AWM
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

In February, AWM received a bequest of $50,000 from the estate of Alice Schafer for unrestricted use by the association. A founding member of AWM and its second president, Alice contributed in countless ways to the organization and to women in mathematics throughout her career, and she will continue to contribute through this extraordinary remembrance.

The AWM 40th Anniversary Schafer session at the January 2011 joint meetings in New Orleans will pay tribute to Alice through the women whose achievements have been recognized by the Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman. This prize has been awarded annually for the past twenty years by AWM, and its winners have gone on to distinguished careers in mathematics, physics, education, and finance. The session will feature many of the Schafer winners as speakers and panelists (and as the session's organizers, too).

February also brought the very welcome news that the Mathematical Sciences Research Institute (MSRI) had generously donated to AWM a large share of the proceeds from the performances of *Truth Values: One Girl's Romp through MIT's Male Math Maze* during the joint meetings in San Francisco in January. MSRI is recognized worldwide, not only for its outstanding mathematical programs, but also for bringing events of interest and relevance to the public. AWM is especially aware of MSRI's sponsorship of the Connections for Women Workshops, Diversity Workshops, Math Circles, the Julia Robinson Mathematical Festival, and most recently, the *Truth Values* play. We applaud MSRI for its support of women in mathematics through these and many other endeavors.

The talented creator and solo performer of *Truth Values,* Gioia De Cari, has told us that the Washington, DC, chapter of the MIT Alumni Club will sponsor a performance of the show in the Washington area at the time of the USA Science Festival there this October. [See the Media Column this issue for a review of the play.]

Just as bad news arrives in clusters (let's forget about this past fall, please), so does good news. As I was finishing this report, we learned that our grant proposal for one year of AWM's Sonia Kovalevsky High School Mathematics Days program had been recommended for funding, and we are awaiting final approval of the award. In 1985, AWM sponsored a symposium on Sonia Kovalevsky, which gave rise to the program of SK Days organized by institutions around the country ever since. They generally consist of workshops, talks, problem-solving, and hands-on experiences for female high-school students and their teachers. Last fall, funding for the SK Days was rescinded because of a court order

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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.

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discontinuing the particular grant program that sponsored it. The grant will allow us a year of breathing room to continue actively seeking much-needed long-term funding for the program. In addition, we were delighted to learn in February that NSA had awarded support for our Workshop for Graduate Students and Recent Ph.D.'s at the 2011 Joint Mathematics Meetings. The workshops have been one of AWM's most highly regarded activities, and AWM is very grateful to NSA for the support it has provided for them.

Among the twenty recently announced 2010 Alfred P. Sloan Foundation Research Fellowship winners in mathematics are five women: Janet Best (Ohio State University), Svitlana Mayboroda (Purdue University), Monica Visan (UCLA), Maria Westdickenberg (Georgia Institute of Technology), and Xiaoyi Zhang (University of Iowa). Congratulations to all on this well-deserved recognition!

In March, the Intel Corporation and the Society for Science & the Public announced the winners of the Intel Science Talent Search 2010. Over 1,700 high school seniors entered this year's competition, and among the top ten awardees were four remarkable young women, including Erika DeBenedictis of Albuquerque, New Mexico, who won highest honors and $100,000 from the Intel Foundation. In developing a software navigation system to help improve spacecraft travel through the solar system, Erika found that gravity and the movement of planets create "easy transit routes," which ultimately could help spacecraft move faster and use less fuel. Lynnelle Ye of Palo Alto, California, received a $40,000 award for a project that provided winning strategies for the computer game "Graph Chomp." Katherine Rudolph of Naperville, Illinois, received a $20,000 award for her mathematical research on the dense packing of identical spheres, and Linda Zhou of River Edge, New Jersey, also received a $20,000 award for her research on how to reverse drug resistance in breast cancer cells. Over the past 68 years, Science Talent Search finalists have gone on to win seven Nobel Prizes, three National Medals of Science, eleven MacArthur Foundation Fellowships, and two Fields Medals, so we can look forward to exciting news in the future about these prize recipients. Kudos to them all!

The AWM-SIAM Sonia Kovalevsky Selection Committee has chosen Suzanne Lenhart to be the 2010 Sonia Kovalevsky Lecturer at the annual SIAM meeting in Pittsburgh this July. Dr. Lenhart is Associate Director of Education, Outreach and Diversity for the National Institute for Mathematical and Biological Synthesis (NIMBioS) at the University of Tennessee – Knoxville. An applied mathematician working on partial and ordinary differential equations and optimal control, she is recognized worldwide for her research publications in various areas of mathematical biology relating to HIV, tuberculosis, bioreactors, bioeconomics, cardiac function, population dynamics, disease modeling, and resource management. She has collaborated with Louis Gross of the Department of Ecology and Evolutionary Biology at the University of Tennessee on three NSF-funded projects utilizing optimal control methods to approach natural-resource problems. Her work with colleagues applying optimal control to a cardiopulmonary resuscitation model resulted in a U.S. patent. Lenhart's extraordinary record of outreach includes her presidency of AWM from 2001–2002, co-organizing AWM's Teacher Partnership Program, membership on the SIAM Board of Trustees and the AWM and SIAM Education Committees, and serving as Director of Research Experiences for Undergraduates at the University of Tennessee from 1990–2005. The keen insight and imagination

exhibited by Sonia Kovalevsky Lecturers confirm Kovalevsky's own observation: "Many persons who have not studied mathematics confuse it with arithmetic and consider it a dry and arid science. Actually, however, this science requires great fantasy."

The last short story in prize-winning Canadian author Alice Munro's collection, *Too Much Happiness,* is a work of historical fiction on the life of Sonia Kovalevsky (called Sophia Kovalevsky in the story). The title of the book is taken from words Sonia's nurse reported she had spoken on her deathbed to her daughter Fufu, an ironic epilogue to a real life story often filled with too much hardship. In the acknowledgment, Munro writes that she discovered Sonia while searching for something else in the *Encyclopædia Britannica.* As the story follows Sonia on her final journal through Europe, returning ill to Sweden, to her daughter, and to her death, it also travels through time and place in her reflections upon who she has been (mathematician, novelist, wife, mother, lover). Munro writes, "They had given her the Bordin Prize, they had kissed her hand and presented her with speeches and flowers in the most elegant lavishly lit rooms. But they had closed their doors when it came to giving her a job. They would no more think of that than of employing a learned chimpanzee."

After much persuasion from Kovalevsky's doctoral advisor Karl Weierstrass, Gösta Mittag-Leffler arranged a position for her at the University of Stockholm, thereby earning it the distinction of being the first university in Europe to have a female mathematics professor on its faculty. Sonia was offered no professorships at Russian universities, although she was the first woman elected to the Russian Academy. Indeed, she was even excluded from meetings of the Academy. But how greatly have attitudes and employment practices changed in the more than one hundred years since then?

The new report *Why So Few? Women in Science, Technology, Engineering, and Mathematics* by Catherine Hill, Christianne Corbett, and Andresse St. Rose, published by the American Association of University Women (AAUW) and available at the website http://www.aauw.org/research/whysofew.cfm, points to environmental and social barriers—including stereotypes, gender bias and the climate of science and engineering departments in colleges and universities—that continue to block women's participation and progress in science, technology, engineering, and math. The 134-page report is brimming with information, results from studies, and recommendations. Here are just a few excerpts:

- Although women are the majority of college students, they are far less likely than their male peers to plan to major in a STEM field. Just over one-fifth of male freshmen planned to major in engineering, computer science, or the physical sciences, compared with only about five percent of female freshmen.
- The path from elementary school to a STEM career has often been compared to a pipeline. This metaphor suggests that as the number of girls who study STEM subjects in elementary, middle, and secondary school increases (more girls go into the pipeline), the number of women who become scientists and engineers will also increase (more women come out of the pipeline), and gender disparities in representation will disappear. This has not happened at the expected rate, especially at the tenured faculty level in science and engineering. If we compare the percentage of tenured female faculty in 2006 with the percentage of STEM doctorates awarded

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to women in 1996 (allowing 10 years for an individual to start an academic job and earn tenure), in most STEM fields the drop-off is pronounced. For example, women earned 12 percent of the doctorates in engineering in 1996 but were only 7 percent of the tenured faculty in engineering in 2006.

- Negative stereotypes about girls' and women's abilities in mathematics and science persist despite girls' and women's considerable gains in participation and performance in these areas during the last few decades. Two stereotypes are prevalent: girls are not as good as boys in math, and scientific work is better suited to boys and men. As early as elementary school, children are aware of these stereotypes and can express stereotypical beliefs about which science courses are suitable for females and males.

