

ASSOCIATION FOR
WOMEN IN MATHEMATICS

Newsletter

VOLUME 45, NO. 5 • SEPTEMBER–OCTOBER 2015

The purpose of the Association for Women in Mathematics is

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

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PRESIDENT'S REPORT

In July, while rooting for the US Women's National Team to win the Women's World Cup in soccer, I was reminded by my husband that I should be rooting for women's teams from around the world, representing countries where opportunities for women to advance are much more limited than they are in the US! But even in the US we are still waiting for the Equal Rights Amendment to become law, we still have severe wage disparity, and the glass ceiling for women and minorities is still unacceptably low in many professions. Luckily, we also have fabulous organizations like the AWM to help advance the cause for women in mathematics and science, at home and around the globe!

AWMA. As the first female President of the International Mathematical Union (IMU), **Ingrid Daubechies** oversaw the creation of a new IMU Committee for Women in Mathematics. I currently represent North America and the AWM on this committee, and in its first year, the committee, chaired by **Marie-Françoise Roy**, decided to give some of its budget to help support the African Women in Mathematics Association (AWMA) to run its first annual general meeting.

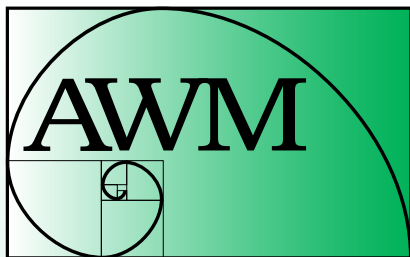
The 2015 AWMA Workshop was held in July in Kenya, bringing together African women mathematicians from around the continent. Congratulations to the AWMA!

Noether Lecture at JMM. The AWM is delighted to announce that the 2016 AWM-AMS Noether Lecture will be delivered by Professor **Karen Smith** from the University of Michigan. The lecture takes place at the Joint Mathematics Meetings (JMM) in Seattle, Washington, January 6–9, 2016. The Noether lecture will be accompanied by the AMS-AWM Special Session on Commutative Algebra, organized by **Karen Smith**, **Irena Swanson**, and **Emily Witt**. In addition, at JMM the AWM will host the usual suite of events: the Executive Committee Meeting; the Business Meeting; the Reception and Prize Session; the AWM Panel focused on the new Research Collaboration Conferences for Women initiative, organized by **Michelle Manes**; an AWM-AMS panel on math education, organized by **Pao-sheng Hsu** and **Jackie Dewar**; the AWM Workshop on Algebraic Combinatorics,



Founding members of AWMA

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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.

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PRESIDENT'S REPORT *continued from page 1*

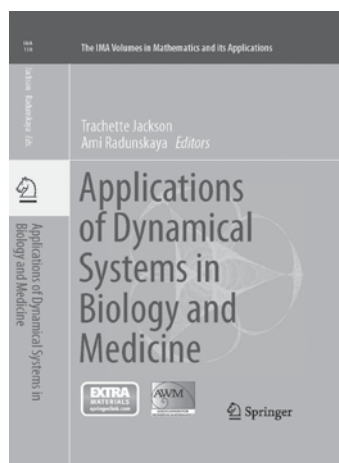
organized by **Gizem Karaali** and **Rosa Orellana**; and the Poster Session for Graduate Students organized by **Brenda Johnson** and **Catherine Searle**.

Women in Math Biology. A new Research Collaboration Workshop for Women in Mathematical Biology, organized in cooperation with AWM, took place at NIMBioS from June 22–25, 2015, at the University of Tennessee, Knoxville. The workshop was organized by **Anita Layton** and included interdisciplinary female researchers in the field of mathematical biology. NIMBioS Associate Director for Education and former AWM President **Suzanne Lenhart** was the local organizer.

These collaborative workshops aim to build strong networks of women working in focused areas of research by forming new research groups and encouraging them to publish together. Junior women work with senior leaders in groups at the workshop and continue to work together afterwards to publish the outcome of their research in a proceedings volume. The publication volume from this workshop will be edited by **Anita Layton** and **Laura Miller** and is under contract in the new AWM-Springer publication series! See the article about the workshop on pages 5–6 of this issue.



*Anita Layton's group at the
Collaboration Workshop*



AWM-Springer Series. In addition to the first three volumes appearing this year based on the Research Collaboration Conferences WiSh, WINE, and WIN3, we now have four new volumes under contract, based on the AWM Symposium 2015, the NIMBioS workshop, and two volumes in honor of **Cora Sadosky** based on the 2014 Cora Sadosky memorial seminar in analysis! These volumes generate much needed revenue for AWM and help to support the formation of networks of female collaborators in focused areas. The series will also serve to highlight significant AWM events such as our symposia, workshops, and panels. Two new volumes are in the planning stages based on the AMS-AWM panel “Work in mathematics education in departments of mathematical sciences” at JMM 2016 and the contributed paper session on “The Contributions of Women to Mathematics: 100 Years and Counting” at MathFest! We look forward to getting these new volumes and others under contract. Also, the proceedings volume from the first WhAM! conference at the Institute for Mathematics and Applications (IMA) is in production in the IMA series and is co-branded with the AWM logo on its cover.

AWM-NSF Travel Grants. A signature program for the AWM for many years has been the AWM-NSF Travel and Mentoring Travel Grants, supporting several generations of women postdocs and junior faculty to advance in the profession. Every three years, the NSF funding needs to be renewed, which gives an opportunity to consider options for rejuvenation. After serving as the lead PI since the 2009 grant cycle, former AWM President **Barbara Keyfitz** is passing the torch to **Lily Khadjavi**. Lily brings new ideas for reaching women from underrepresented minorities and considering ways to fund student travel to conferences. Barbara will continue to handle the evaluation component of the grant, and Lily and Barbara will be joined by continuing co-PIs **Anna Mazzucato**, **Shari Moskow** and former AWM President **Cathy Kessel**. Thank you to Lily and all the continuing PIs for taking on the mission of keeping this important program vital and impactful.

Scientific Advisory Committee. For the past two years, **Ruth Charney**, in her role as AWM President, helped to generate nominations for many female candidates for AMS and SIAM Fellows. Awards Committee Chair **Sylvia Wiegand** was active in generating names and in proposing the establishment of the new Scientific Advisory Committee. Now I am delighted to announce that Ruth and Sylvia have agreed to serve on the new committee to help launch it and ensure its success. The other members will be **Georgia Benkart**, **Suncica Canic**, **Barbara Keyfitz**, and **Susan Montgomery**. The members will rotate on three-year terms. Please help the committee by sending them names of women to nominate for prizes and Fellows to be awarded by any of the professional mathematical societies.

Equal Pay. Returning to my earlier point about income disparity, last fall **Maria Klawe** invited Microsoft CEO **Satya Nadella** to a live fireside chat on stage at the annual Grace Hopper Celebration of Women in Computing. The interview ended up sparking an industry-wide public discussion about income disparity issues for women in computer science. That left some young women in mathematics wondering, why aren't we having such a discussion in the mathematics profession? How can we start such a public discussion to attract the media spotlight for this issue? Let's think of a way!

Membership Renewal. Let me close with a reminder that the new membership year starts October 1. The existence of AWM and the success of our programs depend crucially on the income generated from membership dues and the annual fundraising drive each year. I am continually impressed by the generosity of the many mathematicians, male and female, who donate their time and money to support AWM every year. See our website for a list of more than 100 volunteers serving on our committees, and the number of contributing members increases every year. So please remember to renew your membership and to become a contributing member or make a donation if your finances allow. Thank you for helping to advance the AWM mission!

Kristin Lauter

Kristin Lauter
Redmond, WA
July 25, 2015



Kristin Lauter

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.

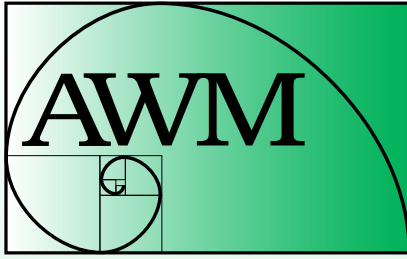
Newsletter Deadlines

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.



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-MAA Falconer Lecturer:
September 1, 2015

AWM Alice T. Schafer Prize:
October 1, 2015

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

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

AWM Essay Contest: January 31, 2016

AWM Mentoring Travel Grants:
February 1, 2016

AWM-Birman Research Prize:
February 15, 2016

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Karen E. Smith Named 2016 Noether Lecturer

The Association for Women in Mathematics and the American Mathematical Society are pleased to announce that Karen E. Smith will deliver the Noether Lecture at the 2016 Joint Mathematics Meetings. Dr. Smith is the Keeler Professor of Mathematics at the University of Michigan. She has been selected as the 2016 Noether Lecturer for her outstanding work in commutative algebra and its interface with algebraic geometry.

Smith received a bachelor's degree in mathematics in 1987 from Princeton University. After a year of teaching high school, she went to the University of Michigan and received a PhD in mathematics in 1993 under the direction of Melvin Hochster. Immediately after receiving her doctorate Smith spent a year at Purdue University as an NSF postdoc working with Craig Huneke, followed by a position as a Moore Instructor at MIT. In 1997, even though she was promoted to assistant professor at MIT, she chose to move back to the University of Michigan, where she continues to teach and do research.

Smith's research in commutative algebra was recognized in 2001 when she received the Ruth Lyttle Satter Prize. Given every two years, this prize recognizes an outstanding contribution to mathematics research by a woman in the previous six years. The citation states: "The Ruth Lyttle Satter Prize in Mathematics is awarded to Karen E. Smith of the University of Michigan for her outstanding work in commutative algebra, which has established her as a world leader in the study of tight closure, an important tool in the subject introduced by Hochster and Huneke. It is also awarded for her more recent work which builds new bridges between commutative algebra and algebraic geometry via the concept of tight closure."

