AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

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President's Report

AWM and World Affairs

The AWM is deeply gratified to announce the newly established Ruth I. Michler Memorial Prize, which will provide a fellowship each year for a recently tenured woman mathematician to spend a semester at Cornell University without teaching obligations. The prize was established through the vision and great generosity of the family of Ruth Michler. Please see the article on pages 6–7.

I am writing this column on a plane returning to Canada from China, where I just spent three days at the officers' and board meeting of ICIAM (I am currently the treasurer). ICIAM (the International Council for Industrial and Applied Mathematics) is a young organization whose mission is to advance the applications of mathematics internationally and whose principal activity is running an international congress every four years. The next Congress, ICIAM07, will take place in Zürich next year, July 16–20, and will feature, for the first time, a special event for women, the Olga Taussky Todd Lecture, organized jointly by AWM and EWM. Fern Hunt is heading an international steering committee that is setting up operating procedures and a selection committee for the lecturer. The Zürich congress has offered travel support to the speaker, as well as a plenary spot, and we are encouraged to think that this will be a regular feature of future congresses. The general goodwill and support of the officers and board members of ICIAM was apparent, and I am pleased to acknowledge it in this column. As an example of this support, it was decided to amend the bylaws of the Council to add gender balance to the list of factors (the other two being diversity of field and geographical distribution) to be considered in appointing program committees and choosing speakers at the congresses.

There was also good news of a different sort. Our committee meetings were hosted by Fudan University in Shanghai, and the Shanghai Society for Industrial and Applied Mathematics decided to take advantage of the arrival of two dozen visitors from abroad by running a two-day forum, with the ICIAM board members and officers as speakers and an audience consisting (I am guessing) mainly of faculty and

IN THIS ISSUE

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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.

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.

Circulation: 3500.

students from several universities in Shanghai. It was delightful to see that at least a third of this group of 30 or so young people consisted of women; this is a notable contrast to my experience in visiting China twenty years ago when there were almost no women among the students and none at all among the faculty. Not surprisingly, there are still very few women faculty members, and none of the senior scientists we met were women. But our hosts told us that about one third of Ph.D. students in mathematics at Fudan University (one of the best universities in China) are women—putting them slightly ahead of the premier universities in the US in this respect, despite the lack of role models.

The lack of women in senior positions is noticeable and awkward. At last year's board meeting, there were three women (including me) among the 30 or so representatives, officers and observers. This year, in a slightly smaller group of 24, I was the only woman (and, since officers do not vote, this means there were no women voting members of the board). The board consists of representatives of the 20 or so member societies of ICIAM, and attendance fluctuates from year to year, as not all representatives can attend. And member societies, who each designate one or two representatives, can change their representatives at will. (Usually they choose someone who wants to travel to the place where the meeting is being held. Since our meetings tend to be in nice places, like Florence or Zürich or Shanghai, finding volunteers is not difficult.) We need to recognize that a situation like this poses difficulties for people who wish to advance the status of women, difficulties that are unlike either the problem of overt discrimination or the annoying indifference of conference and workshop organizers to diversifying their speakers' lists. In a decentralized process like that which selects the ICIAM Board (twenty different groups selecting one or two people), there is no one person or group who can take responsibility for affirmative action, even with the best will in the world. And those of us who feel that statistical equality, or the absence of mathematically provable discrimination against women, is not sufficient to advance the goals of AWM, are frustrated to find that no other mechanism appears to be available. ICIAM faced a similar difficulty last year in composing the prize committee for the five ICIAM prizes that will be given out next year: the President of ICIAM laudably felt that the prize committee, of five, ought to contain at least one woman, for balance, among all the other balances of field and nationality that need to be met. But one prize committee member is chosen by each society, or group of societies, that sponsors a prize. Should we simply hold our breath and hope for a one-out-of-five representation of women as the probabilistic expectation, ignoring what probability theory tells us about clustering? Or do we, more aggressively, tell each society in turn that this is their year to appoint a woman to the committee? The fact is that it seems impossible to be graceful about this. Furthermore, it is close to impossible to avoid having it appear that the woman member of the committee was chosen in part because of her gender, and not purely for the qualifications for which most of us seek professional recognition: scientific merit, scholarship, fairness, and ability to be effective on committees.

The stakes are high here, and many people, including many outstanding women mathematicians, feel uncomfortable with the feeling (that they suspect is shared by others) that they have been distinguished in part for this reason, so that the honor and respect due to the position of responsibility are diminished. It is a complex issue, and one on which as diverse a body as the AWM Executive Committee is not likely to speak with one voice, so I try to be careful, in speaking in favor of this sort of affirmative action, to make it clear that I am offering my own opinion. There are reasons that it seems to be for the greater good to advance women in these positions. Few people argue these days that the current position of women in our profession, with few women in the top ranks at elite universities, represents what the situation would look like had there not been discrimination against women, and social factors impeding women's progress, in the past. The mere fact that things have changed considerably over the past thirty years argues strongly against the notion that what we are seeing now represents any sort of equilibrium. Most people applaud the progress of women and feel that eventually a self-sustaining steady-state will arise, with a virtuous circle of senior women providing role models and encouragement to the ambition of talented young women and girls. And many of us bemoan the fact that progress has been so slow and that we seem to need to fight the same battles again and again. The principle of affirmative action is not that less qualified people be advanced over those more qualified. Instead, the argument goes that taking women and minorities preferentially from a large pool of people of more or less equal qualifications benefits the profession by making a clear, unequivocal statement that all talented and ambitious comers are welcome. One tries to show the world what the leadership should look like, and will look like.

There is a counterargument. By making gender or minority status a criterion for selection, we are giving relatively less weight to some other criteria, be they research excellence or other recognition. One can argue that because of past discrimination, many women have been insufficiently recognized for their contributions, and recognition is overdue. And one can recognize that often what is being celebrated is buzz rather than accomplishment. And that many decisions—most hiring decisions, for example—are made on the basis of estimate of potential and may well be self-fulfilling prophecies. But there are absolutes, or near-absolutes, of achievement, and if we agree that we cannot give some high research prize, for

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Friend: $1000 Benefactor: $2500
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Level 1: $300
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See the AWM website for details.

Subscriptions and back orders
All members except family members receive a subscription to the newsletter as a privilege of membership. Libraries, women's studies centers, non-mathematics departments, etc., may purchase a subscription for $55/year ($65 foreign). Back orders are $10/issue plus shipping/handling ($5 minimum).

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

Newsletter ad information
AWM will accept advertisements for the *Newsletter* for positions available, programs in any of the mathematical sciences, professional activities and opportunities of interest to the AWM membership and other appropriate subjects. The Managing Director, in consultation with the President and the Newsletter Editor when necessary, will determine whether a proposed ad is acceptable under these guidelines. *All institutions and programs advertising in the* Newsletter *must be Affirmative Action/Equal Opportunity designated.* Institutional members receive discounts on ads; see the AWM website for details. For non-members, the rate is $100 for a basic four-line ad. Additional lines are $12 each. See the AWM website for *Newsletter* display ad rates.

Newsletter deadlines
Editorial: 24th of January, March, May, July, September, November
Ad: 1st of February, April, June, August, October, December

Addresses
Send all **Newsletter** material **except ads and book review material** to Anne Leggett, Department of Mathematics and Statistics, Loyola University, 6525 N. Sheridan Road, Chicago, IL 60626; e-mail: leggett@member.ams.org; phone: 773-508-3554; fax: 773-508-2123. Send all **book review** material to Marge Bayer, Department of Mathematics, University of Kansas, 405 Snow Hall, 1460 Jayhawk Boulevard, Lawrence, KS 66045-7523; e-mail: bayer@math.ku.edu; fax: 785-864-5255. Send everything else, **including ads and address changes**, to AWM, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030; phone: 703-934-0163; fax: 703-359-7562; e-mail: awm@awm-math.org.

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http://www.awm-math.org

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To subscribe, send mail to awm-net-request@cs.umd.edu and include your e-mail address; AWM members only.

AWM DEADLINES

Sonia Kovalevsky High School Mathematics Days: August 4, 2006
AWM Workshop at JMM: August 31, 2006
NSF-AWM Travel Grant: October 1, 2006 and February 1, 2007
Alice T. Schafer Prize: October 1, 2006
AWM Noether Lecture: October 15, 2006
AWM-SIAM Sonia Kovalevsky Lecture: November 1, 2006
Michler Memorial Prize: November 1, 2006
AWM Essay Contest: November 3, 2006

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example, on any other basis than the merit of the research, because it would diminish the reputation and value of the prize, then we may be led to question how in any decision one assigns a relative weight to the value of diversity. And it would not be surprising to discover that we all see some value in diversity, and that we all draw the line in different places.

Elsewhere in this newsletter, you will find Bettye Anne Case's report on another event, the "Women in Mathematics: The Legacy of Olga Ladyzhenskaya and Olga Oleinik" workshop co-sponsored by AWM and MSRI, funded by NSA and hosted in MSRI's splendid new Chern building. As you will read, it was a great success. Here I want to point out, in line with the title of this column, the international nature of this event. Besides the excitement of having two senior participants from Russia, Nina Ural'tseva and Tamara Rozhkovskaya, we found that a large number of the young women who applied to the workshop hailed originally from Eastern Europe, and there were lively discussions of how the educational and social systems in different countries might influence the decisions of girls and young women to become mathematicians. We hope to see many more discussions like this, as they may illuminate not only alternative pathways to increasing diversity in the profession, but different ways of looking at many of the other issues, from research funding expectations to balancing work and family life, that influence how many young women choose to become mathematicians, and how satisfied they will be with that decision.

Barbara L. Keyfitz
in the air
May 28, 2006

In Memoriam: Gloria Olive

Born in 1923, Gloria Olive died April 7, 2006. She taught at a number of different institutions, including Anderson College (now Anderson University) in Indiana from 1952 to 1968 and the University of Otago in New Zealand from 1972 to 1989. She received her Ph.D. from Oregon State University in 1963. Her research interests focused on certain classes of functions arising from the study of combinatorics. See the NZMS *Newsletter* online for an article written upon her retirement from Otago: http://www.massey.ac.nz/%7Ewwifs/mathnews/centrefolds/45/Apr1989.shtml.

Karen Vogtmann Named 2007 Noether Lecturer

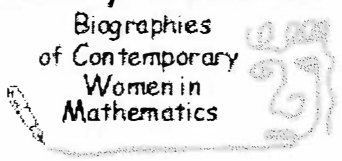
AWM press release

The Association for Women in Mathematics is pleased to announce that Karen Vogtmann will deliver the Noether Lecture at the 2007 Joint Mathematics Meetings. Vogtmann, a professor of mathematics at Cornell University, was selected for this honor because of her fundamental contributions to geometric group theory, in particular, to the study of the automorphism group of a free group.

Inspired to pursue mathematics by an NSF summer program for high school students at the University of California, Berkeley, Vogtmann received both her undergraduate and graduate degrees from Berkeley, investigating algebraic K-theory with Jack Wagoner. After wandering the academic world from Michigan to Brandeis, Columbia to the Institute for Advanced Studies, and back, she settled at Cornell University where she has been for the last twenty years. A profound mathematician, she has authored numerous articles, mentored eight Ph.D. students, and averaged ten invited talks a year. Vogtmann has served as Vice President of the American Mathematical Society and on scientific advisory boards of the American Institute of Mathematics, the Mathematical Sciences Research Institute, the arXiv advisory board, the National Academy of Sciences Delegation to the International Mathematical Union General Assembly, and the Vietnam Education Foundation Panel for mathematics.

Karen Vogtmann

Vogtmann's research views groups as symmetries of geometric objects. By understanding the geometry and topology of suitably chosen objects, she deduces algebraic information about the groups acting on them. Her work investigates orthogonal and symplectic groups, SL(2) of rings of imaginary quadratic integers, groups of automorphisms of free groups, and mapping class groups of surfaces. Vogtmann's recent focus has been on the group of outer automorphisms of a free group where the appropriate geometric object is called ●uter Space. This space turns out to have surprising connections with other areas of mathematics, for example with certain infinite-dimensional Lie algebras and even with the study of phylogenetic trees in biology.



To increase awareness of women's ongoing contributions to the mathematical sciences, the AWM is (*pending funding*) sponsoring an essay contest for biographies of contemporary women mathematicians and statisticians in academic, industrial, and government careers.

