ASSOCIATION FOR WOMEN IN MATHEMATICS

Newsletter

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The purpose of the Association for Women in Mathematics is

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

IN THIS ISSUE

PRESIDENT'S REPORT

As I start to write my first President's Report for AWM, I am filled with regret that I will no longer be reading Ruth's delightful President's Reports at the beginning of each issue of the AWM newsletter. So it seems appropriate to begin by reflecting on how much Ruth Charney has done for the organization as AWM President over the last two years. Under Ruth's leadership and thanks to much hard work on her part, the AWM has been awarded numerous federal grants to support our biannual research symposia and the research workshops at the Joint Math Meetings and the SIAM Annual Meeting. The AWM has awarded new research prizes for women, has launched a new publication series with Springer to publish proceedings volumes of research papers from the Research Collaboration Conferences for Women, and has a new Corporate Sponsorship program to encourage support for our mission from the private sector. The AWM has firmly established a new signature event, the biannual AWM Research Symposia, with the 2013 Santa Clara meeting and the upcoming 2015 University of Maryland conference, both co-organized by Ruth. The AWM Advisory Board and the AWM Financial Taskforce have been launched and are functioning well. This is just to mention a few of the many successful initiatives and ongoing programs. All in all, an impressive set of accomplishments in just two years' time! When asked, "What is new with the AWM recently?" I am proud to respond with any subset of these achievements and new programs to indicate the progress and direction of the organization towards supporting careers for women in mathematics today, and much of this is due to Ruth's leadership over the last two years. So a big "Thank you!" to you, Ruth, for your service and I look forward to continuing to work with you over the next year in your role as Past-President.

AWM at JMM. While the snapshot I have just given of some of AWM's programs and accomplishments over the last two years gives one picture of the organization, another insight comes from admiring the AWM's presence and tradition at the annual Joint Math Meetings last week in San Antonio. The first day is full of AWM events, from the Executive Committee Meeting to the AWM Panel Discussion to the Business Meeting and culminating in the evening reception.

The Executive Committee Meeting included a robust discussion of diversity issues and directions for the organization. The AWM Panel, "Breaking the Glass Ceiling Permanently," was moderated by **Christina Sormani** and included panelists **Estela Gavosto**, **Susan Hermiller**, **Megan Kerr**, **Joan Leitzel**, **Maura Mast**, and **Marie Vitulli**.

The AWM Reception and Awards Presentation was a celebratory event with excellent attendance from the broad mathematical community. The Inaugural

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ASSOCIATION FOR WOMEN IN MATHEMATICS

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

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

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

Circulation: 3500.

PRESIDENT'S REPORT *continued from page 1*

AWM–Joan & Joseph Birman Research Prize in Topology and Geometry was awarded to **J. Elisenda Grigsby**. The AWM Service Awards were presented to **Kathryn Leonard**, **Elebeoba E. May**, **Irina Mitrea**, and **Christina Sormani**. The *25th Annual Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman* was awarded to **Sheela Devadas**, along with Runner-up **Samantha Petti** and Honorable Mention **Madeline Brandt**. (See the full JMM report on pages 4–15.) In addition to being festive and inclusive, the reception serves to highlight the activities of AWM and the accomplishments of female mathematicians, and extra visibility for AWM was provided this year in the JMM blog post written by AMS Media Fellow **Anna Haensch**, including pictures and fun comments from the event.

The second day of AWM activities at JMM kicked off with the 36th annual AWM-AMS Noether Lecture by **Wen-Ching Winnie Li** on "Modular Forms for Congruence and Noncongruence Subgroups." The Noether Lecturer also co-organized, with **Tong Liu** and **Ling Long**, a related AMS-AWM Special Session on Algebraic Number Theory, which took place on the fourth day.

The AWM has a significant presence at the Joint Prize Session, where Ruth Charney presented the *25th Annual Louise Hay Award for Contributions to Mathematics Education* to **T. Christine Stevens**, the *5th Annual M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics* to **Ruth Haas**, and the Alice T. Schafer Prize. In addition, AWM congratulates **Hee Oh**, of Yale University, who was awarded the AMS Ruth Lyttle Satter Prize in Mathematics.

The third and fourth days' activities focused on the AWM Workshop. The workshop consists of a poster session and reception on the evening of the third day and a full-day workshop on a focused research area on the fourth day. This year, the poster session was organized by **Gizem Karaali**, **Lerna Pehlivan**, and **Brooke Shipley**; 19 graduate students presented their research, and for the second year, prizes were given for the best posters. This competition was judged by volunteers and coordinated with the NSF Research Institutes by Sylvia Wiegand, so that the winners are offered prizes which could significantly help their careers: an invitation to participate in a week-long workshop at one of the institutes! The winners were announced at the Workshop Mentoring Lunch the next day, and this year's winners were: Sarah Yeakel (general institute prize), Arezou Ghesmati (MBI prize), and Anisah Nu'Man (honorable mention).

The AWM Workshop on Homotopy Theory was organized by **Maria Basterra**, **Brenda Johnson**, and **Brooke Shipley** and featured 10 research talks by invited speakers and recent PhDs. The invited speakers included some of the leading researchers in the field, and the organizers and more senior women were paired with younger women for the mentoring activities, including the lunch. Students at the lunch commented on the coherence of the workshop and the supportive and community-building atmosphere. This workshop was in part a follow-up to Women In Topology (WIT), a Research Collaboration Conference for Women which took place at Banff International Research Station in August 2013. It was an excellent example of the new AWM Workshop format, serving as a reunion for female researchers in a focused area of mathematics. The workshops not only follow up on and showcase results from research collaboration conferences for women, but also include independent research, welcome newcomers

and provide valuable time for networking. Thanks to all the workshop organizers and volunteers and participants for making it a great success!

Web Editor. After a search led by **Marie Vitulli** and **Bettye Anne Case**, we are very pleased to announce that the AWM has a new Web Editor, **Adriana Salerno**, whose term starts February 1. Adriana was introduced at the Executive Committee Meeting and a few EC members volunteered to help her with brainstorming about the online presence for the organization. *Suggestions are welcome!*

AWM Regional Conferences Coordinator. We are very pleased that **Ami Radunskaya** has accepted this new position, and I want to encourage everyone to think about organizing local conferences in their area and to coordinate with AWM through Ami. Such conferences can be a great way to build community for women in mathematics and can help to support both faculty in their careers and students with networking and job prospects. We particularly hope to create connections with local industry and government through these conferences, to gain support for our programs and to connect students with rewarding career paths in mathematics. We are also seeking to establish cooperation with MAA to participate more actively in Sectional MAA Meetings as part of this effort.

AWM Research Symposium. Registration is open for the upcoming Symposium at the University of Maryland, April 11–12. Please register and join us if you can, for an exciting scientific program with four plenary talks, 14 special sessions on a broad range of research in pure and applied mathematics, and a poster session for graduate students and recent PhDs. The social program will include a networking event with a jobs panel and a banquet with a special guest who will help to present the inaugural AWM Presidential Award to **Sylvia Bozeman** and **Rhonda Hughes**.

A Final Word. The annual fundraising campaign was extremely successful, thanks in large part to the $5,000 matching gift provided by an anonymous donor and to the generous contributions of many of you. Thank you to all who donate their time and their money to support AWM and its programs. Over the years, AWM has built a remarkable community of women (and men) helping other women in mathematics, and improving our profession and society in the process. So congratulations to all who engage in this worthwhile endeavor, and hopefully you all find it even half as rewarding as I do!

Kristin Lauter
La Jolla, CA
January 24, 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.

Sponsorship Levels

α **Circle:** $5000+
β **Circle:** $2500–$4999
γ **Circle:** $1000–$2499

Corporate Sponsorship
See the AWM website for details.

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

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AWM DEADLINES

AWM Louise Hay Award:
April 30, 2015

AWM M. Gweneth Humphreys Award:
April 30, 2015

AWM Travel Grants:
May 1, 2015 and October 1, 2015

AWM Workshop at JMM:
August 15, 2015

AWM-MAA Falconer Lecturer:
September 1, 2015

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AWM at the San Antonio JMM

AWM-AMS NOETHER LECTURE

The 2015 Noether Lecture, "Modular Forms for Congruence and Noncongruence Subgroups," was delivered by Wen-Ching Winnie Li, Pennsylvania State University. She was introduced by Ruth Charney, Brandeis University.

Abstract: The arithmetic of modular forms for congruence subgroups of SL(2, Z) has been a central theme in number theory for over a century. It has close connections with many branches of mathematics. Wiles's proof of Fermat's Last Theorem has brought the field to a new climax. The arithmetic of modular forms for noncongruence subgroups, on the other hand, has not attracted much attention in the past. However, the research in this area has been reinvigorated in the past decade.

This talk is an overview of the progress on modular forms for both congruence and noncongruence subgroups as well as the connections between these two kinds of forms.

Citation for Wen-Ching Winnie Li

Wen-Ching Winnie Li is a Distinguished Professor of Mathematics at Pennsylvania State University. She has been selected as the 2015 AWM-AMS Noether Lecturer for her work in number theory, which is impressive for its depth, the connections it makes between different areas of mathematics, and its continuing influence.

Li received her BS degree from National Taiwan University and her PhD from the University of California at Berkeley. Before joining the Penn State faculty in 1979, she was an assistant professor at the University of Illinois at Chicago, a member of the Institute for Advanced Study in New Jersey, and a Benjamin Peirce Assistant Professor at Harvard University.

Li's research focuses on number theory, in particular modular forms and automorphic forms, as well as broad applications to coding theory and spectral graph theory. She has more than 100 publications and has authored two books. Li's thesis work on the "new" space of modular forms based on the renowned work of Atkin-Lehner was cited in Andrew Wiles' proof of Fermat's Last Theorem. Li studies the rich interplay between combinatorics, group theory, and number theory through associated zeta functions. In particular, she has applied her research results in automorphic forms and number theory to construct efficient communication networks called Ramanujan graphs and Ramanujan complexes. In recent years, she has done important work on the arithmetic of modular forms for noncongruence subgroups, which revitalized the field.

In addition to her position at Penn State, Li serves as Director of Taiwan's National Center of Theoretical Sciences. Previous honors and awards include a Sloan Foundation Fellowship in 1981 and the 2010 Chern Prize in Mathematics, awarded by the International Congress of Chinese Mathematicians for her outstanding contributions to mathematics. She was named a Fellow of the American Mathematical Society in 2013. Li has held numerous visiting professorships at universities in the United States and throughout Europe and Asia.

Wen-Ching Winnie Li and Ruth Charney

Li has always been seriously involved in activities to promote the advancement of women in mathematics. In particular, she was a mentor for the mentoring program for women at the Institute for Advanced Studies in 1999 and for the Banff International Research Station (BIRS) workshop on Women in Numbers in 2008. She was the Distinguished Women in Mathematics Lecturer at UT Austin in 2011.

AWM PRIZES

Louise Hay Award for Contributions to Mathematics Education

In 1990 AWM established the annual Louise Hay Award to recognize outstanding achievements and contributions in any area of mathematics education. While Louise Hay was widely recognized for her contributions to mathematical logic and for her strong leadership of her department, her devotion to students and her lifelong commitment to nurturing the talent of young women and men secured her reputation as a consummate educator. The annual presentation of this award is intended to highlight the importance of mathematics education and to evoke the memory of all that Hay exemplified as a teacher, scholar, administrator, and human being.

Citation for T. Christine Stevens

The 2015 Louise Hay Award is presented to **T. Christine Stevens**, Professor Emerita of Mathematics and Computer Science at Saint Louis University and Associate Executive Director of the Meetings Professional Services Division of the AMS, in recognition of her outstanding contributions to the teaching and learning of mathematics. Christine Stevens received her PhD from Harvard University under the direction of Andrew Gleason. She was co-founder and co-director, with James R. C. Leitzel, of Project NExT, a professional development program of the MAA for faculty in their first two years of full-time teaching. She was the sole director of Project NExT during 1998–2009, gradually adding recent Project NExT Fellows and others to the leadership team. More than 1000 new faculty members participated in Project NExT under her leadership, about half of them women. Approximately 500 other faculty have been involved with Project NExT as consultants and workshop presenters. Many Fellows have gone on to win teaching awards of their own, often citing Project NExT as a factor in their success.

Her contributions to mathematics education are manifold. She has impacted national science policy through her service as an AMS/MAA/SIAM Congressional Science Fellow, her chairing of the MAA's Science Policy Committee, and her service on the SIAM Science Policy Committee. She was an Associate Program Director for the Teacher Enhancement Program at NSF. She has been a strong advocate for

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Christine Stevens and Ruth Charney

expanding opportunities for underrepresented groups as a member of the MAA Committee on Minority Participation in Mathematics and on many other committees.