In addition to the Satter Prize, Smith is the recipient of a Sloan Research Award, a Fulbright award, and research grants from the National Science Foundation and the Clay Foundation. She has twice (in 2002–2003 and 2012–2013) helped organize a Special Year in Commutative Algebra at the Mathematical Sciences Research Institute (MSRI) in Berkeley CA. In 2014, she was an invited speaker at the International Congress held in Seoul, Korea. Smith has been on the editorial board of eight journals, including the two she is currently editing.

Smith has had sixteen PhD students, and she currently has three more working with her. She is the director of an NSF funded Research Training Group (RTG) program, which has supported ten PhD students, ten postdocs and five undergraduates each year since 2005.

Karen Smith is featured in the book *Complexities: Women in Mathematics* edited by Bettye Anne Case and Anne M. Leggett, published in 2005 by Princeton University Press.

The 2016 Joint Mathematics Meetings will be held January 6–9 in Seattle, WA. The lecture honors Emmy Noether (1882–1935), one of the great mathematicians of her time. She worked and struggled for what she loved and believed in. Her life and work remain a tremendous inspiration. Recent Noether Lecturers include Carolyn Gordon, Susan Montgomery, Barbara Keyfitz, Raman Parimala, Georgia Benkart and Wen-Ching Winnie Li.



Karen E. Smith

NIMBioS Research Collaboration Workshop for Women in Mathematical Biology

Laura Miller, University of North Carolina at Chapel Hill

On June 22, 2015, four research teams composed of 24 women in mathematics and biology converged at the National Institute for Mathematics and Biological Synthesis (NIMBioS) in Knoxville, Tennessee to participate in a Research Collaboration Workshop for Women in Mathematical Biology. The goal of the workshop was to kick-start multidisciplinary research projects and form lifetime connections to other women in STEM fields. This workshop was inspired by the highly successful 2013 Institute for Mathematics and its Applications (IMA) Special Workshop: WhAM! A Research Collaboration Workshop for Women in Applied Mathematics: Dynamical Systems with Applications to Biology and Medicine.

NIMBioS was an excellent venue to host this multidisciplinary workshop. Consistent with the institute's mission to trigger research in quantitative modeling and analysis in the life sciences, the research teams consisted of women who are trained and working in both biology and mathematics departments. Each group consisted of a senior faculty member and a junior faculty member from the fields of mathematics, engineering, and the life sciences. These teams each mentored four junior women who ranged from graduate students to assistant professors. Anita Layton (Duke University) organized

the workshop and did an outstanding job of attracting and recruiting some of the most interdisciplinary women in the field of mathematical biology. Suzanne Lenhart (University of Tennessee, Knoxville) was the local organizer and did a fantastic job communicating all of the opportunities for continued research at NIMBioS.

On the first day of the meeting, each research group gave a brief overview of their proposed project. Laura Miller (University of North Carolina at Chapel Hill) and Lydia Bourouiba (Massachusetts Institute of Technology) outlined a project that combines numerical analysis and fluid dynamics to understand how spiders are transported potentially thousands of miles by the wind. Anita Layton and Aurélie Edwards (CNRS, Paris) summarized a highly interdisciplinary and relevant medical project on blood flow autoregulation in the kidney. Their objective was to build upon a published model of calcium dynamics of the afferent arteriole to better understand vasodilative and vasoconstrictive responses. Victoria Booth (University of Michigan) and Megan Hastings Hagenauer (University of Michigan) described the bidirectional relationship between sleep and pain and its significance to the treatment of diseases. The goal of their group was to develop a mathematical model of the interactions between sleep, circadian rhythms and pain sensitivity. Finally, Suzanne Lenhart and Cristina Lanzas (North Carolina State University) described mathematical models that account for the interactions between gut microbiota and *C. difficile*, and the perturbation that antimicrobial therapy causes on the gut microbiota.

After the introductions to the projects, all of the participants broke out into individual working groups.

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*Participants in the 2015 Research Collaboration Workshop
for Women in Mathematical Biology at NIMBioS at the University of Tennessee*

What quickly became obvious as each group delved into its research projects was how quickly one can make substantial progress in a very short amount of time. In fact, the pace of the entire meeting underscored how much work a group of motivated women can get done if given a supportive environment and few interruptions. After an intense afternoon of work, the group headed into Knoxville for some wonderful southern food at Tupelo Honey Cafe. Unfortunately, Lou Gross (University of Tennessee, Knoxville) was not available to advise the group on Knoxville's famous bluegrass music, but a few workshop members did make their way to some local music venues.

On the second day of the workshop, each group moved quickly from breakfast to an intense morning session to delve even deeper into their projects. Coffee and lunch breaks were buzzing with research ideas and networking. By midafternoon, the entire group reconvened to discuss their progress. It was absolutely astonishing to hear how much each team had accomplished in a mere 36 hours. After the group updates, the women scientists and mathematicians met with the NIMBioS postdoctoral fellows and some of the undergraduate students working at the institute through a summer REU program. The degree to which NIMBioS encourages networking and how well they advocate for their postdoctoral fellows is impressive. At the end of the day, some of the participants visited Icon, the restaurant within the World's Fair Park Sunsphere. This was a fabulous location to see the sunset in Knoxville and enjoy the food prepared by their award winning chef, Bruce Bogartz.



Sanjukta Hota presents the results from the Sleep, Circadian Rhythms and Pain group



Kimberly Sheldon describes the importance of dispersal for the population dynamics of spiders

On Wednesday, all of the groups got straight to work preparing for their final presentations and making plans for future research. In between work sessions, NIMBioS provided excellent snacks and meals for the hard-working women with ample time for networking and brainstorming across the research groups. Wednesday concluded with an excellent dinner served at NIMBioS, and many of the groups returned to the hotel to continue working on their talks into the wee hours of the morning.

Thursday morning began with breakfast followed by presentations of the results of three days of hard work. The junior scientists gave the presentations, with the group leaders stepping aside. All of the participants were amazed by the amount of work that been accomplished since the updates on Tuesday afternoon. The spider group had submitted large-scale simulations to a remote cluster at University of North Carolina at Chapel Hill which showed that the spider's silk dragline flaps violently immediately before take-off. The blood flow autoregulation group explored a detailed model consisting of a system of coupled differential equations to accurately capture the dynamics of vasodilation and vasoconstriction. The sleep, circadian rhythms, and pain

group showed just how devastating the combined effects of pain and lack of sleep can be. The antimicrobial therapy group created a model that showed that antibiotic-induced alterations in microbial bile acid metabolism in the gut decreases colonization resistance against *C. difficile*.

During the final lunch, many of the women remarked on how wonderful it was to conduct research with a group of women. In addition to the level of comfort provided, it was great opportunity for junior women to meet senior professors in their field. The meeting format also gave young students the opportunity to hone their presentation skills in a welcoming and safe environment. The interdisciplinary makeup of the workshop allowed mathematicians and biologists to discuss and discover some of the intellectual as well as cultural differences between the two fields.

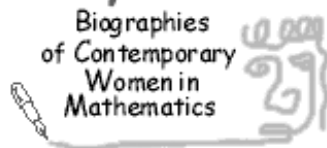
An excellent outcome of the multidisciplinary working groups was the synergy brought through different perspectives. Mathematicians were able to bring modeling approaches, analytical skills, and computational methods to address biological questions. Life scientists were able to bring their knowledge of the application as well as existing data and the potential to collect new data to validate

models. Just as important as networking with women in one's own field was the opportunity to connect to women in another field who may become long-term collaborators and mentors. Many of the participants also learned about a variety of technologies available to enhance collaboration such as GitHub, ShareLaTeX and Basecamp.

Even though the workshop has ended, there is still much more work to be done. Anita Layton and Laura Miller have offered to co-edit a volume in Springer's Association for Women in Mathematics Series that focuses on the research initiated at this workshop. The goal is for each group to write two papers. The first paper will focus on an introduction to the application to be addressed. The second paper will cover the new research that was conducted during the workshop and in the subsequent collaborations. All groups are also strongly encouraged to continue the research for submission to appropriate peer-reviewed journals in the relevant disciplinary fields.

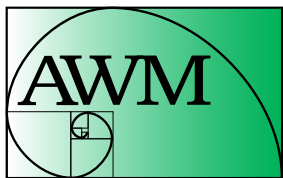
If you are a math or life science faculty member, please consider organizing a similar event at your university or at one of the national mathematics or life science institutes.

Essay Contest



To increase awareness of women's ongoing contributions to the mathematical sciences, the Association for Women in Mathematics holds an annual essay contest for biographies of contemporary women mathematicians and statisticians in academic, industrial, and government careers. AWM is pleased to announce that the 2016 contest is sponsored by Math for America, www.mathforamerica.org.

The essays will be based primarily on an interview with a woman currently working in a mathematical career. The AWM Essay Contest is open to students in the following categories: **grades 6–8**, **grades 9–12**, and **undergraduate**. At least one winning entry will be chosen from each category. Winners will receive a prize, and their essays will be published online at the AWM website. Additionally, a grand prize winner will have his or her entry published in the *AWM Newsletter*. For more information, contact Dr. Heather Lewis (the contest organizer) at hlewis5@naz.edu or see the contest web page: www.awmmath.org/biographies/contest.html. The deadline for electronic receipt of entries is **January 31, 2016**. (To volunteer as an interview subject, contact Heather Lewis at the email address given.)