The essays will be based primarily on an interview with a woman currently working in a mathematical career. This contest is open to students in the following categories: **grades 6–8**, **grades 9–12**, and **undergraduate**. At least one winning entry will be chosen from each category. Winners will receive a prize, and their essays will be published online at the AWM website. Additionally, a grand prize winner will have his or her entry published in the AWM *Newsletter*. For more information, contact Dr. Victoria Howle (the contest organizer) at vehowle@sandia.gov or see the contest web page: www.awm-math.org/biographies/contest.html. The deadline for receipt of entries is **November 3, 2006**. *(To volunteer as an interview subject, contact Howle at the e-mail address given.)*

Barbara Keyfitz, president of AWM, declares "Karen is an absolutely delightful person. It's wonderful that she will give the 2007 lecture; besides her excellent research she is so lively and dynamic that I am very much looking forward to her talk." Irwin Kra, Executive Director of Math for America, adds, "The fact that she is also a wonderful lecturer and a conscientious member of the mathematics community makes her an ideal role model for younger colleagues."

In addition to the Noether Lecture, Vogtmann and collegue Ruth Charney from Brandeis University are organizing a special session on Geometric Group Theory. The session will cover topics of current interest in the field including automorphism groups, quasi-isometry groups, hyperbolic and relatively hyperbolic groups, Artin groups, and CAT(0) geometry.

Ruth I. Michler Memorial Prize Fellowship

Carolyn Gordon, Dartmouth College

The AWM is delighted and honored to announce the establishment of the Ruth I. Michler Memorial Prize of the AWM. The prize, to be awarded annually to a recently tenured woman in the mathematical sciences, provides a fellowship for the awardee to spend a semester at Cornell University without teaching obligations. The prize has been established through the great generosity of the Michler family.

The recipient of the first award will be announced in January 2007. Recently tenured women whose research would benefit from a semester at Cornell are invited to apply by the deadline of **November 1**. Details of the application process will be available on the AWM website this summer.

Ruth Michler, 1967–2000, was born in Ithaca. Her father, Dr. Gerhard Michler, was visiting the Cornell University Mathematics Department at the time, and the family has maintained a close association with Cornell University through the years. Ruth completed her Ph.D. in the areas of cyclic homology and singularity theory at the University of California in 1993. At the time of her tragic death on November 10, 2000, Ruth had been recently promoted to Associate Professor at the University of North Texas and was a visiting scholar at Northeastern University on an NSF POWRE grant. Ruth was a highly energetic mathematician who was already actively mentoring other young mathematicians and organizing seminars and conferences.

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, 2006. She must either be a US citizens or have a school address in the US. The seventeenth annual Schafer Prize will be awarded at the Joint Prize Session at the Joint Mathematics Meetings in New Orleans, Louisiana, January 2007.

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 given by members of student chapters, recommendation letters from professors, colleagues, etc.) should be enclosed with the nomination. Send *five* complete copies of nominations for this award 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, 2006**. If you have questions, phone (703) 934-0163, e-mail awm@math.umd.edu or visit www.awm-math.org. Nominations via e-mail or fax will not be accepted.

A memorial article to Ruth appeared in the *AWM Newsletter* (January–February 2001, Vol. 31, pp. 4–6).

Recently tenured associate professors face many challenges as they shift from the role of mentee to mentor and take on greater leadership in research and in the profession. The Ruth I. Michler Memorial Prize will honor outstanding women at this stage of their careers and enable them to focus on their research in the stimulating environment of Cornell University.

AWM at MathFest

AWM activities at MathFest include the Falconer Lecture and a reception, both co-sponsored with MAA. There will be an AWM table in the exhibit area. We invite all our members to visit the table and explore opportunities to become more involved with AWM. Other activities may be planned. Check www.awm-math.org before your trip to Knoxville, TN for the 2006 MathFest.

The AWM-MAA Reception will be held Friday, August 11, 9:00–11:00 P.M., following the J. T. Sutherland Frame Lecture. All supporters of women in mathematics are encouraged to attend and meet AWM members.

The second AWM-MAA Etta Z. Falconer Lecture, "Cancer Modeling from the Classical to the Contemporary," will be delivered by Trachette Jackson, University of Michigan on Saturday, August 12, 8:30–9:20 A.M. The abstract for her talk follows.

> Cancer is one of the leading causes of death in the world today, and an abundance of research is being conducted in order to better understand tumor development, to evolve existing cancer therapies, and to discover new approaches to combat the disease at the cellular and molecular levels.
>
> Mathematical modeling, aided by computational tools and combined with the experimental data, have the potential to facilitate a deeper and broader understanding of the cellular and molecular interactions associated with tumor initiation, progression, and treatment, and can guide experimental design and interpretation. Many of the challenges cancer researchers are facing lie at the intersection of the mathematical and biomedical sciences and in this talk I will review the progress that has been made in modeling the various aspects of avascular and vascular tumor growth.

Call for Nominations: The 2007 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 winners, beginning in 2003, have been Linda R. Petzold, Joyce R. McLaughlin, and Ingrid Daubechies. The 2006 lecturer will be Irene Fonseca.

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 the AWM office (**five copies**): Kovalevsky Selection Committee, Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030; phone: (301) 405-7892 or electronically to awm@awm-math.org, to arrive by **November 1, 2006**.

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/kovalevsky.htm and www.awm-math.org/kovalevskylectures.html for more details.

Will You Join Us in Madrid?

Bettye Anne Case, Florida State University

A number of programs of special interest to women in mathematics are planned for the International Congress of Mathematicians in Madrid (August 22–30, 2006). Since at least the 1974 ICM this major scientific event, which brings together mathematicians from all over the world, has included panel talks and open discussion among and about women mathematicians. The founding of the European Women in Mathematics (EWM) arose from such discussions at the 1986 ICM in Berkeley.

Long friendships and collaborations on an individual level begin and deepen at ICMs. A home movie shot by Nina Uraltseva in Nice, 1970, shows Cathleen Morawetz and Olga Ladyzhenskaya swimming and talking beside the Mediterranean.

The announcements of the invited speakers, made the year before an ICM, are eagerly awaited by the mathematical community. There are more than 175 invited speakers for ICM–06, and among them there are at least 13 women as sectional speakers; Michelle Vergne will give a plenary address. A series of mathematical lectures named for Emmy Noether was initiated in 1994 in Zürich. That first lecture was by Ladyzhenskaya, introduced by Morawetz. Morawetz gave the second in the series at Berlin ICM-98 and the third was given by Hesheng Hu in Beijing, 2002. After the success of these, the decision was made to continue the series for 2006 and 2010, with selection by the IMU.

The Fourth Emmy Noether Lecture, now an invited lecture of the ICM, will be presented by Yvonne Choquet-Bruhat (Académie des Sciences, Paris, France). She will be introduced by Linda Preiss Rothschild, herself an invited sectional speaker. The talk is titled "Mathematical Problems in General Relativity" and is scheduled Friday, August 25, 11:45–12:45.

Later on August 25—from 18:00 to 20:00—there will be a panel discussion, "Moving (Mostly) Forward: Women Mathematicians." Women from several continents and cultures will discuss the most significant rewards, obstacles, or accomplishments of the profession, with each panelist giving her own perspectives. Some of these issues are shared with women—and men—in other professions; many are shared with other academicians; some may affect a much smaller group. Questions and discussion from the audience will follow short presentations. The planners for this session represent the Association for Women in Mathematics (U.S. based and founded 1971) and EWM with women from many countries in their communications networks; Vergne and other invited speakers have contributed to the planning, and all of them are invited to join the discussion. The country of birth and current employment of panel participants are: Sofia Castro (Portugal), Bryna Kra (U.S.), Marjo Lipponen (Finland), Maryam Mirzakhani (Iran/U.S.), Sylvie Paycha (France), Rubi Rodriguez (Chile), Linda Rothschild (U.S.), Laura Tedeschini-Lalli (Italy), Keti Tenenblat (Brazil), Chuu-Lian Terng (Taiwan/U.S.), Doreen Thomas (S. Africa/Australia), Michelle Vergne (France); Bettye Anne Case, organizer and moderator, (U.S.).

A decade ago, a film was made in Madrid to highlight the differences in the work and life environments of mathematicians from various countries. On August 28, 19:00–19:30, the anniversary showing of that powerful film, "Women and Mathematics across Cultures" may lead to new insights. Other features are planned—for example just before and after the panel, and immediately after the film, there may be a short showing of photos of participants at sessions of previous years, and identifications will be sought from the audience for some unknown to the organizers. Plans for ICM-2010 will begin with photos taken in Madrid 2006, and solicitation of more photos of past ICMs to show in 2010.

Marjo Lipponen, Convenor of EWM, is hoping to arrange a lunch in Madrid where those who are interested in the ideas of this session can meet more informally. Similar events at previous ICMs have been popular and interesting. A Berlin cafe owner, agreeing to save some space (thinking "two or three tables") for a group of women mathematicians, turned away many after seating over fifty for lunch after Morawetz's talk.

As more detail is available before the conference, it will be posted on the AWM website, http://www.awm-math.org, as well as the official ICM site, http://www.icm2006.org/otheractivities/#woman. For more information about women's activities, and AWM's involvement, at previous ICMs, see http://www.awm-math.org/noetherlectures.html and pictures and articles ("Across Borders," "Voices from Six Continents") in *COMPLEXITIES: Women in Mathematics,* Case and Leggett, Princeton University Press 2005.

Please join us in Madrid!

AWM Workshop for Women Graduate Students and Recent Ph.D's

supported by the Office of Naval Research, the National Security Agency, and the Association for Women in Mathematics

Over the past seventeen 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.

WHEN: The next AWM Workshop is scheduled to be held in conjunction with the Joint Mathematics Meetings and will take place in New Orleans, LA, January 4–7, 2007.

FORMAT: 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 panel discussion on areas of career development, a luncheon and a dinner with a discussion period. 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 program. Departments are urged to help graduate students and recent Ph.D.'s obtain supplementary institutional support to attend the workshop presentations and the associated meetings.

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

ELIGIBILITY: Applications are welcome from graduate students who have made substantial progress toward 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 and 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. Nominations by other mathematicians (along with the information listed above) are also welcome. For some advice on the application process from some of the conference organizers, see the AWM Web site.

Send **five** complete copies of the application materials (including the cover letter) to:

Workshop Selection Committee
11240 Waples Mill Road, Suite 200
Fairfax, VA 22030

Phone: 703-934-0163
E-mail: awm@awm-math.org URL: www.awm-math.org

APPLICATION DEADLINE

Applications must be received by **August 31, 2006**. Applications via e-mail or fax will not be accepted.

Sunny Days as Women Share Mathematics

Bettye Anne Case, Florida State University

Mid-May was especially magical at the Mathematical Sciences Research Institute (MSRI) this year—flowers down the hillside and through Berkeley—while over seventy visiting mathematicians, mostly women, many in the earliest bloom of their careers, converged to share mathematics, and to share their stories. Three conferences at MSRI, jointly sponsored by AWM, have celebrated the life and careers of women doing mathematics. The lives and work of Julia Bowman Robinson and Olga Taussky Todd were the inspiration for conferences in 1996 and 1999. [2] This year the sparkling new Simons auditorium of MSRI's refurbished Chern Hall was the setting.