Response from Stevens

It is somewhat embarrassing to admit that I do not remember when I first joined the Association for Women in Mathematics. What I do clearly recall is the vital role that AWM played for me when I first started attending the Joint Mathematics Meetings, where it sponsored outstanding lectures and provided inspiration, encouragement, and interesting company for women mathematicians. Little did I expect that, thirty-five years later, I would be receiving an award from the very organization that had so greatly impressed me at the outset of my career. It is an immense honor for me to join the list of eminent mathematicians and mathematics educators who have received the Louise Hay Award.

I am grateful to the AWM for this award and to those who worked with me in shaping Project NExT: Jim Leitzel, Joe Gallian, Aparna Higgins, Judith Covington, and Gavin LaRose. It is a special treat to be recognized for doing work that was, in fact, a lot of fun. Most of all, I am grateful to the Project NExT Fellows, whose dedication to mathematical research and education not only mirrors the interests of Louise Hay, but also fills me with optimism about the future of our profession.

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

The award is named for M. Gweneth Humphreys (1911–2006). Professor Humphreys graduated with honors in mathematics from the University of British Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her PhD at age 23 from the University of Chicago in 1935. She taught mathematics to women for her entire career, first at Mount St. Scholastica College, then for several years at Sophie Newcomb College, and finally for over thirty years at Randolph-Macon Woman's College. This award, funded by contributions from her former students and colleagues at Randolph-Macon Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

Citation for Ruth Haas

The Association for Women in Mathematics is pleased to present its fifth annual M. Gweneth Humphreys Award to Professor **Ruth Haas** of the Department of Mathematics at Smith College.

Dr. Haas has been a driving force in the strong and vibrant mathematics community at Smith College. She has nurtured and supported a generation of women mathematics students at Smith. An impressive alumnae body attests enthusiastically to the crucial role Haas played in their decision to major in mathematics, attend graduate school,

CALL FOR NOMINATIONS

The 2016 Etta Z. Falconer Lecture

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

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

The letter of nomination should include an outline of the nominee's distinguished contributions to the mathematical sciences or mathematics education and address the nominee's capability of delivering an expository lecture. Nominations are to be submitted as ONE PDF file via MathPrograms.Org. The submission link will be available 45 days prior to the deadline. Nominations must be submitted by **September 1, 2015** and will be held active for two years. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

Ruth Haas and Ruth Charney

and ultimately pursue careers in the mathematical sciences. Former students praise her unwavering support as they move on from Smith, pursue their careers, and face both personal and academic setbacks. Haas was instrumental in establishing the Center for Women in Mathematics and the highly successful post-baccalaureate program at Smith. There is a constellation of other academic and community-building initiatives developed and supported by Haas, including a highly effective undergraduate research course, the annual WIMIN conference (Women In Mathematics In New England), a program for junior visitors, a high school outreach program, and weekly seminars.

The importance of Haas's contributions to Smith and to the mathematics community in general is best understood by the following extraordinary statement from her nomination letter: "Of the U.S. citizen women earning doctorates in mathematics in 2013 from the top 100 graduate schools in America, 6% were mentored by Ruth Haas. From her position at a relatively small school, Ruth Haas is mentoring a sizable percentage of the new generation of American women mathematicians."

The AWM is proud to honor Ruth Haas's outstanding achievements in inspiring undergraduate women to discover and pursue their passion for mathematics.

Response from Haas

I am deeply honored to receive this award and thank the AWM as well as my colleagues and students who nominated me. Many factors contribute to the success of Smith women in mathematics including the supportive and challenging environment created by all of my colleagues and the intelligence and determination of our students. I feel fortunate to have been able to contribute to these students individually and to the mathematical community through them. Sometimes it is small things that make a difference for an individual: a word of support at just the right moment or a simple suggestion to consider an alternative possibility. To me, the art of good mentoring is seizing the moment to support and counsel. One of the most important things we share as mentors and role models is that we struggled too. As we celebrate the fact that an extraordinary woman has finally won a Fields Medal, it is still rare to find a roomful of mathematicians in which women are well represented. We still need to recognize that women mathematicians can be ordinary.

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

In 1990, the Executive Committee of the Association for Women in Mathematics established the annual Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman. The prize is named for Alice T. Schafer (1915–2009), one of the founders of AWM and its second president, who contributed greatly to women in mathematics throughout her career. The criteria for selection include, but are not limited to, the quality of the nominees' performance in mathematics courses and special programs, an exhibition of real interest in mathematics, the ability to

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Madeline Brandt, Samantha Petti, and Sheela Devadas

do independent work, and (if applicable) performance in mathematical competitions.

AWM is pleased to present the twenty-fifth annual Alice T. Schafer Prize to **Sheela Devadas**, Massachusetts Institute of Technology. Additionally, AWM was pleased to honor **Samantha Petti**, Williams College, as runner-up and **Madeline Brandt**, Reed College, as an honorable mention recipient.

Citation for Sheela Devadas

Sheela Devadas is majoring in mathematics at MIT. As a sophomore in high school, Devadas joined a research group for high school students at MIT (PRIMES), where she was assigned a project on Cherednik algebras. As a 15-year-old, she quickly mastered the basics of representation theory, commutative algebra and computer algebra systems. In 2011, the Advantage Testing Foundation Math Prize for Girls announced the names of 19 "astonishingly accomplished young women," including Silver Medalist Sheela Devadas. After completing her junior year of high school, she began studying at MIT, taking many advanced mathematics courses, including Fourier analysis, arithmetic geometry, discrete mathematics, and graduate-level courses in randomness and computation, representation theory, cryptography and commutative algebra.

Continuing her work in representation theory, she is now coauthor of a paper to appear in the *Journal of Commutative Algebra*. Her mentors comment that this is an "excellent paper" and that her work is at a level far beyond her age. Devadas shows great breadth by also engaging in research in theoretical computer science, specifically homomorphism testing. These results are currently being written for publication.

Sheela Devadas, who has the "highest level of imagination and skill" is an "outstanding student" who is "brilliant, and at the same time very hard working, mature, and motivated. This is surely a winning combination." She "has a bright research career ahead of her" and of the "many amazing MIT undergraduates, Sheela is second to none."

Response from Devadas

I am very honored by my selection as the winner of the 2015 Schafer Prize. I was first introduced to complex mathematics by Ms. Tatyana Finkelstein, my middle school math teacher; she has given me interesting problems to work on, encouraged me to pursue opportunities like the MIT-PRIMES program, and always provided inspiration. I would like to thank the MIT-PRIMES program for enabling me to do research in representation theory in high school and my research mentor Dr. Steven Sam for his invaluable teaching and guidance in my first experience with research. I am grateful to my advisor Professor Pavel Etingof for suggesting my PRIMES research project and for his continued guidance, advice, and teaching. At the PROMYS program at BU I was able to listen to the engaging lectures of Professor Glenn Stevens and make a connection with a greater mathematical community. I am grateful to Professor Ronitt Rubinfeld for suggesting and guiding me through research in linearity testing. MIT not only offers wonderful classes, but also provides ample opportunities for undergraduate research. Finally, I would like to thank my family for their support in all my endeavors.

Citation for Samantha Petti

Samantha Petti is a senior mathematics major at Williams College. She is lauded by the faculty for her excellent performance in advanced courses, including a class in upper-level knot theory in her first year. As a student in tiling theory, she also served as a teaching assistant for the course. She took a tutorial course in topology in which her weekly presentations "displayed her strong understanding of the material and strong expository skills."

Petti participated in the SMALL REU at Williams College. Her group produced two research papers, both expected to be published in strong research journals. She also spent a summer working on research at the Oak Ridge National Laboratory, where she worked on an open problem about convergence conditions for the Markov Clustering Algorithm. As a researcher, she was praised for her "originality, confidence, and healthy self-awareness." She has presented her work at MathFest and UnKnot, an undergraduate knot theory conference. She participated in the Budapest Semester in Mathematics and was awarded a 2014 Barry M. Goldwater Scholarship.

Petti's recommendation letters tout her communication skills, focus, and enthusiasm. Additionally, she "has the intellectual firepower, the organizational skills and the fire in the belly to do amazingly strong work."

Response from Petti

I am honored to be named the Alice T. Schafer Prize runner-up. I would like to thank the AWM for encouraging women to pursue mathematics in many ways, including the offering of this prize. There are many people I need to thank for contributing to my mathematics education and inspiring me to be a researcher. In particular, I would like to

thank Professor Adams for sharing his contagious excitement for research and providing me with opportunities to begin research early, Professor Silva for challenging me in several key courses, Dr. Ferragut for his valuable research guidance this summer, and Professor Devadoss for advising my senior thesis. Additionally, I am thankful for the entire math faculty at Williams College, who make the department an inviting and exciting place to learn. I would also like to thank the folks at the Summer Math Program at Carleton College for introducing me to a great community of women mathematicians. Finally, I am grateful for all the support provided by my family and friends through the years.

Citation for Madeline Brandt

Madeline Brandt is a senior mathematics major at Reed College. She has distinguished herself through research, coursework and service. Both at Reed College and in the Budapest semesters in mathematics, she has completed advanced course work with near perfection. Her professors recognize her "unusual gift for problem-solving, creative thinking, and adeptness at absorbing new mathematics."

Brandt has participated in two summer REU programs. At Grand Valley State University she worked in geometry on circle packing on tori. This work is currently being written for publication. Her second REU was at the University of Minnesota at Duluth. At Duluth she worked in number theory on packing polynomials. The resulting work was presented at the Joint Mathematics Meetings and has already been submitted for publication. Her mentors promote her immense potential for research and her excellence in communication of mathematics. She is a "brilliant and self-motivated" student who is also an excellent expositor of mathematics, a leader and community builder, and she is well respected by her teachers and peers. She has "outstanding potential for a successful and influential career in mathematics."

Response from Brandt

I feel greatly honored to receive honorable mention for the 2015 Alice T. Schafer Prize. I would like to thank the AWM for their efforts in encouraging women and girls to pursue careers in mathematics, and for offering the Alice T. Schafer Prize. In addition, I would like to acknowledge the people who have supported and encouraged me. First, I would like to thank Irena Swanson, who has

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CALL FOR NOMINATIONS

2016 M. Gweneth Humphreys Award

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

The award is named for M. Gweneth Humphreys (1911–2006). Professor Humphreys graduated with honors in mathematics from the University of British Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her PhD at age 23 from the University of Chicago in 1935. She taught mathematics to women for her entire career, first at Mount St. Scholastica College, then for several years at Sophie Newcomb College, and finally for over thirty years at Randolph-Macon Woman's College. This award, funded by contributions from her former students and colleagues at Randolph-Macon Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

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

Nomination materials for the Humphreys Award shall be submitted online. See the AWM website at www.awm-math.org for nomination instructions. Nominations must be received by **April 30, 2015** and will be kept active for three years at the request of the nominator. For more information, phone (703) 934-0163, email awm@awm-math.org or visit www.awm-math.org/humphreysaward.html.

been a wonderful mentor, both sparking and solidifying my interest in mathematics. I would also like to thank my REU advisors, William Dickinson and Joseph Gallian, for providing me with opportunities for mathematical research and for always offering encouragement and advice. Lastly, I would like to thank my family for always supporting my interests and pursuits.

AWM – Joan & Joseph Birman Research Prize

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 whose work has been in low dimensional topology and her husband Joseph who is a theoretical physicist whose specialty is applications of group theory to solid state physics.

The inaugural 2015 AWM – Joan & Joseph Birman Research Prize in Topology and Geometry is awarded to **J. Elisenda Grigsby** in recognition of her pioneering and influential contributions to low-dimensional topology, particularly in the areas of knot theory and categorified invariants. Her research has centered on the interplay between the combinatorial theory of Khovanov homology and the more geometric Heegaard-Floer homology. World leaders in the field have praised her fundamental contributions, noting that her work both connects and unifies structures in geometric, symplectic, and contact topology, homological algebra, and representation theory. To single out just one of her many outstanding results, she and her collaborator Wehrli discovered that Khovanov's categorification of the n-colored Jones polynomial detects the unknot when $n>1$. This work has generated a great amount of excitement and activity in the field and was described by a leading expert as "one for the history books."

Ruth Charney and Eli Grigsby

Eli Grigsby is a talented young mathematician who has established herself as a leader in a rapidly developing area that changed the landscape of low-dimensional topology. She was the recipient of an NSF postdoctoral fellowship and DMS research grant and currently holds an NSF CAREER award. She has a track record of impressive results, and she has provided leadership in her field. Grigsby clearly merits the distinction of being the first mathematician to receive the AWM – Joan & Joseph Birman Research Prize in Topology and Geometry.

Response from Grigsby

I am deeply honored to be receiving this award, especially since Joan Birman is a personal hero of mine. Her work laid the foundations for much of my own; the field of low-dimensional topology would be far poorer without her contributions. Her mathematical accomplishments are particularly impressive in light of the fact that she received her PhD only *after* a 15-year detour in industry, during which she also had three children. She is without question one of the most amazing people I have ever known.