ASSOCIATION FOR
WOMEN IN MATHEMATICS



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.

The Librarians' Math Girl

Sarah J. Greenwald

Following in the wake of *The Librarian* franchise [1, 2, 3], a television show *The Librarians* (with mostly new characters) debuted on TNT's cable network in December 2014 [4]. It is here that we meet Cassandra Cillian, who is referred to as the "Math Girl." Each person who works for the library has a kind of superpower, and Cassandra's power manifests itself as synesthesia along with mathematical visions. Popular culture representations have connected mental illness with mathematical ability in the past, but here the illness manifests itself as an actual brain tumor: "ever since a life-threatening tumor began metastasizing inside her head, Cassandra has been given the gift of synesthesia ... numbers

appear as colors, science as musical notes, and when she does math she smells things ... mostly breakfast" [4]. While TNT calls Cassandra's synesthesia a gift, on the show itself her mathematical ability is expressed as a type of fugue state that Cassandra wishes she didn't have. As Cassandra enters the math state she begins spouting mathematical lingo while symbols, figures and equations swirl around. These visualizations are reminiscent of Charlie's visions in *NUMB3RS* [5]. Sometimes the audience sees Cassandra's visions, and other times they are implied. Cassandra doesn't have much control over when she enters or leaves the math state—the other characters try to help her snap out of it, and in this way it is portrayed as a burden rather than a power. Lindy Booth, the actress who plays Cassandra, described her approach to the mathematical synesthesia: "I wanted that idea of channel changing on a TV, moving way too fast. Way, way, way too fast. And the quick movement of it, and the overwhelming nature of it, the fact that she couldn't control any of it... I wanted her to become overwhelmed by it" [6].

While I find the show entertaining overall, the representation of mathematical ability is one of the worst that I can recall in recent memory, from the point of view of reinforcing a number of all too familiar stereotypes. As the show begins, Cassandra, a janitor at a hospital, doesn't have friends or a connection with her family. Tying the mathematical

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.

ability to a terminal brain tumor also makes it hard to separate whether it is her abilities or just the tumor that she views as a curse. It seems to be a bit of both. For example, when the team first begins calling her “Math Girl” Cassandra is not happy with that title. To be fair, Cassandra does eventually come to accept her title, and the fact that she is “not comfortable in her head but she is comfortable in her skin” [7] makes for interesting character dynamics. I also mostly like her interactions with the rest of the team members.

Should I applaud the fact that the writers made Cassandra a female character when she could so easily have been male? I’m thinking of Sylvester Dodd, a neurotic math genius on CBS’s *Scorpion*, for example. But equal opportunity stereotypes are not what I had hoped for. In my ideal image of a Math Girl (or Math Guy), the superheroine would showcase her powers as being tied to hard work and connections with others, not only from her innate (or brain tumor) talent. While Cassandra mentions math terms in almost every episode, they are not connected to the plotline in enough detail to come across as anything but a bunch of technical terms. The golden mean, digits of π , four-dimensional geometry, mathemagics, and a STEM fair are just a few examples of the mathematical references in the show, which returns for a second season in the fall. Will I

keep watching? Yes, but in this case, it will be despite the math, not because of it.

References

- [1] *The Librarian: Quest for the Spear* (2004)
<http://www.imdb.com/title/tt0412915/>
- [2] *The Librarian: Return to King Solomon’s Mines* (2006)
<http://www.imdb.com/title/tt0455596/>
- [3] *The Librarian: The Curse of the Judas Chalice* (2008)
<http://www.imdb.com/title/tt1146438/>
- [4] *The Librarians* (TV Series 2014–)
<http://www.tntdrama.com/shows/the-librarians.html>
- [5] Devlin, Keith and Gary Lorden. *The Numbers Behind NUMB3RS: Solving Crime with Mathematics*. New York: Plume, 2007.
- [6] Encarnacion, Jonathan. “Lindy Booth—Standing Out In A Crowd: *The Librarians* Interview.” November 17, 2014.
<http://www.screenrelish.com/2014/11/17/lindy-booth-librarians-interview/>
- [7] “Lindy Booth Discusses *The Librarians* and Playing Cassandra.” New York Comic Con, 2014. <https://www.youtube.com/watch?v=KSIVdcax1-U>

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, Olga Ladyzhenskaya, Judith Sally, Olga Oleinik, Linda Rothschild, Dusa McDuff, Krystyna Kuperberg, Margaret Wright, Sun-Yung Alice Chang, Lenore Blum, Jean Taylor, Svetlana Katok, Lai-Sang Young, Ingrid Daubechies, Karen Vogtmann, Audrey Terras, Fan Chung Graham, Carolyn Gordon, Susan Montgomery, Barbara Keyfitz, Raman Parimala, Georgia Benkart and Wen-Ching Winnie Li. The 2016 lecture will be delivered by Karen E. Smith.

The letter of nomination should include a one-page outline of the nominee’s contribution to mathematics, giving four of her most important papers and other relevant information. Nominations are to be submitted as ONE PDF file via MathPrograms.Org. The submission link will be available 45 days prior to the deadline. Nominations must be submitted by **October 15, 2015** and will be held active for three years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

BOOK REVIEW

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

Crafting Conundrums: Puzzles and Patterns for the Bead Crochet Artist, Ellie Baker and Susan Goldstine, A K Peters/CRC Press/Taylor & Francis Group, Boca Raton, FL, 2014, xx + 254 pp., ISBN: 978-1-4665-8833-2, \$39.95.

Reviewer: Heidi Burgiel, Bridgewater State University, Bridgewater MA, hbürgiel@bridgew.edu

As stated in the introduction, “This book is for crafters, puzzle lovers, and pattern designers alike.” It is lavishly illustrated, is rich with examples and historical notes, and encourages the reader to experiment and explore beyond the material presented.

Mathematicians and other puzzle lovers will enjoy exploring ways in which the physical constraints of bracelet construction interact with familiar topics from geometry

and topology. At first glance bracelet design seems simple—color a rectangle and identify its sides to make a torus. However, that rectangle will be tiled by beads (represented by a hexagonal tiling) and the end of the first row of beads must be identified with the start of the second row. Most bead crochet bracelets are made up of multiple repeats of a fixed pattern, and the number of beads in each pattern repeat may not be a multiple of the number of beads in each row. Finally, the ends of the crocheted tube of beads tend to twist before they are joined to form a torus.

In Part One, the authors give a clear and precise explanation of how the hexagonal grid they call the “bead plane” is transformed into a torus; a pattern in the bead plane can be transferred to a bead crochet pattern if the end of each row is identified with the beginning of the next (determined by the circumference of the bracelet, usually between 6 and 10), and if the pattern repeats as you read a row of beads from left to right (it is not unusual for a single pattern block to consist of 50 beads).

Part Two of the book is an exemplary wedding of mathematics and crafting. Using the rules derived in Part

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, Barbara Keyfitz, Margaret Cheney, and Irene M. Gamba. Linda J.S. Allen delivered 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.

One, the authors present and solve multiple challenges to design bracelets with various topological and symmetric properties. Detailed explanations and numerous examples lead the reader through an exploration of torus knots to a discussion of knots in general, including an application of braid representations. Chapter Six: Escher Designs leads naturally to Chapter Seven: Wallpaper Groups. This reversal of the standard classroom approach is quite natural in this context, each conundrum laying a foundation for the next.

For pattern designers, the bead plane is a powerful tool for drafting and verifying designs on paper without stringing a single bead. Detailed illustrations and explanations describe the creation of repeating patterns of fish or flowers and are followed by a discussion of how those patterns may be allowed to vary over the length of a bracelet or necklace. The book also presents techniques for designing knotted or linked bracelets and for using different sized or shaped beads to affect the contours of the finished item. Finally, it is clear

from the discussion in Part One how to transcribe designs from the bead plane to the pattern formats commonly used by bead crochet artists.

For crafters, Part Three provides detailed and clearly illustrated instructions for selecting materials, stringing beads (including how to check your work and what to do if you find a mistake) and crocheting and closing a bracelet. Experienced bead crochet artists will appreciate the dozens of patterns at the end of this section and the variety of techniques covered—from bracelets to necklaces, knotted or unknotted, textured or smooth.

The mathematics presented in *Crafting Conundrums* is broad and deep, enriched by its application to bead crochet. The pattern design techniques presented are powerful, effective, and clearly explained. *Crafting Conundrums* is an excellent resource for anyone interested in bead crochet or applications of mathematics in the arts.

EDUCATION COLUMN

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

Family Mathematics Education Memories

Pat Kenschaft, Professor Emerita of Mathematics, Montclair State University

Education takes place not only in schools. The 75 respondents to my survey of African American mathematicians of New Jersey three decades ago indicated that effective elementary math education in this country is largely done at home, so “any group that is underrepresented in mathematics will remain so until we improve elementary mathematics education for all American children.” I have written and worked extensively on that issue,* and decided this time to turn to the family influences that I have witnessed.

When I was four-and-a-half, the Northeast had a September hurricane that wiped out electricity just as my family finished dinner. A search revealed that our family had two candles. Mother took one upstairs to put the baby to bed, and Dad looked uncertainly at his preschooler in the light of the one left on the table. Then he took a glass. “This is the diameter,” he said, wiping his finger across the top of it.

Then he wiped his finger around it. “If you take it around the edge, it goes one, two, three times, and a bit more.”