Front: Deborah Lockhart (NSF), Krystyna Kuperberg, and Irene Gamba
Back: Barbara Keyfitz, Susan Friedlander, and Michelle Wagner (USA)

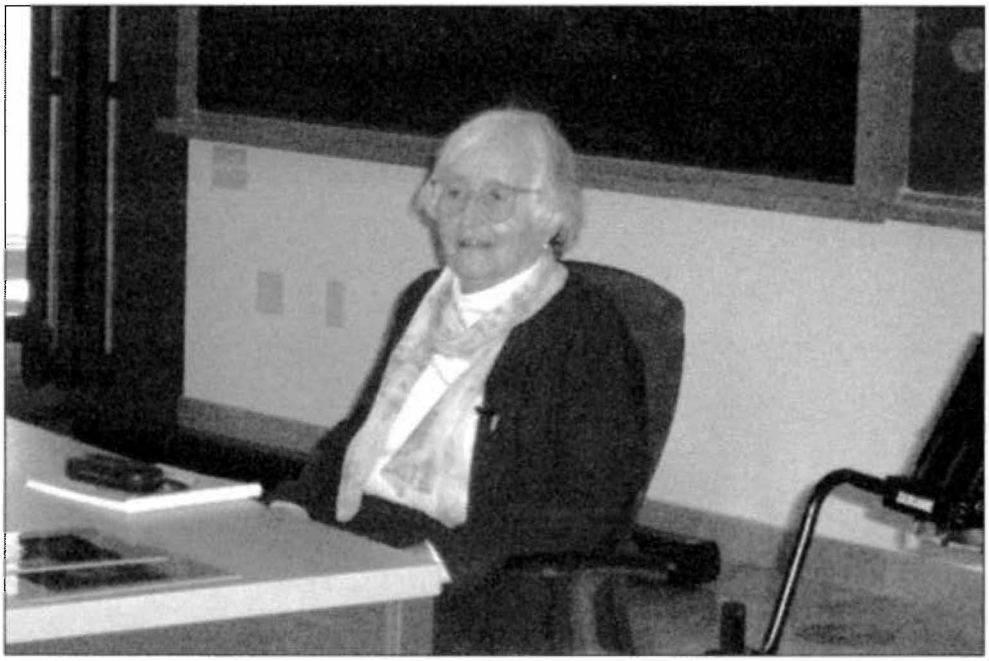
Preparation of the narrative and photos here began upon return, while the energy of the third successful AWM-MSRI conference was still flowing. This documentation of "Women in Mathematics: The Legacy of Ladyzhenskaya and Oleinik" (May 18–20, 2006) will continue in a later AWM newsletter. Also, there will be a conference publication with extended abstracts and photos. [4] The conference organizers were Susan Friedlander, Barbara Keyfitz, Irene Gamba and Krystyna Kuperberg. They are pictured with Deborah Lockhart (NSF) and Michelle Wagner (NSA) who represented their funding agencies while contributing to the conference program; they spoke on panels and shared their career experiences with the other participants.

The format of this conference series is designed so that senior participants provide role models and offer mentoring to their younger colleagues. Featured lectures showcase the research and other contributions of outstanding women in mathematics, from that of the honorees to younger women on the current cutting edge of research. Panel discussions show varied life patterns that produce such achievement. Poster sessions provide an opportunity for junior participants to present, discuss and be critiqued on their work. The informal contacts may be the most valuable and enjoyable of all: teatimes, mealtimes, a banquet. All these activities meld into three days away from everyday life and jobs in which women can discuss research and career issues—and make lifelong friends as part of the bargain.

Examples of such rich long time relationships were described in the first talk of the "2 Olgas" conference; the listeners were mesmerized as Cathleen Morawetz told of meeting each of the namesake Olgas and also Nina Uraltseva (who had been a doctoral student of Ladyzhenskaya) in the early 1960s; she again met all three at the International Congress of Mathematicians in Nice in 1970. [5; 7] Awareness of the long history of their acquaintance lent poignancy to the sight of Cathleen and Nina sitting together for most of the conference—on the front row—and responding with questions and enthusiasm to the other talks. The "2 Olgas" conference provided the basis for many such happy memories, as well as constructive career information and opportunities to network and exchange mathematical ideas.

The seminal work of Olga Ladyzhenskaya and Olga Oleinik in PDE and physical applications has generated many fascinating scientific developments in the US, Russia and throughout the world. Some of their work was directly referenced in talks, and the spirit of that work infused the lectures at the workshop. Experts in PDE, numerical analysis and fluid dynamics lectured about their work in the spirit of the achievements of Ladyzhenskaya and Oleinik. The schedule was intense, with fifteen speakers in three days.

Nina Uraltseva (St. Petersburg State University):
Free Boundary Problems of Obstacle Type



Cathleen Morawetz (NY Courant, Emeritus):
Early Memories of Olga Ladyzhenskaya and Olga Oleinik

[I visited} Russia in 1963.... on an academy exchange for a month.... My interpreter later told me that she did not ask me to her home as her husband had recently been released from the gulag. I was thus quite overwhelmed when Ladyzhenskaya invited me to her apartment.... We sat for a long time and Olga told me of the death of her father, her first teacher, shot in the purges of the thirties.... The only other person whose home I visited was Nina Uraltseva who lived with her son and husband in the sixties in the U.S.S.R. In fact how, as hard as it was, it was still eminently possible for mathematicians to do mathematics. Cathleen Morawetz [4].

Looking at conference photos we see animation and enthusiasm as well as emphasis and concentration—and just how much we talk with our hands. Browsing the titles, the breadth of talks and the depth of both theory and applications is impressive. Note Sunny Canic, talking as she gazes at an aortal stent (now an accepted protocol, but which she has been modeling since early in its development); the intentness of others makes it clear they are gazing at the mathematics formulating in their minds.

Irene M. Gamba (The University of Texas at Austin): Self-similarity for Boltzmann Equations of Maxwell Type and Non-Equilibrium Statistical States

Someone remarked that the conference felt like it was in Europe—a number of women born in the former Soviet Union or with such antecedents attended the conference. (See also [3].) Ladyzhenskaya and Oleinik were known by many of the conference participants and both had talked with sponsorship involving AWM: Oleinik was the Noether Lecturer at the JMM in Orlando in 1996 ("On Some Homogenization Problems for Differential Operators"); Ladyzhenskaya (introduced by Morawetz) gave the first in what is, with 2006, a series of four ICM Emmy Noether Lectures—in Zürich in 1994 (On Some Evolutionary Fully Nonlinear Equations of Geometrical Nature) [1; 2]. Immediacy was heightened as many of the speakers mentioned direct communication with one or the other of the Olgas, including, in the case of Ladyzhenskaya, visits and lectures as she wintered in the U.S. in her last years. Natasa Pavlovic recalls [7]: "It was in the Spring of 2001 when as a graduate student I spent a few weeks at Princeton University. It was such a great honor for me to meet.... I was very much impressed how elegant she was both as a person and as a mathematician.... She came to the blackboard to ask a question. Although she was in a hurry to get to the airport, mathematics was the priority.... The question that she asked after my talk influenced my research path.... with Susan Friedlander. We started to study the modification of the Navier-Stokes equations introduced by Olga Ladyzhenskaya."

Suncica Canic (University of Houston): Mathematics and Cardiology: Partners for the Future

The discussion of the historical panel gave verbal snapshots from different angles, hence necessarily somewhat differing, of life in the Soviet Union and in Russia in the political and cultural setting in which the Olgas worked. Morawetz was joined by Uraltseva and Tamara Rozhkoskaya, both currently working in Russia; contrast was provided by the childhood recollections of Svetlana Jitomirskaya of her mathematician mother's work and life. They are pictured with Keyfitz, the moderator, and Iordanka Panayotova, who joined to translate if needed and who also provided further interesting reflections.

Andrea Bertozzi (UCLA): Shocks in Driven Liquid Films

The three panels about lives and careers were informal discussions taking their direction from audience questions. "Risks and Rewards of Shifting Research Directions" began with examples of mathematical applications in another science requiring major investment in that science. Audience members sharpened the discussion, mentioning dangers of drastic career shifts, in particular a production lull. Most of the senior participants emphasized that every junior mathematician must move from working

Izabella Laba (UBC): A Few Combinatorial Problems in Harmonic Analysis

Natasa Pavlovic (Princeton University): Dyadic Models for the Equations of Fluid Motion

Susan Friedlander (U of Illinois-Chicago) (with B. Keyfitz): Olga Ladyzhenskaya and Olga Oleinik: Two Great Twentieth-century Mathematicians

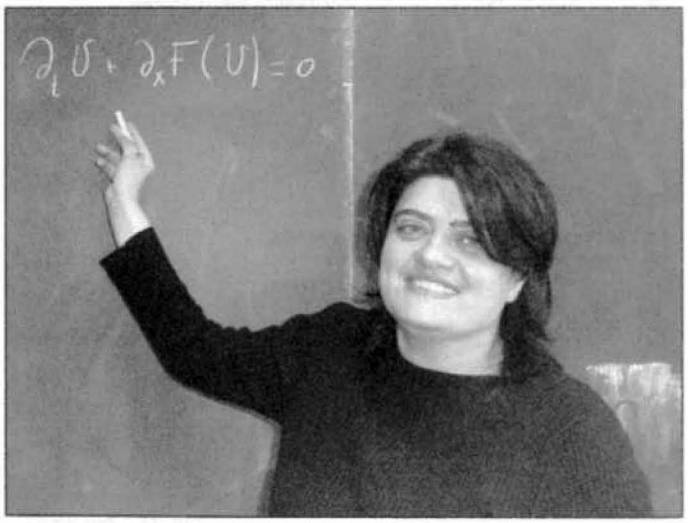
Historical round table about 2 Olgas and mathematics in the Soviet Union: Front: Tamara Rozhkovskaya (Novosibirsk Russian Federation), Nina Uraltseva, Svetlana Jitomirskaya and Cathleen Morawetz. Standing: Iordanka Panayotova (Institute for Scientific Research, Boston College), translator, and Barbara Keyfitz, moderator.

Irene Fonseca (Carnegie Mellon University): Variational Methods in the Study of Imaging, Foams, Quantum Dots ... and More

Barbara Lee Keyfitz (Fields Institute and University of Houston): Oleinik and the Theory of Conservation Laws

on a problem suggested by the major professor to independent productivity—although the work may well still have the same research classification. "Entanglement of Personal and Professional Lives" centered on the obvious—two-body problems and babies. Panelists and audience contributors, encouraged by the openness of others, gave information and personal experiences in a more candid fashion even than they might one to one over coffee with a mentor. The last panel, "How to Advance One's Career," led to discussion of mid-career shifts, in particular shifts involving administration. It is revealing that in addition to their research achievements and awards, both Olgas provided models of women providing strong academic administrative leadership in difficult times.

More than thirty junior participants presented posters, half on each of two days. The presentation, organized by Kuperberg, began in the main lecture hall where each briefly described her work. After these previews, meeting participants followed the presenters into the MSRI atrium to view posters and to talk individually with the presenters. A panel of the senior mathematicians evaluated the posters and selected five they considered especially outstanding for awards. The awardees were Rachel Levy (Duke), Gabriel Koch (Minnesota), Anna Oganian (National Institute of Statistical Sciences), Natalya Popova (Missouri), and Petra Sindelarova (Auburn). The awards, books and a video, will be the more treasured because they were presented by Morawetz and



Konstantina Trivisa (University of Maryland at College Park): On the Dynamics of Binary Fluid Mixtures

Svetlana Jitomirskaya (UCI): Treating Small Denominators without KAM

Uraltseva, providing a tangible reminder of interactions during the conference with Cathleen and Nina. In addition to the concrete support of NSF, NSA, AWM, MSRI, and the efforts of the conference organizers, the work of Rossi and the MSRI staffers was crucial to the success of this pleasurable conference.

The happy memories that were taken away will likely be recounted by some of today's young mathematicians—in 2050.

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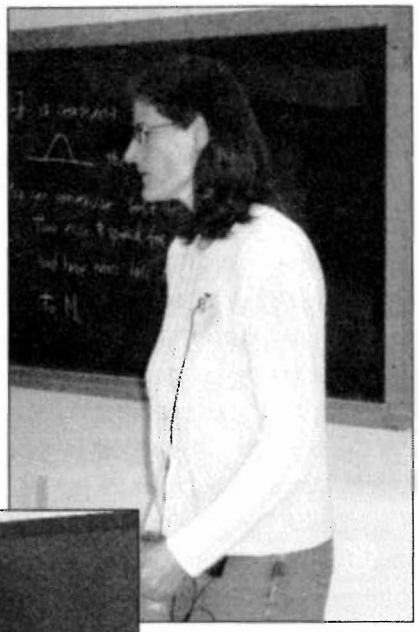
President and President-Elect of AWM, Barbara Keyfitz and Cathy Kessel

Mary Pugh (University of Toronto): Thin Film Equations in a Critical Regime



Gigliola Staffilani (MIT): Dispersive Equations: A Survey

Tatiana Toro (University of Washington): When Do Good Parameterizations Exist?

Women Mathematicians at Berkeley—The Early Years

Calvin C. Moore, UC Berkeley

The author's book, *Mathematics at Berkeley—A History,* an account of the history of the UCB Mathematics Department, will be published later this year by AKPeters Ltd. This article is composed largely of extracts from this book together with contextual material. The author is indebted to Alice Silverberg, who suggested the possibility of such an article and that it might appear in this *Newsletter.* Important sources for the book and this article include the University of California In Memoriam series of the UC History Digital Archives, Constance Reid's biography, *Julia—A Life in Mathematics,* and the biographical materials and essays from the 2000 Lehmer Conference at UCB. The author is grateful to AKPeters for permitting publication of this extracted material in this format. The author also thanks the University Archives of the Bancroft Library, The UC Berkeley Mathematics and Statistics Departments, George Bergman and the Lehmer family for permission to reproduce the photographs used here.