Many thanks to the AWM, not only for establishing this award, but also for connecting me to a whole community of women whose mathematics and life-stories are similarly inspiring. I am profoundly grateful as well to Joan and Joseph Birman for the thoughtfulness and generosity they exhibited in endowing this award. Of course, I am forever in debt to my tirelessly supportive advisors, Rob Kirby and Peter Ozsváth, along with the rest of my extended mathematical "family." Finally, I would like to thank my colleagues at Boston College, both for their nomination and for making the BC math department such an exciting place to learn and do mathematics.

AWM Service Awards

The AWM Service Award, established by the AWM Executive Committee in November 2012, recognizes individuals for *helping to promote and support women in mathematics through exceptional voluntary service to the Association for Women in Mathematics*. The award is given annually to AWM members in recognition of their extensive time and effort

devoted to AWM activities during the previous seven years. Presidents (past, present, and -elect) and current officers are not eligible for the award.

From a vast list of volunteers, the 2015 awardees, Kathryn Leonard, Elebeoba E. May, Irina Mitrea and Christina Sormani were chosen for their extraordinary work and service to the AWM during recent years.

Kathryn Leonard, California State University Channel Islands, is recognized for her active involvement with the AWM Meetings Committee. In that capacity she chaired the JMM Committee which oversees the AWM activities at the JMM, co-organized the AWM Workshop at JMM 2014, organized the AWM Workshop poster session in 2013 and set up a system for pairing mentors with workshop participants. She was also a PI on the grant funding the AWM 2013 Research Symposium and the AWM Workshop at JMM 2014. In addition, she organized a research collaboration conference for women (WiSh) at IPAM; based on that conference, she edited the first AWM-Springer volume, which will bring $1,000 plus royalties to AWM.

Elebeoba E. (Chi-Chi) May, University of Houston, is recognized for her active involvement with the AWM Meetings Committee for the past three years and for prior work helping the AWM Workshop Director organize the AWM-SIAM workshops at the SIAM Annual Meetings. This past year she chaired the SIAM Committee which oversees the AWM activities at the SIAM Annual Meetings. She was the key organizer of the AWM Workshop poster sessions and career panels at the 2013 and 2014 meetings and is organizing the AWM career mini-symposium at the 2015 SIAM CSE Meeting. She coordinated the poster judging competition for the AWM poster presenters at the 2014 SIAM Annual Meeting and helped select the Mathematical Biosciences Institute (MBI) prize winner from among the poster presenters in 2013.

Irina Mitrea, Temple University, is recognized for her service to AWM as a PI on a successful NSF Sonia Kovalevsky Day Grant. Furthermore, her leadership of the team that organized the AWM activities at the 2010, 2012 and 2014 USA Science and Engineering Festivals (USASEF) has been exemplary. She engaged thousands of children in doing mathematics. The activities she designed were fun and challenging! She brought energy, enthusiasm and creativity to designing the events, which has been positively noticed by NSF program officers among many others. Additionally she was an active member of the AWM Executive Committee for four years.

Christina Sormani, City University of New York, Graduate Center and Lehman College, is recognized for her active involvement with the AWM Meetings Committee. In that capacity she has been a member of the JMM Committee which oversees the AWM activities at the JMM. In addition to helping select participants for the AWM Workshop poster sessions, Christina has been the driving force behind the AWM panels held at the JMM in 2012, 2013, 2014 and 2015. With great energy and dedication she suggested topics for the panels, invited the panelists, created a webpage for each panel and moderated the panels. In 2012, the panelists tackled the relevant question of "Maintaining an Active Research Career through Collaboration" and in 2015 the topic was "Breaking the Glass Ceiling Permanently."

Christina Sormani and Ruth Charney
(The other recipients were unable to attend the reception.)

AWM WORKSHOP

Magnhild Lien, AWM Executive Director

The 2015 Joint Mathematics Meetings were held January 9–13, 2015 in San Antonio, Texas. The AWM Workshop for Women Graduate Students and Recent PhDs usually held at these meetings followed a new format established two years ago. The first part of the workshop took place Monday evening with a reception and a poster session for graduate students. The workshop continued on Tuesday with a special session on homotopy theory for recent PhDs and invited speakers, and a luncheon for the workshop participants and their mentors. The new format allowed for a larger

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number of workshop participants, as well as greater exposure of their work presented either in a poster or a talk. Special thanks goes to the workshop organizers **Maria Basterra**, University of New Hampshire, **Brenda Johnson**, Union College, **Gizem Karaali**, Pomona College, **Lerna Pehlivan**, York College and **Brooke Shipley**, University of Illinois at Chicago. Their dedication and enthusiasm while planning the workshop were instrumental in its success.

At the workshop reception held in Bridge Hall of the Henry B. Gonzalez Convention Center, nineteen graduate students presented their posters. There was a steady stream of conference attendees coming by—and not just for the refreshments! In fact we had to remind people about the refreshments in order to clear the sometimes congested area right around the poster displays. The session was scheduled for one hour and fifteen minutes, but many people showed up early and stayed late. The graduate students seemed genuinely excited to showcase their work. Prospective employers came to the poster session to meet with potential candidates for positions at their universities. One aspect of the workshop program is that workshop participants meet with pre-assigned mentors. For many of the participants the first contact with their mentors was during the poster session. The nineteen poster presenters were: **Hannah Lee Altmann**, North Dakota State University, **Sarah E. Anderson**, Clemson University, **Kimberly D. Ayers**, Iowa State University, **Safia Chettih**, University of Chicago, **Elizabeth Leyton Chisholm**, University of California, Santa Barbara, **Jessica C. Dyer**, University of Illinois at Chicago, **Arezou Ghesmati**, Texas A&M University, **Lauren Keough**, University of Nebraska-Lincoln, **Arielle M. Leitner**, University of California, Santa Barbara, **Guanglian Li**, Texas A&M University, **Tina Mai**, Texas A&M University, **Stacey Renae McAdams**, Louisiana Tech University, **Marina Moraiti**, University of Pittsburgh, **Anisah Nu'Man**, University of Nebraska-Lincoln, **Allie Ray**, University of Texas-Arlington, **Martina Rovelli**, EPF Lausanne, **Bianca A. Thompson**, University of Hawaii at Manoa, **Sarah A. Yeakel**, University of Illinoi Urbana-Champaign, and **Zhengyi Zhou**, Cornell University.

Tina Mai explaining her poster

CALL FOR NOMINATIONS

2016 Louise Hay Award

The Executive Committee of the Association for Women in Mathematics has established the Louise Hay Award for Contributions to Mathematics Education, to be awarded annually to a woman at the Joint Prize Session at the Joint Mathematics Meetings in January. The purpose of this award is to recognize outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense. The annual presentation of this award is intended to highlight the importance of mathematics education and to evoke the memory of all that Hay exemplified as a teacher, scholar, administrator, and human being.

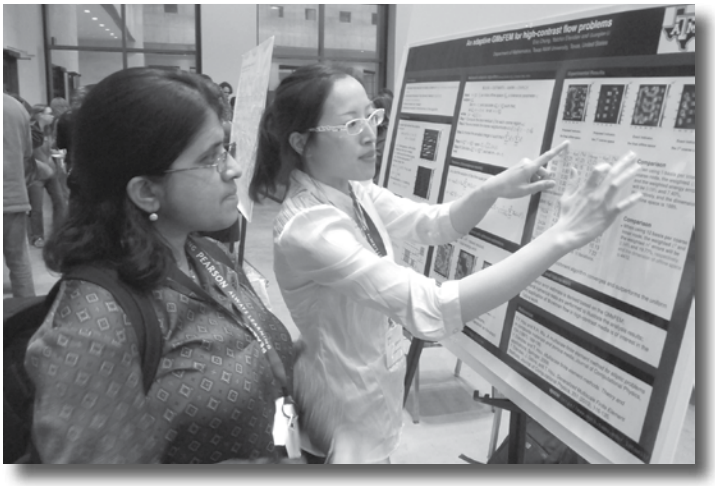
The nomination documents should include: a one to three page letter of nomination highlighting the exceptional contributions of the candidate to be recognized, a curriculum vitae of the candidate not to exceed three pages, and three letters supporting the nomination. It is strongly recommended that the letters represent a range of constituents affected by the nominee's work. Nomination materials for the Hay Award shall be submitted online. See the AWM website at www.awm-math.org for nomination instructions. Nominations must be received by **April 30, 2015** and will be kept active for three years. For more information, phone (703) 934-0163, email awm@awm-math.org or visit www.awm-math.org.

For titles and abstracts of the posters see https://www.dropbox.com/s/ o9q4ltmk2hppq52/AWM%20Activities%20at%20JMM%202015.pdf?dl=0

Poster judging, a new feature started last year, is now a regular part of the workshop. In coordination with the NSF Math Institutes we are able to offer an invitation to participate in a week-long workshop at one of the institutes as a prize for the best poster. Nineteen volunteer judges evaluated the posters, and the two top posters were awarded prizes. The winners were Sarah Yeakel who received the general institute prize and Arezou Ghesmati who received a prize sponsored by the Mathematical Biosciences Institute (MBI) for the best poster related to the biosciences. Anisah Nu'Man received an honorable mention.

During the two-hour luncheon on Tuesday the graduate students and recent PhDs met with their mentors. The winners of the poster judging competition were presented with certificates. The attendees at the luncheon included the workshop participants, the mentors, the workshop organizers, AWM President Ruth Charney, AWM President-Elect Kristin Lauter, Noether Lecturer Wen-Ching Winnie Li and the AWM Executive Director.

This year's workshop talks focused on the field of homotopy theory and encompassed a wide range of topics from operads to algebraic K-theory. The speakers included both senior and junior researchers from across North America and Europe, many of whom had participated in the first Women in Topology (WIT) workshop for collaborative research held at the Banff International Research Institute (BIRS) in August 2013. Some references to results from these collaborations (to appear in an upcoming Contemporary Math volume) were made, but the speakers reported on new research independent from WIT. We had four senior



Guangling Li explaining her poster

Prize-winner Sarah Yeakel explaining her poster

speakers at the workshop. The morning session opened with **Kathryn Hess**, Head of the Homotopy Theory Group at the EPFL in Switzerland and a co-organizer of WIT. She spoke about "Spaces of long embeddings and right-angled Artin operads." **Julie Bergner**, Associate Professor, University of California, Riverside closed the morning session with an account of "Models for equivariant (∞, 1)–categories." The afternoon session started with **Ulrike Tillmann**, Head of the Topology Group at Oxford University, Fellow of the Royal Society and of the American Mathematical Society. Her talk introduced us to "Commutative K-Theory." **Teena Gerhardt**, Assistant Professor, Michigan State University, closed the workshop with a thorough account of the state of the art of "Computations in Algebraic K-Theory." There were six junior speakers: **Kristine Pelatt**, St. Catherine University, **Anna Marie Bohmann**, Northwestern University, **Mona Merling**, Johns Hopkins University, **Inna I. Zakharevich**, University of Chicago, **Irina Bobkova**, University of Rochester, and **Agnes Beaudry**, University of Chicago. For titles and abstracts of the talks see https://www.dropbox.com/s/o9q4ltmk2hppq52/AWM%20Activities%20at%20JMM%202015.pdf?dl=0

The organizers are very pleased not only with the high caliber of research presented but also with the care taken by the speakers to appeal to junior researchers and advanced graduate students. Both factors contributed to well-attended talks and an engaged audience. Their mentoring strategy for the homotopy theory workshop consisted of team mentoring. The three organizers and four senior speakers were divided among four preassigned groups formed from the six junior speakers and the three related graduate student poster

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presenters. Each group included women at different stages of the academic career and was arranged around common interests among the members, e.g. research topic, geographic area, young kids, etc. After these initial meetings the four groups gathered into two groups and continued their conversation over lunch. Many participants mentioned that the advice given was quite useful and that it was particularly helpful to hear from women at several different stages of their careers.

A special thanks to **Maria Basterra**, **Bettye Anne Case**, **Kenneth M. Golden**, **Ruth Haas**, **Brenda Johnson**, **Rachel Levy**, **Ami Radunskaya**, **Brooke Shipley**, **Kathryn Weld**, **Sylvia Wiegand** and **Cindy Wyels** for serving as mentors to the graduate students. These women shared their varied experiences and provided invaluable guidance. Also many thanks to **Sylvia Wiegand**, the organizer of the poster judging and the volunteer judges **Christina Battista**, **Julie Bergner**, **Lakshmi Chandrasekaran**, **Randy Cone**, **Courtney Davis**, **Meghan DeWitt**, **John C.D. Diamantopoulos**, **Rebecca Garcia**, **Leslie Hogben**, **Megan Kerr**, **Yun (Amy) Lu**, **Sara Malec**, **Denise Rangel**, **Sarah Raynor**, **David Saltman**, **Amanda Schaeffer Fry**, **Christina Sormani**, **Ulrike Tillmann**, **Judy Walker** and **Mei Yin**. Sylvia's tireless effort to organize this event and the volunteers' eagerness to participate, not only doing the judging but also meeting afterwards to tally the scores, made it all run very smoothly. Finally, a special thank you to AWM Managing Director **Jennifer Lewis**, who oversaw the setup of the poster session and helped the judges tabulating the scores for the poster judging.