Figures 6 and 9 of the report show that in 2006, women earned 44.9% of the bachelor's degrees in math, but only 29.6% of the doctorates (a number virtually identical to the 30% reported in [3] for all U.S. female doctoral recipients in the mathematical sciences in 2009. Deleting the doctorates from statistics/biostatistics and biometrics departments or programs, which are 45% female, gives a figure of 28% earned by women for the rest.).

Chapter 3 of the report is devoted to a discussion of stereotype-threat research highlighting the work of social psychologist Joshua Aronson, who was a speaker at "Promoting Diversity at the Graduate Level in Mathematics: A National Forum" at MSRI in October 2008. Aronson conducted a field experiment at a large public university in the southwest to investigate stereotype threat among students in a high-level calculus course that is a pipeline to future careers in science. The results showed no difference in performance between female and male STEM majors when they were told that a difficult math test was a diagnosis of their ability (threat condition); however, when the threat was removed by telling the students that women and men performed equally well on the test, the women performed significantly better than the men. Details of the study can be found in [1].

The AAUW report cites the results of an earlier experiment [4] in which researchers administered a test using items from the math section of the Graduate Record Exam to students who had previously demonstrated similar mathematical abilities as measured by grades and test scores. The students were divided into two groups; one group was told that men perform better than women on this test (the threat condition), while the other group was told that there are no gender differences in test performance (the nonthreat condition). In the first group the men had an average score of 25 to the women's average score of 5; while in the second, average scores were more nearly equal—19 for the men to 17 for the women.

In the ensuing decade more than 300 studies have been published that support this finding. The results of these experiments show that stereotype threat is often the default situation in testing environments. The threat can be easily induced by asking students to indicate their gender before a test or simply having a larger ratio of men to women in a testing situation. See [2] for details.

The report makes a number of recommendations—among them are these.

For students:

- Spread the word about girls' and women's achievements in math and science.
- Teach girls that intellectual skills, including spatial skills, can be acquired.

ASSOCIATION FOR WOMEN IN MATHEMATICS

AWM ONLINE

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Classified and job link ads may be placed at the AWM website.

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http://www.awm-math.org

AWM DEADLINES

AWM Workshop at JMM: August 15, 2010

NSF-AWM Travel Grants:
October 1, 2010 and February 1, 2011

Alice T. Schafer Prize: October 1, 2010

AWM Noether Lecturer: October 15, 2010

AWM-SIAM Sonia Kovalevksy Lecture:
November 1, 2010

Ruth L. Michler Memorial Prize:
November 1, 2010

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- Help girls recognize their career-relevant skills.
- Encourage high school girls to take calculus, physics, chemistry, computer science, and engineering classes when available.
- Take proactive steps to support women in STEM majors.
- Teach students and teachers about stereotype threat. Research with college students shows that acknowledging and explicitly teaching students about stereotype threat can result in better performance.

For faculty:

- Conduct departmental reviews to assess the climate for female faculty.
- Create an environment that supports retention.
- Ensure mentoring for all faculty.
- Support faculty work-life balance.
- Create clear criteria for success and transparency.

Largely based upon what is happening at their own schools, members of the AWM Executive Committee have offered anecdotal evidence and expressed great concern that the number of women pursuing graduate studies in mathematics is declining. Figure 3 of the recent annual survey of doctoral students [3] corroborates the trend. The percentage of female U.S. doctoral students in mathematics peaked in 2002–03 at around 38% and has declined almost every year since then to roughly 32% in 2008–09.

What can be done to STEM the tide? Taking the recommendations above to heart might be a good first step. But we hope our readership will have many more creative ideas on how to address these deep-rooted challenges.

[1] Good, C., J. Aronson, & J. A. Harder. Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses, *Journal of Applied Developmental Psychology,* 29(1), (2008), 17–28.

[2] Inzlicht, M., & T. Ben-Zeev. A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males, *Psychological Science,* 11(5), (2000) 365–371.

[3] Phipps, P., J. W. Maxwell, & C. Rose. 2009 Annual Survey of Mathematical Sciences in the U.S. (First Report), Preliminary Report on the 2008–2009 New Doctoral Recipients, *Notices of the AMS*, 57(2), 2010), 250–258.

[4] Spencer, S. J., C. M. Steele, & D. M. Quinn. Stereotype threat and women's math performance, *Journal of Experimental Social Psychology,* 35(1) (1999), 4–28.

Georgia Benkart

Georgia Benkart
Madison, WI
March 24, 2010

Georgia Benkart

CALL FOR NOMINATIONS:

Alice T. Schafer Mathematics Prize

The Executive Committee of the Association for Women in Mathematics calls for nominations for the Alice T. Schafer Mathematics Prize to be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical community are invited to submit nominations for the Prize. The nominee may be at any level in her undergraduate career, but must be an undergraduate as of October 1, 2010. She must either be a US citizen or have a school address in the US. The Prize will be awarded at the Joint Prize Session at the Joint Mathematics Meetings in New Orleans, LA, January 2011.

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

With letter of nomination, please include a copy of transcripts and indicate undergraduate level. Any additional supporting materials (e.g., reports from summer work using math, copies of talks, recommendation letters from professors, colleagues, etc.) should be enclosed with the nomination. Nomination materials for this award, with the exception of transcripts, should be sent to awm@awm-math.org. Transcripts should be mailed to: The Alice T. Schafer Award Selection Committee, Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030. Nominations must be received by **October 1, 2010**. If you have questions, phone 703-934-0163, email awm@awm-math.org, or visit www.awm-math.org.

BOOK REVIEW

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

The Mathematics of Sex: How Biology and Society Conspire to Limit Talented Women and Girls, Stephen J. Ceci and Wendy M. Williams, Oxford University Press, 2009, ISBN 978-0195389395

Reviewer: Judy Roitman, University of Kansas

Do you remember when Barbie said that math is hard? Well, social science is harder. A lot harder.

The Mathematics of Sex is a comprehensive review of that part of the social (and a little bit of the biological) science literature which attempts to understand why there are so few women in math intensive fields (which we'll call MIF). MIF is a subset of STEM (Science, Technology, Engineering and Mathematics). For example, most biology is included in STEM and excluded from MIF. Ceci and Williams narrow their focus even further, to the fact that there are relatively few women in academic positions with research expectations in math intensive fields (we'll call this The Situation). Since explanations of The Situation tend to have policy implications, and since most people aware of The Situation have thoroughly unexamined explanations of it, this work is important.

Explanations of The Situation ("alleged reasons" as Ceci and Williams call them) fall into three categories: biological (male brains are innately more suited for these fields), social and cultural (the deck is stacked against women), and individual choice (women tend to be more interested in other things). Since correlation ≠ causality, it's important to notice that these explanations are not necessarily causal (although this has generally escaped the popular press). An explanation of The Situation could be a correlation sufficient to explain The Situation on statistical grounds.

What exactly is The Situation? The jacket copy informs us that "up to 93% of tenure-track academic positions in some of the most mathematically oriented fields are held by men." This is ambiguous at best. Authors are not responsible for jacket copy, but similarly vague figures documenting The Situation appear in the book without explanation. I don't fault the authors for that; in context it's a minor point whose details could derail the narrative. Rather, this indicates the difficulties of gathering accurate data, the difficulties of giving data meaning, and the even greater difficulties of writing a book which incorporates so much data from so many sources generated for distinct purposes.

The details Ceci and Williams do concentrate on are the ones that matter: details of studies that purport to support various hypotheses about the causes of The Situation. By and large, their critiques of the explanations are devastating, with common problems cutting across disciplines.

One problem is drawing conclusions about statistical tails (few human beings are talented enough to get Ph.D.'s in math intensive academic fields) by studying a more general population. Small babies are studied. The general college-bound population is studied. Connectivity within and among brain hemispheres is studied in adults.[1] The results of these studies are then used to explain The Situation. But most of these subjects do not fall into the tail, and even if some of them did, they wouldn't (or couldn't, e.g., babies) be identified.

Another problem is studying anomalies in an effort to shed light on The Situation. Female to male transsexuals before and after androgen treatment are studied. Boys with serious androgen deficiencies are studied. Girls with high levels of androgen in utero are studied. These populations are small, and there is little overlap with the MIF population. Yet again these studies are used to support explanations of The Situation.

As an aside, one interesting thing that comes out of studies of hormones is that there's a strong correlation between high "mathematical performance" (see the next paragraph for an explanation of the quotation marks) and *low* levels of male hormones—if you want to be a star subject in these experiments, you raise the odds with levels on the low side of normal male, which are of course higher than the high side of normal female.