This is the story of six women mathematicians, all born in the period from 1885 to 1920, who played important roles in the UC Berkeley Mathematics Department beginning in the early decades of the 20th century. All were pioneers in different ways. These mathematicians were Pauline Sperry, Sophia Levy McDonald, Emma Trotskaya Lehmer, Evelyn Fix, Elizabeth Scott, and Julia Robinson. All but Emma Lehmer held tenured positions at Berkeley; Emma was married to Derrick H. Lehmer, a long time faculty member at Berkeley. She published actively both by herself and jointly with her husband, taught occasionally in the department, and was a strong mathematical presence in Berkeley and nationally, contributing to the department's stature. In order to provide context for the stories and the events in the lives of these women mathematicians, some brief comments on the history of the department are needed.

The University of California was founded in 1868 and opened for instruction in Fall 1869. The mathematics faculty consisted of two people, both of whom were graduates of the United States Military Academy (West Point) and who imported the West Point mathematics curriculum. This changed in 1882 when the Regents replaced them with Washington Irving Stringham, who had studied under Benjamin Peirce as an undergraduate at Harvard, received his Ph.D. under J. J. Sylvester at Johns Hopkins, and had spent two postdoctoral years studying under Felix Klein in Germany. His appointment represented a break with the initial leadership of the department. In 1890, Stringham was joined by Mellin Haskell, another Harvard graduate who had received his doctorate under Klein at Göttingen. Subsequent additions to the faculty in this era included Derrick Norman Lehmer, a doctoral student of E.H. Moore at the University of Chicago, who came in 1900, and John Hector McDonald, a doctoral student of Oskar Bolza, also at the University of Chicago, who came in 1902. Stringham, and then Haskell after Stringham's death in 1909, ran the department from 1882 until Haskell's retirement in 1933. Initial appointments to tenure were extremely rare as the university's long standing policy was to grow its own. Almost all appointments were thus at the beginning tenure track level, which until more recently was Instructor. Advancement up the ladder was at many times painfully slow in the early years.

The first mathematics doctoral degree at Berkeley was granted in 1901, but there was a hiatus until 1909, after which doctoral production averaged somewhat under two per year until the mid-thirties. Even though the mathematics faculty had grown to about 12 in 1910 and to about 18 in the mid-thirties, Haskell, Lehmer, and MacDonald were essentially the only ones to supervise dissertations. In the thirteen year period 1909 to 1921, Berkeley produced 18 doctorates in mathematics, 4 of whom were women. By comparison, all US universities during the same period produced 280 mathematics Ph.D.'s, 39 of whom were women (according to the Mathematics Genealogy website [3]); Berkeley was not statistically different from the national pattern. During the following 20 year period through 1941, Berkeley produced 52 doctorates in mathematics including 5 women; the corresponding national numbers (again based on Mathematics Genealogy listings) were 1367 with 155 women. Again the Berkeley numbers are not statistically significantly different from the national pattern. These statistics reflect a stronger presence of women in mathematics graduate programs in the early decades of the 20th century, followed

by a steady decline nationally in the percentage of women doctorates until the late sixties, when the numbers began to increase rapidly.

As Haskell's 1933 retirement neared, faculty in other science departments, as well as the Provost and the President of the University, realized that mathematics was a department that had suffered from inbreeding, had focused too exclusively on its teaching mission and had fallen far behind other departments on campus in developing excellence in research. The end result was that the campus took the exceptional step of recruiting the distinguished and established scholar Griffith Evans as Chair from the Rice Institute in Houston with a charge to remake the department. Starting in 1934, he served as Chair for 15 years and succeeded brilliantly in this task. He made many fine appointments, but for purposes of this narrative, two are of special significance. One was Jerzy Neyman, who was brought in to develop statistics, a field that had not been represented at Berkeley. The second was Alfred Tarski, who was recruited to the faculty in 1942; this appointment led to the development of a strong school of logic that has prospered at Berkeley. From the day Neyman arrived in 1938, his goal was the creation of an independent department of statistics. Evans supported Neyman in his quest for hiring faculty in statistics, but firmly resisted Neyman's efforts for an independent department. It was only in 1955 after Evans had stepped down that Neyman succeeded in his goal of a separate department.

The University was shaken to its core in 1949–50 by the Loyalty Oath Controversy in which the UC Regents tried to impose on all employees, but especially the faculty, a disclaimer oath in which all employees had to swear under oath that they were not members of the Communist Party. This resulted in a collision between the faculty and the Regents, and the Regents ended up dismissing in 1950 a small number of mostly tenured faculty who for a variety of principled reasons had declined to sign the oath. In a subsequent law suit, the disdaimer oath was ruled illegal by the State Supreme Court in 1952, and the Regents were ordered to reinstate the dismissed faculty. Berkeley mathematics faculty were over-represented among the dismissed faculty, and while the Oath Controversy damaged the department, it did in time recover.

With this as background, let us turn to the lives of these women mathematicians. The first one hired at Berkeley (or California as it was then called) was Pauline Sperry in 1917. Sperry was born in Massachusetts on March 5, 1885 and graduated from Smith College in 1906. She stayed on at Smith for graduate work and then taught mathematics at Smith from 1908 to 1912 before deciding to pursue further graduate study in mathematics at the University of Chicago. There she worked under Professor Ernest Wilczynski, formerly

Call for Nominations: The 2008 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, and Ingrid Daubechies.

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. *Five* copies of nominations should be sent by **October 15, 2006** to: The Noether Lecture Committee, Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030. If you have questions, phone 703-934-0163 or e-mail awm@awm-math.org. Nominations via e-mail or fax will not be accepted.

a Berkeley faculty member, in projective differential geometry. Her dissertation was entitled *Properties of a Certain Projectively Defined Two Parameter Family of Curves on a General Surface,* and a paper based on it was subsequently published in the *American Journal of Mathematics.* She returned to Smith for a year as Assistant Professor before coming to Berkeley as an Instructor in 1917. She was promoted to Assistant Professor in 1923 and to Associate Professor in 1931. Although she published infrequently, she did supervise five doctoral dissertations during the 1930s and 40s. One publication of note was her 1931 "Bibliography of Projective Differential Geometry." She was a devoted teacher and prepared two textbooks for freshman mathematics. In 1945 she was selected as Chair of the Northern California Section of the Mathematical Association of America.

Pauline Sperry

Sperry was raised as a Quaker and throughout her life practiced her ethical and moral beliefs. In 1950 she firmly believed that the Loyalty Oath encroached on political freedom, and consequently she declined to sign it. She was fired from the University, but as a result of the litigation, she was reinstated just prior to her retirement in 1952. After retirement she moved to Carmel and devoted herself to her causes and to charitable projects. On the occasion of her 80th birthday, she published an article in the *Smith Alumnae Quarterly,* "Formula for Happiness at Eighty," [5] which begins:

> Everybody knows that unless you personally do something about it, you will feel needed less and less as you grow older. At eighty, I feel needed more and more, and I am eager to tell the secret. Oscar Wilde once said, "Men who are trying to do something for the world are always insufferable, when the world has done something for them, they are charming." The world has done so much for me that I do not mind being insufferable, and I let the charm fall where it may.... I have always burned for causes....

One of her causes was an orphanage in Haiti which she writes about in the article. This article provides insight into the generosity and spirit of this remarkable woman who had not been treated at all well by the University. She died shortly after writing this in 1967.

The second woman mathematician to join the faculty was Sophia Levy, who was appointed in 1921. Her doctoral degree and major research work lay in celestial mechanics which by this point in time had moved from being seen as part of mathematics to being seen as part of astronomy. Her mentor, Armin Leuschner, had originally been in the mathematics department in the 1890s, but he had moved into a newly created Astronomy Department that he chaired for 31 years. He was a distinguished scholar, an early member of the National Academy, and a major figure on campus.

Sophia Hazel Levy was born in Alameda, California on December 12, 1888 of parents who were also native Californians. She attended UC and graduated with a major in astronomy in 1910. Continuing with graduate studies in astronomy, she completed a dissertation under Armin Leuschner in 1920 on the motion of comets and minor planets. During her time as graduate student, she also served for four years as assistant to the Dean of the Graduate Division and for two years as Secretary of the Commission on Credentials of the State Board of Education. After appointment as Instructor in 1921, she was advanced to Assistant Professor in 1924, Associate Professor in 1940 and Professor in 1949.

She contributed scholarly papers to the literature concerning the motions of comets and minor planets. The memorial article on her life states: "Since her work in astronomy required handling of extensive numerical data,

Sophia Levy McDonald

she quite naturally directed herself to the field of numerical analysis, including such subjects as interpolation methods, mechanical quadratures, the numerical solution of algebraic and transcendental equations, Fourier analysis and periodogram analysis." During World War II she taught courses in the mathematics of antiaircraft gunnery to armed services personnel at UC Berkeley and later published a text on the subject with UC Press. She was also deeply engaged in the preparation of secondary school mathematics teachers, was the departmental advisor for prospective teachers and served on a number of regional and statewide committees on mathematics education. With A. L. McCarty of San Francisco City College, she founded in 1939 the Northern California Section of the MAA, serving first as Secretary of the section, next as Vice-President, and then President and Sectional Governor.

At some point in her career, at a time lost in the mists of history, she formed a close personal relationship with her departmental colleague John Hector McDonald, who was 13 years her senior. They had hoped to marry, but marriage was precluded by the university's strict nepotism rules which did not allow close relatives to be employed in the same department. One or the other would have had to resign. In any case they waited until John reached mandatory retirement age and in 1945 they married. She was subsequently known as Sophia Levy McDonald. John died in 1953 and his In Memoriam article states: "The colleagues who were privileged to have insight into his character, his intellectual power, and his artistic sensitiveness are grateful to Mrs. McDonald for the comfort and happiness which her devotion brought to his later years." [1]

Sophia retired from active duty in the department in 1954. At the time the department had an assistant professor on the faculty who was well qualified to take over McDonald's manifold responsibilities with respect to the training of teachers and was someone whom McDonald wished to succeed her. However the department declined to promote him to tenure because of the absence of a research record. It would be the better part of a decade before the department again focused efforts on the training of teachers.

McDonald's memorial article concludes appropriately as follows: "The daughter of pioneer parents in California, Sophia Levy McDonald viewed herself as somewhat of a pioneer for women in the field of study and research in the exact sciences. She contributed to the fame which the Astronomy Department enjoyed under the leadership of the late Professor Leuschner in the field of celestial mechanics, and she contributed significantly to the teaching of mathematics in the schools and colleges in California." [1]

The third woman mathematician in our story is Emma Trotskaya Lehmer. Emma Trotskaya was born November 6, 1906 in Samara, a city on the Volga River in Russia. Her family moved to Harbin, Manchuria in 1910 where her father Motvey Trotsky served as the Far Eastern representative of a large Russian firm. They were thus spared the trauma of World War I and Revolution, and they remained there as expatriates after the war. Emma had originally hoped to return to Russia for college, but the purges and famine in Russia made that impossible. She instead looked to the US, and she applied and was admitted to UC Berkeley in 1924 as a freshman. She developed an interest in mathematics and decided to major in it. During the summer of 1926, following her sophomore year, she got a job assisting Professor Derrick Norman Lehmer on a research project in number theory. While working on this project, she soon met and worked with Lehmer's son, Derrick Henry Lehmer, known as Dick, who was a math major one year ahead of her in college. Their friendship ripened into love, and Dick and Emma were married April 20, 1928 when he returned to Berkeley following

his year of graduate study at the University of Chicago. After a trip to Manchuria to meet her family, they returned, and both went off to Brown University. Dick had transferred there to finish his doctoral work, while Emma enrolled in the master's program at Brown.

After completing their degrees at Brown in 1930, the Lehmers moved around for ten years as Dick held various postdoctoral fellowships and then a faculty position at Lehigh University. Emma bore two children during this period in 1932 and 1934. The faculty position that Dick yearned for was of course a position at Berkeley; however, the university's nepotism regulations precluded that as long as his father was still on the faculty. His father retired in 1937, and in 1940 Dick Lehmer was appointed to a faculty position at Berkeley.