This workshop was made possible by funding from the National Science Foundation.

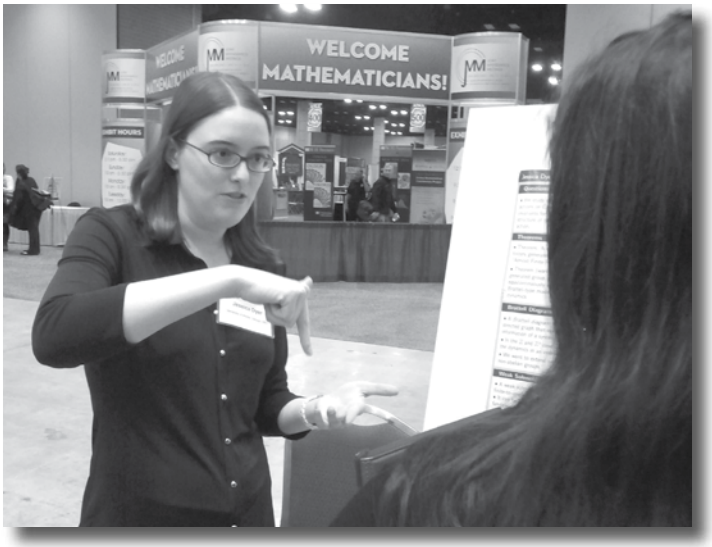
Honorable mention Anisah Nu'Man explaining her poster

Homotopy group: Safia Chettih, Agnes Beaudry, Brooke Shipley, and Kirsten Wickelgren

MBI prize-winner Arezou Ghesmati and Ruth Charney

AWM AT THE SAN ANTONIO JMM

AWM Panel: Susan Hermiller, Estella Gavosto, Christina Sormani, Marie Vitulli, Megan Kerr, Joan Leitzel, Maura Mast



Jessica Dyer explaining her poster

Passing of the silver bowl, an AWM tradition: Ruth Charney and Kristin Lauter

Two Presidents: Francis Su (MAA) and Kristin Lauter (AWM)

AWM Web Editor, Adriana Salerno

BOOK REVIEW

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

Beyond Banneker: Black Mathematicians and the Paths to Excellence, Erica N. Walker, SUNY Press, 2014, ISBM 978-1438452159.

Reviewer: Pat Kenschaft, kenschaft@pegasus.montclair.edu

Beyond Banneker: Black Mathematicians and the Paths to Excellence by Erica N. Walker is an exploration of the educational lives of 35 African Americans who earned a doctorate in mathematics, based on extensive recorded interviews with all of them. Three earned their doctorates before 1965, twelve between 1965 and 1985 (the "second generation") and the remaining since 1985 (the "third generation"). There are many long quotes from these interviews.

The book concentrates on the patterns that enabled them to earn their doctorates. Chapter 2, "Kinships and Communities," about the social support systems that enabled them to negotiate graduate school, might be useful to anyone of any race contemplating earning a doctorate in any field, perhaps especially mathematics.

Major conclusions of the book are that mentoring and social support groups (called "spaces") are important to success in mathematics. This is not surprising, but the variety of descriptions of manifestations of both is illuminating.

My major objection to the book is its lack of attention to the effect of elementary school teachers. It provides many interesting accounts of the impact of high school teachers and of college and university professors. However, my own interviews with 75 black mathematicians of New Jersey three decades ago (where I defined a "mathematician" as someone with any degree in mathematics) repeatedly yielded this conclusion: "Until mathematics is taught better in American elementary schools, children who aren't taught it at home will not learn it, so any ethnic group that is underrepresented in mathematics will remain so until elementary mathematics education is greatly improved." My experiences in elementary schools that this finding prompted supported their observations.

One book cannot do everything and this one is a significant contribution to human knowledge.

AWM at MathFest 2015

AWM is sponsoring two events at this year's MAA MathFest in Washington, DC. The organizers of both events are Alissa S. Crans, Loyola Marymount University; Jacqueline Jensen-Vallin, Lamar University; and Maura Mast, University of Massachusetts Boston.

"Contributions of Women to Mathematics: 100 Years and Counting" will be held Saturday, August 8, in the afternoon. In celebration of the 100th anniversary of the MAA, the AWM sponsors this session to acknowledge and recognize the contributions, achievements, and progress of women mathematicians over the past 100 years. This century has seen great mathematical achievements by women, the most recent and most public being Maryan Mirzakhani's winning the Fields Medal. To honor this and other advances in mathematics by women, this session welcomes talks about mathematics done by women and historical or biographical presentations celebrating women in mathematics.

The poster session "Highlights from AWM Student Chapters" will be held in celebration of the 10th anniversary of the formation of the first chapters. This program has expanded to fifty chapters and has impacted thousands of undergraduate and graduate women across the country. AWM Student Chapters sponsor and host a range of activities including invited speakers, Pi Day Celebrations, field trips, outreach programs to local schools, Sonia Kovalevsky Days, and career panels. In this poster session, AWM Student Chapters are invited to share their stories, ideas, and successes with other AWM Student Chapters and with the mathematical community.

See http://www.maa.org/sites/default/files/pdf/mathfest/MF15CallForPapers.pdf for further information. The deadlines for applying for the events are **April 30** and **June 5**, respectively.

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 Imitation Game

Sarah Rees, Newcastle University, UK

The film is set at Bletchley Park, where German codes were cracked repeatedly during World War II. It centers on the story of Alan Turing, a brilliant mathematician who, as a professor in Manchester shortly after the war, was prosecuted for homosexual activity in 1952, and died in 1954 shortly after his conviction and a non-custodial sentence of estrogen injection. And it features his relationship with Joan Clarke, one of the very few women employed as a mathematician at Bletchley Park, to whom he was briefly engaged to be married.

Benedict Cumberbatch plays Turing as a somewhat autistic individual, maybe drawing on his recent experience playing Sherlock Holmes, while by contrast Keira Knightley plays Joan Clarke as an attractive, articulate, socially observant and highly intelligent woman, who helps Turing in his personal relationships with the other Hut 8 mathematicians. The film follows the development of the mechanized "bombe" machines, which were designed by Turing and others to make feasible the seemingly impossible task of searching for the keys of the Enigma machines used by the Germans. The keys were changed on a daily basis, with different keys too for the codes used by different sections of the German military machine, and for each key there were around 159×10^{18} possibilities.

The story is told in flashback during an interview of Turing by a fictitious detective Robert Nock, who (and this seems a little unlikely) has read Turing's 1950 paper "Computing machinery and intelligence," and asks Turing about the "Turing test" and "imitation game" that are described in that article.

I had to see this film; it has a big personal connection to me. My father, David Rees, was a Bletchley Park mathematician, a Hut 6 man, recruited from Cambridge by his undergraduate supervisor, Gordon Welchman, just a few months after the war started. My mother was another Joan, seven years younger than Joan Clarke, and never at Bletchley, but also a Cambridge "Wrangler" (i.e., classified first class in her examination), also a research mathematician, and a junior teaching fellow at Girton College until, facing the same choices as Joan Clarke, she prioritized marriage and family. Neither Joan was awarded an undergraduate degree by the University of Cambridge; women were only allowed "titular degrees" until they were finally allowed to be members of the University in 1948, although they studied alongside the men and took the same examinations.

And anyway I'm a mathematician myself, with interests in decision problems and computability, and of course I'm familiar with Turing's work. And this is, I think, a very British story, and I am glad to see it told. So I went to see the film, together with my 14-year-old daughter, and some friends. It turns out that the sister of one of them knows the granddaughter of Commander Alastair Denniston, the naval chief who headed the British Government Code and Cypher School (at Bletchley Park during World War II) from 1919 until 1942. Cmdr. Denniston doesn't get a sympathetic treatment in the film, and the British press has reported his family's unhappiness with that. I would say that the film's portrayal of Cmdr. Denniston is one of a few examples of dramatic license used by the film makers to make a complex story a bit more digestible for a non-technical audience.

But back to the film. I was fascinated. It raised questions for me, and I had to find out the answers. So I checked the literature, and I went and saw the film a second time. I still found it beautiful and moving.

Really the film is about Turing, the man, the magnitude of his personal achievement, and the sadness of his end. Repeatedly we are told: "Sometimes it's the people no one imagines anything of who do the things no one can imagine." The achievements of the Bletchley Park team were incredible. But undoubtedly the team could have not achieved what it did without a few key individuals, and certainly Turing was one of those.

Of course a few details were changed. Does it matter? I think not, but I felt the need to check them out.

Turing didn't need to apply for a job at Bletchley Park. He and Welchman were simply there from the outset. And similarly, like many other younger mathematicians, Joan Clarke was recruited by Welchman, who had taught her at Cambridge. Turing didn't stand all alone in his work on the bombe. He worked with Welchman from the beginning to develop an idea brought to them by a Polish team. Indeed the idea of the diagonal board, which speeded up the operation of the bombe, was Welchman's (not Hugh Alexander's, as in the film). And it was Turing, Welchman, Alexander and Milner-Barry who wrote, in 1941, to Churchill asking for

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(and getting) more resources, not Turing alone.

And the whole idea of the bombe was that it was able to rule out a high proportion of the possible key settings and hence make the problem of finding the key of the day tractable (using ad hoc hand arguments on the remaining possibilities) precisely by deriving contradictions from the assumed existence of particular words (such as "Wetter") in the original plaintext. This certainly wasn't a revelation that speeded up the performance of the machine a few years after its original construction. And the fact that some operators were lazy or foolish and made "silly" choices for information visible in the preamble of messages that allowed the cryptanalysts to guess a small set of candidates for the secret keys was a separate issue, not, so far as I know, particularly related to the bombe.

But again, these are details. I don't think they matter. The basic facts of the story remain the same, even if sometimes the order of events has been changed, and characters modified or interchanged. After 30 years of secrecy immediately after the war, a body of literature now exists that explains the techniques used at Bletchley Park and chronicles the successes and failures.

Maybe it is more important to ask how accurate the portrayals are of the two central characters, the opportunities that were available to them, and the choices they were both forced to make in their lives.

Some have told me they found Benedict Cumberbatch's portrayal of Turing a little irritating, his suggestion of autistic traits somewhat overplayed. Others have complained that the film does not make enough reference to his acknowledged homosexual activity. I personally have no complaint on either score.

But how did I find Joan Clarke? She doesn't surprise me. There's footage available of her in a 1992 BBC Horizon documentary that supports Keira Knightley's portrayal of her, in which she reports that when Turing talked to her about his homosexuality the day after the start of their engagement in the spring of 1941: "Naturally, that worried me a bit, because I did know that was something which was almost certainly permanent, but we carried on." She certainly seemed to know what she had gotten into. And the film suggests that her relationship with Turing was a true meeting of minds. The engagement held for a few months, Joan wore a ring (though not at work), and the two met each other's families and apparently planned a conventional future which included children. But the engagement ended in the summer of 1941, reportedly by mutual consent, because of Turing's belief that a marriage could not succeed, due to his homosexuality.

Of course we were meant to laugh at some of the sections of the film that showed the social constraints of the time: the vocabulary, the accents (yes, people from certain social classes really did talk as if they had to carry hot potatoes in their mouths; even in the seventies we had elocution lessons at my nice girls' school). But it wasn't all funny. It is shocking that although many, many women were employed at Bletchley Park (about 3/4 of a total of 10,000) only a handful have been acknowledged as cryptanalysts. Many women were employed as members of the WRNS to operate the bombes; this was certainly unpleasant, hot, noisy work. Others with backgrounds in language were employed alongside the cryptanalysts to analyze messages once they had been decrypted. Some men, and I think also some women, who were employed for the vital hand search for the keys (still a massive job even with the bombes) were not mathematicians but had been selected for acknowledged, excellent problem solving skills. Now, nearly 70 years after it all ended, it is hard to check all the facts, find out who was involved in what. But still, of the handful of women named in the literature, I could find only one other listed as a graduate mathematician.

Joan Clarke's entry to Bletchley must have been much the same as my father's. She too had been taught by Welchman as an undergraduate (he'd taught her geometry in her third undergraduate year), and it was he who recruited her. She'd started her study in Cambridge in 1936, with a scholarship to study at Newnham College, one of only two colleges in Cambridge that took women at that time. Joan was a truly excellent student, achieved first class marks in both parts I and II of her undergraduate degree, and was awarded the prestigious Philippa Fawcett Prize on graduation (named after a Newnham student who in 1890 had been placed above all the men in the year in her final degree examination, subsequently becoming a college lecturer and published researcher in fluid dynamics). As the war broke out Joan had just been awarded a scholarship to finance her studies for the one year Cambridge postgraduate certificate Part III mathematics, which prepares students for doctoral study; she was allowed to finish this before moving to Bletchley Park. But when she arrived at Bletchley, despite the way in which she had been recruited, she was given only routine clerical work to do with other women. And when she was promoted, it was to a linguist's grade, this being, as I understand, the only grade open to her as a woman. She, and the other female codebreakers, were also paid less than the men.