I was totally puzzled, but I had the unusual pleasure of my daddy’s complete attention, so I did my best to cooperate. I remember when the concept of “length” hit me. Suddenly I understood! “Do it with the saucer,” Daddy said.

“This is the diameter.” I drew my finger across the saucer. “It goes one, two three times around the edge, and

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* Kenschaft, Patricia C. (1981). Black women in mathematics in the United States. *The American Mathematical Monthly*, 88(8), 592–604. DOI: 10.2307/2320508

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———. (2014, revised edition). *Math power: How to help your child love mathematics even if you don't*. Mineola, NY: Dover Publications, Inc.

with a little bit left over.”

He was obviously delighted. “The edge of a circle is called the circumference. If you take the diameter of a circle and wrap it around the edge, the number of times it goes is a bit more than three and is called pi.”

“But pie is something we eat for dessert.”

“A pie is a circle, so it has a pi in it.” We laughed happily together—my first math memory.

When I started elementary school, I came home daily for lunch. In second grade my mother and I were enjoying a lunch alone together when she said, “Think of a number from one to ten.” I did. “Double it.” I did. “Add six.” I did. “Take half of it.” I did. “Subtract your original number.” I did. “The answer is three.” Amazing Mother! I

was very impressed.

We went through the whole process again with a different number. Surprise! The answer was still three. “Why is that?” I demanded to know.

“Let’s call the number you chose x ,” Mother responded. That seemed like an odd name for a number, but Mother was insistent. After I agreed, she went through the steps: $2x$, $2x + 6$, $x + 3$, 3 . Wow! Amazing what can be understood by calling a number x !

About the same time, I was proudly allowed to dry the flatware after dinner while my mother washed dishes and my father dried breakables. I reported, “Miss Mitchell says you can’t subtract a larger number from a smaller number.” My parents looked at each other strangely and long. “Isn’t that true?” I hazarded. While we finished the dishes, they explained about negative numbers and generalized

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.

WHEN: 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>.

subtraction. When we were finished, I told them I thought I should tell Miss Mitchell about all this tomorrow. There was another long stare between them. "You tell her, Bup," said my father to my mother. "We think that is not a good idea, Patty. Miss Mitchell must have some reason for not wanting to tell the class. Perhaps she thinks the other children wouldn't understand." It was my first lesson in classroom politics.

When I was in fifth grade and Mother was ironing, I asked Mother what people meant when they talked about "algebra." "Let's look it up in the Junior Encyclopedia," was her response. While she ironed, I read the "Algebra" section aloud and we discussed anything doubtful. That gave me a good overview that later motivated my ninth grade algebra teacher, Belle Kearny, to lend me her "College Algebra" book to read in class to avoid boredom. It was so fascinating, I also read it at home. She came

in before school some mornings to answer my questions.

By the time I was a Girl Scout I was extremely interested in mathematics and astronomy, which were inseparable in my perception. The Girl Scouts didn't have a math badge, but they did offer an astronomy badge. Mother convinced the local Girl Scout council that she was qualified to coach my troop in the astronomy badge, so for a while it met at our home in the evenings. In those days a girl couldn't earn a badge unless her entire troop did (which Mother thought was very odd), but Mother and I worked hard together to teach my fellow-scouts, and we succeeded. They and I earned the badge.

Some years later I had a dramatic experience that made me aware of how fortunate I was to have had the math education I did. When I was a graduate student, there was an announcement in our neighborhood meeting that a

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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.**

nearby African American church was looking for tutors for its tutoring program. That seemed like an effective way to serve (it was the '60s), so I showed up at the appointed time. When I said I was a graduate student in mathematics, the person in charge told me excitedly to wait a moment, and soon the minister showed up.

"Are you willing to tutor anyone who wants to learn?" he demanded, repeating the question doubtfully when I said I was. Then he told me that his wife wanted to learn mathematics, but I was not to humiliate her in the process. Did I understand? No humiliation! I claimed I did, and before long I had a frightened African American woman in front of me.

Her lack of knowledge was truly appalling, but the speed with which she learned impressive. In few sessions we went through arithmetic, starting with addition, and through elementary algebra. She had gone through a segregated school system in the South, but her experience made me resolve that I would take no chances when I had children of my own.

When I found myself explaining the commutative law of multiplication for the second time while changing a dirty diaper, I laughed at myself. My priorities were clear! I was sure they would be toilet trained by the time they started college, but I wasn't so sure they would learn about the commutative law of multiplication if I didn't get them while they were down.

Somewhat later in their preschooler years, I entertained them during long car trips by seeing who could answer faster questions like, " $5 + 7 = ?$ " They were nineteen months apart, and this became a great competitive sport. After they knew their addition and subtraction facts, we progressed to multiplication and division.

When the younger one started kindergarten, I resumed teaching part time.

"What are you doing?" asked the six-year-old.

"I'm grading papers."

"I know that! What is on the papers?"

"It's mathematics."

"I know that! What is the mathematics?"

"You'll learn when you are older."

"Not when I'm older. *Now!!!*"

The next day at lunch, she said, "Let's graph more of those equations and find their points of intersection." After a while, a younger plaintive voice said, "I feel left out." My first internal reaction was that five-year-olds don't do this. Then I remembered that yesterday I thought six-year-olds don't do this. By the end of lunch they were seeing who could graph

equations and find the point of intersection faster.

When they were in middle school, they proofread my book *Linear Mathematics* and both found mistakes, which was helpful. Perhaps being so error-free, partly due to my two children, is one reason it was republished recently by Dover Publications.

When they were in high school, I confessed to a close friend that I feared my children were passing me intellectually.

"That's good," was the reassuring response. You want your children to be smarter than you are."

"I do?" I responded doubtfully.

"Yes, you do!" she said with comforting conviction. And now I am.

I do not want to leave the impression that I think families are entirely responsible for their children's abilities. When I was seven and my brother was four, his IQ was diagnosed at 50. He has enriched our family in many ways. If you want to read my memoir of my mother, which also tells of his life, just email me at kenschaft@pegasus.montclair.edu.

Ruth I. Michler Prize

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

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

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

The application deadline is November 1 for the award to be used during the 2016–17 academic year.



www.awm-math.org/michlerprize.html



Cornell University



PRIMES: Devadas Interview

The following interview was conducted in the fall of 2014, after Sheela Devadas was awarded the Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman by the Association for Women in Mathematics. She graduated from MIT in 2015 and entered a doctoral program in mathematics at Stanford University. The interviewer Susan Ruff is a lecturer for Writing Across the Curriculum in the MIT Mathematics Department. She is an editor of MAA's Mathematical Communication website.

This article is reprinted from <https://math.mit.edu/research/highschool/primes/testimonials/devadas.php>

Susan Ruff: Congratulations for receiving the Schafer Prize for Excellence in Mathematics!

Sheela Devadas: Thank you. It was a surprise when my advisor, Professor Etingof, told me. The initial e-mail went to my spam folder.

SR: The criteria for the prize include interest, performance, and independence in mathematics. What fostered these for you?

SD: In middle school I had a really good math teacher, Tatyana Finkelstein, who encouraged me to participate in programs like PRIMES and the PROMYS summer program at Boston University. In these programs, your research is guided but the work is your own to some degree. Obviously you have to ask questions, because when high school kids start PRIMES, they don't really know that much about advanced math like representation theory. Having regular meetings with your advisor, but still having the ability to do independent work on your own, really helps to develop confidence.

How PRIMES introduces students to research

SR: In PRIMES, what is the role of the mentor?

SD: I had a really good graduate-student mentor, Steven Sam, and the research was supervised by Professor Etingof. My mentor was really dedicated to the project. We met about once a week and I would tell him what I had been doing during that week in particular. I usually had at least a few questions and he would help with the answers, because obviously he has a lot more background than I do. So answering questions was a big role of the mentor—but also suggesting directions if I seemed stuck, without doing the proofs for me. When it came time to write the paper, a lot of the initial sections and background was his work, but then the



AWM President Ruth Charney presents the Schafer Prize to Sheela Devadas.

subsequent sections were all my work. So a lot of what the mentor does is give you a base to build off.

SR: For people who don't know, can you briefly describe what PRIMES is and how it works?

SD: PRIMES is a program for high school students to participate in real math research (they extended it to computational biology and computer science as well). For the math program, you submit an application which involves some pretty difficult math problems; I think they have become more difficult since I applied to PRIMES in its first year. Then in January you get assigned to your project and a mentor. Sometimes there will be other students working on the same project. Initially Carl Lian was working on the same project as me, but he graduated from high school before I did. After that I was working mostly by myself.

Depending on the project, you might have to do some background reading first. I had to learn linear algebra and abstract algebra because I didn't know anything about those at the time. I was just taking calculus. So depending on the project, there's a month to three months of background research; your mentor will guide you through it. My mentor told me what books to read and assigned me some problems from the books to type up so that I could also learn LaTeX. Once I got to a stage where I could understand what the research problem is, we started having regular meetings to actually work on the research problem. Then in May there's a PRIMES conference where everyone presents a short PowerPoint about their project so far and where it may go in the future.

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SR: Who was the audience for that conference?

SD: It was mostly the other PRIMES students and the other PRIMES mentors, but it's open to all of MIT. I've been to several PRIMES conferences as presenter and more recently as an audience member (because my sister was participating and somebody had to take a video). It's pretty interesting to see the work that the high school students are doing. It's impressive in a lot of ways, including the other fields like computer science and biology, though they separate the days of the conference by field now. In recent years they have also introduced reading groups, but I don't know how those work because I have never participated in them.

Advantages and challenges of collaboration

SR: When you started out, you had someone else working on the research with you and then you were working on it by yourself. Were you working on the same problem the whole time?