Emma began publishing mathematics papers shortly after receiving her master's degree, including three short notes in the *Bulletin of the American Mathematical Society*, the first one of which contained the results of her master's thesis. These were followed by a paper in the *Annals of Mathematics* in 1938, and then a *Bulletin* note jointly authored with her husband in 1941; all of this of course with small children in the house. The Lehmers spent the 1945–46 year at the Ballistic Missile Research Laboratory at Aberdeen where Dick was working with the ENIAC computer that was designed and used to compute ballistic trajectories. But on some weekends the Lehmers could use it as a numerical sieve. Emma recalls that "When they could arrange child care, they would stay at the lab all night long while the ENIAC processed one of their problems. They would return home at the break of dawn." [2]

After her 1941 paper Emma did not publish anything until 1951, when she resumed publishing mathematical papers, and a steady stream of publications in number theory followed. The last one appeared in 1993 when she was 87. In over 60 years of married life, which combined devoted family life as well as mathematics, the Lehmers co-authored 11 papers in number theory. But these form only a small part of Emma Lehmer's 56 total publications. Emma was also widely known for her fine translation of Pontrjagin's book *Topological Groups*.

Once Dick held a faculty appointment, the university's nepotism regulations did not permit her to hold a faculty position except for some short-term visiting positions to meet teaching needs. By the time these regulations were

Emma Trotskaya Lehmer, ca. 1928

rescinded in 1971 both were virtually at the age of mandatory retirement. In any case Emma never felt excluded from the mathematical community, and indeed was a vital part of it. She travelled with her husband to mathematical conferences around the world and had many research accomplishments [2]. The article in [2], which is based on interviews with her, says: "Emma Lehmer considers that she is quite fortunate in the way her career turned out. She would have liked to teach more (she taught some during World War II under special wartime exceptions to the university nepotism rules that usually prevented more than one member of a family from holding a faculty position). She considered that not having to teach freed her up to do research." In fact her publication record, judged just by the number of publications, exceeds that of any of the other five women we are discussing. Today Emma lives alone in the house in the Berkeley Hills that she shared with Dick, and will turn 100 not long after this account appears in print.

In 1938 Evans had successfully completed the recruitment of Jerzy Neyman from University College London to build up a school of statistics. As soon as he arrived, Neyman started to recruit students from many different disciplines to work with him in his Statistical Laboratory—the precursor of a separate department. A number of these students completed their doctoral degrees under Neyman and were subsequently hired into faculty positions at Berkeley.

Neyman justified this inbreeding on the grounds that virtually no other program was turning out well trained students in modern statistics. Among those recruited by Neyman to work with him who went on to faculty positions were two women, Evelyn Fix and Elizabeth Scott. Both were originally appointed in the Mathematics Department, but when statistics split off as a separate department in 1955, they joined the Statistics Department and spent the remainder of their careers in that department

Evelyn Fix was born January 27, 1904 in Duluth, Minnesota, and received her bachelor's degree in mathematics from the University of Minnesota in 1924. She went on to earn a BS in education in 1925. She then taught high school mathematics in Minnesota from 1925 to 1934, while also receiving an MA in Mathematics in 1933. In 1934, she moved to Seattle, Washington and worked as a high school mathematics teacher, secretary, and school librarian from 1934 to 1941. She had received a certificate degree in librarianship in 1936 from the University of Washington.

Prompted by a friendship with Evans developed during a summer school course she took from him in 1931 at Minnesota, she attended Summer Session at UC Berkeley in 1939 and again in 1940. The distinguished British statistician R. A. Fisher had also taught in this 1931 summer program at the University of Minnesota, and this may have prompted an interest in statistics. In any case, in 1941 she came to Berkeley to stay, signing on as Research Assistant under Neyman in the Statistical Laboratory. She continued her work during the war, supported on Neyman's grants and also teaching, first as an Associate and then as Lecturer in the Mathematics Department. After the War she completed her work for a doctoral degree under Neyman, and the degree was awarded in 1948. Her dissertation consisted of three parts, two of which were technical reports she had prepared while working in the Statistical Laboratory. The third part was entitled "Distributions Which Lead to Linear Regressions." She was appointed as a Lecturer for two years (1948–1950) before being appointed as Instructor in 1950 and then as Assistant Professor in 1951. She was promoted to Associate Professor in 1957 and to Professor in 1963. She died of a heart attack on December 30, 1965 shortly after returning home from a banquet for the Fifth Berkeley Symposium.

Her research interests ranged over a number of topics from early work on probability in her war work and her thesis, to work with J.L. Hodges on discriminant analysis, to work with Neyman which led to her computation of tables of the power of the chi-squared test and to problems of risks, and finally to joint work with F. N. David on statistical problems of biology and health. Her memorial article notes: "Aside from her own research, Miss Fix was very generous and very able in helping colleagues from the University and the community at large with statistical questions arising in their research. Many footnotes acknowledge this help." [1] During her career, she supervised the doctoral work of one student.

F. N. David, Betty Scott, David Blackwell, and Evelyn Fox, ca. 1962

She helped with the organization of the periodic *Berkeley Symposia on Mathematical Statistics and Probability.* As her memorial article opines: "Miss Fix participated in the organization of the Statistical Laboratory and then of the Department of Statistics, essentially from the very start. It pleased her to see statistics come alive and she contributed a great deal to the spirit of the laboratory and department. In addition to other qualities she had an unusual gift for cooking and many of us will long remember her hospitality, at her apartment and, later, at her home with F. N. David in Kensington." [1]

Perhaps at this point some mention of F. N. (Florence Nightingale) David is appropriate as she was at times a presence in the Statistics Department at Berkeley, although

she was never a regular faculty member. She was born in England in 1909 and received her doctoral degree in 1938 at University College London, under Karl Pearson, the same year that Neyman left University College to come to Berkeley. David also subsequently served as a faculty member at University College London. In 1948 she began regular summer visits to Berkeley where she taught in summer session. She was subsequently recruited to the Riverside campus of University of California, and her memorial article states:

> After retiring from UC Riverside in 1977, Dr. David was named Professor, Emeritus and Research Associate at UC Berkeley where she continued to teach for another decade, and, at the same time, continued her long-term collaboration as a consultant with the United States Forestry Service. She was the author of nine books, two monographs, and over 100 papers in scientific journals. In August of 1992, she received the first Elizabeth L. Scott Award at the Joint Statistical Meetings in Boston. She was cited for "her efforts in opening the door to women in statistics; for contributions to the profession over many years; for contributions to education, science, and public service; for research contributions to combinatorics, statistical methods, applications, and understanding history; and her spirit as a lecturer and a role model." [1].

Elizabeth Leonard Scott was born on November 23, 1917 in Fort Sill, Oklahoma, where her father, an officer in the U.S. Army, was stationed. After graduating from high school in Oakland, California, she entered UC Berkeley in 1935 and majored in astronomy, graduating in 1939. Shortly after Neyman arrived at Berkeley in 1938, C. D. Shane, Director of the Lick Observatory, recommended to Scott that she learn statistics because he felt that applications of modern statistics to astronomy would be important but were not well developed. Scott then entered graduate school in astronomy, but split her time over the next ten years between the Astronomy Department, the Statistical Laboratory, and the Mathematics Department. She was a Research Assistant in the Statistical Laboratory for 1939–41 and a Teaching Assistant in Astronomy in 1941–42; she worked on Neyman's NDRC contract during the war. She was also a University Fellow in Astronomy for 1942–44 and then a

Betty Scott in the 60s

Teaching Assistant in Mathematics for 1944–46. After the war she worked as an Associate in Astronomy, as Research Assistant in the Statistical Laboratory, and then Lecturer in Mathematics.

During the war she worked on statistical problems concerning the effectiveness of bombing, and then began work on statistical problems in astronomy and bi-variate distributions. Her interests began in astronomy, but shifted more and more to statistics. After discussion with her mentors, she decided to submit a dissertation in astronomy, in which an astronomical problem was solved by statistical methods. Her dissertation, formally under the direction of Robert Trumpler in astronomy, but also effectively under Neyman as well, consisted of two parts (I) Contribution to the Problem of Selective Identification of Spectroscopic Binaries, and (II) Note on Consistent Estimates of the Linear Relation Between Two Variables. The degree was granted in 1949. She was appointed as Instructor in Mathematics on January 1, 1950, and was then promoted to Assistant Professor 18 months later. Advancement to tenure came in 1957 and to Professor in 1962. She served as Chair of Statistics from 1968 to 1973, and her memorial article says that she will be remembered by her deans as a feisty chair of her department and a champion of its students. (The two deans she served under were Walter Knight and the

author.) She supervised the dissertation of nine doctoral students during her career.

Throughout her career Scott contributed both to astronomy and to statistics. There is an observational feature concerning the formula used to estimate the distance to a galactic cluster known as the Scott effect. She began a life long collaboration with Neyman that included statistical problems concerning the distribution of galaxies, weather modification (cloud seeding), and carcinogenesis. In other work, singly authored, she explored ozone depletion and its possible effects. She also undertook statistical studies of career patterns of men and women in academia—work that resulted in several, influential reports. One such study undertaken with Elizabeth Colson collected and analyzed data on gender disparities and was reprinted by Congress. Another study on salary inequality was done for the Carnegie Commission and was used by institutions to make salary corrections.

She was an effective mentor and role model for many young women in science, and as noted above an award named in her honor was created. She was refreshingly and vigorously outspoken in many venues about discrimination and inequality. Finally, she held a number of important positions in professional societies—President of the Institute of Mathematical Statistics, Vice President of the International Statistical Institute, and Vice President of the Bernoulli Society—and was elected as an Honorary Fellow of the Royal Statistical Society (London). She retired from active duty July 1, 1988, and died unexpectedly a few months later.

NSF-AWM Travel Grants for Women

The objective of the NSF-AWM Travel Grants program is to enable women researchers in mathematics or in mathematics education to attend research conferences in their fields, thereby providing a valuable opportunity to advance their research activities and their visibility in the research community. By having more women attend such meetings, we also increase the size of the pool from which speakers at subsequent meetings may be drawn and thus address the persistent problem of the absence of women speakers at some research conferences. All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians appointed by the AWM.

Travel Grants. These grants provide full or partial support for travel and subsistence for a meeting or conference in the applicant's field of specialization. A maximum of $1000 for domestic travel and of $2000 for foreign travel will be applied. For foreign travel, U.S. air carriers must be used (exceptions only per federal grants regulations; prior AWM approval required).

Eligibility. These travel funds are provided by the Division of Mathematical Sciences (DMS) and the Division of Research, Evaluation and Communication (REC) of the NSF. The conference or the applicant's research must be in an area supported by DMS. Applicants must be women holding a doctorate (or equivalent experience) and with a work address in the USA (or home address, in case of unemployed mathematicians). Anyone who has been awarded an AWM-NSF travel grant in the past two years is ineligible. Anyone receiving a significant amount of external governmental funding (more than $2,000 yearly) for travel is ineligible. Partial travel support from the applicant's institution or from a non-governmental agency does not, however, make the applicant ineligible.

Applications. An applicant should send *five* copies of 1) the AWM Travel Grant Form, where conference name, conference dates and location (city/state/country), and amount of support requested should be provided, 2) a cover letter, 3) a description of her current research and of how the proposed travel would benefit her research program, 4) her curriculum vitae, 5) a budget for the proposed travel, and 6) a list of all current and pending travel funding (governmental and non-governmental) and the amounts available for your proposed trip to: Travel Grant Selection Committee, Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030. If you have questions, contact AWM by phone at 703-934-0163 or by e-mail at awm@awm-math.org. Applications via e-mail or fax will not be accepted. There are three award periods per year. The next two deadlines for receipt of applications are **October 1, 2006** and **February 1, 2007**.

Julia Robinson, ca. 1943

The final woman mathematician at Berkeley that we shall discuss is Julia Robinson. The news was electrifying—on April 27, 1976 it was announced that Julia Bowman Robinson had been elected to the National Academy of Sciences—the first woman to be elected to the Mathematics Section of the Academy. John Kelley, then departmental chair, decided that the department should immediately seize this opportunity to take what many regarded as the long overdue step of appointing Julia Robinson as a Professor of Mathematics.