The film portrays Joan as being treated as an equal by the other (male) mathematicians in her team, and certainly by Turing. And nothing I have read suggests to me that this was not the case. She became Deputy Head of Hut 8 in early 1944 and was a particular expert in a technique developed by Turing that became known as Banburismus. Her wartime achievements were recognized by an MBE in 1947 (Turing's by an OBE, a higher ranking honor than MBE), although what had been achieved at Bletchley Park remained completely secret until the first book, *The Ultra Secret*, was published in 1974.

Many of the Bletchley men had successful, even glittering, mathematical careers after the war. Couldn't Joan Clarke have had that too? She might have returned to her post-graduate studies; a few, including Peter Hilton, did (Hilton went to work in Oxford with Whitehead, whom he'd met at Bletchley Park). Others moved without further study to posts in British universities; a small group, including my father and Jack Good, followed Max Newman to the mathematics department in Manchester, where Newman set up a Computing Laboratory, to which he recruited Turing in 1948. But Joan did neither.

To my knowledge Cambridge was the only British university that still barred female students; Oxford had admitted women in 1920, London in 1878, the Scottish universities in 1892. But life for a female academic would certainly have been very different than for a man. Many of the positions would have been residential posts in women's colleges, in London, Oxford, and Cambridge (and that was my mother's original route, a few years after Joan Clarke, until she met, married and followed my father, ultimately to a post alongside him in a provincial university). In the mid-20th century, a tiny number of brilliant female mathematicians flourished in traditional universities such as Cambridge. For some of them the "monastic" environment may (or may not) have been made more palatable by their marriages to similarly successful men. But it must have been a curious place to be a woman, with many limitations, and it would not have suited everyone.

It seems that Joan Clarke made a choice. I read that her experience of working alongside such a brilliant brain as Turing made her reluctant to continue as a pure mathematical researcher after the war. So in fact, as many of the other mathematicians also did, she worked after the war at GCHQ (Government Communication Headquarters) in Cheltenham, the postwar successor of Bletchley Park's GC&CS (Government Code and Cypher School), where she married a colleague Jock Murray in 1952. When due to his ill health they left Cheltenham for a period in Fife, Scotland (returning to GCHQ again in 1962), the two of them developed an interest in Scottish history. Joan became expert in numismatics, continuing her numismatic research later in retirement, and it is her achievements there that are celebrated in the obituary I found.

People have asked me if my father featured in the film. No, he didn't. But then he was in Hut 6, not Hut 8. Did he know Turing? He said not really; Turing and the Hut 8 mathematicians worked on the naval code, while the Hut 6 group worked on the Luftwaffe code, which still used the Enigma machine, but with a different daily key. And although he and Turing were both involved in the post-war Anglo-American project to develop the first electronic computers, their paths do not seem to have crossed much. In Bletchley, my father played chess, and was in the Bletchley village team, including Hugh Alexander and Harry Golombek (but not Turing), that beat Oxford University 8–4 in December 1944.

Did my father talk about his time at Bletchley? Certainly not before *The Ultra Secret* was published in 1974; none of the Bletchley people talked about what they'd done until then, they'd all signed the Official Secrets Act. But actually despite that my sisters and I somehow knew that our father had worked on decoding during the war; I think we'd concluded this from the fact that he was familiar with the German typewriter keyboard, which has a Z where we would expect to see Y (as is quite clear in the shot of an Enigma machine early in the film). And maybe this belief was reinforced by the decoding games we played as children? Of course my father had close friendships with people he'd got to know at Bletchley; two of us had godfathers who were Bletchley mathematicians, but we didn't know of that connection when we were children. Nobody talked, and of course Turing would not really have discussed the secret with Inspector Nock, but that conversation framed the film nicely.

I enjoyed the film. I'd happily see it again.

Related Links

https://www.google.com/culturalinstitute/exhibit/the-women-of-bletchley-park/QQZ2YSRa

http://www-history.mcs.st-and.ac.uk/Biographies/Clarke_Joan.html

http://www.ibtimes.co.uk/imitation-game-who-was-real-joan-clarke-1474909

http://www.telegraph.co.uk/news/obituaries/military-obituaries/naval-obituaries/10178823/Rosalind-Hudson.html

http://www.theguardian.com/world/2013/nov/20/mavis-batey

EDUCATION COLUMN

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

Some of My Favorite Math Competitions

Suzanne Lenhart, University of Tennessee

In our column a year ago, Betsy Yanik, Kelly Sturner and I wrote about a variety of opportunities and ideas for getting involved in local outreach programs in mathematics. Math Circles, camps or clubs may have a variety of activities, ranging from working logic puzzles to learning about careers. As a co-organizer for the last 13 years of the Bearden High School Math Club in Knoxville, Tennessee, I have found that some students also enjoy participating in math competitions, especially the team-style ones. Below I discuss a few of our favorite competitions.

The Team Scramble is a 100-problem, 30-minute test in which the entire team races to complete a single answer sheet, exercising collaborative and organizational skills in addition to mathematical skills. The free-response questions include topics from arithmetic to calculus with puzzles mixed in. Each problem counts one point, so that correctly completing an arithmetic task earns a point for the team just as a correct solution (with no calculators) to a calculus problem does. The students work together and plan how to distribute the work. This past fall, Susan Bothman, a Bearden High School teacher, recruited about 40 students to participate. We provided a lot of food for participants and all of us seemed to have fun! Check out the website of National Assessment and Testing (run by Thomas Clymer) for this competition: http://www.natassessment.com/

Moody's Mega Math Challenge is a mathematical modeling contest for high school students sponsored by The Moody's Foundation and organized by SIAM (Society for Industrial and Applied Mathematics). A challenge problem is an open-ended, applied math modeling question focused on a real-world issue. Teams of three to five students work on a solution paper for part of a weekend. They may use computers, software packages, books or any other inanimate sources, all of which must be properly referenced within the solution paper, but they cannot get any help from persons not on their team. A maximum of two teams per school and one teacher-coach may register. (Usually someone volunteers to provide food!) Preparing a team to participate in and to enjoy this competition takes a little time. You need to teach some modeling ideas and to provide some simpler questions for practice, but good materials are available on the website. For example, a short handbook on the modeling process, "Math Modeling: Getting Started and Getting Solutions," associated flashcards and a companion document detailing the connections to the Common Core are posted for free downloading. Registered teams may also avail themselves of free licenses to both MathWorks and Wolfram modeling and simulation software, along with links to tutorials and educational materials from each of those companies. For more information, visit http://m3challenge.siam.org.

Here is a summary of a sample practice problem of the month, **Stamp Out the Deficit**:

> The United States Postal Service (USPS) is facing a budget crisis; over the next three years, it needs to trim its budget by more than $20 billion. In 2012, as part of its attempt to save money, the USPS released a comprehensive strategic plan that called for closing 223 mail processing centers, eliminating Saturday delivery, and increasing the price of postage.
>
> Because of political controversy surrounding these ideas, several of these initiatives are currently on hold or delayed, including the closure of the processing centers and the elimination of Saturday delivery. And recently, in contrast to many of the proposed reductions, USPS enacted a growth strategy that calls for package delivery seven days a week during the holiday season and even includes opening several post office locations on select Sundays in December.
>
> Your team has been asked by the Postmaster General to reevaluate the five-year strategic plan released in 2012 in light of current events and updated financial reports.

For a fun individual challenge, the Math League offers six contests a year, each with six questions. The difficulty level typically increases from the first to the last question. Usually almost all of my students can correctly answer the first two questions. The last question on each contest is challenging even to the most talented students. The graphics that go with the questions can be quite clever! Our Bearden students seem happy to work on these contests. The primary authors of this competition are Steve Conrad, Dan Flegler and Adam Raichel, and a main concern is preparing questions that could stimulate class discussion. Teachers may use these questions to introduce new topics or enhance discussion of known ones. You can find sample contests at http://www.mathleague.com.

While the Team Scramble and the Math League

competitions have fees for participation, there are many free contests. Two examples are the Rocket City Math League and the Log1 contests provided through Mu Alpha Theta (the National High School and Two-year College Mathematics Honors Society). See http://mualphatheta.com. Also, information on other contests is available from the National Association of Math Circles Wiki at http://www.mathcircles.org/content/math-competition-listing.

Many universities offer free statewide problem solving competitions for high school students, so you might contact nearby institutions to see if such activities are available. This is particularly attractive if your students would be interested in a "live" mathematics team competition.

If you want to tell us about your favorite math competitions, please share your ideas. Send your messages to Suzanne Lenhart at lenhart@math.utk.edu.

MATHEMATICS, LIVE!

A Conversation with Diana Thomas

Interviewer: Katharine Ott, Bates College

Diana Thomas is Professor of Mathematics at Montclair State University and Director of the Center for Quantitative Obesity Research. In January she gave an MAA Invited Address at the Joint Mathematics Meetings on "Dispelling obesity myths through mathematical modeling." Diana and I met in San Antonio the day before her talk to discuss her career. Below are excerpts from our conversation.

Katharine Ott: Briefly, what is your area of research?

Diana Thomas: I am at the interface of mathematical methods and obesity research. Right now, I don't have a particular area of math that I apply. The researchers in obesity drive the problems. They have problems that they are interested in solving and I either utilize what I have in my toolbox, or I might have to learn something new, or I might reach out and talk to a statistician.... Sometimes the math that you need is very simple, and sometimes the math that you need is more complex.

I have to give you the background of how I ended up in this area of research. I did not enter graduate school knowing that I was going to do obesity research. I was trained as a dynamicist at Georgia Tech, and when I came out to the New York area after graduate school I first started applying my dynamical systems training to number theory and combinatorics. There was a great group of people in the area who did that kind of math. During this time I worked a lot with undergraduates. In 2008, I wrote a paper with an undergraduate on pregnancy. We worked on a fetal energy balance model. Kevin Hall at the NIH reviewed the paper and he invited us to a conference on math models of the metabolism. That is where I met the obesity researchers.

KO: It sounds like you have to be a very flexible person to do this kind of research. How did you learn to work this way?

DT: It wasn't that I started out being flexible. Well, I was kind of flexible in the sense that many mathematicians are when they mentor undergraduates. This is because you want to go where the undergraduate wants to go. But one of the skills that I have learned over the past 6–7 years is that I can't just go with the math that I know, I might have to reach out. The obesity researchers never know if the problem that they are asking me is easy to solve or difficult to solve. Sometimes I will put things for future work at the end of a paper and they'll say, "Can we do it for this paper?" and I'm like, "Do you want to wait another two years?"

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

DT: A researcher from the Pennington Biomedical Research Center wanted to monitor adherence [to a diet program] using mathematical models in patients. The fact that he was going to apply my model to patients, it changed my life! It made it so that I knew I had to be right, I really had to make sure that every little piece of what we were doing was as accurate as possible. That obviously took a lot of effort, but we were also responsible for delivering it. It's not just that the end product was the mathematical model; we had to find a way to put it in the hands of the dieticians. Initially we coded the whole thing in Maple hooked to Excel, because they had around 1000 subjects. I thought that it worked fine, but when I went down to Pennington, the dietician sat down with me and said, "The second that you walk out of here, it's not going to work anymore." So we brought in a computer programmer who was a mathematician at one time. Now he does all of our Java applications and makes it so that people can actually use the model.

KO: Are there a lot of mathematicians working in obesity research?

DT: No, in fact a friend of mine, David Allison from the University of Alabama, Birmingham (he's a statistician) and I applied for NIH funding to run a workshop to bring

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together researchers at the interface of mathematics and obesity. There is funding available. It is a summer workshop and it lasts for a week. We did not get many mathematicians applying last time. The NIH likes to fund early career researchers, and mathematicians, if they did apply, were a little further along. It's not like someone finishes graduate school and says, "I want to do mathematics and obesity." So now we fund almost any mathematician who applies, and I want to make a pitch for mathematicians, especially women, to get involved!

KO: Is there a reason why you especially want women to get involved?

DT: Yes. I think the AWM is a fabulous organization. They do not seem to have the equivalent in medicine. In mathematics, we demand things like equal representation on committees. In medicine, there are more women, yet they are not as equally represented at the top. That's why I would like to see more female mathematicians in the field.

KO: Are there any other areas in medical research besides obesity where mathematics and mathematical modeling are playing such a direct role?

DT: Yes, and in fact I've gravitated a little bit towards pregnancy and reproductive health.… There is a lot of mathematics in in utero development. We don't have many tools to look inside the body, only ultrasounds. Modeling helps us delineate what is an at-risk versus a normal, healthy pregnancy.