SD: Carl was working on one case of the problem while I focused on a separate case. We did have meetings together initially, especially when we were doing the background reading for the research problem. Once Carl graduated from high school and went to MIT, we started meeting separately

because I was still in PRIMES and his work was through MIT's UROP program.

SR: Can you describe the difference between working with someone else and working individually? Is it useful to do joint projects in math?

SD: It's definitely useful, especially when you are starting out. I didn't know all that much about the subject at the time, so it was useful to have other people around who could tell me if I was doing something that was just incredibly off base for whatever reason. You start out with a lot of assumptions and then you have to pare down the assumptions, but then there are other assumptions that you need to make that I wouldn't have necessarily made. Group work is pretty different, because talking to people and bouncing ideas off each other feels really different from just writing all this algebra down on scratch paper.

SR: In what ways?

SD: It's different when you're writing up on the board and somebody else can see something you wouldn't necessarily have seen. Also, it's somewhat slower because you do have to explain to other people what you were thinking a lot more often than when you are doing individual work, which is one of the difficult things. But then it's also useful because everyone has a different perspective on the project.

CALL FOR NOMINATIONS

The 2017 AWM – Joan & Joseph Birman Research Prize in Topology and Geometry

The Executive Committee of the Association for Women in Mathematics has established the AWM – Joan & Joseph Birman Research Prize in Topology and Geometry. First presented in 2015, the prize will be awarded every other year. The purpose of the award is to highlight exceptional research in topology/geometry by a woman early in her career. The field will be broadly interpreted to include topology, geometry, geometric group theory and related areas. Candidates should be women, based at US institutions who are within 10 years of receiving their PhD, or have not yet received tenure, at nomination deadline.

The AWM – Joan & Joseph Birman Research Prize in Topology and Geometry serves to highlight to the community outstanding contributions by women in the field and to advance the careers of the prize recipients. The award is made possible by a generous contribution from Joan Birman who works in low dimensional topology and her husband Joseph Birman who is a theoretical physicist.

The nomination should include: 1) a one to three page letter of nomination highlighting the exceptional contributions of the candidate; 2) a curriculum vitae of the candidate not to exceed three pages; and 3) three letters supporting the nomination (submitted independently). Nomination materials should be submitted online at MathPrograms.Org. The submission link will be available 45 days prior to the nomination deadline. Review of candidates will begin in mid-February. For full consideration, nominations should be submitted by **February 15, 2016**. If you have any questions, phone 703-934-0613 or email awm@awm-math.org.

SR: Do you find that when you write a paper it's helpful to have had that experience of trying to explain?

SD: Yes. Definitely. Writing it down is explaining to people, although there is a degree of separation between you and the people you're explaining to.

SR: Do you have a preference—if you have a choice—between working on a project by yourself or working on it with someone else?

SD: It depends. Having the mentor guiding me has been really useful. But I do prefer to work independently most of the time, simply because I think I understand my own thought processes a lot better than I understand other people's thought processes. Sometimes I have no idea where people come up with their ideas, so when it comes to what is the motivation for this idea, I have no idea—because somebody else came up with it.

SR: Let me know if I understand correctly: it sounds like although it's useful to have the experience of trying to explain to other people because that helps you when it comes time to write the paper, in the stage of idea generation it sounds like it slows you down a bit and you might prefer to do the idea generation by yourself. Maybe interacting with others after the ideas are generated might be more helpful and more efficient.

SD: That's the way I work. I know for other people it really depends on how introverted or extroverted they are. I'm a fairly introverted person so my idea generation works best internally. But there are definitely other people who generate ideas best when they are bouncing them off other people.

Why math research is rewarding

SR: Can you articulate what it is about math research that you enjoy?

SD: Well in math competitions, somebody has already solved this problem. *Many* people have already solved this problem and they have probably solved it in a simpler and better way than I am capable of. With math research, though, it's the idea that I might be the first person ever to have understood a particular concept in a novel way. If I can articulate that understanding, I am increasing the knowledge pool of the world in some sense, even if it doesn't necessarily have immediate applications to something most people consider useful. It's just interesting to push the frontiers of human knowledge.

The research problems are more difficult than math competitions but that's what makes them more interesting. They have a greater depth; there isn't just one trick like you can use to solve a lot of math competition problems. You build

on previous work but also have your own original ideas.

I haven't done math competitions since high school because I really didn't enjoy them all that much. Competition doesn't really appeal to me: I don't like having conflicts with people. In math competition, while you can sit down and do practice problems with your friends, at the end of the day you enter the competition separately and one of you will probably get a better score than the other. But I like research—while working with other people sometimes can slow you down, collaboration is definitely better than competition. With research you can sit down and work on research problems with your friends and then you go away and work on them independently. Then you come together and talk about it, and both of you learn something.

Also, I like research in math in particular because nothing stands between you and your ideas: you aren't relying on physical substances that can and will go wrong. I had an experience with science fair, growing plants, that did not go well: in all pots, most plants died, so we couldn't draw any conclusions. In math the things you're researching don't generally keel over.

SR: Did you have any experience with research before doing PRIMES?

SD: A little bit. It was more guided independent work. In middle school, Tatyana Finkelstein would do things like tell us to think about multiplying points in the plane without telling us that that the purpose was to figure out how complex numbers worked. She taught us about abstract algebra by having us consider symmetries of different shapes. It was like guided research in some ways because she would point us in a certain direction and then we worked together within the class and by ourselves until we got to this math concept. That's why I understand complex numbers well. I remember sitting down one day and painstakingly proving that when you multiply two complex numbers the angles add and the radii multiply. That was a lot of fun. When I actually learned about it in high school, I was like "The polar form of complex numbers makes a lot of sense to me now!" A lot of her students end up doing PRIMES or other programs, because she really pushes people to do interesting math.

Advice for future PRIMES students

SR: You started doing math research in the PRIMES program while you were still in the 10th grade. Do you think it's a good idea to start doing research so early? What challenges do you face in PRIMES and how did you cope with them?

SD: I think it's a good idea to figure out if you want to

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do research early, because it's a different mindset than other fields and math competitions. But, like I said, I didn't even know what linear algebra and abstract algebra were when I started doing research—I had a lot of background to catch up on. My mentor helped by emailing me some exercises to do from each chapter of the book. Doing the exercises was the important part. If I had just read the book, I don't think I would have really understood what was going on at all.

SR: Do you have any suggestions for future PRIMES students who need to learn a body of material like that?

SD: Do exercises, but not just the ones that are assigned to you by your mentor, because you never know what's going to end up being applicable to your project later. I kept having to go back at other points during the project to learn other concepts. I had to do a lot of reading during the project, so it was also very important to learn how to read math. That's

a separate skill that should be cultivated at the same time as learning the background concepts.

SR: Do you have any advice for PRIMES students for how to read math?

SD: I would start at a low level and move upwards. Textbooks are one thing, but then papers are an entirely different beast, because the papers aren't necessarily designed to teach. They're designed to tell the math community about this thing that the author found. Start with more advanced textbooks than you know and then start with papers that are written well. Papers that are not written so well should come last.

While you read, keep a scrap sheet of paper next to you, so you can write down words you don't know. Most of the math definitions on Wikipedia are correct, so if you don't know what a "module" is and you've encountered this word for the first time you should probably just look it up on Wikipedia. Also, when you're reading math, the proofs often

NSF-AWM Mentoring Travel Grants for Women

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

Mathematics Education Mentoring Grants. Women mathematicians who wish to collaborate with an educational researcher or to learn about educational research may use the mentoring grants to travel to collaborate with or be mentored by a mathematics education researcher. In order to be considered for one of the travel grants, a mathematics applicant must hold a doctorate in mathematics. A mentor should hold a doctorate in mathematics education or in a related field such as psychology or curriculum and instruction. The applicant's research must be in a field which is supported by the Division of Mathematical Sciences of the National Science Foundation.

Selection Procedure. AWM expects to award up to seven grants, in amounts up to \$5,000 each. Awardees may request to use any unexpended funds for further travel to work with the same individual during the following year. In such cases, a formal request must be submitted by the following February 1 to the selection committee or funds will be released for re-allocation. (Applicants for mentoring travel grants may in exceptional cases receive up to two such grants throughout their careers, possibly in successive years; each such grant would require a new proposal and would go through the usual competition.) For foreign travel, U.S. air carriers must be used (exceptions only per federal grant regulations; prior AWM approval required).

Eligibility and Applications. 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.

Deadline. There is one award period per year. Applications are due **February 1**.

skip algebra steps. So if you want to actually understand what's going on, it's useful to work through the algebra yourself on the scrap paper. Sometimes knowing why the algebra works out gives you a more intuitive understanding of what's going on with the theorem.

Once you're done with it, you should try to summarize what you think you've learned, so that you can make sure that you figured it out. If you can't summarize it, then you should probably read it again.

SR: Once you're done with the background reading and are doing the research, do you have any strategies for idea generation that you would suggest to other PRIMES students?

SD: I read as much of the previous work that I can find—both work I have done and that other people have done—and I look for cases that are similar to see if I can generalize. I ask people who know more about the subject than I do when it's necessary. It helps to break the problem into smaller parts. If you're trying to prove something that's huge, just focus on a case like $n = 3$ first and see if that's slightly easier to deal with. Then try $n = 4$. If there's a big similarity between those cases, then you can probably generalize it.

SR: Do you have other advice for PRIMES students?