Julia Bowman was born December 8, 1919 in St. Louis, Missouri, and shortly thereafter her family moved to Arizona and then to San Diego, California. She attended San Diego State College from 1936 to 1939 and then transferred to Berkeley for her senior year, where she received her bachelor's degree in mathematics in 1940. She continued on for graduate work at Berkeley, receiving a master's degree in 1941. Raphael Robinson, with whom she had taken a course in her first year at Berkeley, subsequently courted her successfully, and they were married on December 22, 1941, after which she was known as Julia Robinson. As a child she had suffered from rheumatic fever, an illness that had damaged her heart and kept her out of school for nearly two years. The illness had a life-long effect on her health, but heart surgery in 1961 followed by two other major surgeries in the 1960s allowed her to enjoy a more active life [4, p.68].

After receiving her master's degree she continued to study and work in the department, and for some time she worked in Neyman's Statistical Laboratory. Robinson became interested in mathematical logic under the influence first of her husband and then under the direction of Alfred Tarski. She completed her doctoral work under Tarski in 1948 with a dissertation entitled *Definability and Decision Problems in Arithmetic,* in which she proved that the notion of an integer can be defined arithmetically in terms of the rational numbers. This was a very significant result that had important consequences for other decision problems. After her doctoral work she became interested in Hilbert's 10th problem, which asks if there is a decision procedure for determining whether a diophantine equation with integer coefficients has a solution in integers. This was a topic that occupied her attention for the rest of her career. She published a number of significant contributions to the problem, first in 1952, then in 1961 (jointly with Martin Davis and Hillary Putnam), and in 1969, an improvement on the 1961 result. She formulated what was called by others the Robinson Hypothesis, and at that point she in fact was closer to a solution of the 10th problem (in the negative) than she imagined. It was in early 1970 that a 22-year-old Russian mathematician, Yuri Matijasevich, who, upon reading her 1969 paper, filled in the missing piece in a few weeks of work finally to resolve the 10th problem in the negative. Matijasevich and the mathematical community accorded Robinson substantial credit for her role in the solution. Davis also deserves a piece of the credit, as does Putnam. Robinson and Matijasevich subsequently collaborated on some further refinements to the solution.

Robinson's contributions to the resolution of this Hilbert problem brought her great recognition, with election to the NAS in 1976 being one of the major ones. She had never had a regular faculty position at Berkeley but had taught part time in the department on a number of occasions. Nepotism rules in place at the time would not have permitted her appointment, but Raphael took early retirement in 1971, so that nepotism was no longer an obstacle. (In any case, nepotism rules were rescinded in 1971 as a antiquated relic of the past.) As she states in her "autobiography": "In fairness to the University, I should explain that even after the heart operation, I would not have been able to carry a full time teaching load" [4, p.79]. After a conversation with the Dean, who

endorsed the proposal, Kelley approached Robinson shortly after her election to the Academy in the Spring of 1976 to ask if she was interested in an appointment as Professor in the department, where it was made clear that the appointment could be a part-time one with the percentage time of the appointment completely at her discretion. Her response was positive, and her choice was for a 25% appointment. It took several months to assemble the paperwork for the appointment and to gain approval for it through the various levels of review, and her appointment as Professor of Mathematics at 25% time was approved over the summer retroactive to July 1, 1976.

Many other honors for Robinson followed, including selection as Colloquium Lecturer of the American Mathematical Society in 1980 and then election as President of the Society in 1983—the first woman to serve as President of the Society. She was selected as Prize Fellow of the MacArthur Foundation in 1983. But in the summer of 1984 Robinson learned that she had leukemia. On July 30, 1985, she died of this ailment just weeks after her retirement from the university on July 1, 1985. All were saddened by this tragic event. She had very much hoped to return to her research after service as President of the AMS, but this was not to be. Her husband Raphael established the Julia Robinson Graduate Fellowships in Mathematics at Berkeley in her honor with an initial contribution, and after his death in 1995, the bulk of their estate came to the department to provide very generous funding for these fellowships.

What do we learn from the stories of these six women? They were of very different backgrounds and of personality. All were courageous and pioneers in their own ways, but at the very least, these stories show the presence and influence of women in the Berkeley mathematics community from a very early time. Pauline Sperry was certainly one of the first if not the first woman mathematician to be appointed to a tenure track position in a major research university in the US. Two of these women married early in life and only one, Emma Lehmer, had children. She was also the only one not to have held a regular faculty position. Julia Robinson wanted children, but after she became pregnant and lost the baby, her doctor advised her never to become pregnant again because of her heart problems [4, p. 43]. Another theme which comes through is the effect of the university's nepotism rules. One could have hoped that the university would have seen how misguided this policy was earlier than 1971 when it was finally rescinded.

Julia Robinson, 1976

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Photo Credits

Betty Scott, Group, and Julia Robinson (ca. 1943): Courtesy of UCB Statistics Department

Emma Trotskaya Lehmer: Courtesy of the Lehmer family

Julia Robinson (1976): Courtesy of UCB Mathematics Department (photo by George Bergman)

Pauline Sperry: Courtesy of The Bancroft Library, University of California, Berkeley. Call Number UARC 13:3075.

Sophia Levy McDonald: Courtesy of The Bancroft Library, University of California, Berkeley. Call Number UARC 13:2535.

In Celebration of Evelyn Silvia

Jessica Utts, Department of Statistics, UC Davis
Angela Cheer, Department of Mathematics, UC Davis

Our friend and mentor Evelyn Silvia, Professor of Mathematics at the University of California, Davis, passed away on January 21, 2006 of ovarian cancer, just a few weeks before her 58th birthday. We are delighted to have this opportunity to share with you our reflections on her life.

It would be a tribute to anyone's life to be able to say that she or he made a difference to someone at some point in life. But there are very few people who made a difference in so many different ways, to so many different people, as did Evelyn Silvia. She actively sought to correct injustices, to encourage the best in everyone, to provide financial help to students and family when needed, and to serve her many communities in a myriad of ways. Although she advised everyone else to say "no" to requests for their time and energy, she was unable to keep herself from contributing generously to worthy endeavors—from learning sign language to help deaf children learn mathematics, to serving the local community as a rape-crisis counselor.

Evelyn Silvia (UC Davis file photo)

The diversity of stories we have received of Evelyn's influence, and the passion contained in them, convinced us to share some of the writers' original words. The following are examples of the many legacies Evelyn Silvia leaves behind, illustrated with the words of friends, family and colleagues. Not only did she help many, many people, but she did so in creative ways that would be worthwhile for many of us to emulate. In reading about some of Evelyn's good deeds, feel free to initiate them in your own life! Imitation is the sincerest form of flattery.

- She was a strong advocate for women's issues on campus. She organized a support group to which all women faculty at UC Davis were invited. She continued to be the mainstay of this group for over a decade. Here are two first-hand accounts of the difference her work on behalf of women made in the lives of women faculty:

Evelyn changed the face of our university. I first met her when I arrived in 1977 with a mandate to develop a program in quantitative analysis of plant-environment interactions. As the first woman hired into a tenure track professorship in my department of 40, I felt somewhat isolated and uncertain of my place in the university. Evelyn had organized the "Faculty Women's Research Support Group" to meet monthly in our homes, talk about our research, and provide encouragement in our academic endeavors. While I was not aware of feeling oppressed at work, I found it amazingly comforting to have the opportunity to walk into a room full of women, as a complement to the all-male faculty meetings of my department. Evelyn campaigned energetically to have women represented on the important university committees; she counseled us individually and cheered on the group support network; she remained vigilant in protesting any gender-based inequities that surfaced. Her demands for fair treatment gradually improved the status of women at the university and contributed immeasurably to our self esteem.

Wendy Silk, Professor of Land, Air and Water Resources

Evelyn was a warrior. There are always many battles to be fought, and in each and every battle, Evelyn tirelessly championed the side of justice, tolerance, and equal opportunity. She was very active in recruiting those less motivated, like myself, into those battles, and in doing

so effected important changes on our campus. I always marvel at Evelyn's apparent ability to be in two places at once, both leading the charge and gently lashing us from the rear. Perhaps this amazing feat was possible because of her expertise in geometrical transformation.

Maureen Stanton, Professor of Evolution and Ecology

- Evelyn was equally passionate about mentoring assistant professors, male and female. She wrote a pamphlet entitled "Collegial Advice for Assistant Professors" that is now available online, linked to the Provost's website at UC Davis: http://www.math.ucdavis.edu/~emsilvia/CollegialAdvice/html/CollegialAdvice.html. Evelyn routinely held Thanksgiving and Easter dinners at her home and invited a myriad of people who had no family in the area, especially newly hired faculty members. As noted by one of her colleagues:

  It has been mentioned that Evelyn truly cared about the success of junior faculty, but let me say some more about this. She wrote some wonderful notes with very sensible advice and suggestions. Even more, I was truly moved by the attention she gave to young faculty. When I first arrived on campus it was not an easy time for me. When one is a newcomer to a strange place, it is hard and if on top of that one is an assistant professor it is even harder. It makes a difference to receive a friendly handshake. She was the first person to come into my office and introduce herself and offer a welcome. That quarter Evelyn and [her husband] Doyle had us over for our first Thanksgiving dinner in Davis.

  Jesus De Loera, Professor of Mathematics

- It is no surprise that Evelyn won the UC Davis Academic Senate Distinguished Teaching Award, as well as the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics. She was constantly praised for her tough but caring approach to teaching.

  I am so deeply saddened today to learn of Dr. Silvia's passing at far too young an age. She was one of the most difficult teachers of my life however; she was a teacher in every sense of the word. She was truly inspiring. I loved to watch her teach. She always seemed to be bounding all over the place. Her amazing positive energy and enthusiasm, even at 8 a.m., was truly contagious. She was always there to help me. I remember how disappointed she would be when she thought I did not make enough of an effort at something. In years since I have often thought of those wonderful days when it seemed like I could feel my brain stretching through my skull, while her class and those of a few others were taking me to another level of being a student. She continually encouraged me and genuinely cared that I succeeded at UC Davis and in my life.

  Riad Steven El-Bdour, B.S. in Mathematics, UC Davis, 1997

Evelyn Silvia with students (UC Davis file photo)

- One of the many passions in Evelyn's life was the Master of Arts in Teaching (MAT) Program, which she directed during many of her years at UC Davis. Staff and students were awed by her energy and devotion to the success of the program and its students. She was awarded a large National Science Foundation grant to help bring together students in the program and public school teachers.

  Evelyn poured her soul into the MAT students. After taking over that program, she seemed to be in perpetual

motion. Math education was very important to her, and she wanted to assure that the next generation of math teachers was well prepared. Not only did she spend every waking hour (seemingly) working on issues for and with the MAT students, but she worked with current teachers at workshops during the summer to help them better their math teaching skills as well. Her passion for math and teaching was obvious.

Nancy Davis, Undergraduate Coordinator, UC Davis Math Department, 1999–2005

Describing Dr. Silvia as selfless would be an understatement. As Principal Investigator she was entitled to remuneration [from the NSF grant]. She refused to accept it. Instead, the money was used to support graduate students as they endeavored to become mathematics teachers. In so many ways, Dr. Silvia tried to help others with every tool she had. Her noble deeds and good work have affected countless people who were touched by her strong and caring voice.

Al Mendle, Supervisor of Teacher Education, UC Davis

The true measure of one's worth is not found in the number of committees chaired or the number of publications one leaves behind, but in the number of lives one has touched in a positive way. By that measure, and many others, Evelyn Silvia leaves a legacy that will affect many generations to come.

In addition to her devotion to mentoring and education, Evelyn found time for research, which she once said was "the one thing I do for myself." She loved mathematics, and her expertise was in classical analysis, with much of her research concerning univalent analytic functions in one complex variable. An anonymous reviewer of her work commented that "Professor Silvia is a well-regarded and highly respected researcher in her chosen field, with high visibility and national and international recognition."

Evelyn's service to the university was unparalleled in its quantity and quality. In Fall 2000, as part of the review of Evelyn for a high level advancement, the Department of Mathematics counted the number of administrative and Academic Senate committees she had served on from the time she was promoted to Professor in 1984. The astounding result was that she had served on more than 220 of these committees and had served as chair or head of 40 of them! In addition, she served as the Director of the UC Davis Teaching Resources Center, Secretary of the Faculty Senate and Head Advisor for the Math Department during that time period. Anyone who served on a committee with her quickly learned that she was not there to add another name to her list of committees. She was always completely prepared for meetings. She read and analyzed all committee materials and always had constructive input. Many of us learned how to be good committee members by watching Evelyn in action.