Even the shape of the placenta at birth can be studied mathematically. There's a woman, her name is Dr. Carolyn Salafia, who owns a business called Placental Analytics and she hires mathematicians. An example of what they do is to study the surface of the placenta and how it is related to autism. The surface of the placenta has a vascular structure to it—it's a graph. A graph theorist could actually sit down and start looking at graph-theoretic metrics of one particular vasculature versus another and potentially help to determine what is healthy and what is not healthy.

KO: If a graduate student or an early career mathematician is interested in these kinds of problems, what can they do make themselves more aware of problems at the interface of math and medicine?

DT: It's not like math biology where there is an actual field of math biology. I think it is pretty hard for an early person to do this [kind of research] because they are going to have to wander out of their discipline quite a bit and take some risks.… Mathematicians need to get tenure and they need the support of their department. The department might say that this is not really mathematics, so there is a lot of risk involved. I think that mathematicians can bring a lot to the field but only when they feel secure themselves—when they are close to tenure, or tenured. I was just tenured when I started doing this.

KO: Your current department must be supportive of this work.

DT: They are, but they already knew me. They had already evaluated me and I had already gotten tenure. It was like family saying, "OK, she's taking a risk, and we're going to take this risk with her." I really think you need your department's support in terms of tenure and promotion.

KO: You are giving a talk tomorrow to a big audience. Do you get nervous when you give a talk?

DT: No, that is one of the skills that I've gained working with obesity and medical researchers. I had to bomb a few talks before I learned. In mathematics we have a very laid-back way of presenting. It involves going to the chalkboard and being interactive with the audience so that they can ask you for more detail. With medical audiences, they need to get what you are doing in three seconds or less. If they don't understand what you are doing in three seconds or less, they don't listen. I learned to explain myself in sound bites. I was convinced in the first few years that mathematicians couldn't do this. I practiced and practiced to hit the mark and to make sure that I can deliver what I have to say quickly. It goes beyond just my research. It has affected my lectures as a teacher, and it sure works well with administration.

KO: Can you think of a time in your career that you found challenging?

DT: The switch was hard. When I made the switch [to do obesity research] it was over a period of time starting in 2008, and I'm probably still making the switch in a lot of ways. I know how to do things in math and I would say that I have a place in math. I used to direct the undergraduate poster session at the JMM, and I'm in a math department, and so I knew who I was. All of a sudden to have my papers rejected by math journals that say it's not math, and then to turn around and get them rejected from the medical world as well was difficult. I was working like I've never worked in my life—long, long hours, and long, long days to the point that I eventually got sick—and to not have any product from it, some days I just felt like quitting.… I definitely have come over that bump. I have figured out how to speak the right way and how to publish in the right journals. But man, those few years were hard; to be an associate professor and then all of a sudden go dry, and not for laziness sake, but just dry because I couldn't publish anymore.

KO: Is there a time in your career that has been especially rewarding, or is there a certain accomplishment that you are most proud of?

DT: This is an exciting moment for me here [at the Joint Mathematics Meetings]. To come back here is a very exciting time of my career, because I feel like the math community just scratched their heads for a second at me and now they are welcoming me back. It's a huge thing for me.

KO: We have talked about how your research career has changed over the last 6–7 years. You have also been an award winning teacher in your career. Has your teaching changed over this time period as well?

DT: Absolutely. I had to redefine myself as a teacher, too. That's one of the reasons that I got sick. I was trying to be the star teacher doing mathematics, getting kids to discover things, and then I was trying to be this researcher who was on the medical time clock and traveling all of the time.… I realized that I couldn't teach that way anymore. For a couple of years I felt like I was not doing the students a service that I used to do them, but now I realize that I've brought them another side. I can show them now this other side of mathematics where things are applied and I spend a lot of time on professional development with students, especially my female students. We have a series of books that all the students get on how to speak, how to negotiate, how to not do the "flamingo" when you give a talk, and how to write a grant.

KO: Do you think it would be good for the AWM or another math organization to provide more training in grant writing?

DT: I think that would be great.… We did one at the workshop that I mentioned earlier and it was fabulous. One of the first things David Allison did in that workshop was he gave us the probability of winning a grant. That put something in the minds of the people who were there. I also recommend a book called *How to Write a Bad Grant*. It's a really thin book written by a former Program Officer at the NIH.

KO: Is there anything else that you would like to share with the AWM readership?

DT: I had a female postdoc from Germany come and visit me, and while she was visiting she recommended some books. She gave me the name of one of the books, and it was something like *How to Play Like a Man and Think Like a Woman*. I thought, "I've been working with men all my academic life, I don't need this book!" After she left I ended up getting the book, and then I read the rest of the set of four. They are really good books and I recommend them to everyone.

KO: Thank you for that recommendation and for your time!

Diana Thomas's reading list:

- Lloyd Fricker. *How to write a REALLY Bad Grant Application (and Other Helpful Advice for Scientists)*. Bloomington: AuthorHouse, 2004.
- Gail Evans. *Play Like a Man, Win Like a Woman: What Men Know About Success that Women Need to Learn.* New York: Broadway Books, 2000.
- Christine K. Jahnke. *The Well-Spoken Woman: Your Guide to Looking and Sounding Your Best*. Amherst: Prometheus Books, 2011.
- Phyllis Mindell. *How to Say it for Women: Communicating with Confidence and Power Using the Language of Success*. New York: Prentice Hall, 2001.
- Linda Babcock and Sara Laschever. *Ask For It: How Women Can Use the Power of Negotiation to Get What They Really Want*. New York: Bantam Books, 2009.

Web Items of Interest

Thanks to all who forward these links to us.

The June 2014 memorial service at York University, Toronto for Lee Lorch is available on YouTube: https://www.youtube.com/watch?v=478C-_nJ4y4

Developing Assessments for the Next Generation Science Standards: http://www.nap.edu/catalog/18409/developing-assessments-for-the-next-generation-science-standards?utm_medium=etmail&utm_source=The+National+Academies+Press&utm_campaign=NAP+mail+new+2014.06.03&utm_content=&utm_term=

The *Girls' Angle Bulletin* is a bimonthly magazine that contains interviews with mathematicians, articles on math, mathematical activities, math problems, and math inspired art. See: http://www.girlsangle.org/page/bulletin.php

The sixth year of the Math for Girls contest at MIT: http://www.bostonglobe.com/metro/2014/09/27/for-girls-rare-chance-flex-math-muscles/WUyteAIjKYvmZXwfxjoWFI/story.html

Call for leadership from two women scientists and professors at Yale (Shirley McCarthy, radiology, and Meg Urry, physics): http://yaledailynews.com/blog/2014/11/04/a-call-for-leadership/

The Global Search for Education: What do Finland and Puerto Rico Have in Common? by C. M. Rubin: http://www.huffingtonpost.com/c-m-rubin/the-global-search-for-edu_b_6155918.html?utm_hp_ref=teachers

AWM Research Symposium 2015
University of Maryland College Park
April 11 – 12, 2015

- **ORGANIZERS:**
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  Shelly Harvey, Rice University
  Kristin Lauter, Microsoft Research
  Gail Letzter, National Security Agency
  Magnhild Lien, California State University Northridge
  Konstantina Trivisa, University of Maryland

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For details on registration, housing, and the special sessions visit
https://sites.google.com/site/awmmath/home/awm-research-symposium-2015

Many thanks to our sponsors and funders:

Remembering Lesley M. Sibner

Lesley was the 1994 AWM Noether Lecturer. She supported the goals of AWM and served on our panels and committees through the years. Her husband's memoir is followed by remembrances from friends and colleagues.

Robert J. Sibner, CUNY Graduate Center and BC

Lesley M. Sibner

Lesley and I were invited to spend two months in the fall of 2013 at the Mathematics Institute of the newly formed Shanghai campus of NYU. On September 10, we dropped off our visa application at the Chinese consulate and the next day, September 11, Lesley had a scheduled routine medical examination. As a result of medical negligence and carelessness, she died that day. I began writing this memoir as a way to re-live our lives together. When approached by AWM about printing my story, I wasn't sure what content might most interest readers of this newsletter, but I did feel that it was important for young women to see that a mathematician as talented as Lesley also had many other interests, for them to see that a woman, as a serious mathematician, could also lead a well-rounded multi-faceted life.

Mathematics was not Lesley's first love, nor even her first interest. She had found school mathematics neither very challenging nor very interesting. Her first loves were English and French literature and, in particular, the plays of the Elizabethan and Restoration eras. She acted in summer stock and decided on an acting career. Upon graduating secondary school (with the English and History awards) she enrolled in the theater department at Carnegie Tech (now Carnegie-Mellon University) where the acting training emphasized classical theater. She left after two and a half years to seek acting work in New York and to study with drama coach (and former actress) Uta Hagen. However, Lesley (née Millman) decided eventually that an acting career was not sufficiently fulfilling for her. To support herself, she took a job as a receptionist and returned to school at City College of New York (CCNY) in September 1956. Although classes had already started, she was admitted immediately on the basis of her academic record and told that her courses at Carnegie Tech would satisfy the requirements for a major in Speech and Drama.

She would, however, have to take an assortment of required courses, one of which was in mathematics. At the time, such a course at CCNY contained an introduction to the basic concepts of limits and the calculus; she immediately fell in love with the subject. Obviously her professor thought that she had a talent for it since, as a proper introduction to the calculus, her professor set her upon a summer project of reading and doing the problems in the first chapter of Courant's classical calculus text (these days thought to be too sophisticated except for advanced, mathematically mature students). The following fall, she started the calculus sequence for engineers and science majors and was also advised to take a physics class, where she found herself in a class taught by a young instructor who had unsuccessfully started graduate studies in physics at the age of 18 and was now teaching physics at CCNY. In later years, Lesley loved to tease me that she almost decided to drop the course when, on the spur of the moment, after having described *how* to use the slide rule, I decided to explain w*hy* it worked. I knew the theory of course, but the explanation could have used some preparation! We started chatting during lab hours and soon discovered that we had both been at Carnegie Tech (with little overlap) and had dozens of mutual friends who had been in the theater department there. Lesley always claimed that she fell for the fact that I had a beard (not so usual at that time), a red supercharged MGTD sports car (which I unfortunately was in the process of selling) and also that I understood that $1/x$

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got large when x got small. As far as I was concerned, falling madly in love with her was a no-brainer. It was lust at first sight and love at first conversation. (I was probably also impressed that a first semester calculus student was asking about uniform continuity.) We soon moved in together and married at the end of the school year.

At some point in the spring of our first year together, we visited my old mechanic, just to say hello. The mechanic had a Morgan roadster for sale and when Lesley saw it, she fell in love with its classic lines and the way it drove; we bought it immediately. This was likely the beginning of Lesley's lifelong love and fascination with small, agile, beautifully made cars. She had an expired out of state license and had to take a NY drivers test which she took, of course, in our Morgan. The instructor, wind blowing in his face, not able to reach the brake pedal, or even see the speedometer, was in a panic. The next week she retook the test and passed easily—in her mother's Plymouth. We often took a drive up the west side of Manhattan, and near Grant's tomb there was a hairpin U-turn. Because of the Morgan's rock stiff suspension, it was possible to put the car into a four wheel drift while maintaining control. With me shouting "floor it," Lesley was determined to perfect these difficult drifts around the turn.

I began full-time graduate studies in math that fall (1958) and Lesley the year after, she having been fortunate enough to attend a course in advanced calculus taught by the Fields Medalist Jesse Douglas. We eventually moved close to NYU, and our apartment became a frequent meeting place with fellow students.

Throughout her life, Lesley was adamant about being physically active; as a youngster she was an accomplished figure skater, and during our graduate studies Lesley developed a passion for skiing. (Years later we bought a log house in Stratton, Vermont where we skied for many years.) Eventually she developed an even stronger passion for tennis, and this continued for the rest of her life. Days before her death she played a two and a half hour mixed doubles tournament match (with me) and, having won the match, was looking forward to playing in the second round the following weekend. (As the tie-breaker in the second set dragged on and on we began, after each point, telling each other pointedly "we do *not* want to play a third set.")

She obtained her PhD in 1964 under the joint supervision of Lipman Bers and Cathleen Morawetz at the Mathematics Institute of NYU (now the Courant Institute). Her dissertation was on a problem in partial differential equations arising in the mathematical theory of gas dynamics. At the time, Bers had already changed fields from PDE to complex analysis but somehow realized that Lesley's talents were in "hard" analysis. He suggested a very technical problem in PDE involving a delicate estimate, at a boundary transition point, of the behavior of a solution of an equation of mixed type with discontinuous coefficients. Years later, Lesley asked Lipa why he had given her such a nasty technical problem (of suspiciously marginal interest). He smiled and said that he wanted her to learn how to do research in analysis.