SD: You should know that you are going to be dedicating a lot of time to this project, and even time that you're not really aware of dedicating. I spent a lot of time thinking about the project when I was doing other things: when I was eating, or when I was in the shower. If that's happening, it's definitely a good thing, because it means that you're really working on it. You should want to think about the project—if not, you should probably try spending more time working on it. If the project is just not interesting to you then you should maybe talk to your mentor about why it's not interesting to you at this time and how to move forward. I was interested in my project all the way through because there was just so much information to take in. It was a lot of fun.

SR: You were doing this at the same time as doing all of your regular high school classes?

SD: Yes. I was doing regular high school classes the whole time. Then I took some classes with Harvard Extension because, after calculus, my high school didn't offer any other math courses. The project was useful when I got around to taking linear algebra as a class: I already knew a lot of things, but not everything, obviously.

Being a woman in mathematics

SR: The Schafer Prize is awarded by the Association for Women in Mathematics and it's named after one of the

Association's founding members, who contributed a great deal to women in mathematics throughout her career. Do you have any observations about your experience as a woman in PRIMES and at MIT?

SD: There were other girls doing projects in PRIMES, but most of the people I interacted with on my project were guys. I didn't really notice it when I was in PRIMES.

When I got to college, it took a little while, but eventually I did get used to being the only girl in the room a lot of the time. Most guys don't really care that you're a girl. Most of my professors I don't think really cared or noticed, or it wasn't really relevant. But then sometimes you do encounter the occasional person who will say things like "girls aren't generally good at math" and they'll remember that you're there and say "present company excepted, of course." In one way, people forgetting is a good thing and then in other ways it means they might say things without necessarily thinking about them.

I think college may not be the place where the real bottleneck of girls going into STEM happens. I think the career doesn't work for a lot of women for some reason, and neither do earlier levels, like middle school. I was the only girl on the math team in middle school a lot of the time. Gender politics in middle school are really awkward.

For me so far, being at MIT has been the best time to be a woman in math because people don't really seem to care. At MIT, girls who do math and science are treated as normal. It's unusual to be a *person* who doesn't like math or science at MIT. But not necessarily everyone in high school likes math and most of the girls in high school aren't really into math. You end up feeling lonely because there's a "bro" culture in some high school math competitions (and even in middle school). I didn't notice that culture as much in college, because I moved away from math competitions in general.

SR: Do you have any suggestions for how to encourage girls in math?

SD: It really helped that my middle school math teacher, who encouraged me in math, was a woman. Because it told me "Wow, it's actually totally normal for girls and women to be into math." Just having a peer group of other girls, and having mentors who are women who have been a success in their field, is really important. I've had two research projects since I've come to MIT and I've enjoyed both of them a lot, but I think that my research adviser who was female was able to tell me things that men just don't necessarily know about the experience of women in academia. It's

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important to have mentors and have a peer group, regardless of whether it's through an official capacity. I think it's important to support things like the Math Prize for Girls competition (that's for high school girls) and MIT's Undergraduate Society of Women in Mathematics.

Research after PRIMES

SR: How did being in PRIMES affect your thinking about the future?

SD: By the end of my first year of PRIMES, I realized that math research was what I wanted to do for a career. It was a lot more interesting than math competitions and any of the math I was doing in high school. So by the time I went to college, I already knew that eventually I wanted to get a PhD and pursue research. It helps that my dad is a professor so I have some idea what academic research looks like from an outside perspective. It always seemed to me that he really enjoyed his job. I know we're similar in temperament and I thought I'd really enjoy it too.

SR: Tell me about the research you've been doing at MIT.

SD: My first project was a continuation of what I was doing in PRIMES. I wrote up everything I had done so far as a paper with my mentor. I think that the journal is actually going to publish this paper now.

SR: Congratulations!

SD: It's pretty exciting. I might actually buy a print copy. I don't get print copies of most of my mathematics things—I usually just read them on the computer. Now I'm working on a continuation of the work, dealing with a different case. My previous mentor, Professor Etingof, is still the official supervisor for the project, but I'm now working with Yi Sun, a graduate student at MIT.

In between, for a few years, I went into an entirely different field with Professor Ronitt Rubinfeld of CSAIL, working on a project about homomorphism testing. The idea is that you want to test if a program computes a homomorphism but you don't want to have to make too

many queries to this program. We have a program-testing algorithm for which the number of queries is independent of the size of the domain. Which is interesting, because by making a constant number of queries we're able to see something about the accuracy of the program on the whole domain, because it's a homomorphism, which has the property that $f(a) + f(b) = f(a + b)$. It's a linearity test, essentially. It's pretty cool. I presented it at the Electrical Engineering and Computer Science Conference last year as a poster and we're working on writing it up into a paper now. It's been a lot of fun.

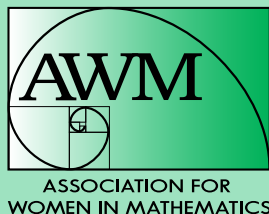
SR: Was that your first conference other than the PRIMES conferences?

SD: I also presented my PRIMES research at the 2012 Joint Math Meetings poster session in Boston. That was an experience. I think it went pretty well. Putting things together into a poster and trying to explain it to other people is useful for making sure you know what's going on. Somebody told me once that to know if you truly understand a math concept you have to explain it to someone else. The poster sessions were fun in that sense. Some of the people in the PRIMES poster session—I think they were family members of some of the other PRIMES students—didn't know what I was talking about. That happens. When I practiced my PRIMES presentation on my own family I am pretty sure they didn't know what I was talking about either. My dad was pretty happy when I did my second project in linearity testing because he's a computer scientist so he could follow along.

Closing words

SR: Thank you very much for doing this interview. Is there anything else you'd like to say to the MIT or PRIMES communities?

SD: Math is fun and a lot of people think you're weird for thinking that math is fun. That's an experience I've had a lot. But you're not weird. There are lots of other people who love math and the community is really great and supportive. So become a part of the greater math community. It's a nice place.



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Announcements

“Regional math conferences for women” is a great idea. It’s now in its eighth year.

The planned AWM Regional Conferences for Women is an exciting new program and an important step in closing the gender gap in mathematics. The purpose of this note is to let members of the Association know that one regional conference for women already exists. The Center for Women in Mathematics at Smith College has hosted WIMIN (Women In Mathematics In New England) annually since 2008.

WIMIN is not a focused research conference. It’s a one-day meeting like an undergraduate conference but much more. There are two plenary speakers, dozens of undergraduate and graduate talks, and a panel discussion by graduate students. It’s really a vertically integrated meeting. It’s an opportunity for women at all levels to meet and mentor younger women and be guided by the women who came before them. Held in September each year, it’s also a chance for colleagues to reconnect and catch up with each other.

WIMIN is open to all and there are always some talks by male undergraduates. We think the participation of men in a conference celebrating the achievements of women is important for the health of our profession.

Finally we are excited that Ami Radunskaya, who delivered one of the plenary talks at last year’s WIMIN, will coordinate the new AWM program. If readers are interested in planning a similar event, please contact us. And readers are invited to this year’s WIMIN on September 19: www.math.smith.edu/~jhenle/wimin15/

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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 in the Washington, DC area. The MMW is part of the institutes’ Mathematical Sciences Diversity Initiatives and 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, postdocs, and faculty are encouraged to attend the workshop. For more information, please see www.msri.org/e/MMW2015.

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University of California Davis

REGISTRATION INFORMATION

www.math.unl.edu/~ncuwm/
18thAnnual

Registration opens Oct. 1, 2015,
and closes when capacity is reached.

For undergraduate participants, most local expenses are covered
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ICERM



The Institute for Computational and Experimental
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APPLY TO BECOME AN ICERM POSTDOC

*The Institute for Computational and Experimental
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Postdoctoral Institute Fellows: ICERM funds two
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Applicants must have completed their Ph.D.
within three years of the start of the appointment.
Documentation of completion of all requirements for
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For full consideration: applicants must submit an
AMS Standard Cover Sheet, curriculum vitae (including
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More details can be found at:
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BROWN UNIVERSITY — MATHEMATICS DEPARTMENT — J. D. Tamarkin Assistant Professorships: One or more three-year non-tenured non-renewable appointments, beginning July 1, 2016. The teaching load is one course one semester, and two courses the other semester and consists of courses of more than routine interest. Candidates are required to have received a Ph.D. degree or equivalent by the start of their appointment, and they may have up to three years of prior academic and/or postdoctoral research experience. Applicants should have strong research potential and a commitment to teaching. Field of research should be consonant with the current research interests of the department. For full consideration, applicants must submit a curriculum vitae, an AMS Standard Cover Sheet and three letters of recommendation by **December 1, 2015**. Applicants are encouraged to identify Brown faculty with similar research interests. Please submit all application materials on line at <http://www.mathjobs.org>. Email inquiries should be addressed to juniorsrch@math.brown.edu. Brown University is committed to fostering a diverse and inclusive academic global community; as an EEO/AA employer, Brown considers applicants for employment without regard to, and does not discriminate on the basis of, gender, race, protected veteran status, disability, or any other legally protected status.

