourages action by highlighting existing efforts and draws on the collective wisdom of a diverse group of stakeholders to articulate a shared vision for modernizing the undergraduate mathematics program. We embrace the diversity of experience of our members.

Workshop participants included AMS President Robert Bryant, as well as several current and past presidents of all five associations. Participants also included faculty members from large departments at research universities, a statistician working at Google, a mathematician working at an HBCU, a vice president from the New York Hall of Science, faculty members from liberal arts colleges, faculty members from large comprehensive universities, the Executive Vice President of the APLU, a chemist working at the American Chemical Society, and an Achieving the Dream project director.

What can you do?

In reaching out to the membership of the five associations (including through this article) we hope to galvanize our colleagues and spur on a grassroots effort to improve education in the mathematical sciences.

Read the reports listed above. Read the Common Vision report, which will appear later this year and identifies common themes found in the above reports in order to provide a snapshot of the current thinking about undergraduate mathematics and statistics programs. Our report will also include a list of project ideas generated at our workshop. For example, you might identify a part of your curriculum that you would like to change in some way (like the calculus sequence, or the collection of upper level analysis courses, or the courses that do not require calculus and are intended for non-majors), and organize a meeting this summer with your colleagues about it; in advance, start a Google document where you can share ideas. Small changes, including more care and intention about our curriculum, can help our students have a better classroom experience. The activities are ones where we deem "small wins" are realistic, and are aimed at updating the mathematical sciences curriculum, updating pedagogical methods to align with best practices, and changing the culture of our discipline.

Please, do something. *Do* something. Do *something*.

The Common Vision website:
http://www.maa.org/common-vision

How to Choose a Scientific Advisor in Mathematics

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Choosing an advisor is an important step. Advisors can open new doors for research and introduce you to leading researchers. Or perhaps they will not, because they left the active research arena years ago and lost contact with their colleagues. Nevertheless they can help you to go smoothly through graduate school and prepare you for teaching positions. But it would be nice to know ahead of time what kind of result you could expect with the particular professor.

Navigating the academic world may be difficult for young women, especially if they are the first in their family to go into graduate school. The advice they hear may not be realistic. For instance, when you ask somebody in your department how to choose your advisor, you may hear the standard advice: take courses, talk to professors and figure out what mathematics you would like to do. You try it and feel that this is not the whole truth. Your intuition is correct. I did exactly this at the very beginning of my career, more than 25 years ago. I completely ignored any utilitarian aspects. I wish I had been not so idealistic in my career decisions. As a result, I spent a lot of time being a graduate student, since I have a learning disorder which limits my professional choices. I hope that my acquired experience might prove useful to others.

Talking to Others in Your Department

You can ask other faculty in the department about a particular professor, but keep in mind that they may be close friends or have other relationships that can place them in an awkward position when you want to inquire about their colleagues as advisors. Another method of getting information is talking to other students, both past and present, working with professors at your school. You also need to know the main directions of a potential advisor's research. Ask students who already work with somebody how often they go to conferences, do they get to meet other mathematicians working in the area, and is it a promising area in the sense of finding a job. Remember that the specialists you meet at conferences and workshops are the ones who will be making decisions about your hiring, and it is useful to work in an area where there are a lot of mathematicians.

There is a mentoring program at AWM, and people who have used it found it helpful. The advantage here is

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that your mentor is often not in your department, and you can get more impartial advice. And, of course, it is one more professional connection.

Former Students and Research

There are diverse reasons why professors might want to work with a graduate student, and they may not include the student's advancement as a researcher. The very existence of a student is considered as proof of research of her/his professor at some schools, the same as a few publications. And an independent study for the professor might reduce her/his teaching load. I've had different reading courses in my life and can attest that their levels vary quite widely. Clearly people put different amounts of effort into their guidance.

You can look at his/her former students. There may be a list of PhD graduates on some department websites, and you can find all students of a particular professor and see where are they are now and if anybody got a postdoc position. If, for example, you'd like to try your hand at research, then it is a good sign when you can find other women who got postdoc positions. Of course, all students are different, but when a professor has guided more than 10 students, and nobody ever got a postdoc position, that tells you something. The Mathematics Genealogy Project (genealogy.math.ndsu.nodak.edu/) also lists PhD students.

To look for signs of important and recent research, visit sites like MathSciNet (http://www.ams.org/mathscinet/) that show how many publications there are in his/her name. When the professor has had only joint works with his PhD students (or even REU program students) in the last 10 years, and all of them are the students' published thesis results, then the professor is not active in her/his own research anymore. It could be what you wish for in an advisor—I'm just helping you to figure out your options. For people who are interested in research, here is an important additional piece of info: it is helpful if you have a published paper that is your own and not shared with anyone. So you can check to see if graduated students' theses are published as joint articles with their advisors or separately. Of course, sometimes there is shared work, and yes, then there must be at least two authors. Nevertheless occasionally advisors who made no real input into the research expect to be listed as co-authors. Strictly speaking, their names should not be on the paper. But they offer their help in publishing, and then just put their name on, like it belongs there. It means that you share your result with your advisor, and there could be advantages to such a trade-off, like being on good terms with your professor and hoping for good references. However, there are professors who would let you have your result to yourself and help you with publishing without taking credit. You can write to former students and ask if their published works' were really shared. I did it with a student of one professor and got an answer that there was no research input from his side at all in their joint paper, but he managed to convince the student that it is "traditional." Well, not all professors have such traditions, and if you want to avoid learning such a thing at the time of your thesis defense, then you'd better check it out before you start your research.

Other Advice

Now I would like to mention depressing stuff, namely sexual harassment. In Russia when I was young, men would openly state their belief that a girl goes into graduate school for math because she could not manage to get laid and a math department is her last hope. Luckily in our time of Political Correctness nobody would dare to say that. A bit more than 25 years ago I ended up with the guy who was sure that my drive to do math should include my agreement to sleep with him. Not only have I never known anyone who turned into a serious mathematician by becoming her advisor's mistress, but quite to the contrary I've seen young women destroyed by it. The predicament is lose-lose: if you don't agree, then you do not get to work with the guy and do not get your degree, and if you do, then nobody believes that the results you get are your own. You get to be called a whore and there is still no guarantee of a degree. In both cases you do not become a researcher. As for me, I had lost time and now nobody believes that I was very good once. I can only tell stories about people who started with me, and by now they have 30-40 publications, with a book, or became department chairs, while I finally got my PhD degree at 50, on my third try.

Getting back to our time: checking with other female students if there is a professor who "made one female student really uncomfortable in his office" still looks like a prudent move.

Officially all your career decisions must have only one reason: mathematics. If somebody asks you why you decided to work with one advisor and not another, your reply must be along these lines: "Yes, this professor does interesting math, and I understand that I could do good work with her/him, but the other one works in the area which I find more appealing." I hope my experiences have helped you. Good luck in your PhD endeavors!

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