The summer she obtained her degree, Bers arranged for us to accompany him to ETH in Zürich and to write up lecture notes for a six-week course he was to give on Teichmüller theory. (The lecture notes that we produced were quite important and the only source of the material for many years.) We found a charter flight that arrived in Europe a week early and I, with an absurd lack of imagination, thought we should go directly to Zürich to "settle in," but Lesley immediately vetoed this. (Bers had quietly told Lesley that when he first saw Rome, his thought was that he "might have died without seeing it.") We made a connecting flight to Rome.

We next spent two years as instructors at Stanford University. She continued her work on PDEs of mixed type (elliptic or hyperbolic in different regions of the plane). She also obtained an extension to degenerate elliptic equations of the Morse index theorem (which describes what happens to the eigenvalues of the Laplacian as the domain shrinks). She employed a variety of techniques, but a constant throughout were inequalities and a-priori estimates. Her love of these methods persisted during her entire career.

The American Fulbright committee awarded two (separate) Research Scholar grants, one to Lesley and one to me, to Paris for the year 1966-67. The French Fulbright committee had to review and approve the American committee's decision and balked at funding two grants to the same family. At first, we were given the choice of who would receive the grant. (Note that this was 1966. Even then there was some sensitivity in the mathematical community to feminist issues.) We had several conversations with George Springer, the chair of the US committee, who came up with a better solution; it was arranged that we would "split" the grant and both be Fulbright Research Scholars. Although her French sponsor had been Laurent Schwartz and we were officially at l'Institut Henri Poincaré in Paris (essentially the only research location in Paris proper at that time), Lesley actually spent most of her time at l'Université Paris-Sud in Orsay, where Eli Stein was visiting and giving lectures on harmonic analysis.

We purchased a basic French sedan and drove everywhere in Paris. In those days, parking was easy; often one

simply parked on the sidewalk! We skied at Val d'Isère, Megève, Davos and, finally, St. Moritz. Returning from skiing one day in St. Moritz, our car caught fire and burned to the ground. Taking advantage of this disaster by using the insurance proceeds, we purchased an Alfa Romeo GTV sports coupe that we have loved and immaculately preserved to this day. On the way to pick up the car during a visit to the University of Florence, we gave talks in Zürich and met category theorist Myles Tierney and his wife Hanne (with whom Lesley has always remained close). We drove back to Paris but returned to Italy later that summer after vacationing in Cannes. We both found enormous pleasure and contentment in these long drives together. In Naples, after checking out of our hotel and preparing to drive back to Paris, we passed by the Port, where a pothole disabled the Alfa. Not knowing what to do next, we noticed, a short distance away, a ferry going to the nearby resort island of Ischia. We shrugged and boarded the ferry. The next morning we called the local Alfa Romeo dealer from Ischia and spoke to the young service manager, Elio. He told us that we should enjoy ourselves in Ischia for a few days while he took care of the car. We became friends with Elio and visited him a number of times in the ensuing years. On one of the visits, we met Elio's childhood friends, Franco and Anna Macchi, with whom we also became lifelong friends. We usually stayed with them whenever we were in Rome.

We returned to New York in the fall of 1967 and Lesley took a position at Brooklyn Polytechnic Institute (now NYU-Poly School of Engineering) where she stayed for

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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**.

the remainder of her career. Up until this time, her work continued in partial differential equations and mine in complex analysis and Riemann surfaces. However, in a coffee shop at an AMS meeting in Chicago in 1968, a meeting with Bers profoundly changed both our mathematical careers. He suggested a problem that he thought would interest both of us since it encompassed both our fields, namely, to show the *existence of compressible gas flow on a Riemann surface*.

Armed with some basic research materials (including Springer's Riemann surface book and notes of Charles Morrey) we returned to France, having arranged to spend the summer of 1968 at l'Université de Nice. Arriving in Paris during *les évènements de Mai*—the 1968 student revolt—we were just in time to get tear-gassed during a demonstration. In the restaurant Chez Robert, we met a couple, Guy and Marie-Claude Von Dorpp. (The restaurant still exists; it is near our present apartment in Paris, and we continued to frequent it often over the years, Lesley consistently ordering their wonderful rognon de veau). When the Von Dorpps discovered that we were mathematicians, they said that they were heading to the new Faculté de Science Jussieu, for a political meeting chaired by mathematician Claude Chevalley, and invited us to join them. Over the years, Marie-Claude remained our dearest friend in Paris, and we always stayed with her when there. She spoke no English, which was wonderful for our language skills! In those years, Americans who spoke French were a rarity and a curiosity. It was easy to make friends.

Of course, when we arrived in Nice, we found that the events of May had caused the university to close. Nevertheless, we rented an apartment in the hills above Nice and spent the summer (except for a short vacation in St. Tropez) attacking the problem that Bers had suggested and dining in the old town in the evening. We soon realized that the problem had a wider scope, that it could be considered, not just for a Riemann surface, but for a Riemannian manifold of any dimension, and also for a more general class of non-linear equations in divergence form involving a "density" coefficient depending on the gradient of the solution. (The densities included those of minimal surface type.) Framing the problem in terms of differential forms, we obtained a non-linear generalization of the classical Hodge–de Rham theorem about harmonic differential p-forms: *for a given density, until the ellipticity degenerates, there exists in each cohomology class of the manifold, a unique p-form solution of the non-linear equation*. Lesley, who previously had worked solely in analytic problems, became fascinated by the differential geometric and topological aspects of the problem. This problem began our collaboration which continued throughout our mathematical careers.

In 1970 I was a member at the Institute for Advanced Study and Lesley, who was teaching only graduate courses, was able to arrange a one-day schedule at Poly and commute from Princeton. At the Institute we both talked mainly to Michael Atiyah and were exposed to many new ideas of algebraic geometry, including K-theory and index theorems. Lesley was invited to spend the following year as a member at the Institute also.

Between our two years at the Institute, we decided to summer again in the south of France. We took with us a suitcase that we could barely lift, filled with math books. We rented an apartment in a vineyard outside St. Tropez and alternated days between the beaches and the mathematics. Actually, many days we did both, taking a mathematics book to the beach; it amused Lesley to wonder what people on the topless beach thought was in those K-theory books she was reading. For 1F20 (22¢), we purchased liters of wine made in the wine cellar beneath our (fragrant) bathroom. For our many visitors, we maintained huge platters of cheeses and pâtés. On the flight home, the plane made an unexpected stop. (Perhaps in Gander? Bangor?) The customs inspector was extremely suspicious of the suitcase of math books and kept asking if any of it was pornography. (I'm sure the authors of the books would have appreciated this!)

The following year at the Institute, Raoul Bott suggested that we prove some of the theorems in algebraic geometry theory by using PDE techniques. By constructing a parametrix (an approximate inverse of the ∂-bar operator), we obtained a generalization of the Atiyah-Bott-Lefschetz formula for holomorphic self maps and also obtained a constructive proof of the classical Riemann-Roch theorem of complex analysis.

In 1972, Jim Eels organized a global analysis summer. For conferences at the International Centre for Theoretical Physics (ICTP) in Trieste followed by another at the University of Warwick in England, we brought the Alfa back to Europe. (It was this summer that we met Karen Uhlenbeck, as well as many others working in this field of research.) We heard about a world famous shop near Grenoble that made custom made ski boots. Once we had the boots, we wanted to use them, but it was the beginning of July! On July 4th we skied in bathing suits on the glacier at Tigne in the French Alps.

A few years later, on the way to the annual math meeting in San Francisco, we arranged to meet Bott for some skiing in

Alta, renowned for its light fluffy powder. Unfortunately, it had just received several feet of very heavy wet snow. We coped as well as we could, Raoul using the classical Arlberg Telemark technique and the two of us the newer reverse shoulder. No one fared particularly well! For many years we skied in earnest at our house in Vermont. Much later, in January 1993, we had CNRS grants at l'Institut Fourier in Grenoble and looked forward to some great skiing at nearby Alpe d'Huez. We suffered a terrible disappointment: there was absolutely no snow in France that January. With no skiing possible, we reluctantly spent the month, including weekends, doing mathematics. Having sold our house in Vermont, in the mid and late 1990s we started skiing in the mountains of Colorado; Lesley's absolute favorite, for its simplicity, non commercialism and sheer beauty, was Arapahoe Basin.

Lesley continued to develop new interests during our long life together and when she became interested in something, she pursued it with passion. From childhood, she had always loved animals and was very comfortable with them. I had visions of our going on safari (which we unfortunately never got around to doing) and Lesley wanting to pet the lions. At some point she had even thought fleetingly of becoming a veterinarian. She had always wanted a terrier, in particular a Kerry Blue. We went to a breeder and naively said that we wanted a "good" dog. This term meant one thing to us, but quite another to the breeder who, once the dog had been chosen, immediately started speaking about our entering him in dog shows. Doing this had never occurred to us but, aside from feeling obligated to do so, we (Lesley in particular) became enthusiastic about it. The ensuing years were spent driving around the northeast entering the dog at various shows. He soon won a sufficient number of shows to become a champion, as did our second Kerry Blue a few years later. At first, we showed the dogs ourselves, but eventually engaged a handler who took the dogs when we traveled.

When Karen Uhlenbeck obtained her result on the removability of point singularities of Yang-Mills connections in R^4 with finite energy, she mentioned to Lesley that there were many other situations in gauge theory for which a removable singularity theorem would be desirable, and she suggested to Lesley the problem of obtaining them. In 1979 Lesley spent a sabbatical at Harvard, spoke extensively to Cliff Taubes, and learned about Yang-Mills gauge theory. She obtained one result and then interested me in these problems and we began collaborating. In a series of papers we proved several other removable point singularity theorems. The various cases required different analytic tools but the assumption was always that the curvature (and Higgs field if it was present) be a solution in a punctured neighborhood of a point and to be in an appropriate Sobolev space. The objective was always to show that there was a *smooth* (gauge equivalent) configuration that extended over the point.

In the spring of 1984 we visited l'Universitá degli Studi di Firenze in Italy on a CNR grant and lived in Bellosguardo, in the hills south of the city. Heating was no longer supplied in April and it was an extremely cold and rainy month; newspapers pointed out that it had rained every single day of the month without fail and that the temperatures were far below normal! The bathroom was frigid and huge, with a bathtub at the far end. Our villa had once been occupied by Elizabeth Barrett Browning (before she settled into Casa Guidi, where she lived for many years). Lesley pondered, somewhat sardonically, whether perhaps Browning's pulmonary problems had been exacerbated by her stay there!

In 1986–87, Lesley received an NSF-VPW (Visiting Professorship for Women) Fellowship which she spent at the University of Pennsylvania, and I took a sabbatical there. She taught a graduate course on the mathematics involved in the analysis of gauge theory which resulted in a set of lecture notes (later published by Poly) which provided the basic analytic tools used in the subject. During this year, we began looking at higher codimension singularities. In Yang-Mills theory, one considers a connection (the gauge potential) and its curvature (the field strength). For a space with a singular set of codimension two, the connection over-describes the physics because equivalent connections correspond to the same physical system while the curvature under-describes it, as shown by the famous Bohm-Aharanov experiment. The missing ingredient is the *holonomy*, which describes the change in the connection as it is transported around the singularity. We succeeded in obtaining a complete classification by holonomy of singular connections and, moreover, we obtained necessary and sufficient conditions on the holonomy for the singularity to be removable. This last result turned out to be a crucial element in our proof with Uhlenbeck of the existence of non-minimal Yang-Mills fields.

For several decades, it had been an outstanding conjecture that any solution of the (second order) Yang-Mills equations (a critical point of the action) was necessarily a solution of the (first order) self-dual equations (a minimum of the action). When we visited Uhlenbeck, we discussed Atiyah's dimensional reduction of Yang-Mills in Euclidean 4-space to Yang-Mills-Higgs on hyperbolic 3-space, Taubes construction of a non-minimal solution of the Yang-Mills-Higgs equations in Euclidean R^3, and our recent co-dimension-two removable singularity theorem. Putting these

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ideas together, the three of us produced a counterexample to the conjecture by finding non-minimal critical point solutions of Yang-Mills. The possible physical significance of the existence of these non-minimal solutions concerns the change of state of a particle, in quantum mechanics, that is given by a path integral involving the exponential of the action along a path, a "phase factor." Except for paths near the critical points of the action, this phase factor oscillates very rapidly, cancelling out any contribution. The main contribution to the integral is by the minima, but other critical points of the action also contribute to that integral.

In April of 1990 we spoke at a conference on Geometry and Several Complex Variables in Guadeloupe, F.W.I. and snorkeled at a beautiful semi-hidden nude beach east of town. It was during this meeting that Lesley saved my life (literally). While she sunned on the shore, I rented a Sunfish and set out. Every time I tried to change the tack from starboard to port, I overturned. Each time I climbed back on and repeated the maneuver, each time overturning. I was getting increasingly tired with each climb back on the Sunfish and the shore was getting more and more distant. No one was noticing from the beach except Lesley, who managed to get a rescue team sent out just before I disappeared over the horizon. It turned out that the sail had been incorrectly rigged!