Evelyn's love and compassion extended beyond her professional work. One friend correctly described her as "fiercely loyal" to her friends and family. Although she had no children of her own, she played a major role in the lives of her two stepchildren, as well as her many nieces and grandnieces and nephews. Her nieces all lived on the East Coast, and when they were 11 years old, Evelyn would fly them to California and spend a few weeks showing them around. She explained that at that age they were old enough to appreciate it, but young enough to be willing to leave their friends for two weeks. She was a tremendous influence in their lives. One of her nieces wrote:

My Aunt Ev was an amazing woman. As a child, to me, she seemed so much larger than life. She was my idol. I remember learning sign language with her so she could teach deaf children math. I remember how proud I was watching her be honored as teacher of the year. I remember how beautifully she sang and signed "Bridge Over Troubled Water" for the gift of music at a church service we attended. I remember the summer my cousin Dorothy and I spent humiliated as she chased us through Disneyland in bright red Coca Cola pants. I remember the morning we made her hamburger and toast for breakfast in bed and she actually ate it. One day she stood in line for hours to buy me concert tickets to the Who when she didn't even know who the Who were. I am so grateful for every moment I spent with her.

Tammy, Evelyn's niece

As we reminisced over Evelyn's influence in our own lives, we realized that we shared a common bit of good fortune. Evelyn had paved the way for both of us as the first tenure-track woman in the Math Department at UC Davis, and the only other woman in the Department when each of us started; Jessica joined the Math Department in 1978 and moved to the newly formed Statistics Department in 1979 and Angela joined the Math Department in 1984. There could not have been a more dynamic, compassionate and wise mentor than Evelyn to greet us when we arrived. We are both sure that our experience at UC Davis would have been radically different had she not been there first.

The true measure of one's worth is not found in the number of committees chaired or the number of publications one leaves behind, but in the number of lives one has touched in a positive way. By that measure, and many others, Evelyn Silvia leaves a legacy that will affect many generations to come. She has truly made the world a better place, and everyone who knew her, a better person. We feel blessed to be counted among them.

Dr. Silvia's family, friends, colleagues and students have established an endowed scholarship in her name, which will support juniors or seniors majoring in math or statistics who plan to teach mathematics at K–12 grade levels. Anyone wishing to donate to the fund may send checks payable to the UC Davis Foundation, Evelyn M. Silvia Scholarship Fund, c/o UC Davis Department of Mathematics, One Shields Avenue, Davis, CA 95616.

Math Propels Women into Technical Careers

Nirmal Devi, Embry Riddle Aeronautical University

The mathematics department at Embry Riddle Aeronautical University at Daytona Beach, Florida celebrated its second annual "Women In Math Day" on March 31st, 2006. One hundred five female high school students and fourteen teachers from Volusia County participated in this event.

The program included a workshop, team competitions, panel discussion, campus tour and an award ceremony. The workshop presenter was Ms. Amy Misakonis. She graduated from Embry Riddle with a BS in Aerospace Engineering. She has been working for United Space Alliance on the space shuttle program for four years in the payload mechanical engineering group. She was a great role model for the young high school women. Her message to the participants was: "Many opportunities are available in scientific fields at the Kennedy Space Center or virtually anywhere in the world. I am just an example of a girl who had dreamed of being an astronaut and being a part of something great, who enjoyed mathematics."

The team competitions included basic exercises and applied word problems from Algebra I and II as well as Geometry. Students enjoyed the thrill of solving mathematical problems and quizzes. The competition went on for two hours. First, second and third prizes were given to the winning teams. During the lunch hour, we had a panel discussion. Through the career panel component of the program, we hoped to expose the high school students to adults from diverse professions. The panel team consisted of two female faculty, two female students and the workshop presenter. The questions from the students included asking what kinds of math courses are needed to get into the engineering programs at Embry Riddle. Undergraduate and graduate students majoring in engineering and aeronautics served as program escorts and mentors.

The 2006 Annual High School Women in Mathematics Day is a group effort by five energetic and dedicated women in the Department of Mathematics to expand the department's outreach efforts to make a difference for our high school graduates. The committee provided the opportunity for participants to discover and be enlightened about possible careers in mathematics, science, or engineering. The purpose of this event is to encourage the high school women to take math courses. According to the National Center for Education Statistics, in early elementary school boys and girls like math and science about the same. By the eighth grade, boys who show an interest in these subjects outnumber the girls 2 to 1. At Embry Riddle the male to female ratio is 5 to 1.

It was a day of fun that provided lots of information for the young women. We hope that these female high school students left with the message that the world of science and engineering is a viable and attractive option for them if they have the necessary math skills.

Education Column

The MER-AWM Session at the 2005 Joint Meetings

Cathy Kessel, AWM President-Elect

This is part 2 of an article that appeared in the May–June 2005 issue of the AWM *Newsletter.* In part 1, I described the Mathematical Education of Teachers II Conference. In this part, I'll describe the first segment of the MER-AWM session on understanding underrepresentation that I organized together with Naomi Fisher and Ginger Warfield. I had the idea for the session at the 2004 joint meetings, initially motivated by concern about the statistics on hiring and tenure of women in math departments. I live in Berkeley and stay in contact with a few people at the University of California at Berkeley. In the past ten years, no women have been hired for tenure-track jobs in its math department, although in 2005, a woman did get a joint appointment in physics and math that was tenure track. Because so much time has elapsed since the meetings and so much has happened since (e.g., the controversial remarks of Lawrence Summers), I will also mention events outside of the session.

My talk began the session. I was followed by two very distinguished speakers—Virginia Valian and Mary Frank Fox. Valian's book *Why So Slow?* has been the topic of two reviews in the AWM *Newsletter,* one by Judy Roitman in July, 2003 and one by me in May, 1999. (For those who haven't read them, I suggest reading Roitman's first; I think she does a good job in illustrating the relevance and importance of Valian's idea of gender schemas, which is a central concept in the book.) Valian is a psychologist, so she focuses on individual behavior. Fox is a sociologist, and her work concerns institutional influences on the careers of women in science. I think that each illuminates an important piece of what's been a puzzle to me: why it's sometimes so hard to be a woman in mathematics. In this article, I won't describe their talks. Instead, I'll focus on bridging some of the gaps that I see in mathematicians' (and others') understanding of social science and pointing out a few subtleties involved in understanding and using social science. This will, I hope, help readers to better understand and appreciate Valian's and Fox's work.

My talk revisited the social science underpinnings of some (as they say in education) interventions,[1] already familiar to many of us in order to give a sense of how social science can help. One of the things that I've noticed about these interventions is the social science part is often not discussed. I think that social science can help us to better understand how math departments work and how people in math departments make decisions about admissions, retention, hiring, and tenure. This is not to deny that mathematics plays a role in these decisions, but rather to suggest that these decisions are not based purely in mathematics.

In my talk, I described several studies, two of which led to interventions—namely, the Math/Science Network's Expanding Your Horizons conferences and the Treisman workshops. I'll describe these studies and interventions, and try to point out some aspects of social science that I think they illustrate. It's not entirely coincidence that three of my examples come from California; in one way or another I've been involved with each.

The first example illustrates how what we see is influenced by how we observe. Elizabeth Fennema and her colleagues studied children in reform classrooms. First, second, and third graders were interviewed and asked to solve problems and do calculations over a three-year period. The researchers found no gender differences in ability to complete the tasks successfully, except for the superior performance of third grade boys.

However, there were gender differences in the methods that the children used. Girls were more likely to use what the researchers called "standard algorithms." For example, to calculate 38 + 26: Add 8 and 6, get 14, carry up the 1, add that to 3 and 2; the result is 64. Boys tended to use what the researchers called "invented algorithms"—methods generated "individually or in interactions with other children." For example, to calculate 38 + 26: "Thirty and 20 is 50, and 8 makes 58; then 6 more is 64."

There is much that can be said about the two classifications and assumptions about the kinds of student understanding associated with each, but I will not pursue this line of thought here. Instead, I'd like to consider the work of Lisa Butler. For her M.A. thesis, Butler conducted similar

[1] I'll digress a little, I don't like the term "intervention" because it suggests that the status quo needs no change.

interviews with third and fourth graders, but with additional questions designed to elicit sources and preferences about different solution methods. Boys and girls reported seeing or using "invented algorithms" at home when working with their brothers, uncles, or fathers on homework or tasks, such as building things or measuring electric wire. In Butler's interviews, some boys used these methods rather than "standard algorithms." No girl did. Butler's study is hardly conclusive (she used a very small sample); however, I think it illustrates how differences in interview questions can lead to different findings. In particular, "invented algorithms" may not have been invented by their users or in their users' classrooms. (I read Fennema et al.'s article after hearing of Butler's findings and grumbled, "they aren't invented and they aren't algorithms." Fennema and her colleagues have since replaced "algorithms" with "strategies" in later discussions, but I have not heard of any change in the use of "invented.")

Research methods—in this case, the questions a researcher asks—may reflect different perspectives on learning. Butler is far from being a mathematics education researcher—currently she is investigating AIDS in Africa. (I found out about her M.A. thesis findings when she was preparing a talk as a graduate student at Berkeley.) Her advisor Geoffrey Saxe is well-known for his studies of knowledge not acquired in schools, for example, his study of calculation strategies used by child candy-sellers in Brazil. In contrast, many mathematics education researchers focus on in-school learning.

My second example is Uri Treisman's study of undergraduates at the University of California at Berkeley. This again illustrates how different perspectives may affect the nature of research methods and results. This time the difference is in ways to collect data and interpret it, rather than in the kind of interview questions asked.

Treisman did a survey of faculty members at the University of California, asking for possible reasons why some minority students were doing poorly in the university's calculus courses. Four explanations were common: insufficient motivation, inadequate preparation, insufficient family support or understanding of higher education survival skills, and low income. These became hypotheses for a study. First, students were interviewed and asked, for example, how many hours they studied. Their replies were not terribly illuminating. Second, a different method of collecting data was used: two groups of students (20 African-American students and 20 Chinese-American students) were videotaped as they studied calculus and worked problems.

Still, there was no clear explanation for why, on average, African-American students did poorly in calculus at Berkeley and Chinese-American students did not. Here it's helpful to know that in analyzing videotape, one can focus on many different things. Treisman and his group had been focusing on the four hypotheses. He wrote:

> We were advised by some graduate researchers in the social sciences to step back and question our hypotheses; this was really useful. Instead of looking at what happens when students get stuck on a problem, we were encouraged to look more globally at their lives.

Treisman's group found that not only were the four hypotheses wrong, but that the videotapes did yield an explanation. The rest is history. The Chinese-American students tended to study as a group, combining social and academic activities; African-American and Latino students tended to study in isolation. Group study allowed the Chinese-American students to correct and learn from each other, and to pass along any knowledge gleaned from a TA or professor outside of class. Treisman and his colleagues designed workshops that addressed this situation, facilitating access to knowledge and building a sense of community. Later, a form of "workshop calculus" was instituted for most undergraduate calculus recitation sections at Berkeley, and I worked on this expansion.

My third example is about the origins of the Math/Science Network, which celebrated its 30-year anniversary in 2004. I was on its board for four years and on the Expanding Your Horizons advisory board for five-odd years. The Math/Science Network began with a problem identified by sociologist Lucy Sells: A large percentage of undergraduate women entering the University of California at Berkeley were not prepared for calculus.

Sells did a small study of high school students. Young women were taking so few mathematics and science courses in high school that they were unprepared for a high percentage of college majors. Girls lost interest in mathematics and science very early—often by grade 7.

To address this problem, a group of female mathematicians, mathematics teachers, sociologists, scientists, college administrators, and others was convened in 1974 by Nancy

Kreinberg, who worked at the Lawrence Hall of Science at the University of California at Berkeley. In 1976, the First Expanding Your Horizons conference was held at nearby Mills College. This conference, like later Expanding Your Horizons conferences, was a one-day conference that included a panel discussion, hands-on workshops, and career discussions with role models (women with mathematics-based careers).

I am not sure where the designers of the EYH conferences got the idea of role models. I have asked a few of the Network founders, but my guess is that it came directly or indirectly from the work of Albert Bandura. In the 1950s and 1960s, Bandura, a psychologist at Stanford University, did a famous series of studies in which he documented how children mimicked behaviors of adults. A recent New Yorker article characterizes his findings: "The best way to teach new behaviors, Bandura found, was to give people models that they could bond with who could guide them through concrete realistic steps."