Then there is the problem of what is actually being studied. No one is actually studying high level mathematical performance. How could they? It's not well defined. Instead, they study surrogates, from SAT-M to GRE-Q to the ever-popular 2D and 3D rotations. (They don't study grades because, guess what, girls' grades are, on average, higher. They don't study courses taken either, since girls have pretty much caught up.) Anyone who is both thoughtful and honest in the field admits that the relationship between surrogates and reality is theoretical at best. When you try to connect high performance on these surrogate markers with the only measures of mathematical performance at hand—things like courses and grades—the connection tends to disappear, with the exception of the Mental Rotation Test. But Ceci and Williams constantly remind us that we really don't know what the Mental Rotation Test is measuring and how it relates to over-all mathematical ability.

[1] A rare example of a biological methodology used to support a biological hypothesis.

Another problem with these studies is lack of robustness. Results vary over time. Results vary over space (i.e., country). The most famous example of lack of robustness is the Stanley and Benbow finding (one of a relatively few studies of the upper tail) in which the number of 13 year old boys with SAT-M scores over 700 outnumbered the number of 13 year old girls with SAT-M scores over 700 by something like 13 to 1.[2] But this was in 1983. The ratio in 2005 was 3.2 to 1. You can't make firm conclusions about gender differences with data that doesn't replicate over time or space.[3]

While I've cited these problems mostly in connection to studies that are used to prop up biological explanations of The Situation, many of these problems also enter into the second category of studies, those that look to social and cultural explanations. I don't think I'm alone among AWM members in tending to favor these myself—subtle discrimination, the large effect of small differences over time, stereotype threat, and so on. These speak to my internalization of my experience. But even here, when variables are carefully controlled, explanations seem to vanish or, if not vanish completely, to become ghosts of themselves. These discussions are subtle and difficult to summarize, but I'll try a little.

Consider stereotype threat.[4] It turns out that the stereotype seems to be changing with time, so conclusions (and interventions) based on earlier data may no longer apply. And the data is inconsistent—some studies show things working the other way.

As for outright bias, when other variables are controlled, it's not clear how much bias actually exists. It's also not clear what effect it has—if women on average have fewer square feet in their laboratories than men, does it actually affect the research they do, or the desire of young women to follow in their footsteps?

The only robust finding here is due to Donna Ginther and her colleagues: don't have kids. Motherhood (but not fatherhood) has the strongest association with differentially negative treatment: less productivity, lower salaries, slower advancement in rank, and so on. Ceci and Williams also accept without question that an accumulation of small differences can lead to big differences, in fact huge ones.[5]

The author's preferred explanation for The Situation is individual choice. Women may choose to put more energy into their families. They may choose fields other than MIF because they have a broader spectrum of talent. They may choose fields other than MIF because they like them better.

The authors are not naïve. They recognize that choice isn't free. In particular, they write with great sympathy of the difficult situations mothers face (they are a married couple with three daughters, the eldest of whom has an engineering degree). But, as they point out, the much larger proportions of women veterinarians, doctors, and lawyers—all of them fields which several decades ago had few women in them—not to mention English, history, and Spanish professors, asks for a deeper explanation. Which they partially provide, by talking about the relatively short half-life of MIF knowledge—take a few years off and it's almost impossible to come back. While recognizing the reasonableness of what they say, I find it disturbing that their basic solution is to throw up their hands. They discuss various approaches to the issue of making the MIF workplace friendlier to mothers (and fathers) who want to give substantial care to their children, and none really meets their approval. My admittedly unsubtle summary of their approach is: soften the demands of the workplace, and you will lower the quality of work that is produced across the board. I'm not so sure. It's not clear that this experiment has been seriously performed. It's also not clear that, if we are patient and continue with outreach, The Situation might not modify itself and approach that in medicine (both animal and human) and law. It is not clear that The Situation is itself robust.

Ceci and Williams ask whether it really would be useful to society to have more women engineers and fewer women doctors—I'm not so sure that it's a zero-sum game. They ask whether the drive to increase the number of MIF women might not in fact lead to a large number of women who are not as happy professionally as they would have been if we'd only left them alone to follow their desires—I don't think that outreach is the same as coercion, and counterfactuals have no truth value.

An interesting side issue is that of eradicating gender difference by teaching specific skills. They cite studies which point out that while skills such as perceiving which

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[2] Old hands may remember this study, published in *Science,* in which the authors concluded that there had to be a biological explanation, and the popular media concluded that there must be a Male Math Gene.

[3] That the 1983 figure has taken on a life of its own, refuses to die, and cannot seem to be killed—Cathy Kessel calls it a zombie statistic—is somewhat infuriating.

[4] Stereotype threat is a negative change in performance when people are reminded that they belong to a social group which is stereotyped as being less capable. Its opposite is called stereotype lift. For example, asked to state their gender at the start of an exam, girls tend to do more poorly than other girls asked to state their gender after they have finished the exam.

[5] Which seems right to me.

figures are rotated variants of each other can be taught, if you teach both boys and girls, both will improve and the gap may even widen (as it has, in various studies). When you intervene, what is your goal?

Studies of gender difference in intellectual performance which put forward biological explanations are so fraught that many in the academy feel they simply should not be published. Ceci and Williams are not particularly sympathetic to biologically based explanations, but make an impassioned plea for lack of censorship. They believe in the importance of give and take, of not preventing research by others which, on the face of it, goes against your own personal beliefs, and of the value of having to respond to research which you may even find repugnant. They give the example of Arthur Jensen's theories on racial differences in intelligence. Many people found them so repugnant that they dismissed them out of hand. But a researcher named James Flynn decided that they needed to be refuted on scientific grounds. So he did, and in so doing provided early and careful evidence of the power of cultural effects, work that Ceci and Williams call ground breaking. They quote Flynn as saying that his work would not have been done without Jensen. Ceci and Williams have great faith in the power of free discussion in social science to approach truth. To a mathematician (well, to this mathematician) their discussion illuminates a major difference between mathematics and social science, and highlights the innate difficulties of the latter.

Finally: should you read this book? It is subtle, wide-ranging, and I can't pretend to have done it justice. If you are interested in the technicalities of these issues, by all means read it. But it is technical. It is not written for a lay audience. The book which will explain the subtleties of these issues to a general public has not yet been written. Perhaps Ceci and Williams will someday write it. I hope so.

EDUCATION COLUMN

Nine-day Courses

Ginger Warfield, University of Washington

If you ever feel the need to see an expression of the quintessence of skepticism, try telling someone about a math course taken by mathematicians and K–12 teachers, side by side. Now add on that both of them learned a lot. And that they had a great time doing so.

This is not a fairy tale. The course exists—in fact it is part of a sequence—and the examples of university mathematicians participating and responding with enthusiasm are too numerous to be written off. If I had spent time learning grant-writing rather than teaching, they would be even more numerous, but that's another story. The examples that do exist deserve describing.

The description needs to start with some background: for several decades Ruth Parker, of the Mathematics Education Collaborative (MEC), has been developing and constantly improving a set of nine-day summer courses designed to enrich the mathematical understanding of teachers. I believe the initial courses were all aimed at elementary teachers, but they have expanded to include secondary as well. Most were developed in the context of various NSF projects, and in the process set into a model for developing teacher leadership and community engagement and support of inspiring depth and effectiveness.

A few years ago, an NSF project in Birmingham, Alabama in which Ruth and MEC were involved was told to include university faculty. The project bought the time of eight university mathematicians, engineers and teacher educators to attend a nine-day course alongside K–12 teachers. At that point, both Ruth and the university STEM faculty were skeptical about the wisdom of such a move, but they obediently moved forward with this new K–20 partnership. The results were successful beyond any of their dreams. Evidence for that success takes many forms, but two are notable: 1) after the one obligatory course, all of the mathematicians involved and many more voluntarily enrolled in all of the subsequent courses, and 2) a subset of them from one particular institution went back and designed a major for future middle school teachers around MEC's courses.

A few years into this, I had the good fortune to encounter Ruth on our shared home turf of Washington state. Since we are both passionately interested in strengthening mathematics education and supporting K–12 teachers in Washington, and since what we each have to contribute meshes very neatly, we joined forces and have been hurling ourselves into an effort to bring this model to the state. On the fiscal front the results have been a bit disheartening, but some small scale funding has been enough to keep our enthusiasm alive and to convince a growing number of people that this really is an exciting and fruitful model. In particular, a number of faculty members from around the state have now, on their own time, taken one of MEC's

courses, taught either by Ruth herself or another member of her team of instructors. Everyone who did is now urging colleagues to follow suit.