DAVIDSON COLLEGE — Visiting Assistant Professor — The Department of Mathematics and Computer Science at Davidson College invites applications for a two-year teaching postdoctoral position at the Visiting Assistant Professor level to begin August 1, 2016. Completion or imminent completion of the Ph.D. in Mathematics or closely related field is required. Candidates must be committed to outstanding teaching and continuing scholarly activity. In turn, the department is committed to mentoring the candidate in all aspects of a career at a liberal arts college. We seek candidates whose teaching and research interests complement or expand upon areas of expertise within the department. The teaching load is 4 semester courses per year. Davidson is strongly committed to achieving excellence and cultural diversity and welcomes applications from women, members of minority groups, and others who would bring additional dimensions to the college's mission. Consistently ranked among the nation's top liberal arts colleges, Davidson College is a highly selective, independent liberal arts college located in Davidson, North Carolina, close to the city of Charlotte. Davidson faculty enjoy a low student-faculty ratio, emphasis on and appreciation of excellence in teaching, and a collegial, respectful atmosphere that honors academic achievement and integrity. See www.davidson.edu/math for further information and <https://jobs.davidson.edu> to apply. The deadline for completed applications is **November 30, 2015**.

INSTITUTE FOR ADVANCED STUDY — School of Mathematics, Princeton, NJ — The School of Mathematics at the Institute for Advanced Study has a limited number of memberships with financial support for research during the 2016-17 academic year. The School frequently sponsors special programs. However, these programs comprise no more than one-third of the memberships so that each year a wide range of mathematics is supported. Candidates must give evidence of ability in research comparable at least with that expected for the Ph.D. degree, but otherwise can be at any career stage. Successful candidates will be free to devote themselves full time to research. About half of our members will be postdoctoral researchers within 5 years of their Ph.D. We expect to offer some two-year postdoctoral positions. Up to 8 von Neumann Fellowships will be available for each academic year. To be eligible for the von Neumann Fellowships, applications should be at least 5, but no more than 15 years following the receipt of their Ph.D. The Veblen Research Instructorship is a three-year position in partnership with the department of Mathematics at Princeton University. Three-year instructorships will be offered each year to candidates in pure and applied mathematics who have received their Ph.D. within the last 3 years. Usually the first and third year of the instructorship will be spent at Princeton University and will carry regular teaching responsibilities. The second year is spent at the Institute and dedicated to independent research of the instructor's choice. Candidates interested in a Veblen instructorship position may apply directly at the IAS website <https://application.ias.edu> or they may apply through MathJobs. If they apply at MathJobs, they must also complete the application form at <https://applications.ias.edu> but do not need to submit a second set of reference letters. Questions about the application procedure should be addressed to applications@math.ias.edu. In addition, there are also two-year postdoctoral positions in computer science and discrete mathematics offered jointly with the following institutions: The Department of Computer Science at Princeton University, <http://www.cs.princeton.edu>, DIMACS at Rutgers, The State University of New Jersey, <http://www.dimacs.rutgers.edu> and the Simons Foundation Collaboration on Algorithms and Geometry, <https://www.simonsfoundation.org/mathematics-and-physical-science/algorithms-and-geometry-collaboration/> School term dates for 2016-17 academic year are: term I, Monday September 19 to December 16, 2016; term II, Monday January 16, 2017, to Friday, April 14, 2017. During the 2016-17 academic year, the School will have a special program on Homological Mirror Symmetry, and Paul Seidel from MIT will be the Distinguished Visiting Professor. Maxim Kontsevich from IHES will be attending the program for one month during each of the fall and spring terms (from mid-October to mid-November) and for the month of February. Denis Auroux from UC Berkeley will be attending for term II. Homological Mirror Symmetry (HMS) was initiated by Kontsevich. It benefits from a close relation with string theory and has developed into a powerful and versatile idea. During the program, we will consider the core conjectures of HMS and its role as a framework within which wider questions from mirror symmetry and other parts of mathematics can be studied. This is still a developing subject, and the program is open to a variety of approaches and viewpoints. The intention is that the fall term will have a greater focus on the core building blocks of HMS as currently understood: the A-model theory (Lagrangian submanifolds, holomorphic curves and their generalizations), the B-model theory (derived categories in algebraic geometry) and mathematical interpretations of the Strominger-Yau-Zaslow approach, including the Gross-Siebert program. Specific questions of interest include: the role of singular Lagrangian submanifolds (such as Lagrangian skeleta); the effect of instanton corrections on the construction of mirror manifolds; and the structure of wrapped Fukaya categories. We will also consider the interplay between the various algebraic notions that appear in HMS. The second term would widen the focus, allowing space for emerging interactions between HMS and other areas. Examples are the theory of Special Lagrangian submanifolds, tropical geometry and non-archimedean analytic geometry, as well as sheaf-theoretic methods. We also intend to look at applications of ideas from homological mirror symmetry to specific classes of manifolds, such as complex symplectic manifolds and cluster varieties. There will be two workshops during the special program. The term I workshop "homological mirror symmetry: methods and structures," will be held November 7-11, 2016. The term II workshop, "homological mirror symmetry: emerging developments and applications", will be held March 13-17, 2017.

NORTHWESTERN UNIVERSITY — Assistant Professor of Instruction Northwestern University's Department of Mathematics invites applications for a full-time, benefits-eligible, non-tenure eligible faculty appointment as Assistant Professor of Instruction, beginning September 1, 2016. Duties include teaching six quarter-long courses per academic year at all levels of the undergraduate program. Minimum qualifications include Ph.D. in Mathematics, which must be conferred by September 1, 2016. Preference will be given to candidates who have demonstrated excellence, breadth, and innovation in teaching. Applications should be made electronically at www.mathjobs.org and should include (1) the American Mathematical Society Cover Sheet for Academic Employment, (2) a curriculum vitae, (3) a teaching statement, (4) a statement of mathematical interests, and (5) four letters of recommendation, at least two of which discuss the candidate's teaching qualifications in depth. Inquiries may be sent to: hiring@math.northwestern.edu. Review of application materials will begin on **November 1, 2015** and will continue until the position is filled. Northwestern University is an Equal Opportunity, Affirmative Action Employer of all protected classes including veterans and individuals with disabilities. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States.

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NORTHWESTERN UNIVERSITY — Boas Assistant Professor — Applications are invited for Boas Assistant Professorships at Northwestern University.

The Boas Assistant Professorships are three-year, full-time, non-tenure-track positions beginning September 1, 2016, with a teaching load of four quarter courses per year. Applications are invited from qualified mathematicians in all fields. Candidates should have met all requirements for a Ph.D. by September 1, 2016. Applications should be made electronically at www.mathjobs.org and should include (1) the American Mathematical Society Cover Sheet for Academic Employment, (2) a curriculum vitae, (3) a research statement, and (4) four letters of recommendation, one of which discusses the candidate's teaching qualifications. Inquiries may be sent to: boas@math.northwestern.edu The review process starts **December 1, 2015**; applications arriving after this date will also receive consideration. Northwestern University is an Equal Opportunity, Affirmative Action Employer of all protected classes including veterans and individuals with disabilities. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States.

NORTHWESTERN UNIVERSITY — Lectureships Applications are solicited for a 3 year lectureship starting September 1, 2016. This is a non-tenure track, full-time position with a teaching load of six quarter courses per year. We invite applications from qualified mathematicians in all fields and the primary criterion for selection is teaching excellence. Preference will be given to those candidates whose teaching and research interests are compatible with current faculty. Candidates should have met all requirements for a Ph.D. by September 1, 2016. Applications should be made electronically at www.mathjobs.org and should include (1) the American Mathematical Society Cover Sheet for Academic Employment, (2) a curriculum vitae, (3) a research statement, (4) a teaching statement, and (5) four letters of recommendation, one of which discusses the candidate's teaching qualifications. Inquiries may be sent to: boas@math.northwestern.edu. Review of application materials will begin on **November 1, 2015** and will continue until the position is filled. Northwestern University is an Equal Opportunity, Affirmative Action Employer of all protected classes including veterans and individuals with disabilities. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States.

NORTHWESTERN UNIVERSITY — RTG Postdoctoral Fellowships in Analysis Applications are invited for RTG Postdoctoral Fellowships in Analysis at Northwestern University, in conjunction with the Mathematics Department's NSF Research Training Groups grant in Analysis on Manifolds. The RTG Postdoctoral Fellowships are three-year, full-time, non-tenure-track positions beginning September 1, 2016, with a teaching load of three quarter courses per year. Candidates should have met all requirements for a Ph.D. by September 1, 2016 but should be within two years of Ph.D. as of January 1, 2016. Only US Citizens and Permanent Residents are eligible for these positions. Candidates are invited in all areas of analysis. Applications should be made electronically at www.mathjobs.org and should include (1) the American Mathematical Society Cover Sheet for Academic Employment, (2) a curriculum vitae, (3) a research statement, and (4) four letters of recommendation, one of which discusses the candidate's teaching qualifications. Inquiries may be sent to: boas@math.northwestern.edu The review process starts **December 1, 2015**; applications arriving after this date will also receive consideration. Northwestern University is an Equal Opportunity, Affirmative Action Employer of all protected classes including veterans and individuals with disabilities. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States.

NORTHWESTERN UNIVERSITY — Tenure and Tenure-track Positions — Applications are invited for Tenured and Tenure-track positions starting in September 1, 2016. Priority will be given to exceptionally promising research mathematicians. We invite applications from qualified mathematicians in all fields. Applications should be made electronically at www.mathjobs.org and should include (1) the American Mathematical Society Cover Sheet for Academic Employment, (2) a curriculum vitae, (3) a research statement, and (4) four letters of recommendation, one of which discusses the candidate's teaching qualifications. Inquiries may be sent to: tenure@math.northwestern.edu. The review process starts **November 1, 2015**; applications arriving after this date may also receive consideration. Northwestern University is an Equal Opportunity, Affirmative Action Employer of all protected classes including veterans and individuals with disabilities. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States.