These "role models" tend to be people of the same gender—suggesting why the third and fourth grade girls in Butler's study did not adopt their male relatives' ways to solve arithmetic problems. (Note that I've written that role models *tend* to be of the same gender. My experience, and, I suspect, the experience of many AWM members, is full of counterexamples.)

Bandura's ideas have been used to spectacular effect. Miguel Sabido, an astute Mexican television writer, drew on them to create soap operas intended to address public health and social problems. In 1975, he created "Ven Conmigo" ("Come with Me"), a soap opera concerned with adult literacy. The day after an episode showed the national distribution center for free literacy booklets, thousands of people came to the center and traffic was jammed until after midnight. Over the past thirty years Sabido's method of writing soap operas has been refined and exported. Producers carefully study a region's culture and values before developing plots that respect United Nations covenants about human dignity and equity. Researchers study attitudes and behaviors before and after the dramas air. Incidents, such as the massive traffic jam after a "Ven Conmigo" episode, give additional evidence of a program's effect. Sabido's approach to using television to address social concerns makes an interesting contrast with the effort to build on the popularity of the U.S. television show "NUMB3RS." (For details and commentary about the mathematics worksheet program associated with "NUMB3RS," see Sarah Greenwald's "Complex NUMB3RS" in the May issue of MAA's *Focus*.)

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— to be continued —

AWM Grants and Awards

CONGRATULATIONS to those listed below who have received grants and awards from AWM and our funding agencies through our competitive funding process.

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Lily Khadjavi, Loyola Marymount University

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Azime S. Saydam, University of Louisiana at Monroe

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Jianyuan Kathy Zhong,
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Vivien G. Miller, Mississippi State University

Sonia Kovalevsky Day Grant

February 4, 2006 Cycle

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Barnard College, Columbia University, New York, NY

Jackson State University, Jackson, MS

Lincoln University, Jefferson City, MO

Southeastern Louisiana University, Hammond, LA

St. John's University, Jamaica, NY

University of North Dakota, Grand Forks, ND

Sonia Kovalevsky High School Mathematics Days

Through a grant from Elizabeth City State University and the National Security Agency (NSA), the Association for Women in Mathematics will support Sonia Kovalevsky High School Mathematics Days at colleges and universities throughout the country. Sonia Kovalevsky Days have been organized by AWM and institutions around the country since 1985, when AWM sponsored a symposium on Sonia Kovalevsky. They consist of a program of workshops, talks, and problem-solving competitions for high school women students and their teachers, both women and men. The purposes are to encourage young women to continue their study of mathematics, to assist them with the sometimes difficult transition between high school and college mathematics, to assist the teachers of women mathematics students, and to encourage colleges and universities to develop more extensive cooperation with high schools in their area.

AWM anticipates awarding 12 to 20 grants ranging on average from $1500 to $2200 each ($3000 maximum) to universities and colleges; more grants may be awarded if additional funds become available. Historically Black Colleges and Universities are particularly encouraged to apply. Programs targeted toward inner city or rural high schools are especially welcome.

Applications, not to exceed six pages, should include: a) a cover letter including the proposed date of the SK Day, expected number of attendees (with breakdown of ethnic background, if known), grade level the program is aimed toward (e.g., 9th and 10th grade only), total amount requested, and organizer(s) contact information; b) plans for activities, including specific speakers to the extent known; c) qualifications of the person(s) to be in charge; d) plans for recruitment, including the securing of diversity among participants; e) detailed budget (i.e., food, room rental, advertising, copying, supplies, student giveaways, etc. Honoraria for speakers should be reasonable and should not, in total, exceed 20% of the overall budget. Stipends and personnel costs are not permitted for organizers. The grant does not permit reimbursement for indirect costs or fringe benefits. Please itemize direct costs in budget.); f) local resources in support of the project, if any; and g) tentative follow-up and evaluation plans.

The decision on funding will be made in late August. The high school days are to be held in Fall 2006 and Spring 2007. If selected, the organizer(s) must submit a report of the event along with receipts (originals or copies) for reimbursement to AWM within 30 days of the event or by May 15, 2007, whichever comes first. Reimbursements will be made in one disbursement; no funds will be disbursed prior to the event date. An additional selection cycle will be held February 4, 2007 for Spring 2007 *only if* funds remain after the August 2006 selection cycle.

Send *five* complete copies of the application materials to: Sonia Kovalevsky Days Selection Committee, Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030. For further information: phone 703-934-0163, e-mail awm@awm-math.org, or visit www.awm-math.org. Applications must be received by **August 4, 2006**; applications via e-mail or fax will not be accepted.

Klawe Appointed President of Harvey Mudd

press release; see also www.hmc.edu/headline/Klawe.html

Maria Klawe

Maria Klawe, dean of Princeton University's School of Engineering and Applied Sciences, has been chosen to serve as the fifth president of Harvey Mudd College (HMC). A renowned computer scientist and scholar, Klawe will be the first woman to serve as president of HMC, which is celebrating its 50th anniversary this year. She will begin her duties July 1, 2006, succeeding Jon C. Strauss, who will retire after more than nine years of service as president.

"We are extraordinarily pleased that Maria Klawe will be leading Harvey Mudd College into its second half-century," said R. Michael Shanahan, chair of the HMC board of trustees. "Her keen understanding and appreciation for the value of undergraduate education and research makes her the perfect choice for us. She understands our mission and will guide the college in formulating and articulating a vision for engineering, science and mathematics education in the new century. Her experience in industry will be a major asset as we continue to develop corporate relationships."

Klawe earned her B.Sc. and Ph.D. degrees in mathematics at the University of Alberta, Canada, and began her tenure at Princeton in January 2003. Prior to that, she held academic positions at the University of British Columbia (UBC), the University of Toronto and Oakland University. During her 15 years at the University of British Columbia she served as head of the Department of Computer Science from 1988 to 1995, vice president of student and academic services from 1995 to 1998, and dean of science from 1998 to 2002. She also spent eight years in industry, serving at IBM Almaden Research Center, in San José, CA, first as a research scientist, then as manager of the Discrete Mathematics Group and manager of the Mathematics and Related Computer Science Department.

Her teaching interests center on making mathematics accessible and appealing to all students and on the use of technology to enhance learning and motivation. In 2005, she won the Princeton Engineering Student Council teaching award for her work in teaching second-semester calculus. In 2002, she organized the Aphasia Project at UBC, bringing together faculty from human-computer interaction, psychology and audiology and speech sciences to produce handheld devices to improve the quality of life and independence of people with aphasia (loss of language most commonly caused by stroke).

Klawe has been active in many organizations promoting women and leadership in science and technology and is currently chair of the board for the Anita Borg Institute for Women and Technology in Palo Alto, CA. She is a current member of the Executive Committee, the past president (2002–2004), and also a fellow (1995) of the Association of Computing Machinery (ACM) and was a board member of the Computing Research Association. Her service to other organizations includes work as a trustee for the Institute for Pure and Applied Mathematics at UCLA, the Mathematical Sciences Research Institute in Berkeley, and the American Mathematical Society. She holds honorary doctorates from

Dalhousie University (2005), Queen's University (2004), the University of Waterloo (2003), and Ryerson University (2001).

An advocate for women and minorities pursuing careers in engineering, science and mathematics (fields where they are traditionally underrepresented), the hiring of Klawe is part of a trend that emerged during Strauss's tenure. The percent of women students at HMC has risen from 20 percent (1990) to 33 percent (2005) and the percentage of women faculty from 17 percent (1995) to 35 percent (2005). HMC ranks second in the nation in percentage of women faculty in engineering.

Klawe is married to Nicholas (Nick) Pippenger, a professor of computer science and mathematics, who will leave his position at Princeton to join the faculty in the HMC Department of Mathematics. They have two children: Janek, age 23, who is pursuing his Ph.D. in computer science at Princeton, and Sasha, age 20, who will be on leave from the University of New Hampshire during the spring semester 2006 to study international relations at the University of Cape Town in South Africa.

Klawe's personal interests include painting, long distance running, hiking, kayaking, juggling and playing electric guitar. She describes herself as "crazy about mathematics" and enjoys playing video games. In 2005, she established the Kathleen W. Klawe Prize for Excellence in Teaching of Large Classes at the University of Alberta in the name of her mother, an economics professor there in the 1960s and 70s. She gives a painting to each person who donates a minimum of $1500 to the endowed fund.

Book Review

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

Piled Higher and Deeper: A Graduate Student Comic Strip Collection and **Life is Tough and Then You Graduate: The Second PhD Comic Strip Collection,** Jorge Cham, Piled Higher & Deeper Publishing, 2002, ISBN 0-9721695-0-4 and 2005, ISBN 0-9721695-2-0 respectively

Reviewer: Leigh Shaw McCue, Aerospace and Ocean Engineering, Virginia Tech, mccue@vt.edu

The weather is warm, final grades are recorded, and undergraduates, graduate students, and faculty are venturing out of their offices and away from campus to enjoy a few moments of mid-summer levity. Of course many students and faculty find humor inside their offices as well. No, it's not finals or faculty meetings I'm referring too, but comic strips. (Who says adults don't like comics?) While some academic comics poke fun at specific aspects of academia, such as those posted weekly on the Academic Keys website (http://www.academickeys.com/all/cartoon.php), one particularly noteworthy strip follows the lives and thesis progression of a handful of aspiring Ph.D.'s and their faculty advisor. Jorge Cham's *PhD Comics* (http://www.phdcomics.com) mixes fictional cartoon characters with the realities of graduate life in a movingly realistic and comically uplifting manner.

"Piled Higher and Deeper" by Jorge Cham, www.phdcomics.com

Created while Cham was a graduate student at Stanford University, his *PhD Comics* is "the popular comic strip about life (or the lack thereof) in grad school." To Cham's great credit, however, the strip is not trite, as one might imagine. Instead, Cham addresses very real social and economic issues within the context of his comedic commentary including graduate student stipends, student-advisor interaction, affordable housing, dual-career couples, work-life-family constraints, and gender inequalities. The strip follows the fictional lives of five primary protagonists: Cecilia, an over-achieving engineering graduate student; Mike Slackenerny, the brilliant, yet procrastination-prone, career engineering graduate student with wife and child;

Tajel, Cecilia's roommate, a socially-conscious humanities graduate student; nameless guy, the hard-working, yet bottom of the research barrel engineering graduate student; and Professor Smith, general villain.

Gender representation amongst characters comprising the world of *PhD Comics* is statistically skewed in favor of women, a fact directly addressed in a comic dated 9/27/00. This conscious decision on the part of Cham to over-represent women is a reflection of his support of women in traditionally male-dominated fields. This sentiment is echoed by his character's dialogue: "I think the presence of strong female characters [in *PhD Comics*] provides positive role models for today's often-ignored women in academics." (9/27/2000).

Numerous comics, and specifically those which arise from the pairing of Cecilia and Tajel, allow for highlighting the sentiments of women in academia on topics such as dating (11/5/97, 4/15/98, 4/2/04, 2/3/05), the feeling of life being put-on-hold for graduate school (11/28/01, 9/17/02, 2/8/03, 12/8/04, 9/9/05, 3/9/06), the stresses associated with the underrepresentation of women in science and engineering, such as general awkwardness from excessive attention (11/9/98, 9/10/01, 6/6/05), post-graduation earnings disparities (10/25/01), feeling the need to represent womankind (4/10/98), and general bucking of traditional gender roles (10/22/05). Additionally, the character of perpetual-student Mike and his family highlight work-life issues encountered by many in academia (7/2/04, 3/8/05, 1/28/06). Cham's themes are enduringly supportive of women and families, providing hope and comedy in the confusing context of grad-life dating, offering reminders of why we sought an academic career in the first place, and highlighting sympathetic interactions between male and female graduate students as well as well-meaning faculty (even if the students of the strip don't see it that way).

Cecilia and Tajel provide a fictional support structure, even mentoring of sorts, for females entering graduate school through the sincere treatment of realistic aspects of their graduate life within the confines of a fictional existence. In many ways, the comic nature of his social commentary allows Cham to identify and specifically address key issues which may be far more subtle in everyday reality.

Even the student-vilified Professor Smith illustrates someone faculty may in some ways relate to, and in many respects learn from, in improving mentor-student interaction and enabling the best possible learning/researching environment for graduate student researchers. Dr. Cham's *PhD Comics* provides a sincere, yet light-hearted, medium through which to portray graduate student and faculty life.

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