Since my involvement enabled me to be among those enrolled in a course, I now have a much better picture of what they have to offer, not to mention an even more fervent desire for more of my colleagues to be able to take them. The course I took was the single prerequisite to all of the others, with the title of Patterns: Foundations for Algebraic Reasoning. It was originally designed to provide a bridge from the land of patterns with colored tiles and snap cubes where elementary school teachers are comfortable and at home to the land of symbolic representations and abstract reasoning that for most of them is absolutely foreign turf. Bridges, however, work both ways. For most of us who live and breathe the abstract and symbolic, the colored tiles and snap cubes are just as foreign—merely a bit less threatening. In fact (pulling an abrupt metaphor switch), the tools of the symbols and abstractions have become so automatic that we have completely lost touch with what can be done by thinking with our bare hands. Watching an elementary school teacher provide an elegant and completely tight explanation for why the 100th element in some sequence will require exactly 279 tiles, without use of a single variable or algorithm, is both salutary and humbling. Locking those tools in the cupboard and diving in without them is not only salutary, but a lot of fun.

On the other hand, much as I like to keep my colleagues amused, it's not for the entertainment value that I have been fighting to give them an opportunity to take part in the course. What is profound and vital is to be able to observe intimately the transformations happening to the participating teachers. The teachers come in with every good intention of learning, but with defenses bristling almost visibly around them. In the first days, the characteristic request is for an instructor to validate a solution to a problem so they can be rid of it. When the instructor instead asks a further question about their solution, the eyebrows go down and the teeth come close to clenching. A week later, the same folks are saying, "Wait, I know I've got the right answer, but there's got to be a better way to get it," or "Quiet! I don't want to hear your solution—I'm still working on it!" In fact, in my group there was one who got pulled over by a cop on her way home, because she was thinking so hard about a problem that her driving was erratic.

What produces this transformation? Partly it's the structuring of the material—an extremely careful sequence of challenges. Partly it's the structuring of the class time, with a constant balancing of autonomous effort, alone or in partnership, and class discussion. Partly it's the huge talent of the instructor for choosing how and how hard to push each student individually and the class as a whole. That talent is bound up in the instructor's absolute and constant conviction that the transformation will indeed occur.

And what do I hope to achieve by enticing college and university faculty members into taking this course? A whole raft of things. Some are quite specific, like fulfilling the wish of the community college faculty member who took the course last summer and urgently wants others at her college to take it because they are in the process of redesigning their developmental course and she feels the new design should be based on what she learned. In fact, there are things I am itching to introduce into my courses for future elementary school teachers, and I'd love to see others have the joy of making such plans. I'd say, though, that my two major reasons are less specific and more profound. One is that by nature of the structure of college teaching we are necessarily at some remove from the actual learning process of most of our students. That's not going to change—in fact in the current budget crunch it is likely to get worse. That being the case, it seems to me all the more beneficial to have the opportunity to experience at first hand the joy and excitement that we can bring to our students if we can engage them in the real learning of the subject we all love.

My other reason brings us back to that bridge-building metaphor. Mathematics education is in uproar—it would be hard to avoid knowing that. Many of us would dearly love to be helpful in some way, even a quite small way. What blocks us is that K–12 teachers qua teachers are close to being symbolic abstractions for us. It's not a question of not valuing them as human beings. It's a question of needing to meet on relevant ground, share experiences and build relationships. The relevant ground in this case is where mathematical thinking and learning happen. With color tiles and snap cubes, for instance. Or with symbols and algebraic reasoning. Simply where mathematics is alive and exciting and engaging—that's all!

Note: For details on the nine-day courses themselves, see www.mec-math.org.

CORRECTION

In the announcement "Hersh Receives Michler Prize" in the March–April issue of this newsletter, we misspelled Irena Peeva's last name. Our apologies, Irena!

MEDIA COLUMN

Media Column Editors: Sarah Greenwald, Appalachian State University, greenwaldsj@appstate.edu *and Alice Silverberg, University of California, Irvine,* asilverb@math.uci.edu

Reflecting on *Truth Values* as Faculty Member of the MIT Mathematics Department

Gigliola Staffilani

We first learned of the solo performance, *Truth Values: One Girl's Romp Through MIT's Male Math Maze,* when our department head Michael Sipser announced its fall 2009 Cambridge production to the MIT math community. Written and performed by one of our former graduate students, who goes by the stage name of Gioia De Cari, the news generated a lot of excitement and a few jitters. As a member of the MIT department faculty I was anxious to go, but wondered if the play might paint the faculty and department's character in an unfair light.

I made the play's opening night. It was performed at the Central Square Theater, a newly outfitted, inviting and intimate space in the heart of Cambridge. From the very beginning De Cari easily filled up the center stage with her dynamic presence and clear voice. Within the first few minutes of the play, I lost all concern about misrepresentation or over-characterization of the MIT math department as a sexist enclave. For certain, De Cari describes instances of overt sexism while a student in the late 80s: while a regular participant in a weekly seminar, a senior faculty member asked her to provide cookies. Nonetheless, with lighthearted impersonation and humor, De Cari portrayed her mentors, faculty and fellow students sensitively. Surprisingly, this sensitivity could be felt both when they were intentionally sexist or when they were just bewildered at finding among them a woman who, in addition to enjoying other delights such as fashion and acting, was as passionate and dedicated to mathematics as they were.

De Cari's experience of the MIT Graduate Math program developed her mathematically, but one gets the sense that it may have also sustained or supported her through a family tragedy and her growing awareness of musical and theatrical talents. De Cari's solo performance gave voice to the struggles of a young, very talented woman who loved mathematics and theater; who proved to herself and others her capabilities as a mathematician, while making a choice for a different life path. *Truth Values* as such is testimony: funny, sad, intense and real.

The narrative's scope and lightness made way for relaxed and engaging post-production discussion with Gioia and guests, entitled Talk in the Box! tackling "the ongoing debate about gender equality." While much has changed at MIT and elsewhere since the late 80s, it was, however, in 2005 that Lawrence Summers delivered his famous comments about women in science as President of Harvard University. It was those comments in fact that prompted De Cari to finish earlier drafts of the play and bring it to production. It was quite inspiring therefore to see the production's affects on students and faculty, women and men alike, talking about sexism and diversity in math and science today, while commenting on the play's artistic aspects.

It was then not a surprise that word-of-mouth quickly spread of the production's quality and community draw, bringing in more faculty, students and deans at MIT and those from area math and science departments. Sold out engagements extended it by seven days (the maximum possible).

This entire experience made me think back to when I first joined the MIT mathematics faculty in 2002, as one of the only two senior women faculty members in the department. In spite of this, I never experienced gender discrimination or differential treatment from my colleagues at MIT. I could imagine, however, that matters could have been quite different only a short while ago for a woman graduate student doing mathematics.

Having been educated in Italy through undergraduate study, I experienced no sense that girls couldn't compete with boys in math and science. In fact, it was assumed that girls would excel in these areas because of better study habits. When I came to the U.S. in 1990, I was amazed to find in a variety of settings the implicit presumption that women did not have the same talent for mathematics as men.

These perceptions have since improved in the U.S., but more remains to be done as we strive for even wider diversity. *Truth Values* is a thought provoking reflection on where math communities have been and where we should go from here.

In the press releases for the play De Cari referred to herself as a "recovering mathematician." It is fair to say that De Cari not only contributed to mathematics through her graduate research in logic, but returned to the community her development as an artist. If ever she were to wonder whether her graduate school experience in the MIT mathematics department was worthwhile, I for one can attest to the value of what she has given back—to us all.

Following the production, we asked our women graduate students and faculty for their reactions. Below is a sampling

of their responses:

> Gioia's story is engaging, entertaining, and personal—one woman's path to find herself and her passions while pursuing a doctorate in MIT's math department. The depiction of the wacky mathematicians is both frank and sometimes timeless, helping us to laugh at ourselves and our little community, glad that we can now wear pink sweaters and short skirts without anyone taking offense.
> *—Jennifer French (MIT math graduate student)*

> The play explores the joy of being a mathematician, the pains of graduate school, and the path of discovering that research isn't the same as taking classes. Some of the topics she talks about are specific for women, some are specific for mathematicians, but I think everyone who ever had a hard time in their career and thought about changing it will find something of their own reflected in her play.
> *—Martina Balagovic (MIT math graduate student)*

> Over the years I have gotten quite sick of having to explain to people what horrendous effects even a little playful sexism can have. Now I can just send them to the play to experience the pain quite vividly. As a wonderful side effect, the non-mathematician will also get a feel for the joy and excitement in maths.
> *—Katrin Wehrheim (MIT math assistant professor)*

USA Science & Engineering Festival

The Association for Women in Mathematics will join more than 350 of the nation's leading science and engineering organizations, including colleges and universities, corporations, federal agencies, museums and science centers, and professional engineering and science societies, at the USA Science & Engineering Festival this October in DC to celebrate the "Best in American Science." More than 750 exhibits spanning aerospace, green energy, medicine, biotechnology, climatology, robotics, nanotechnology, botany, neuroscience, genetics, and many other scientific disciplines will be free to all.