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

Application deadline: August 15, 2015

For many years, the Association for Women in Mathematics has held a series of workshops for women graduate students and recent PhDs in conjunction with major mathematics meetings. Pending funding, an AWM Workshop is scheduled to be held in conjunction with the Joint Mathematics Meetings in Seattle, WA, January 6–9, 2016.

FORMAT: The new format, which started in 2013, presents research talks focused on a research theme that changes from year to year. In addition, a poster session for graduate students includes presenters from all fields of mathematics. The AWM Workshop talks in Seattle in 2016 will focus on algebraic combinatorics. Participants will be selected in advance of the workshop to present their work. Recent PhDs will join senior women in a special session on algebraic combinatorics where they will give 20-minute talks. The graduate students will present posters at the workshop reception and poster session. Pending funding, AWM will offer partial support for travel and hotel accommodations for the selected participants. The workshop will include a reception and a luncheon. Workshop participants will have the opportunity to meet with other women mathematicians at all stages of their careers.

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

MENTORS: We also seek volunteers to act as mentors for workshop participants. If you are interested in volunteering, please contact the AWM office at awm@awm-math.org by **September 15, 2015**.

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

All applications should include:

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

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

Lesley cut short her year 1990–91 at the Bunting Institute and Harvard math department to take over the chairmanship of the math department at Poly. Starting in 1993 she became an Associate Secretary of the AMS. We spent the spring of 1996 at l'Institut des Hautes Études (IHES) in Bures-sur-Yvette. Arriving in January, we promptly joined the tennis club of nearby Gif, although the courts there would not open until spring. However, the club did have two courts in a Quonset hut in Bures, close to IHES housing. The fact that these courts were not heated did not faze Lesley. She insisted on playing frequently, even though it meant doing so encased in heavy parkas, gloves and wool hats.

Lesley was interested in cooking various cuisines. Once, when she and Lydia Marshall, a good friend and well known author of cookbooks, were both in Paris, Lydia took her to a restaurant supply store and supervised the purchase of an enormous supply of cooking equipment. Back in New York, Lesley attended many classes in the cooking school run by Lydia as well as classes in Julie Sahni's Indian cooking school. Lesley was more interested in sauces than baking, which she found too regimented. (Soufflés were an exception to this aversion.) She always preferred to modify ingredients and experiment. She allowed me to watch, keep her company, do some chopping, and occasionally, some sautéing. (She taught me how to make a mirepoix.) Only rarely was I allowed to do any serious cooking, because I messed up the kitchen and used too many pots.

In the 1980s Lesley became interested in oriental rugs. Everywhere we traveled, we sought out places to see some rugs. Years later, in 1999, on the day after we moved into our summer house in Woodstock NY, we attended a nearby auction. The temperature was over 100°F, the lights went out, and most people left. Lesley, who had become knowledgeable about the quality and value of rugs, observed that it was ridiculous, nobody was bidding. She ended up buying thirteen rugs, thus furnishing every room in the house.

My (partial) chronology stops here, but we continued traveling and doing mathematics together for many more years. I'd like to mention a few other things. Some of Lesley's favorite classical authors were Chekhov, O'Casey and Austin, plus, of course, Shakespeare and the restoration playwrights. Her favorite mystery writer was Dick Francis. We were constant theater goers, especially to off-Broadway productions that Lesley had discovered. We had similar taste in art; our first major canvas purchase was a large abstract oil by Rolf Scarlett, a contemporary of Jackson Pollack. We accumulated a collection of (mainly abstract) works by Woodstock artists.

When I first met Lesley, I immediately fell madly in love with her. At that moment, I knew that I had found my "zing." I never ceased to be entranced by her. She was fascinating. She was exciting to be with. We had fun together. Fifty six years later, I was still madly in love with her.

> *And there is a Catskill eagle in some souls that can alike dive down into the blackest gorges, and soar out of them again and become invisible in the sunny spaces. And even if [she] forever flies within the gorge, that gorge is in the mountains; so that even in [her] lowest swoop the mountain eagle is still higher than the other birds upon the plain, even though they soar.*
> *—Herman Melville,* Moby-Dick

In her desk, I found a small collection of fortune cookie sayings, including the following:

> *There is only one happiness in life, to love and be loved.*

Ed Dunne, AMS

I am very sorry about Lesley. Deane Yang let me know. By strange coincidence, on Thursday night, at dinner with my wife, I was just telling her about how remarkable Lesley was. I mentioned how Lesley was both a strong mathematician and a genuinely nice person. You and she were often helpful to me, whether it was offering to drive out of your way to get me to my hotel at an AMS meeting or offering help with the book program. In my early days as an editor at the AMS, Lesley was a great resource, suggesting people to talk to or topics to look for. Her help and kindness just flowed naturally and effortlessly from her. I was always impressed. Although it has been a little while since I have seen you or her, I will miss her terribly. You have my deepest sympathy. You have lost someone tremendous. [*from a condolence email, September 2013*]

Hanne Tierney, Artistic Director, FiveMyles, Brooklyn

Lesley and I were close friends for 40 years. I think what I loved and admired most about her was the certainty with which she knew her own mind. It let her go after something that interested her with single-minded persistence and passion. She was so incredibly her own person; she did things her way and felt comfortable with it. Impulsively generous and thoughtfully kind, Lesley's immense warmth and compassion were a part of her valued by her friends above anything else. I have always been grateful for this friendship.

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LESLIE M. SIBNER *continued from page 31*

Robert M. Fossum, University of Illinois, Urbana-Champaign

Lesley Sibner was active in the AMS for many years, the last 25 of them as an officer and member of many program and editorial committees of the Society. Her research had taken her to many corners of the world. She befriended many of those she met during her travels. I became aware of Lesley through some of her New York City colleagues and, after finally meeting her in the mid-1990s, became fast friends with her husband Bob and her. Not only that, her enthusiasm for the mathematical sciences convinced me that her services were needed in the AMS.

Her most notable service was as Associate Secretary for the Eastern Section of the AMS. This lasted over a period of 15 years beginning in 1993. As a corollary of holding this office she was a member of the Abstracts Editorial Committee and the Council of the AMS.

As Associate Secretary she was the face of the AMS in the Eastern Section and was responsible for organizing many of the Society sponsored events in the section. One of the responsibilities was to plan and bring to fruition two sectional meetings each year, usually one in the spring and one in the fall. This was a commitment she took very seriously. She was determined to develop these sectional meetings into vibrant environments of high-level mathematics and which mathematicians with similar interests would be anxious to attend.

This responsibility involves many tasks. Meetings must be arranged several years in advance of the meeting date. Since there are meetings about every six months, the activity is continuous and unending. As soon as the details for one meeting are made final, one's attention has to turn to the next and future meetings. As several meetings are being planned simultaneously one must be able to juggle these tasks. Lesley was a master at this.

The first task is to find suitable sites for the meetings, most often at university or college campuses. Having friends and acquaintances at institutions throughout the section is an advantage here—and Lesley had many of these.

Then comes the most important task of arranging for a desirable scientific program. The Associate Secretary arranges for the scientific program of the meeting by working closely with the section's program committee. This involves finding plenary speakers and arranging for breakout or special sessions. Again Lesley's broad network of mathematical friends worked in her favor and she was able to arrange scientifically excellent meetings during her years as Associate Secretary. Her sectional meetings were excellent since her standards were high.

During Lesley's tenure the Society began a series of international meetings. These are based on the model of the sectional meetings: two days of sessions and plenary lectures. They are organized in cooperation with the mathematical society of the host country. There are usually two of these a year, and the duty of planning and organizing one of these falls on one of the four Associate Secretaries. Lesley was uniquely qualified to be involved with these meetings because of her contacts with mathematicians throughout the world. She was the U.S. organizer for several very successful meetings with the Mexican Mathematical Society (SMM) held in Guanajuato (1995), Oaxaca (1997), and Denton, TX (1999). In addition she was the associate secretary of record for joint meetings in Lyon, France (2001), Pisa, Italy (2002), Taipei, Taiwan (2005) and Rio de Janeiro (2008).

Every fourth year an Associate Secretary is charged with all of the scientific planning for the annual AMS meeting, usually held in early January. The work involved is similar to but more difficult than that for a sectional meeting. Lesley's circle of mathematical friends was again an excellent resource for her responsibilities for these meetings.

Lesley worked tirelessly for the AMS and was remarkably successful in changing the mathematical community's perception of these meetings. She enormously enjoyed organizing the mathematical program of the meetings. In addition to the sectional meetings and the occasional annual meeting, she was even more proud of her involvement in the organization of many of the international joint meetings with foreign societies.

Lesley and Bob lived a very rich intellectual, cultural, and social life. They owned an apartment in Paris near Institut Henri Poincaré, a summer home in Woodstock NY, a condo in Delray Beach, FL (tennis), as well as their apartment in New York City. These residences provided the Sibners with the opportunity to continue their mathematical research and to enjoy the many attractions of these interesting locations.

My wife and I enjoyed visiting the Sibner's summer home in Woodstock. Robin played tennis with Lesley, a game at which Lesley excelled. We met many of their Woodstock friends and enjoyed the country life for the short time we were visiting.

It was a real pleasure knowing and working with her. She is missed.

Deane Yang, Brooklyn Poly

I first saw but did not meet Lesley when I was a graduate student at Harvard. The Harvard math department is on the third, fourth, and fifth floors of the Science Center. There is an open stairwell that goes between the three floors and passes through the department lounge on the fourth floor. I often saw Cliff Taubes, who was a Junior Fellow then, and a woman with dark black hair discussing mathematics at the blackboard. It was only much later that I learned it was Lesley while she was on sabbatical.

My next memorable encounter was a CBMS conference in January 1984 that Lesley organized at what was then known formally as Polytechnic Institute of New York but informally as Brooklyn Poly. Jerry Kazdan gave the main set of lectures, but also there were Rick Schoen and Karen Uhlenbeck. This was my first encounter with Brooklyn Poly, and it left a very positive impression on me.

It was, however, in 1990 when Lesley played an extremely critical role in my life as a mathematician. I was at the time a visiting associate professor at Columbia and looking for a permanent position, preferably somewhere in or near New York. When Lesley learned about this (I don't remember whether she heard about this from someone else or directly from me), she immediately expressed strong interest in having me join the Brooklyn Poly math department. She was the department head and was able to convince the Provost to give me a generous offer. Although I also had an offer from Queens College, I chose Brooklyn Poly.

A significant reason for this was that I found a solid core of research mathematicians (Lesley, Ed Miller, and Erwin Lutwak) leading the small department. Although life at Brooklyn Poly turned out to be a bit of a roller coaster ride, I have never regretted my decision, largely because I have always enjoyed working with Lesley, Ed, and Erwin on both mathematics and the challenges of department administration.

Years later, I learned that the position Lesley offered me was originally for a statistician. Since Brooklyn Poly is an engineering institution, it is more naturally oriented towards the more applied and practical aspects of mathematics. It had not been easy for her to convince the university administration that it would be better to hire me than a statistician. I will always be extremely grateful to her for doing this.

Karen Uhlenbeck, University of Texas

I first met Lesley Sibner at a conference in Trieste in the early '70s. I went to a talk entitled "Non-linear Hodge Theory" given by her, and when I went in, I think I expected the speaker to be male. This very stylish woman in a suede purple pant suit (and I think, boots, but I don't quite remember that) got up and gave a polished talk with energy and assurance. I was quite interested in the mathematics, since the work I had been doing involved the system version of the equation she was talking about. I went up afterwards, and we became instant fast friends. This was the first time I had a close association with a woman mathematician. Back in those days, if you wanted to succeed as a mathematician, you hung around men.

Lesley always claimed that "New York women" were different and did not suffer from the insecurities and hang-ups that the rest of us were stuck with. She really did boost my confidence immensely, and it helped that we were interested in the same mathematics. I visited her often in her apartment in New York. As I recall, I stayed with my in-laws at first, but later, after I separated from my husband, slept on her living room sofa. She introduced me to a number of her friends, including the Tierneys, talked mathematics for hours, and carted me around to her favorite restaurants.

Of course, I should have mentioned right away that her husband Bob was involved with everything she did, including my friendship with her. Later we grew apart. In the early years we met at AMS conferences, but later when Lesley became the first woman secretary of the AMS, I was going to more specialized conferences. The Sibners went to Vermont and then the Catskills in summer; I went canoeing and then hiking with my second husband. She and Bob went to Florida to play tennis in the winter; we started taking biking trips all over the world at Christmas time. They had an apartment in Paris, but we went to Europe seldom.

I never forgot my debt to her, and wish we had spent more time together. The one time the Sibners visited me in Texas, we got a paper on monopoles out of it which went to PNAS. I was looking forward to seeing a lot of both Lesley and Bob when we moved to the East Coast. I am incredibly sad about her death, and will miss her very much.

Lesley was a true pioneer, an excellent mathematician and a wonderful person.

AWM Conflict of Interest Policy

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

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

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

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

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

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