REED COLLEGE — Tenure-Track Assistant Professorship in Mathematics — The Reed College Mathematics Department invites applications for a tenure-track assistant professorship in mathematics, to begin in Fall 2016. Applicants should have a Ph.D. in mathematics with specialization in analysis or applied mathematics, broadly construed, and be committed to excellence in teaching and scholarship. Reed is a distinguished liberal arts college with 1400 students that offers a demanding academic program to bright and dedicated undergraduates. The successful candidate is expected to teach the equivalent of five semester courses per year and to supervise senior theses (required of all students). Further information about the position can be found at <http://www.reed.edu/mathsearch>. Applications must be submitted through the MathJobs.org website at <http://www.mathjobs.org/jobs/Reed>, and should include a cover letter, curriculum vitae, teaching statement, research statement, and three letters of recommendation. The cover letter should address how the applicant's teaching and scholarship are suited to the liberal arts college environment. Applications will be accepted until the position is filled, but they should be received by **25 November 2015** to guarantee full consideration. Reed community believes that cultural diversity is essential to the excellence of our academic program. All applicants are invited to address how their teaching, scholarship, mentoring, community service, or other activities could support Reed's commitment to diversity and inclusion (<http://www.reed.edu/diversity/>). An equal opportunity employer, Reed College encourages applications from members of underrepresented groups. Any questions may be directed to the chair of the search committee, Irena Swanson, iswanson@reed.edu.

UNIVERSITY OF CALIFORNIA, IRVINE — Department of Mathematics — Irvine, CA 92697-3875-Job #02900 — Visiting Assistant Professor in Mathematics — Applications are invited for Visiting Assistant Professors, renewable up to three years, in all areas of mathematics. VAPs teach no more than five quarter classes per year. Strong promise in research and teaching is required. Appointments will be effective July 1, 2016, or later. A Ph.D. degree is required. Completed applications must be submitted through <http://www.mathjobs.org> and must contain: (1) AMS cover sheet. Indicate your area of mathematical specialization. (2) Cover letter (3) CV (4) Research statement (5) Teaching statement (6) Selected reprints and/or preprints (7) At least three reference letters (at least one addressing teaching) sent electronically through www.mathjobs.org. Please reference job #02900 in the subject line of all correspondence. Applications are welcome at any time. The review process starts **November 1, 2015**, and will continue until positions are filled. The University of California, Irvine is an Equal Opportunity/Affirmative Action Employer advancing inclusive excellence. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age, protected veteran status, or other protected categories covered by the UC nondiscrimination policy.

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UNIVERSITY OF CALIFORNIA, IRVINE — Department of Mathematics — Irvine, CA 92697-3875- Job # 02907– Assistant Professor positions in Mathematics. The Department of Mathematics at the University of California, Irvine, is seeking outstanding candidates to fill one or more tenure-track positions to start July 1, 2016. Applicants must hold a Ph.D. and should have demonstrated excellence in research and teaching. We encourage applications from any area in pure and applied mathematics. Applications are welcome at any time. The review process starts **November 1, 2015**, and will continue until the positions are filled. A separate statement that addresses past and/or potential contributions to diversity, equity and inclusion should also be included in the application materials. The University of California, Irvine is an Equal Opportunity/Affirmative Action Employer advancing inclusive excellence. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age, protected veteran status, or other protected categories covered by the UC nondiscrimination policy. Completed applications must be submitted through www.mathjobs.org and must contain: (1) AMS cover sheet (2) Curriculum Vitae (3) Cover letter (4) Research statement (5) Teaching statement (6) Selected reprints and/or preprints (7) At least three reference letters (at least one addressing teaching) sent electronically through www.mathjobs.org (8) Statement of Diversity- A brief statement that addresses past and/or potential contributions to diversity, equity and inclusion (optional). Instructions for the electronic application process can be found at <http://www.mathjobs.org>. Indicate your area of mathematical specialization in field labeled “Area of Specialization” – example: “Algebra.”

UNIVERSITY OF NEBRASKA — LINCOLN — Faculty Positions, Department of Mathematics — The Department of Mathematics at the University of Nebraska-Lincoln invites applications for the following positions: (1) **Milton Mohr Professor of Mathematics**, at the Associate Professor or Full Professor level. Review of applications will begin **December 15, 2015** and continue until a suitable candidate (or candidates) is found. (2) **Two Tenure-Track Assistant Professor** positions in Mathematics. Review of applications will begin **November 13, 2015** and continue until suitable candidates are found. Each of these positions begins August 2016. For more information about these positions and information on how to apply for them, please go to: <http://www.math.unl.edu/departments/jobs/>. The University of Nebraska is committed to a pluralistic campus community through affirmative action, equal opportunity, work-life balance and dual careers.

UNIVERSITY OF PENNSYLVANIA — Tenure-Track Position in Mathematics —The Department of Mathematics invites applications for one tenure-track Assistant Professor position. We are especially looking for mathematicians whose work relates to geometry. Responsibilities include teaching undergraduate and graduate courses in Mathematics and conducting research in the field. Ph.D. in Mathematics is required. Applications should be submitted online through www.mathjobs.org and include the following items: cover letter, curriculum vitae, research statement, teaching statement, a publication list, and at least 3 reference letters from mathematicians familiar with your work (one of these should comment on your teaching ability). Review of applications will begin **November 1, 2015** and will continue until the position is filled. It is anticipated that the position will start July 1, 2016. The Department of Mathematics is strongly committed to Penn's Action Plan for Faculty Diversity and Excellence and to establishing a more diverse faculty (for more information see: <http://www.upenn.edu/almanac/volumes/v58/n02/diversityplan.html>). The University of Pennsylvania is an EOE. Minorities/Women/Individuals with disabilities/Protected Veterans are encouraged to apply.

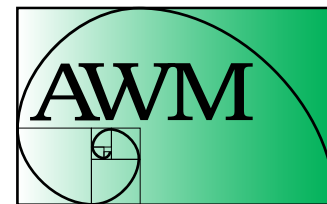
WILLIAMS COLLEGE — The Department of Mathematics and Statistics invites applications for two tenure-track positions in statistics, beginning fall 2016, at the rank of assistant professor (in an exceptional case, a more advanced appointment may be considered). We are seeking highly qualified candidates who have demonstrated excellence in teaching and research and who are committed to working with an increasingly diverse student body. The candidates will become the fourth and fifth tenure-track statisticians in the department, joining a vibrant and active statistics group with a newly established statistics major. The teaching load is two courses per 12-week semester and a winter term course every other January. In addition to excellence in teaching, an active and successful research program is expected. The candidate should have a Ph.D. by the time of appointment. We welcome applications from members of groups traditionally underrepresented in the field. Candidates may apply via interfolio.com by uploading their vita and having three letters of recommendation on teaching and research uploaded to <http://apply.interfolio.com/30206>. Teaching and research statements are also welcome. Evaluations of applications will begin on or after November 15 and will continue until the position is filled. All offers of employment are contingent upon completion of a background check. Further information is available upon request. For more information on the Department of Mathematics and Statistics, visit <http://math.williams.edu/>. Williams College is a coeducational liberal arts institution located in the Berkshire Hills of western Massachusetts. The college has built its reputation on outstanding teaching and scholarship and on the academic excellence of its approximately 2,000 students. Please visit the Williams College website (<http://www.williams.edu>). Beyond meeting fully its legal obligations for non-discrimination, Williams College is committed to building a diverse and inclusive community where members from all backgrounds can live, learn, and thrive.

WILLIAMS COLLEGE — The Williams College Department of Mathematics and Statistics invites applications for two full-time visiting positions in mathematics for the 2016-2017 year. The teaching load is four courses. Preference will be given to candidates who will have a Ph.D. in mathematics by September 2016. Applicants can apply electronically at <http://mathjobs.org>. Evaluations of applications will begin on or after **November 15** and will continue until the position is filled. All offers of employment are contingent upon completion of a background check <http://dean-faculty.williams.edu/prospective-faculty/background-check-policy>. For more information on the Department of Mathematics and Statistics, visit <http://math.williams.edu/>. Williams College is a coeducational liberal arts institution located in the Berkshire Hills of western Massachusetts. The college has built its reputation on outstanding teaching and scholarship and on the academic excellence of its approximately 2,000 students. Please visit the Williams College website (<http://www.williams.edu>). Beyond meeting fully its legal obligations for non-discrimination, Williams College is committed to building a diverse and inclusive community where members from all backgrounds can live, learn, and thrive.

YALE UNIVERSITY — J. WILLARD GIBBS ASSISTANT PROFESSORSHIPS IN MATHEMATICS — 2016-17 — The Gibbs Assistant Professorships are intended primarily for men and women who received the Ph.D. degree and show definite promise in research in pure or applied mathematics. Appointments are for three years. The salary will be at least \$77,000. Each recipient of a Gibbs Assistant Professorship will be given a moving allowance based on the distance to be moved. The teaching load for Gibbs Assistant Professors will be kept light, so as to allow ample time for research. This will consist of three one-semester courses per year. Part of the duties may consist of a one-semester course at the graduate level in the general area of the instructor's research. Yale is an Affirmative Action/Equal Opportunity Employer. Qualified women and persons with disabilities, protected veterans, and members of minority groups are encouraged to apply. Review of applications will begin immediately with an application deadline of **November 30, 2015**. Submit applications and supporting material through MathJobs.org. Submit inquiries to math.positions@yale.edu. Offers expected to be made in early February 2016.

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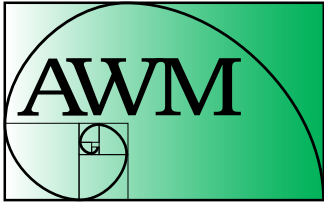
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