Imagine chatting with Albert Einstein, building an underwater robot, lunching with a Nobel Laureate, or managing cargo in the space shuttle within a virtual reality environment. These are just a few of the many activities planned for the first USA Science & Engineering Festival. Satellite events will be held across the country by universities, student science clubs, national laboratories, and a wide array of other organizations.

Scientists will visit local schools, and many scientific organizations will open their doors to the general public. The Festival will offer more than 40 performances by science

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CALL FOR NOMINATIONS:

The 2011 Kovalevsky Prize Lecture

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

The mathematicians who have given the prize lecture in the past are: Linda R. Petzold, Joyce R. McLaughlin, Ingrid Daubechies, Irene Fonseca, Lai-Sang Young, Dianne P. O'Leary, and Andrea Bertozzi.

The lectureship may be awarded to anyone in the scientific or engineering community whose work highlights the achievements of women in applied or computational mathematics. The nomination must be accompanied by a written justification and a citation of about 100 words that may be read when introducing the speaker. Nominations should be sent to awm@awm-math.org. Nominations must be received by **November 1, 2010** and will be kept active for two years.

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

Festival *continued from page 11*

comedians, bands, magicians, and many others. Festival organizers hope to have a million people join in across the nation, and the best part—it's all free.

AWM will be one of several representing the mathematics branch of science at the two day Expo on the National Mall. AWM's goal is to help families learn about the career potential in doing mathematics. Irina Mitrea, AWM Executive Committee member and organizer of AWM's events at the USA Science & Engineering Festival says: "We are excited about the opportunity to showcase ways in which mathematics can become a profession in itself or a big part of someone's professional life. Now, more than ever before, stimulated by demands in technological and scientific areas of human activities, mathematics is seen as a key component for professional success whose prominence will continue to accentuate even more in the future."

Inspiring the next generation of scientists and engineers is a big reason for hosting a giant science party on America's front lawn. A new report by the National Science Board (NSB) says that in 2007 foreign students on temporary visas earned 50 percent or more of all doctoral degrees awarded in engineering, physics, mathematics and the computer sciences. Global security company Lockheed Martin, which employs approximately 71,000 engineers, is the festival host and has a strategic purpose for its support.

Another reason to get the nation's families excited and engaged in science and engineering right now, is because that's where many of today's and tomorrow's jobs will be. The U.S. science and engineering workforce is now at more than 5.5 million and averages a 3.2% growth rate. This rate is about double that of the American workforce as a whole, reports the NSB.

The USA Science & Engineering Festival will be held October 10–24, 2010 in Washington DC. The Expo on the National Mall will be held October 23–24. For a complete list of sponsors, partners and exhibitors, visit www.usasciencefestival.org.

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, or
- 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**.

In Memoriam

Mary Boas

"An exceptional mother-in-law beat the 'meddling' stereotype" first appeared in Orlando Sentinel, *March 7, 2010. Reprinted by permission of Sherry Boas, author, columnist, and daughter-in-law of Mary Boas.*

Mothers-in-law are often the subject of derogatory humor. They are frequently characterized as interfering, overbearing, meddling members of the family tree. My mother-in-law, Mary Boas, who died February 17, was not like that at all. If anything, she epitomized the opposite of those traits.

Born March 10, 1917, in Prosser, Washington, as the only child of older parents, Mary spent most of her childhood on her parents' chicken farm in Monroe, Washington, where, among other skills, she learned how to slaughter, pluck and cook chickens. Some of my favorite memories revolve around my mother-in-law's cooking. Her fried chicken, homemade fudge and beach plum jelly were some of the tasty treats she prepared for special occasions.

Mary's idyllic youth—living on a beautiful, rural property where she was the much-loved, pampered daughter of two devoted parents—gave her a sense of independence and a strong belief in her ability to achieve whatever goals she set. Although she grew up on a farm, Mary was raised in a family that emphasized education. Her mother, Anne Goff, was a teacher in a one-room schoolhouse, the same school that Mary attended throughout her youth. Although she had no siblings, she was close to her older cousin, Rachel, who went to college when the thought of higher education didn't even enter most women's minds.

Mary knew at an early age that she wanted to pursue an academic career. And she did. In 1940, she graduated from the University of Washington after earning bachelor's and master's degrees in mathematics. To further her education and teach, Mary left her beloved Washington and moved to North Carolina to attend Duke University.

Although leaving her family probably made the move difficult, it was at Duke that she met her future husband, Ralph Philip Boas Jr., a mathematics instructor. Mary and Ralph were married on Cape Cod in 1941, and Mary spent the early years of her marriage working toward her Ph.D. in physics at Massachusetts Institute of Technology. She earned that degree in 1948, the same year that my husband, the first of her three children, was born.

My husband and his siblings grew up in Evanston, Illinois, with two parents whose lives were immersed in academia.

Mary Boas on her 92nd birthday

For three decades, Mary taught physics at DePaul University in Chicago while her husband taught math at Northwestern. Mary was the author of the textbook *Mathematical Methods in the Physical Sciences.* The third edition of her book, which she revised at age 88, is still used in college classrooms today.

I met my husband's parents in 1970, about a week after I met their son. Ralph—my Ralph—and I drove from Boston to Evanston to spend Christmas with his family. Before venturing west, we stopped first at the home of my parents in Pennsylvania, where their reaction to our plans was anything but cordial. My mother and father took an immediate dislike to the man who was to become my husband and, after experiencing their reaction, I was afraid of how Ralph's parents would receive us. I needn't have worried. Ralph's parents were loving, kind and non-judgmental—traits, I was to learn, that remained constant throughout their lifetimes.

It is never easy when someone you love dies, and it is always difficult to lose a parent. I'm glad knowing that my mother-in-law, Mary Boas, lived a long and full life. I'm proud of her accomplishments, appreciative for the unconditional love she bestowed on her family and grateful for the many years we all had together.

Two years ago, my then 25-year-old son, Timothy, agreed to leave Florida and move in with his grandmother to be her companion and caretaker. Together they attended garden club meetings, went to concerts, fixed meals and, in general, enjoyed each other's company. I'm so glad the two of them were able to spend that precious time together, and I'm glad, too, that Mary remained in her own home—as she so fervently wished to do—until she died.

People can make all the jokes they want about meddling mothers-in-law. My mother-in-law was the exception. Even more than that, she was exceptional in so many ways.

JMM 2010

Above, left to right: Panelists Maia Averett (Mills College), David Manderscheid (University of Nebraska-Lincoln), Ellen Spertus (Mills College and Google), and Christine Min Wotipka (Stanford University), with Georgia Benkart (University of Madison-Wisconsin)

Right: Bettye Anne Case (Florida State University)

Participants in the AWM Workshop for Women Graduate Students and Recent Ph.D.'s (from left to right): Kate S. Owens (College Station, TX), Kelly Jabbusch (University of Freiburg), Raegan Higgins (Texas Tech University), Audrey Malagon (Mercer University), Cornelia Van Cott (University of San Francisco), Katharine Ott (University of Kentucky), Ursula Whitcher (Harvey Mudd College) and Amanda Knecht (University of Michigan)

Left: Elizabeth Stanhope (Lewis & Clark College) and Chia-Yen Tsai (University of Illinois at Urbana-Champaign) at the AWM poster session

Enjoying the AWM reception

Silvia Saccon (University of Nebraska-Lincoln) and Cornelia Van Cott (University of San Francisco)

Ekin Ozman (left, University of Wisconsin-Madison) explaining her poster in the AWM poster session to Alice Silverberg (University of California, Irvine)

Workshop panelists Sharon Frechette (College of the Holy Cross), Maura Mast (University of Massachusetts, Boston), Ann Almgren (Lawrence Berkeley National Lab), and Alissa S. Crans (Loyola Marymount University)

At the AWM reception

Left to right: Susan Friedlander (USC) and Alice Silverberg (University of California, Irvine)

Participants in the AWM Workshop for Women Graduate Students and Recent Ph.D.'s (from left to right): Audrey Malagon (Mercer University), Amanda Knecht (University of Michigan), Ursula Whitcher (Harvey Mudd College) and Katharine Ott (University of Kentucky)

Left to right: Carol Wood (Wesleyan University), Sylvia Bozeman (Spelman College), Robert Bozeman (Morehouse College) and Matthew Miller (University of South Carolina)

Left to right: Alissa S. Crans (Loyola Marymount University), Megan Kerr (Wellesley College) and Rachelle DeCoste (Wheaton College)

Anne Shiu (University of California, Berkeley) explains her poster.

Olena Ostapyuk (Kansas State University) explains her poster.

Awards at the JMM

Janet Beery, Amy Cohen, Bryna Kra, Elizabeth Mayfield, Maria Monks, and Ileana Streinu received awards from organizations other than AWM at the Joint Prize Session at the Joint Mathematics Meetings in San Francisco, CA in January. Congratulations! The citations and responses below are reprinted from the prize booklet (see "January 2010 Prizes and Awards" online at www.ams.org/ams/prizebooklet-2010.pdf).

Levi L. Conant Prize

This prize was established in 2000 in honor of Levi L. Conant to recognize the best expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years, and it is awarded annually. Conant's will provided for funds to be donated to the AMS upon his wife's death, which occurred sixty years after his own demise.

Citation for Bryna Kra

The Levi L. Conant Prize for 2010 is awarded to Bryna Kra for her article, "The Green–Tao Theorem on Arithmetic Progressions in the Primes: An Ergodic Point of View" (*Bull. Amer. Math. Soc. (N.S.)* 43 (2006), no. 1, 3–23). The search for patterns in the prime numbers has fascinated both professional mathematicians and mathematical amateurs at least since the days of Euler, Goldbach, Lagrange, and Waring. Although the Prime Number Theorem provides asymptotic estimates on the distribution of primes, it does not yield information about regular patterns. The modern history of the subject began with a conjecture of Hardy and Littlewood in 1923 that, given k-tuples $\{a_i\}$ and $\{b_i\}$ of nonnegative integers, then, with obvious exceptions, there are infinitely many integers n such that the sets $\{a_i n + b_i : 1 \le i \le k\}$ consist only of primes. In 1939, van der Corput proved that the primes contain infinitely many triples in arithmetic progression. Computational methods by Moran, Pritchard, and Thyssen found a progression of length 22 in 1995, a record that was finally broken in 2004, when Frind, Jobling, and Underwood found a progression of length 23 starting with the prime 56211383760397 and with common difference 44546738095860. That very same year Ben Green and Terence Tao achieved their striking breakthrough with a proof that the set of prime numbers contains arithmetic progressions of length k for every natural number k.

Kra's article is an engaging exposition of the many mathematical strands woven into the fabric of the proof—number theory, ergodic theory, harmonic analysis, discrete geometry, and combinatorics. The paper is written in a relaxed and readable style, while conveying a wealth of insight. Kra describes how a conjecture of Erdös and Turán sparked the imaginations of a succession of brilliant mathematicians—Szemerédi, Furstenberg, Gowers, Green, and Tao—all of whom contributed significant ideas from combinatorics, ergodic theory, and harmonic analysis. Although Szemerédi's Theorem itself is too weak to yield the Green–Tao Theorem directly, the contemplation of this theorem from many vantage points yielded enough insight to permit Green and Tao to prove their celebrated result.

Kra's narration captures the fascinating history of and conveys the key mathematical concepts behind the Green–Tao result. The article provides an instructive comparison of the proofs of Szemerédi's Theorem by Furstenberg, Gowers, and Tao, revealing the similarity lurking beneath the apparent differences in approach. It is an excellent and well-told lesson in the value of thinking and rethinking about important mathematical results.

Biographical Note

Bryna Kra earned her undergraduate degree from Harvard University in 1988 and her Ph.D. from Stanford in 1995 under the direction of Yitzhak Katznelson. Before her appointment to Northwestern University in 2004, she held postdoctoral positions at the Hebrew University of Jerusalem, the University of Michigan, the Institut des Hautes Études Scientifiques, and Ohio State University and was an assistant professor at Pennsylvania State University. Kra works in dynamical systems and ergodic theory with a focus on problems related to combinatorics and number theory, frequently in collaboration with Bernard Host. She was an invited speaker at the 2006 International Congress of Mathematicians and was awarded a Centennial Fellowship, also in 2006. Kra organizes a mentoring program for women in mathematics at Northwestern, runs a math enrichment program for children at a local elementary school, and is currently chair of the Northwestern math department.

Response from Bryna Kra

It is an honor and a pleasure to be awarded the Conant Prize. It is especially gratifying for me because this project is linked in my memory to the birth of my second son. The invitation to give a "Current Events" talk on Green and Tao's proof arrived while I was still in the hospital. As I sleepily rocked a newborn, their proof occupied my mind.

I would not be standing here without the support of many people. My parents have always been my strongest proponents, and I was pleased to finally write something that

my mathematician father was happy to read! This article was only made coherent with the help of many colleagues who took the time to read and improve preliminary versions. And I especially thank my husband and children for their patience and support throughout.

Certificates of Meritorious Service

The Certificate of Meritorious Service is presented for service at the national level or for service to a Section of the MAA. The first such awards were made in 1984. At each January meeting of the Association, honorees from several Sections are recognized.

Citation for Elizabeth Mayfield, Maryland-District of Columbia-Virginia Section

Betty Mayfield holds degrees in mathematics from the University of North Carolina at Greensboro and the University of Rhode Island. She has taught at Hood College since 1979, where she is currently professor and chair in the Department of Mathematics. Her research interests include underwater acoustics, mathematical pedagogy and its effects on young women, and the history of mathematics. She has been awarded the college's Mortar Board Excellence in Teaching Award and its Laughlin Award for Professional Achievement, and she was inducted into the campus Ionic Society in recognition of outstanding service.

Betty is finishing a term as the MAA's first vice president. She has served on the Committee on Sections, the Centennial Planning Committee, and as chair of the Committee on Undergraduate Student Activities and Chapters and the Search Committee for the Associate Secretary. She is a long-time consultant for Project NExT. She has served the Maryland/DC/Virginia Section with distinction as its governor (2001–04), chair (1997–99), newsletter editor (1993–95), and Project NExT founder (2000–01). Betty received the Section's 2001 Award for Outstanding College or University Teaching, was an invited speaker for the Fall 2006 meeting, and has been a member of the Teaching and Nominations Committees. Finally, Betty served as local arrangements coordinator for the Fall 1996 and Fall 2008 Section meetings. The Fall 2008 meeting was especially noteworthy: for that meeting, Betty rounded up what seemed like the entire undergraduate population of Hood College to serve as volunteer helpers!

Betty is a tireless—no, indefatigable—promoter of the activities of the MAA in general, and the Maryland/DC/Virginia Section in particular. She has been a longtime contributor to the goals of the MAA at both local and national levels.

The MAA proudly awards Betty Mayfield with a Certificate of Meritorious Service.

Response from Elizabeth Mayfield

I am just thrilled to receive this award. Working with the members of the Maryland-District of Columbia-Virginia Section is an absolute pleasure. I am especially grateful to all those other individuals who have helped me and who have done so much for the Association. Many thanks to the Section and to the MAA.

Citation for Amy Cohen, New Jersey Section

Amy Cohen is a graduate of Radcliffe College and received her Ph.D. from the University of California at Berkeley. She has been a member of the faculty at Rutgers University since 1972. Her research interests include partial differential equations, inverse scattering, and the Korteweg-de Vries equation. Recently, she has turned her attention to issues of diversity, graduate education, and teacher preparation.

Amy Cohen's service to the MAA, both at the local and national levels, has been outstanding. In the Section, she has chaired the Teaching Award Committee, helped organize workshops and panels for Section meetings, and made presentations for NJ Section NExT.

Her national service includes the Committee on Research on Undergraduate Mathematics Education, CUPM, the AMS-MAA Joint Data Committee, and the Committee on the Gung-Hu Award. She served as member of the MAA Board of Governors as the New Jersey governor 2000–03.

Her service to other national organizations on behalf of mathematics includes a term as treasurer of the Association for Women in Mathematics, a term on the Council of the American Association for the Advancement of Science, and membership on the AMS Committee on an Award for an Exemplary Program or Achievement in a Department of Mathematics.

Because of concern about a New Jersey law governing transfer from community colleges to public four-year institutions, Amy Cohen organized a statewide conference on transfer articulation in mathematics to encourage mutual understanding and cooperation to mitigate unintended consequences and enhance student achievement.

The MAA proudly presents the Certificate of Meritorious Service to Dr. Amy Cohen.

Response from Amy Cohen

It is crucial to our country and our profession that undergraduate education in mathematics become more effective and more satisfying for faculty and students alike. I am grateful for the opportunity to work with the MAA—both in the New Jersey Section and in the national organization—toward the improvement of undergraduate education in mathematics. This

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award is an added cause for gratitude. I hope to continue to work with the MAA and to enjoy the professional community it provides.

Citation for Janet Beery, Southern California-Nevada Section

The Southern California-Nevada Section of the MAA is pleased to recognize Dr. Janet Beery of the University of Redlands for her many contributions to the Section as well as to the national organization. Janet has served as a valued officer of the Section for more than a dozen years, first as student chapter coordinator and now as newsletter editor. As student chapter coordinator, she played an integral role in attracting large numbers of students to our meetings, through her organization of our annual student poster session, career panels, and other programs. As newsletter editor, she successfully and seamlessly transitioned the Section's newsletter from hard copy to electronic, now fully integrated into the Section's website. As a result of the money saved on labor, copying, and printing, our Section is in excellent financial health and is now able to bring in more outside speakers to our meetings.

For her many accomplishments and tireless dedication, the MAA is pleased to present Dr. Beery with a Certificate of Meritorious Service.

Response from Janet Beery

I am surprised, delighted, and flattered to be added to a list of honorees that already includes such wise and hardworking people as Barbara Beechler, Mario Martelli, and Ernie Solheid of the Southern California-Nevada Section. I very much enjoyed working with the students of our Section during my years coordinating their activities at our twice-yearly conferences, and I continue to enjoy working with all of the members of our Section as I gather information for our newsletters. I thank the Southern California-Nevada Section for nominating me for this award, and I humbly dedicate the award to the memory of my friend and mentor Barbara Beechler.

Frank and Brennie Morgan Prize

The Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student recognizes and encourages outstanding mathematical research by undergraduate students. It was endowed by Mrs. Frank Morgan of Allentown, Pennsylvania.

Citation for Honorable Mention, Maria Monks

The Morgan Prize Committee is pleased to award Honorable Mention for the 2010 Morgan Prize for Outstanding Research by an Undergraduate Student to Maria Monks.

The award recognizes her excellent work in combinatorics and number theory. She has an impressive portfolio of five papers, three of which have already appeared in *Proceedings of the AMS; Journal of Combinatorial Theory, Series A;* and *Electronic Journal of Combinatorics.* Maria is a 2009 Goldwater Scholar and a recipient of the 2009 Alice T. Schafer Prize for women in mathematics. She is currently a senior at MIT and, in addition to her achievements in mathematics, is an accomplished cross-country runner.

Biographical Note

Maria Monks was raised in Hazleton, Pennsylvania, where her father fostered her interest in mathematical problem solving. She grew as a mathematician through competitions and programs such as the Lehigh Valley ARML Team and the Mathematics Olympiad Summer Program.

At the 2007 and 2008 Duluth REUs supervised by Joe Gallian, she solved an open problem on partition reconstruction from minors and discovered a new mock theta function which provides a new combinatorial proof of a partition congruence identity. As an undergraduate at MIT, Maria worked with Richard Stanley on a classification problem in matroid theory and also worked in a fluid dynamics laboratory modeling wave dynamics in trenches. In 2008 she was a coach of the USA team for the Girls Math Olympiad in China, and she is heavily involved with the Harvard-MIT Mathematics Tournament, a competition for high school students run by MIT and Harvard undergraduates. She was the primary author of the 2009 competition and enjoys writing problems in her spare time.

When she is not busy attacking a deep open problem in mathematics, Maria can often be found running. She has competed for the MIT varsity cross-country team for the past four years and intends to train for marathons upon completion of her cross-country career.

Response from Maria Monks

I am very honored to have been named an Honorable Mention for the Frank and Brennie Morgan Prize, and I thank the AMS, MAA, and SIAM for selecting me for this award.

There are more people that deserve to be thanked than can possibly fit into a reasonably sized response, but I would like to express my gratitude to the people who had the most impact on my mathematical career. I thank Joe Gallian for nominating me for this prize and for serving as a wonderful advisor at the Duluth REU. I also express my gratitude to Ken Ono and Richard Stanley for their help, advice,

and mentorship in various research projects. Most importantly, I thank my father, Ken Monks, and the rest of my family for providing a wonderful environment in which to grow up and for opening my eyes to the beauty of mathematics.

David P. Robbins Prize

This prize was established in memory of David P. Robbins by members of his family. Robbins, who died in 2003, received his Ph.D. in 1970 from MIT. He was a longtime member of the Institute for Defense Analysis Center for Communications Research and a prolific mathematician whose work (much of it classified) was in discrete mathematics. The prize is for a paper with the following characteristics: it shall report on novel research in algebra, combinatorics or discrete mathematics and shall have a significant experimental component; and it shall be on a topic which is broadly accessible and shall provide a simple statement of the problem and clear exposition of the work. This prize is awarded every three years.

Citation for Ileana Streinu

The 2010 David P. Robbins Prize is awarded to Ileana Streinu of Smith College for her paper "Pseudo-triangulations, Rigidity and Motion Planning" (*Discrete Comput. Geom.* 34 (2005), no. 4, 587–635).

In this remarkable work Streinu gives a combinatorial, algorithmic proof of the notorious "carpenter's rule problem," which asks whether any polygonal chain in the plane can be continuously straightened out. In such a process the edges are taken as rigid but the vertices are joints; of course, no crossings are allowed at any time.

Streinu's proof is independent of, and quite different from, the earlier-published differential proof of R. Connelly, E. D. Demaine, and G. Rote ("Straightening Polygonal Arcs and Convexifying Polygonal Cycles," *Discrete Comput. Geom.* 30 (2003), no. 2, 205–239). This deservedly celebrated paper and Streinu's paper both do, however, arise in part from the idea of Rote's that a polygon could be convexified by motions which cause points on the perimeter to move away from one another.

The idea for Streinu's proof came from her careful examination of computer experiments in which the basic feasible solutions to convexification problems were coded as graphs. Further experimentation (using *Mathematica*®) allowed Streinu to identify patterns in these graphs and eventually to connect them with pseudo-triangulations and ideas from rigidity theory. The ultimate result was an explicit, efficient, and discrete algorithm for the carpenter's rule problem, and a beautiful and highly original paper.

Biographical Note

Ileana Streinu received a Ph.D. in computer science from Rutgers University and a doctorate in mathematics from the University of Bucharest, Romania, both in 1994. Since then, she has taught at Smith College in Massachusetts, where she is the Charles N. Clark Professor of Computer Science and Mathematics, and at the University of Massachusetts Amherst, where she holds a 2008–11 Five Colleges 40th Anniversary Professor appointment. She had visiting positions at the Technical University in Berlin, École Normale Supérieure in Paris, Stanford University, Kyoto University,

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CALL FOR NOMINATIONS:

The 2012 Noether Lecture

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

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

The letter of nomination should include a one-page outline of the nominee's contribution to mathematics, giving four of her most important papers and other relevant information. Nominations should be sent by **October 15, 2010** to awm@awm-math.org. If you have questions, phone 703-934-0163 or email awm@awm-math.org.

LORIA Nancy, and Universitat Politecnica de Catalunya in Barcelona, and she is a recipient of the 2004 Moisil Award of the Romanian Academy in theoretical computer science.

Ileana Streinu's mathematical interests include discrete and computational geometry, rigidity theory, kinematics, matroids, and graph theory. Her recent work extends in multidisciplinary directions, ranging from robotics and origami to the emerging fields of bio- and nano-geometry, where she is pursuing mathematical questions arising in studies of flexibility, rigidity, and motions for macromolecules.

Response from Ileana Streinu

It is a great honor to receive the Robbins Prize, acknowledging my algorithmic solution to the carpenter's rule problem.

Through its simple statement, the problem exercised a fascination on all who encountered it. I learned about it from Sue Whitesides, who brought it up at a problem-solving workshop she organized in 1998. When, in 1999 at a Discrete Geometry meeting in Switzerland, Günter Rote proposed the use of expansive motions, he also suggested a proof plan that contained most of the ingredients of what was to become the celebrated Connelly, Demaine, and Rote proof of the carpenter's rule theorem. This connection with rigidity theory and Maxwell's theory of lifted polyhedra marked a turning point in my research interests. I am grateful to all the colleagues who worked on this problem for the inspiration and the challenges they generated, which caused me to look deeper and in different directions. The emergence of pseudo-triangulations, with their clean combinatorics and unexpected rigidity properties, was a rewarding surprise. I am convinced that so much more about them, and their three-dimensional relatives, still remains to be discovered.

I am deeply grateful to the selection committee and the AMS for having awarded me this distinction, and to my family, friends and collaborators (especially to Ciprian S. Borcea, who is all of these) for their support.

Funding by NSF and by DARPA's "Mathematical Challenges," generous support from Smith College and UMass Amherst, and sabbatical visiting positions have enabled periods of extended, uninterrupted "thinking time" that are so important for any mathematical work.

I would like to use this opportunity to also thank all my American colleagues for their many kind invitations that I am too rarely able to honour. I thank especially mathematicians at Brown University, UCLA, MIT, Minnesota, and Harvard. I hope to have occasions in the future to develop more collaborations with them.

Finally, special thanks go to my family for their patience and their support.

CNSF Statement

The Coalition for National Science Funding (CNSF) strongly endorses a FY 2011 National Science Foundation (NSF) budget of at least $7.424 billion.

CNSF appreciates the support that both the Congress and the Administration have provided for NSF over the past two years. NSF is critical to America's ability to compete globally in technological innovation. Faced with ever-increasing international competition, maintaining U.S. scientific leadership will require continued robust investments in the NSF.

NSF invests more than 90 percent of its budget directly in support of research at colleges and universities in all 50 states. The agency identifies the best ideas and people who, through their work, advance the frontiers of knowledge in all sciences, mathematics and engineering. These advancements can be transformative, initiating the development of new products and companies and the creation of jobs.

NSF recognizes that scientific advancement often requires knowledge and discoveries across many disciplines. Partnerships across academia, industry, and government are an integral part of NSF's strategy to aid scientific development. Its research portfolio includes the biological sciences, the mathematical and physical sciences, the geosciences, computer and information science, the social, behavioral, and economic sciences, and engineering. These areas of inquiry, along with the agency's funding of major state-of-the-art facilities and instrumentation, are essential for understanding our universe and for the continued development of cutting-edge science and technology necessary for sustaining U.S. competitiveness.

In addition to being a cornerstone of America's research enterprise, NSF also supports educational activities that ensure a diverse, competitive, and globally engaged science, technology, engineering, and mathematics workforce. These efforts encompass all educational levels, K–12 through post-doctoral.

Global competition increasingly requires that the U.S. make the necessary investments in science and engineering research and education. The NSF is well-suited for such

investments since it supports science broadly and encourages interdisciplinary interactions and collaborations between universities and industry. These investments will help ensure our country's ability to compete at the highest levels.

Each year NSF has to decline over $2 billion of highly rated proposals because of a lack of funds. These declined proposals represent opportunities that could produce substantial benefits to the U.S. It is imperative that NSF receive a FY 2011 budget level that will increase the agency's ability to contribute to the nation's well-being. **We urge you to support a NSF FY 2011 budget of at least $7.424 billion.**

CNSF is an alliance of over 100 organizations united by a concern for the future vitality of the national science, mathematics, and engineering enterprise. AWM is one of its member. For more information, see www.cnsfweb.org.

Opportunities

Career Mentoring Workshop for Women

The fourth annual Career Mentoring Workshop for Women will be held July 18–20, 2010 at the United States Military Academy in West Point, NY. The goal of the workshop is for each participant to leave with a good understanding of the job search process together with mentors and a group of peers from across the nation who can assist her and provide additional support as she navigates the job market.

Topics of discussion include professional opportunities, an overview of the job search process and employment register, revising application materials, the interview process, starting your postgraduate career, and different career options.

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AWM Workshop for Women Graduate Students and Recent Ph.D.'s at the 2011 Joint Mathematics Meetings

Application deadline: **August 15, 2010**

For many years, the Association for Women in Mathematics has held a series of workshops for women graduate students and recent Ph.D.'s in conjunction with major mathematics meetings. We have received support from the National Security Agency for the AWM Workshop to be held in conjunction with the Joint Mathematics Meetings in New Orleans, LA in January 2011.

FORMAT: Up to twenty women will be selected in advance of the workshop to present their work; the graduate students will present posters and the recent Ph.D.'s will give 20-minute talks. AWM will offer funding for travel and two days subsistence for the selected participants. The workshop will also include a dinner with a discussion period, a luncheon, and a panel discussion on areas of career development. 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, posters, and panel. Departments are urged to help graduate students and recent Ph.D.'s who are not selected for the workshop to obtain institutional support to attend the presentations and panel.

ELIGIBILITY: Applications are welcome from graduate students who have made substantial progress towards their theses and from women who have received their Ph.D.'s within approximately the last five years, whether or not they currently hold 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 cover letter
- 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 concise description of research
- a curriculum vitae
- at least 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, 2010**.

See http://www.awm-math.org/workshops.html.

Applicants should be women in the mathematical sciences entering their final year of graduate studies. Participants will receive partial funding for the workshop. The application deadline for the 2010 workshop is **May 15, 2010**. More information about the workshop, including application materials, is available at www.wheatoncollege.edu/camew.

Questions may be directed to Rachelle DeCoste at decoste_rachelle@wheatoncollege.edu.

Nominations for Norwood Award

The Section on Statistical Genetics and the Department of Biostatistics in the School of Public Health, University of Alabama at Birmingham (UAB) are pleased to request nominations for the Ninth Annual Janet L. Norwood Award for Outstanding Achievement by a Woman in the Statistical Sciences. The award will be conferred on September 15, 2010. The award recipient will be invited to deliver a lecture at the UAB award ceremony and will receive all expenses, the award, and a $5,000 prize.

Eligible individuals are women who have completed their terminal degree, have made outstanding contributions to the statistical sciences, and, if selected, are willing to deliver a lecture at the award ceremony. For additional details about the award, please feel invited to visit our website at http://www.soph.uab.edu/ssg/norwoodaward/aboutaward.

Nominations consist of a full curriculum vitae accompanied by a letter of not more than two pages in length describing the nature of the candidate's contributions. Contributions may be in the area of development and evaluation of statistical methods, teaching of statistics, application of statistics, or any other activity that can arguably be said to have advanced the field of statistical science. Self-nominations are acceptable.

Please send nominations to: Professor David B. Allison, Department of Biostatistics, 1665 University Boulevard, RPHB 327, Birmingham, AL 35294-0022; phone: (205) 975-9169; fax: (205) 975-2541; email: dallison@uab.edu. Deadline for receipt of nominations is **June 25, 2010**. Electronic submissions of nominations are accepted and encouraged.

EYH Receives NSB Award

EYH, March 2010

The Expanding Your Horizons (EYH) Network was recently named recipient of the 2010 National Science Board (NSB) Public Service Award as an organization that has made significant contributions and impact in public understanding of science, technology, engineering and mathematics (STEM). The award ceremony will take place at the U.S. State Department in Washington, D.C. on May 4, 2010.

"We are excited to honor The Expanding Your Horizons Network with the NSB Public Service Award in recognition of its decades-long commitment to the early development of interest in mathematics and science among young girls," said Dr. Steven Beering, NSB Chairman. "We are thoroughly impressed with The Network's impact on the lives of hundreds of thousands of young women, having grown from a small grassroots activity to a nationwide organization."

The NSB Public Service Award honors individuals and groups that have made substantial contributions to increasing public understanding of science and engineering in the United States. These contributions may be from a wide variety of areas including mass media, education and/or training programs, entertainment, and non-profit and for-profit corporations.

"The Expanding Your Horizons Network is honored to receive such a prestigious award from the National Science Board," said Stacey Roberts-Ohr, Executive Director of EYH. "It's wonderful to be recognized for the extensive work we do on behalf of young women and to be included in such an esteemed group of prior winners. It's rewarding to know that we have helped hundreds of thousands of young women explore STEM careers. We are grateful to our partners who coordinate EYH conferences both in the United States and globally, and sincerely thank all of our terrific workshop leaders and volunteers."

2010–2011 Individual Membership Form

JOIN ONLINE at www.awm-math.org!

ASSOCIATION FOR WOMEN IN MATHEMATICS

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The AWM *Newsletter* is published six times a year and is a privilege of membership. If you have questions, contact AWM at awm@awm-math.net, (703)934-0163, or visit our website at: http://www.awm-math.org.

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Individual Dues Schedule

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NOTE: All checks must be drawn on U.S. Banks and be in U.S. Funds. AWM membership year is October 1 to September 30.

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